The IEEE Thesaurus is a controlled vocabulary of almost 10,900 descriptive engineering, technical and scientific terms, as well as IEEE-specific society terms [referred to as “descriptors” or “preferred terms”]. Each descriptor included in the thesaurus represents a single concept or unit of thought. The descriptors are considered the preferred terms for use in describing IEEE content. The scope of descriptors is based on the material presented in IEEE journals, conference papers, standards, and/or IEEE organizational material. A controlled vocabulary is a specific terminology used in a consistent and controlled fashion that results in better information searching and retrieval.

Thesaurus construction is based on the ANSI/NISO Z39.19-2005(2010) standard, Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabulary. The Thesaurus vocabulary uses American-based spellings with cross references to British variant spellings. The scope and structure of the IEEE Thesaurus reflects the engineering and scientific disciplines that comprise the Societies, Councils, and Communities of the IEEE in addition to the technologies IEEE serves.

IEEE has developed its controlled vocabulary through consultation with subject matter experts (specialists in a particular field) and specialists in information analysis. The IEEE Thesaurus thus provides a controlled vocabulary of subject headings to help people categorize or search for engineering and computing concepts, especially IEEE published content.

The IEEE Thesaurus also provides a conceptual map through the use of semantic relationships such as broader terms (BT), narrower terms (NT), ‘used for’ relationships (USE/UF), and related terms (RT). These semantic relationships identify theoretical connections between terms. *Italic text denotes Non-preferred terms. Bold text is used for preferred headings.*

Abbreviations used in the Thesaurus:
- BT - Broader term
- NT - Narrower term
- RT - Related term
- USE - Use preferred term
- UF - Used for

*Refer to ANSI/NISO NISO Z39.19-2005 (R2010) Sections 5 through 8 for detailed information on controlled vocabularies, display formats, usage and spelling, and selection criteria for descriptors (http://www.niso.org/kst/reports/standards).
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
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<th>USE</th>
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<td>New Radio</td>
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</tbody>
</table>
### 3GPP Standards

**BT:** Standards publications  
**NT:** Long Term Evolution

### 3rd generation mobile communication

**USE:** 3G mobile communication

### 3rd generation partnership project

**USE:** 3GPP

### 4G mobile communication

**UF:** 4th generation mobile  
**BT:** Cellular technology  
Mobile communication  
**RT:** 3G mobile communication  
5G mobile communication  
Cellular radio  
Enhanced mobile  
**broadband**  
Long Term Evolution  
Next generation networking  
Radio access networks  
Spread spectrum  
**communication**  
Telecommunication  
**computing**  
Time division synchronous  
**code division multiple access**

### 5G mobile communication

**USE:** 5G mobile communication  
**systems**  
5th generation systems  
5th generation wireless  
**systems**  
**BT:** Cellular technology  
Mobile communication  
**RT:** 4G mobile communication  
6G mobile communication  
Cellular radio  
Land mobile radio  
Next generation networking  
Tactile Internet

### 5G mobile communication

**USE:** 5G mobile communication  
**systems**  
5th generation systems  
5th generation wireless  
**systems**  
**BT:** Cellular technology  
Mobile communication  
**RT:** 4G mobile communication  
6G mobile communication  
Cellular radio  
Land mobile radio  
Next generation networking  
Tactile Internet

### 6G mobile communication

**USE:** Mobile communication  
**RT:** 5G mobile communication  
Cellular radio

### 2021 IEEE Thesaurus

**Ultra-dense networks**  
**NT:** Enhanced mobile  
broadband  
New Radio

### 5th generation mobile systems

**USE:** 5G mobile communication

### 5th generation systems

**USE:** 5G mobile communication

### 5th generation wireless systems

**USE:** 5G mobile communication

### 802.11

**USE:** IEEE 802.11 Standard

### 802.11ax

**USE:** IEEE 802.11ax Standard

### 802.11e

**USE:** IEEE 802.11e Standard

### 802.11g

**USE:** IEEE 802.11g Standard

### 802.11n

**USE:** IEEE 802.11n Standard

### 802.15

**USE:** IEEE 802.15 Standard

### 802.16

**USE:** IEEE 802.16 Standard

### 802.3

**USE:** IEEE 802.3 Standard

### 8K UHD

**USE:** UHDTV

### 9/11

**USE:** Terrorism

### 9/11 attack

**USE:** Terrorism

### 911 attack

**USE:** Terrorism
A/D
USE: Analog-digital conversion

A/D conversion
USE: Analog-digital conversion

A/D converter
USE: Analog-digital conversion

AAL
USE: Ambient assisted living

ABC algorithms
USE: Artificial bee colony

Abdomen
BT: Body regions

Abrasive water jet cutting
USE: Water jet cutting

Abrasives
BT: Production materials

Absorption
BT: Materials science and technology
RT: Semiconductor detectors

Abstract algebra
BT: Algebra
NT: Galois fields
Modules (abstract algebra)

Abstracts
BT: Writing
RT: Information retrieval
Information services

AC generators
UF: Alternating current generators
BT: Generators
RT: Pulse width modulation
NT: Induction generators
Synchronous generators

AC light emitting diode lamps
USE: LED lamps

AC machines
UF: Alternating current machines
BT: Electric machines

AC-AC converters
RT: Pulse width modulation
Sensorless control
Windings

AC motors
UF: Alternating current motors
BT: AC machines
Motors
RT: Pulse width modulation
Pulse width modulation inverters
Space vector pulse width modulation
NT: Hysteresis motors
Induction motors

AC-AC converters
UF: AC-AC convertors
BT: AC-AC power conversion
Converters
Power conversion
RT: AC machines

AC-AC power conversion
USE: AC-AC converters

AC-DC power converters
UF: AC-DC power convertors
AC/DC power converters
Analog-to-digital converter
Analog-to-digital convertor
BT: Power conversion
RT: Machine vector control
Pulse width modulation inverters
Voltage multipliers
Voltage-source converters
NT: Rectifying circuits

AC-DC power convertors
USE: AC-DC power converters

AC-LED lamps
USE: LED lamps

AC/DC power converters
USE: AC-DC power converters
Accelerated aging
BT: Aging
Materials testing

Accelerated computing
USE: Hardware acceleration

Accelerated testing
USE: Life estimation

Acceleration
BT: Mechanical factors
RT: Accelerometers
Gravity

Acceleration measurement
USE: Accelerometers

Accelerator architectures
BT: Computer architecture

Accelerator beams
USE: Particle beams

Accelerator magnets
BT: Magnetic devices
Particle accelerators

Accelermeters
UF: Acceleration measurement
BT: Measurement
RT: Acceleration
Fall detection

Access charges
BT: Economics
Multiaccess communication

Access control
BT: Security
RT: Biometrics (access control)
Building services
Capability-based security
Communication system

security
Computer security
Countermeasures

(computer)
Identification of persons
Smart cards
Trust management
Whitelists

NT: Authorization
Blacklistung
Multi-factor authentication

Access point base station
USE: Femtocell networks

Access protocols
BT: Protocols
RT: CAPTCHAs
NT: Media Access Protocol

Access rights
USE: Permission

Accident prevention
BT: Industry applications
RT: Explosion protection
Preventive maintenance
Risk analysis
Safety devices

NT: Accidents

Accidents
BT: Accident prevention
RT: Domestic safety
Electric shock
Emergency services
Explosions
Fires
Hazardous areas
Occupational health
Occupational safety
Oil pollution
Product safety
Risk analysis

NT: Aerospace accidents
Electrical accidents
Industrial accidents
Marine accidents
Railway accidents
Road accidents

Accreditation
BT: Educational programs
RT: Conformance testing
Training

Accuracy
BT: Mathematics

Acoustic applications
UF: Ultrasonic applications
BT: Acoustics
RT: Acoustic measurements
Biomedical acoustics
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
</table>
| **Acoustic communication (telecommunication)** | BT: Acoustic applications  
RT: Telecommunication  
services |
| **Acoustic beams** | BT: Beams  
RT: Mobile communication  
OFDM  
Wireless networks |
| **Acoustic devices** | UF: Ultrasonic devices  
BT: Acoustics  
RT: Piezoelectric devices  
NT: Acoustic waveguides  
Acousto-optical devices  
Acousto-electric devices  
Bulk acoustic wave devices  
Film bulk acoustic resonators  
Surface acoustic wave devices |
| **Acoustic diffraction** | BT: Acoustic propagation |
| **Acoustic distortion** | BT: Distortion  
RT: Acoustic noise  
Acoustic signal processing  
Loudspeakers  
Nonlinear acoustics |
| **Acoustic distortion measurement** | USE: Distortion measurement |
| **Acoustic emission** | BT: Acoustics  
RT: Acoustic noise  
Acoustic testing  
Nondestructive testing |
| **Acoustic field** | BT: Acoustics |
| **Acoustic imaging** | BT: Acoustic applications  
RT: Acoustic testing  
Oceanographic techniques |
| **Acoustic materials** | UF: Acoustic metamaterials  
BT: Materials  
RT: Piezoelectric materials |
| **Acoustic measurements** | BT: Measurement  
RT: Acoustic applications  
Acoustic testing  
Anechoic chambers  
Biomedical acoustics  
Frequency measurement  
Phase measurement  
Seismic measurements  
Wavelength measurement |
| **Acoustic metamaterials** | USE: Acoustic materials AND  
Metamaterials |
| **Acoustic noise** | UF: Audible noise  
BT: Acoustics  
RT: Acoustic distortion  
Acoustic emission  
Acoustic signal detection  
Environmental factors  
Mechanical factors  
Vibrations  
NT: Background noise  
Noise cancellation  
Noise level  
Noise reduction  
Working environment noise |
| **Acoustic phonetics** | BT: Acoustics  
Phonetics |
| **Acoustic propagation** | BT: Acoustics  
RT: Acoustic pulses  
Waves  
NT: Acoustic diffraction  
Acoustic pulses |

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2021 IEEE Thesaurus

Acoustic reflection
BT: Reflection
RT: Acoustic scattering

Acoustic refraction
BT: Acoustic waves

Acoustic scattering
BT: Scattering
RT: Acoustic reflection
Waves

Acoustic sensors
BT: Sensors

Acoustic signal detection
BT: Signal detection
RT: Acoustic noise
NT: Sonar detection

Acoustic signal processing
UF: Audio enhancement
BT: Signal processing
RT: Acoustic arrays
Acoustic distortion
Acoustic transducers
NT: Active noise reduction
Speech processing

Acoustic surface waves
USE: Surface acoustic waves

Acoustic testing
BT: Acoustic applications
Materials testing
RT: Acoustic emission
Acoustic imaging
Acoustic measurements
Photoacoustic effects

Acoustic transducers
BT: Transducers
RT: Acoustic signal processing
Array signal processing
NT: Acoustic arrays

Acoustic wave attenuation
USE: Acoustic waves AND
Attenuation

Acoustic waveguides
BT: Acoustic devices
Acoustic waves
UF: Acoustic wave attenuation
BT: Acoustics
RT: Seismic waves
NT: Acoustic refraction
Acoustoelectric effects
Surface acoustic waves

Acoustical engineering
BT: Engineering - general

Acoustics
UF: Ultrasonics
BT: Physics
RT: Acoustoelectric effects
Fourier transforms
Magnetoacoustic effects
Phonons
Resonators
Vibrations
NT: Acoustic applications
Acoustic devices
Acoustic emission
Acoustic field
Acoustic noise
Acoustic phonetics
Acoustic propagation
Acoustic pulses
Acoustic waves
Acoustooptic effects
Biomedical acoustics
Cepstral analysis
Music
Nonlinear acoustics
Psychoacoustics
Reverberation
Spectral shape
Underwater acoustics

Acousto-optic devices
USE: Acousto-optical devices

Acousto-optical devices
UF: Acousto-optic devices
BT: Acoustooptic devices
RT: Acoustic devices

Acoustoelectric devices
UF: Electroacoustic devices
BT: Acoustic devices
RT: Acoustoelectric effects
Piezoelectric devices
Pulsed electroacoustic methods

Surface acoustic wave devices

**Acoustoelectric effects**
- **UF:** Electroacoustic effects
- **BT:** Acoustic waves
  - Electric fields
- **RT:** Acoustics
  - Acoustoelectric devices
  - Semiconductor materials
- **NT:** Pulsed electroacoustic methods

**Acoustomagnetic effects**
- **USE:** Magnetoacoustic effects

**Acoustooptic devices**
- **USE:** Acousto-optical devices

**Acoustooptic effects**
- **BT:** Acoustics
- **RT:** Acousto-optical devices
- **NT:** Piezooptic effects

**Acquired immune deficiency syndrome**
- **UF:** AIDS
  - Acquired immunodeficiency syndrome
- **BT:** Diseases
- **RT:** Human immunodeficiency virus

**Actinium**
- **BT:** Chemical elements

**Action potentials**
- **UF:** Bioelectric potentials
- **BT:** Physiology
- **RT:** Axons
  - Membrane potentials
  - Neurons
  - White matter

**Activated sludge process**
- **USE:** Sludge treatment

**Activation analysis**
- **BT:** Chemical analysis

**Active appearance model**
- **BT:** Computer vision

**Active circuits**
- **BT:** Circuits
  - Active inductors
    - Gyrators
  - Operational amplifiers

**Active contours**
- **BT:** Motion analysis

**Active distribution networks**
- **BT:** Power distribution networks

**Active disturbance rejection control**
- **USE:** Robust control

**Active filters**
- **BT:** Filters
  - Band-pass filters

**Active inductors**
- **BT:** Active circuits
  - Inductors
- **RT:** Gyrators
  - Integrated circuits
  - MOSFET circuits

**Active matrix addressing**
- **BT:** Active matrix technology

**Active matrix liquid crystal displays**
- **UF:** AMLCDs
  - Active-matrix liquid-crystal displays
  - **BT:** Active matrix technology
  - Liquid crystal displays

**Active matrix organic LEDs**
- **USE:** Active matrix organic light emitting diodes

**Active matrix organic light emitting diodes**
- **UF:** AMOLEDs
  - Active matrix organic LEDs
  - Active matrix organic light-emitting diodes
  - **BT:** Active matrix technology
  - Organic light emitting diodes
Active matrix technology
  UF: Active-matrix
  BT: Displays
  NT: Active matrix addressing
      Active matrix liquid crystal displays
  emitting diodes
      Active matrix organic light emitting diodes
      Thin film transistors

Active networking
  BT: Network architecture

Active noise reduction
  BT: Acoustic signal processing
      Noise reduction
  NT: Echo cancellers

Active perception
  BT: Psychology
  RT: Cognition
  Control systems
  Sensor fusion

Active pixel sensors
  BT: Image sensors

Active RFID tags
  BT: RFID tags

Active shape model
  BT: Image processing
  Pattern recognition

Active-matrix
  USE: Active matrix technology

Active-matrix liquid-crystal displays
  USE: Active matrix liquid crystal displays

displays

Activities
  USE: IEEE activities

Activity recognition
  BT: Cognition
  Pattern recognition
  Sensor systems
  Computer vision

Actuators
  UF: Dielectric electroactive polymer actuators
  Electroactive polymer
  Electrostrictive polymer
  Ionomeric polymer-metal composite actuators
  Nanoactuators
  BT: Control equipment
  RT: Control systems
  Servomechanisms
  Servosystems
  Shape memory alloys
  Dielectric elastomer actuators
  Electrostatic actuators
  Electrothermal actuators
  Hydraulic actuators
  Intelligent actuators
  Microactuators
  Piezoelectric actuators
  Pneumatic actuators

Ad hoc networks
  BT: Computer networks
  RT: Cross layer design
  Data communication
  Land mobile radio
  Mobile computing
  Multicast communication
  Protocols
  Wireless LAN
  Wireless sensor networks
  NT: AODV
  Mesh networks
  Mobile ad hoc networks
  Vehicular ad hoc networks

Ad hoc On Demand Distance Vector
  USE: AODV

Adaptation models
  BT: Adaptive algorithms

Adaptive algorithms
  BT: Algorithms
  NT: Adaptation models

Adaptive antenna arrays
  USE: Adaptive arrays

Adaptive arrays
  UF: Adaptive antenna arrays
  BT: Antenna arrays
  RT: Adaptive signal detection
  Array signal processing
## 2021 IEEE Thesaurus

### Radar countermeasures
- Radio communication

### Adaptive codes
- USE: Adaptive coding

### Adaptive coding
- UF: Adaptive codes
- BT: Data compression

### Adaptive control
- UF: Self-tuning regulators
- BT: Adaptive systems
- RT: Cognitive systems
- Control systems
- Disturbance observers
- Iterative learning control

### Adaptive equalisers
- USE: Adaptive equalizers

### Adaptive equalizers
- UF: Adaptive equalisers
- BT: Equalizers

### Adaptive estimation
- BT: Statistics

### Adaptive filters
- BT: Adaptive signal processing

### Adaptive learning
- BT: Education
- RT: Distance learning
- Human computer interaction
- User interfaces

### Adaptive mesh refinement
- BT: Numerical analysis

### Adaptive optics
- BT: Optics

### Adaptive scheduling
- BT: Scheduling
- RT: Adaptive systems
- Production control

### Adaptive signal detection
- BT: Adaptive signal processing
- RT: Adaptive arrays
- Blind source separation
- Source separation

### Adaptive signal processing
- BT: Signal processing
- NT: Adaptive filters
- Adaptive signal detection

### Adaptive systems
- BT: Cybernetics
- Systems engineering and theory
- RT: Adaptive scheduling
- Learning systems
- Neural networks
- NT: Adaptive control
- Cognitive radar
- Line enhancers
- Multi-agent systems
- Variable structure systems

### ADAS
- USE: Advanced driver assistance systems

### Add-drop multiplexers
- BT: Multiplexing equipment
- NT: Optical add-drop multiplexers

### Added delay
- BT: Delay systems

### Adders
- BT: Circuits
- RT: Digital integrated circuits
- Logic circuits

### Additive manufacturing
- USE: Three-dimensional printing

### Additive metric
- USE: Maximum likelihood detection

### Additive noise
- BT: Noise
- NT: AWGN
- Additive white noise

### Additive white noise
- BT: Additive noise
- RT: Gaussian noise

### Additives
- UF: Fuel additives
- BT: Materials
2021 IEEE Thesaurus

RT: Production materials

Adenoviridae
USE: Adenoviruses

Adenoviruses
UF: Adenoviridae
BT: Microorganisms

Adhesive bonding
USE: Adhesives

Adhesive strength
BT: Materials testing

Adhesives
UF: Adhesive bonding
BT: Bonding
NT: Conductive adhesives
Nonconductive adhesives

Adiabatic
BT: Power electronics

Adjacent channel interference
USE: Interchannel interference

Admission control
BT: Quality of service
RT: Bandwidth

Admittance
UF: Electric admittance
BT: Electric variables
RT: Admittance measurement
Impedance

Admittance measurement
BT: Electric variables
RT: Admittance
Impedance measurement

Adsorption
BT: Surface morphology
RT: Interface phenomena
Molecular sieves
Surfactants

Advanced driver assistance systems
UF: ADAS
BT: Vehicle safety
RT: Collision avoidance
Intelligent vehicles
Vehicle-to-everything

Advanced Research Projects Agency Network
USE: ARPANET

Advanced TV
USE: HDTV

Advanced video coding
USE: Video coding

Adversarial machine learning
BT: Machine learning

Advertising
BT: Marketing management

Aerial robots
USE: Unmanned aerial vehicles

Aerodynamics
BT: Dynamics
Mechanical factors
RT: Aerospace control
Shock waves
Wind tunnels

Aerosols
BT: Electrostatic processes
RT: Liquids
Particle production
Spraying

Aerospace accidents
BT: Accidents
RT: Aerospace safety
Space vehicles
NT: Air accidents

Aerospace and electronic systems
RT: Auditory displays
Digital signal processing
Programming
Systems engineering and theory
NT: Aerospace control
Aerospace engineering
Aerospace materials
Aircraft manufacture
Aircraft navigation
Aircraft propulsion
Command and control

Advanced electronics
Electronic warfare
Military equipment
Radar
### Aerospace testing
**BT:** Aerospace engineering  
**Testing**  
**RT:** Aerospace simulation  
**NT:** Wind tunnels

### Affective computing
**BT:** Artificial intelligence  
**Human computer interaction**  
**RT:** Behavioral sciences  
Cognitive systems  
Emotion recognition  
Human factors  
Psychology  
User experience

### Affordances
**BT:** Object recognition  
Optimization methods  
**RT:** Interactive systems  
User interfaces  
Virtual reality

### Africa
**BT:** Continents

### Afterburners
**USE:** Incineration

### Ag
**USE:** Silver

### Age factors
**USE:** Aging

### Age of information
**USE:** Information age

### Aged
**USE:** Aging

### Ageing
**USE:** Aging

### Agent-based modeling
**BT:** Computational modeling  
Software agents  
**RT:** Multi-agent systems

### Aggregates
**BT:** Materials  
**RT:** Building materials

### Agile computing
**USE:** Agile software development

### Agile manufacturing
**BT:** Manufacturing systems  
**RT:** Computer integrated manufacturing  
Flexible manufacturing systems

### Agile software development
**UF:** Agile computing  
**BT:** Software development management  
**NT:** Scrum (Software development)

### Aging
**UF:** Age factors  
Aged  
**BT:** Materials science and technology  
**RT:** Ambient assisted living  
Assisted living  
Cataracts  
Electric breakdown  
Energy storage  
Gerontology  
Insulation life  
Life estimation  
Reliability  
Senior citizens  
**NT:** Accelerated aging

### Agricultural engineering
**BT:** Engineering - general  
**RT:** Agricultural machinery  
Agricultural robots  
Agriculture

### Agricultural machinery
**UF:** Combine harvesters  
Tractors  
**BT:** Machinery  
**RT:** Agricultural engineering  
Agriculture  
Applicators  
Blades  
**NT:** Agricultural robots

### Agricultural products
**BT:** Agriculture  
**RT:** Agricultural robots  
Food products  
Irrigation
AI chips

USE: AI accelerators

AIDS

USE: Acquired immune deficiency syndrome

Aids for the handicapped

USE: Assistive technology

AIEE Standards

BT: IEEE Standards

Air accidents

BT: Aerospace accidents

RT: Air safety

Air traffic control

Air bags

USE: Automotive components

Air cleaners

UF: Air filters

Air purifiers

BT: Machine components

RT: Air pollution

Cleaning

Purification

Air conditioning

BT: Cooling

RT: Building services

Air filters

USE: Air cleaners

Air gaps

UF: Air-gap

BT: Electromagnetic analysis

RT: Electrodes

Spark gaps

Air interface

USE: Communication channels

Air pollutants

USE: Air pollution

Agricultural robots

BT: Agricultural machinery

Robots

RT: Agricultural engineering

Agricultural products

Mobile robots

Unmanned vehicles

Agriculture

UF: Livestock

BT: Industries

RT: Agricultural engineering

Agricultural machinery

Animals

Dairy products

Food waste

Genetic engineering

Pest control

Soil pollution

Vegetation mapping

NT: Agricultural products

Aquaculture

Digital agriculture

Fertilizers

Greenhouses

Irrigation

AI

USE: Artificial intelligence

AI accelerators

UF: AI chips

Artificial intelligence chips

BT: Artificial intelligence

Microprocessor chips

RT: Application specific integrated circuits

coprocessors

Field programmable gate arrays

Graphics processing units

Learning (artificial intelligence)

Multiprocessing systems

Neural network hardware

Neural networks

Neuromorphic engineering

System-on-chip
### 2021 IEEE Thesaurus

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<tr>
<th>Air pollution</th>
<th>Aircraft</th>
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<tr>
<td><strong>UF:</strong> Air pollutants</td>
<td><strong>BT:</strong> Air transportation</td>
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<tr>
<td><strong>BT:</strong> Air quality</td>
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<tr>
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Machine learning

Matching pursuit algorithms
Maximum likelihood

Multicast algorithms
Parallel algorithms
Partitioning algorithms
Prediction algorithms
Projection algorithms
Pursuit algorithms
Signal processing

Software algorithms
Viterbi algorithm
Whale optimization

All optical networks

USE: All-optical networks

All-optical networks

UF: All optical networks
BT: Optical fiber networks

Allocation

USE: Resource management

Alloying

BT: Metals
RT: Aluminum alloys
Aluminum compounds
Barium compounds
Bismuth compounds
Calcium
Cobalt
Cobalt alloys
Copper alloys
Gallium alloys
Gallium compounds
Germanium alloys
Gold alloys
Hafnium compounds
Indium compounds
Iron alloys
Lithium
Lithium compounds
Neodymium alloys
Nickel alloys
Niobium alloys
Platinum alloys
Silicon alloys
Strontium compounds
Tin alloys
Titanium alloys

Yttrium compounds
Intermetallic
Shape memory alloys

Use: Metals

Alpha particles

BT: Nuclear physics
RT: Ions

Alphovoltaic power sources

USE: Radioactive materials

Alternating current generators

USE: AC generators

Alternating current machines

USE: AC machines

Alternating current motors

USE: AC motors

Alternators

BT: Electric machines
RT: Synchronous generators

Altimetry

BT: Pressure measurement
RT: Atmospheric measurements

Aluminium

USE: Aluminum

Aluminium alloys

USE: Aluminum alloys

Aluminium compounds

USE: Aluminum compounds

Aluminium industry

USE: Metals industry

Aluminium oxide

USE: Aluminum oxide

Aluminum

UF: Al

Aluminium

BT: Chemical elements

Metals

NT: Aluminum alloys

Aluminum compounds
## 2021 IEEE Thesaurus

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<th>Subject</th>
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2021 IEEE Thesaurus

BT: Materials
NT: Diamond-like carbon
Glass

Amorphous semiconductors
BT: Semiconductor materials
RT: Silicon
Thin film devices

Amorphous silicon
BT: Silicon

Amperometric sensors
BT: Electrochemical devices
Gas detectors

Amplifiers
BT: Signal processing
RT: Frequency response
Klystrons
Optical fiber amplifiers
Rail to rail amplifiers
Rail to rail operation
NT: Broadband amplifiers
Differential amplifiers
Distributed amplifiers
Low-noise amplifiers
Operational amplifiers
Power amplifiers
Preamplifiers
Pulse amplifiers
Radiofrequency amplifiers
Resonators

Amplify-and-forward cooperative communication
USE: Cooperative communication

Amplitude estimation
BT: Parameter estimation
RT: Reflection coefficient

Amplitude modulation
BT: Modulation
RT: Demodulation
Intensity modulation
NT: Amplitude shift keying
Quadrature amplitude
modulation

Amplitude shift keying
UF: ASK
BT: Amplitude modulation

Amygdala
UF: Amygdalae

Corpus amygdaloideum
BT: Brain

Amygdalae
USE: Amygdala

AN Project
USE: Ambient networks

Anaesthesia
USE: Anesthesia

Analog circuits
BT: Circuits
RT: Microwave circuits
Millimeter wave circuits
Neuromorphics
Submillimeter wave circuits
Switched capacitor networks
UHF circuits
VHF circuits
NT: Analog integrated circuits
Analog processing circuits

Analog CMOS integrated circuits
USE: CMOS analog integrated circuits

Analog computers
UF: Analogue computers
BT: Computers
RT: Summing circuits

Analog digital integrated circuits
USE: Analog-digital integrated circuits

Analog integrated circuits
UF: Analogue integrated circuits
BT: Analog circuits
Integrated circuits
RT: Analog processing circuits
MMICs
Microwave integrated circuits
Millimeter wave integrated circuits
Neural network hardware
Submillimeter wave integrated circuits
UHF integrated circuits
NT: CMOS analog integrated circuits
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<th>BT: Integrated circuits</th>
<th>NT: Mixed analog-digital integrated circuits</th>
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<td><strong>Analog-to-digital conversion</strong></td>
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<td><strong>Analogue digital integrated circuits</strong></td>
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<td><strong>Analytical hierarchy process</strong></td>
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2021 IEEE Thesaurus

Analytical models
BT: Modeling
RT: Neuroinformatics
NT: Common Information Model
(computing)

Anatomical structure
BT: Medical diagnostic imaging

Anatomy
BT: Biological systems
NT: Auditory system
Biological tissues
Body regions
Cardiovascular system
Circulatory system
Digestive system
Embryonic structures
Endocrine system
Fluids and secretions
Human anatomy
Immune system
Integumentary system
Lymphatic system
Musculoskeletal system
Nervous system
Neuroanatomy
Respiratory system
Sense organs
Stomatognathic system
Urogenital system

Android (operating system)
USE: Operating systems

Androids
BT: Robots
RT: Human factors
Man-machine systems

Anechoic chambers
BT: Test facilities
RT: Acoustic measurements
Antenna measurements
Electromagnetic
measurements
Immunity testing
TEM cells
Anemometers
USE: Fluid flow measurement

Anesthesia
UF: Anaesthesia

Anesthesiology
BT: Medical specialties

Anesthetic drugs
BT: Anesthesia

Aneurism
USE: Aneurysm

Aneurysm
UF: Aneurism
BT: Medical conditions

Angiocardiography
BT: Biomedical imaging
RT: Biomedical applications of
radiation

Angiography
UF: Arteriography
BT: Biomedical imaging

Angioplasty
BT: Medical treatment

Angular velocity
BT: Mechanical variables
measurement
RT: Velocity control
Velocity measurement

Angular velocity control
BT: Velocity control

Animal behavior
BT: Behavioral sciences

Animal structures
BT: Animals
NT: Beak
Feathers
Tail

Animals
BT: Organisms
Zoology
RT: Agriculture
Biological systems
Life sciences
NT: Animal structures
Birds
Bovine
2021 IEEE Thesaurus

Cats
Dinosaurs
Dogs
Horses
Insects
Marine animals
Mice
Rabbits
Rats
Rodents
Wildlife

Animation
UF: Computer animation
BT: Graphics
RT: Computer graphics
Visual effects
Visualization
NT: Facial animation

Animatronics
BT: Robotics and automation

Anisotropic
BT: Filters

Anisotropic conductive films
BT: Conductive films

Anisotropic diffusion
USE: Anisotropic magnetoresistance

Anisotropic effects
USE: Anisotropic magnetoresistance

Anisotropic magnetoresistance
UF: Anisotropic diffusion
Anisotropic effects
Anisotropic magnetoresistance sensors
Anisotropic material
Anisotropic processing
Anisotropically
Anisotropy
BT: Magnetoresistance

Anisotropic magnetoresistance sensors
USE: Anisotropic magnetoresistance

Anisotropic material
USE: Anisotropic magnetoresistance

Anisotropic processing
USE: Anisotropic magnetoresistance

Anisotropically
USE: Anisotropic magnetoresistance

Annealing
UF: Annealing temperature
BT: Heat treatment
Materials processing
RT: Simulated annealing
Softening
Thermal factors
NT: Rapid thermal annealing

Announcements
USE: IEEE news

Annotations
BT: Metadata
RT: Text analysis

Anomalies
USE: Outlier detection
BT: Data mining

ANOVA
USE: Analysis of variance

ANSI
UF: American National Institute of Standards
BT: Standards organizations
RT: ASA

ANSI Standards
BT: Standards publications
RT: ASA Standards
IEEE Standards
ISO Standards
NT: National Electric Code

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# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Ant colony optimization</th>
<th>Antenna theory</th>
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<tbody>
<tr>
<td>BT: Probability</td>
<td>BT: Antennas</td>
</tr>
<tr>
<td>RT: Graph theory</td>
<td>RT: Antenna radiation patterns</td>
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<table>
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<tr>
<th>Antarctica</th>
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<td>BT: Geoscience</td>
<td>NT: South Pole</td>
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<table>
<thead>
<tr>
<th>Antenna accessories</th>
<th>Antennas</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Antenna components</td>
<td>BT: Antennas feeds</td>
</tr>
<tr>
<td>BT: Antennas</td>
<td>RT: Antenna measurements</td>
</tr>
<tr>
<td>NT: Radomes</td>
<td>Beam steering</td>
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</table>

<table>
<thead>
<tr>
<th>Antenna arrays</th>
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<td>SIMO communication</td>
<td>Beam steering</td>
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<td>SISO communication</td>
<td>Butler matrices</td>
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<td>NT: Adaptive arrays</td>
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<td></td>
<td>Spatial diversity</td>
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<td>Waveguide theory</td>
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<table>
<thead>
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<table>
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<table>
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<tr>
<td>RT: Antennas</td>
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<table>
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<td>RT: Anechoic chambers</td>
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<table>
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<tr>
<td>RT: Antenna theory</td>
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<tr>
<td>NT: Near-field radiation pattern</td>
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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Antennas and propagation</th>
<th>Malware</th>
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<tr>
<td>Transmitting antennas</td>
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<td>UHF antennas</td>
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<tr>
<td>Yagi-Uda antennas</td>
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</table>

### Antibacterial

**USE:** Antibacterial activity

### Antibacterial activity

**UF:** Anti-bacterial
**BT:** Antibiotics

### Antibiotics

**UF:** Anti-biotics
**NT:** Anti-fungal
**BT:** Antibiotics

### Antidepressants

**BT:** Drugs

### Antiderivatives

**USE:** Integral equations

### Antiferroelectric materials

**USE:** Dielectric materials

### Antiferromagnetic materials

**BT:** Magnetic materials
**RT:** Antiferromagnetic resonance

### Antiferromagnetic resonance

**BT:** Magnetic resonance
**RT:** Antiferromagnetic materials

### Antifreeze

**USE:** Anti-freeze

### Anti-fungal

**USE:** Antifungal
**BT:** Antibiotics

### Antivirus software

**BT:** Software
**RT:** Computer viruses

### Anti-reflective coatings

**USE:** Antireflection coatings

### Antireflection coatings

**UF:** Anti-reflective coatings
**BT:** Coatings

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<table>
<thead>
<tr>
<th>Term</th>
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<tr>
<td>Optical reflection</td>
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<td>Antireflective coatings</td>
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<tr>
<td>Antireflection coatings</td>
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<td>AODV</td>
<td>Ad hoc On Demand</td>
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<td>AOI</td>
<td>Information age</td>
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<td>Apache hadoop</td>
<td>Cluster computing</td>
<td></td>
</tr>
<tr>
<td>Apache spark</td>
<td>Cluster computing</td>
<td></td>
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<td>APCVD</td>
<td>Atmospheric pressure</td>
<td></td>
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<tr>
<td>chemical vapor deposition</td>
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<tr>
<td>APDs</td>
<td>Avalanche photodiodes</td>
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<td>Apertures</td>
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<tr>
<td>BT: Apertures</td>
<td>RT: Aperture coupled antennas</td>
<td>Reflector antennas</td>
</tr>
<tr>
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<tr>
<td>RT: Antenna feeds</td>
<td>Antenna feeds</td>
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<td>RT: Antenna feeds</td>
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<td>RT: Antenna feeds</td>
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<td>Reflector antennas</td>
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<td>RT: Couplers</td>
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<td>NT: Aperture antennas</td>
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<td>Aperture coupled antennas</td>
<td>NT: Aperture antennas</td>
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<td>Appearance matching</td>
<td>Image matching</td>
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<td>Appliances</td>
<td>Home appliances</td>
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<tr>
<td>Application programming interfaces</td>
<td>Mobile application</td>
<td></td>
</tr>
<tr>
<td>BT: Computer interfaces</td>
<td></td>
<td></td>
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<tr>
<td>Application security</td>
<td>Computer security</td>
<td></td>
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<tr>
<td>Application software</td>
<td>Software</td>
<td></td>
</tr>
<tr>
<td>Application specific integrated circuits</td>
<td>Custom integrated circuits</td>
<td>Semicustom integrated circuits</td>
</tr>
<tr>
<td>BT: Circuits</td>
<td>Integrated circuits</td>
<td></td>
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<tr>
<td>Application specific processors</td>
<td>Program processors</td>
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<td>Application virtualization</td>
<td>Cross platform virtualization</td>
<td>Cross-platform virtualization</td>
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<tr>
<td>BT: Computer applications</td>
<td>Emulation</td>
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<tr>
<td>Application virtualization</td>
<td>Network function</td>
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<tr>
<td>virtualization</td>
<td>Simulation</td>
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<td>Applicators</td>
<td>Production equipment</td>
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<td>BT: Agricultural machinery</td>
<td>RT: Agricultural machinery</td>
<td>Labeling</td>
</tr>
<tr>
<td>Appraisal</td>
<td>Human resource</td>
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<tr>
<td>BT: Management</td>
<td>RT: Incentive schemes</td>
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<tr>
<td>Appropriate technology</td>
<td>Technology</td>
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</tr>
<tr>
<td>BT: Technology</td>
<td>RT: Microhydro power</td>
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<tr>
<td>Approximate computing</td>
<td>Microhydro power</td>
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<tr>
<td>Approximation</td>
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</table>
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT:</th>
<th>Computers and information processing</th>
<th>USE: Arc discharges</th>
</tr>
</thead>
</table>
| **Approximation algorithms** | | \begin{itemize} 
  \item Arc lamps
  \item Arc-flash
\end{itemize}

<table>
<thead>
<tr>
<th>BT:</th>
<th>Algorithms</th>
</tr>
</thead>
</table>
| **Approximation error** | | \begin{itemize} 
  \item Arc discharges
\end{itemize}

<table>
<thead>
<tr>
<th>BT:</th>
<th>Approximation methods</th>
</tr>
</thead>
</table>
| **Approximation methods** | | \begin{itemize} 
  \item Approximation theory
  \item Numerical analysis
  \item Least squares approximations
  \item Minimization methods
  \item Signal representation
  \item Approximation error
  \item Chebyshev approximation
  \item Curve fitting
  \item Extrapolation
  \item Function approximation
  \item Interpolation
  \item Linear approximation
  \item Mean square error methods
  \item Perturbation methods
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Approximation methods</th>
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</thead>
<tbody>
<tr>
<td><strong>Approximation theory</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>BT:</th>
<th>Architecture</th>
</tr>
</thead>
</table>
| **Architecture** | | \begin{itemize} 
  \item Industries
  \item Building information management
  \item Buildings
  \item Structural engineering
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Architectural description languages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture (computer)</strong></td>
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</table>

<table>
<thead>
<tr>
<th>BT:</th>
<th>Agriculture</th>
</tr>
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| **Aquaculture** | | \begin{itemize} 
  \item Fisheries
  \item Marine animals
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Architecture description languages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture (computer)</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>BT:</th>
<th>Geoscience</th>
</tr>
</thead>
</table>
| **Arctic** | | \begin{itemize} 
  \item North Pole
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Area measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arctic</strong></td>
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</table>

<table>
<thead>
<tr>
<th>BT:</th>
<th>Gases</th>
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| **Argon** | | \begin{itemize} 
  \item Ar
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Artificial intelligence chips</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Artificial intelligence chips</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>BT:</th>
<th>Mathematics</th>
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</table>
| **Arithmetic** | | \begin{itemize} 
  \item Digital arithmetic
  \item Fixed-point arithmetic
  \item Floating-point arithmetic
\end{itemize}

<table>
<thead>
<tr>
<th>BT:</th>
<th>Electromechanical devices</th>
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</table>
| **Armature** | | \begin{itemize} 
  \item Electromechanical devices
\end{itemize}

<table>
<thead>
<tr>
<th>USE: Arm pit</th>
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</thead>
</table>
2021 IEEE Thesaurus

USE: Axilla

Arms
BT: Extremities
NT: Wrist

Arms (robotic)
USE: Manipulators

ARPANET
UF: Advanced Research Projects Agency Network
BT: Communication systems
RT: Internet
Packet switching

ARQ
USE: Automatic repeat request

Array
USE: Arrays

Array processing
USE: Arrays AND Parallel processing

Array signal processing
UF: Beamforming
BT: Signal processing
RT: Acoustic arrays
Acoustic transducers
Adaptive arrays
Blind source separation
Direction-of-arrival estimation
Signal resolution
Source separation
Time of arrival estimation

Arrayed waveguide gratings
UF: AWG device
BT: Optical waveguides
RT: Demultiplexing
Integrated optics
Multiplexing

Arrays
USE: Array
Array processing
BT: Data structures
NT: Sensor arrays

Arresters
BT: Surge protection

Arsenic
BT: Chemical elements
NT: Arsenic compounds

Arsenic compounds
UF: Arsenite
Arsine
BT: Arsenic

Arsenite
USE: Arsenic compounds

Arsine
USE: Arsenic compounds

Art
BT: Graphics
RT: Computer graphics
Layout
Photorealism
NT: Digital art
Fractal art

Arterial blood circulation
BT: Arteries

Arterial blood pressure
BT: Arteries

Arterial occlusion
BT: Arteries

Arterial pressure
USE: Blood pressure

Arterial wall structures
USE: Arteries

Arterial walls
USE: Arteries

Arteries
USE: Arterial wall structures
Arterial walls
Artery
BT: Blood vessels
NT: Arterial blood circulation
Arterial blood pressure
Arterial occlusion
Carotid arteries

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<table>
<thead>
<tr>
<th>Arteriography</th>
<th>USE: Angiography</th>
<th>Artificial neural networks</th>
<th>BT: Neural networks</th>
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<tbody>
<tr>
<td><strong>Arteriosclerosis</strong></td>
<td>BT: Diseases</td>
<td>Artificial organs</td>
<td>NT: Convolutional neural networks</td>
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<tr>
<td>NT: Atherosclerosis</td>
<td>Coronary arteriosclerosis</td>
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<tr>
<td><strong>Artery</strong></td>
<td>USE: Arteries</td>
<td>Artificial limbs</td>
<td>BT: Artificial biological organs</td>
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<tr>
<td><strong>Arthritis</strong></td>
<td>BT: Diseases</td>
<td></td>
<td>Prosthetics</td>
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<td><strong>Artificial bee colony algorithm</strong></td>
<td>UF: ABC algorithms</td>
<td>NT: AI accelerators</td>
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<td>BT: Algorithms</td>
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<td>Affective computing</td>
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<td>RT: Cooperative systems</td>
<td></td>
<td>Autonomous robots</td>
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<tr>
<td>Optimization</td>
<td></td>
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<td>Search problems</td>
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<td>Context awareness</td>
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<tr>
<td><strong>Artificial biological organs</strong></td>
<td>UF: Artificial organs</td>
<td></td>
<td>Cooperative systems</td>
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<td>BT: Prosthetics</td>
<td>NT: Knowledge based systems</td>
<td></td>
<td>Decision support systems</td>
</tr>
<tr>
<td>RT: Biological systems</td>
<td>NT: Knowledge engineering</td>
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<tr>
<td>NT: Artificial heart</td>
<td>Learning (artificial intelligence)</td>
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<td>Artificial limbs</td>
<td></td>
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<td><strong>Artificial fibers</strong></td>
<td>USE: Synthetic fibers</td>
<td>Artificial limbs</td>
<td>BT: Artificial biological organs</td>
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<td>Prosthetics</td>
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<td>BT: Artificial biological organs</td>
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<td><strong>Artificial immune systems</strong></td>
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<td>Artificial organs</td>
<td>USE: Artificial biological organs</td>
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<td><strong>Artificial intelligence</strong></td>
<td>UF: AI</td>
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<tr>
<td>BT: Computational and artificial intelligence</td>
<td>NT: Convolutional neural networks</td>
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<tr>
<td>RT: Autonomous automobiles</td>
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<td>Feedforward neural networks</td>
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<td>Generative adversarial networks</td>
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<td>Independent component analysis</td>
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<tr>
<td><strong>Artificial satellites</strong></td>
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<table>
<thead>
<tr>
<th>Term</th>
<th>RT:</th>
<th>NT:</th>
<th>USE:</th>
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<tbody>
<tr>
<td>Satellite communication</td>
<td>Satellites</td>
<td>Earth Observing System</td>
<td>Program processors</td>
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<td>Low earth orbit satellites</td>
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<td>American Standards</td>
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<td>Space stations</td>
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<td>Amplitude shift keying</td>
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<td>Assistive devices</td>
<td>Assistive technology</td>
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<td>Rehabilitation robotics</td>
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<tr>
<td>Assistive technologies</td>
<td>Fall detection</td>
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</table>
Assistive technology

UF: Aids for the handicapped
Handicapped aids
Biomedical equipment
Communication aids
Gaze tracking
Gerontechnology
Medical control systems
Orthotics
Prosthetics
Rehabilitation robotics
Sensory aids
Sign language
Wearable robots

NT: Assistive devices
Closed captioning
Video description
Wheelchairs

Association rules

BT: Data mining

Associative memory

UF: Content addressable memory

BT: Memory

RT: Neural networks

Associative processing

BT: Data processing

RT: Computers and information processing

Astatine

BT: Chemical elements

Asthma

USE: Respiratory system

Astrochemistry

UF: Planetary chemistry

BT: Chemistry

Astronomy

BT: Science - general

RT: Extraterrestrial measurements

Gamma-ray detectors
Telescopes

NT: Astrophysics

Extrasolar planets
Gravitational waves
Observatories
Radio astronomy

Astrophysics

BT: Astronomy

Physics

RT: Gravity measurement

Dark matter

Orbits

Stellar dynamics

Asymptotic stability

BT: System analysis and design

Discrete-time systems

Eigenvalues and eigenfunctions

Stability

Asynchronous circuits

BT: Circuits

Asynchronous communication

BT: Data communication

Web services

Asynchronous transfer mode

BT: Data communication

Protocols

B-ISDN

Broadband communication

ISDN

Multiprotocol label switching

SONET

Atherosclerosis

BT: Arteriosclerosis

Atmosphere

BT: Geoscience

Atmospheric measurements

Meteorology

Air quality

Atmospheric modeling

Atmospheric waves

Atmospheric measurements

BT: Measurement

Air pollution

Air quality

Altimetry

Atmosphere

Geophysical measurements

Global warming

Meteorology
2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Pressure gauges</td>
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<td>Remote sensing</td>
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<td>Terrestrial atmosphere</td>
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<td>Modeling</td>
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<tr>
<td><strong>Atmospheric pressure chemical vapor deposition</strong></td>
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<tr>
<td>UF: APCVD</td>
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<tr>
<td>BT: Chemical vapor deposition</td>
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<td><strong>Atmospheric sintering</strong></td>
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<td>USE: Materials preparation</td>
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<td><strong>Atmospheric-pressure plasmas</strong></td>
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<tr>
<td>UF: Single atom lasers</td>
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<td>BT: Lasers</td>
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<tr>
<td>RT: Atom optics</td>
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<td>Atomic beams</td>
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<td>Gas lasers</td>
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<tr>
<td><strong>Atom optics</strong></td>
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<tr>
<td>UF: Atomic optics</td>
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<tr>
<td>BT: Particle beam optics</td>
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<tr>
<td>RT: Atom lasers</td>
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<tr>
<td>Atomic beams</td>
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<td><strong>Atomic batteries</strong></td>
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<tr>
<td>UF: Nuclear batteries</td>
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<tr>
<td>BT: Tritium batteries</td>
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<tr>
<td>Conversion</td>
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<tr>
<td>Nuclear power generation</td>
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<tr>
<td>NT: Radioisotope thermoelectric generators</td>
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<tr>
<td><strong>Atomic beams</strong></td>
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<tr>
<td>BT: Particle beams</td>
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<tr>
<td>RT: Atom lasers</td>
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<tr>
<td>Atom optics</td>
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<tr>
<td><strong>Atomic clocks</strong></td>
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<tr>
<td>UF: Atomic frequency standards</td>
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<tr>
<td>BT: Clocks</td>
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<tr>
<td>RT: Frequency measurement</td>
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<tr>
<td>International Atomic Time</td>
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<td>Masers</td>
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<td>USE: Nuclear power generation</td>
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<tr>
<td>BT: Microscopy</td>
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<tr>
<td>RT: Casimir effect</td>
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<tr>
<td>Magnetic force microscopy</td>
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<td>Nanotechnology</td>
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<td>Scanning microwave</td>
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<td>microscopy</td>
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<td><strong>Atomic frequency standards</strong></td>
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<td>USE: Atomic clocks</td>
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<td><strong>Atomic lasers</strong></td>
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<tr>
<td>USE: Gas lasers</td>
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<td><strong>Atomic layer deposition</strong></td>
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<td>BT: Chemical vapor deposition</td>
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<td>BT: Measurement</td>
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<td>Radiation detectors</td>
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<tr>
<td>USE: Atom optics</td>
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<td><strong>ATPG</strong></td>
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<tr>
<td>USE: Automatic test pattern generation</td>
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<td><strong>Atrial fibrillation</strong></td>
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<td>BT: Fibrillation</td>
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<td><strong>Atrophy</strong></td>
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<tr>
<td>BT: Medical conditions</td>
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<td><strong>Attenuation</strong></td>
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<tr>
<td>USE: Acoustic wave attenuation</td>
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<td>Light attenuation</td>
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<td>Propagation</td>
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<td>Attenuation measurement</td>
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<td>Attenuators</td>
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<td>Diagnostic radiography</td>
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<td>Insertion loss</td>
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<td>BT: Electric variables</td>
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<td>Topic</td>
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<td>Loss measurement</td>
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<td>Audio enhancement</td>
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<td>AND</td>
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<td>Audio visual systems</td>
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<td>USE: Position measurement</td>
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<td>Audio watermarking</td>
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<td>USE: Watermarking</td>
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<td>Audio-visual instructional aids</td>
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<td>USE: Educational technology</td>
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<tr>
<td>Audio-visual systems</td>
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<tr>
<td>UF: Audio visual systems</td>
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<tr>
<td>BT: Audio systems</td>
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<td>RT: Educational technology</td>
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<td>USE: Audio-visual systems</td>
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<td>Auditory displays</td>
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<tr>
<td>BT: Audio systems</td>
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<tr>
<td>RT: Communication equipment</td>
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<tr>
<td>systems</td>
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<tr>
<td>Auditory icons</td>
<td></td>
</tr>
<tr>
<td>USE: Audio user interfaces</td>
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<tr>
<td>Auditory implants</td>
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</tr>
<tr>
<td>UF: Auditory midbrain implants</td>
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<tr>
<td>BT: Implants</td>
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<tr>
<td>Auditory midbrain implants</td>
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</table>
2021 IEEE Thesaurus

USE: Auditory implants
Multimedia systems
Web design

Audit: Auditory system

UF: Hearing
BT: Anatomy
RT: Biomedical acoustics
Chatbot
Head
Hearing aids
Psychoacoustics
NT: Psychoacoustic models

Authorization
USE: Authoring systems

Authorisation
USE: Authorization

Auto: Augmented reality

BT: Programming
Virtual reality
Digital representation
Digital transformation
Digital twin
Extended reality
Mixed reality
Network slicing
NT: 3D audio
Immersive audio
Immersive experience
Spatial augmented reality
X reality

Autism
BT: Medical conditions

Auto: Augmented virtuality

BT: Virtual reality

Austenite

UF: Gamma phase iron
BT: Iron alloys
RT: Materials science and technology
Smart materials

Australia

BT: Continents

Authentication

BT: Computer security
Blockchain
CAPTCHAs
Image processing
Interactive systems
Password
Video signal processing
NT: Multi-factor authentication

authorization

USE: Authoring systems

Authorisation
USE: Authorization

Auto: Autonomous guided vehicles

BT: Computer security
Blockchain
CAPTCHAs
Image processing
Interactive systems
Password
Video signal processing
NT: Multi-factor authentication

Automated guided vehicles

USE: Autonomous vehicles

Automated highways

BT: Automation
Intelligent transportation systems
Road safety
Smart transportation

Automated indexing
USE: Machine assisted indexing

Automated meter reading
USE: Automatic meter reading

Automated storage and retrieval systems
USE: Storage automation
<table>
<thead>
<tr>
<th><strong>Automatic control</strong></th>
<th><strong>Automatic Test Markup Language</strong></th>
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<tbody>
<tr>
<td>BT: Control systems</td>
<td>USE: XML</td>
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<tr>
<td>NT: Power generation</td>
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<table>
<thead>
<tr>
<th><strong>Automatic frequency control</strong></th>
<th><strong>Automatic test pattern generation</strong></th>
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<tbody>
<tr>
<td>BT: Frequency control</td>
<td>UF: ATPG</td>
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<table>
<thead>
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<th><strong>Automatic gain control</strong></th>
<th><strong>Automatic testing</strong></th>
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<tbody>
<tr>
<td>USE: Gain control</td>
<td>UF: Self testing</td>
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<td>BT: Automation</td>
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<tr>
<td></td>
<td>Testing</td>
</tr>
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<td>RT: Automatic test equipment</td>
</tr>
<tr>
<td></td>
<td>Maintenance engineering</td>
</tr>
<tr>
<td></td>
<td>NT: Automatic test pattern generation</td>
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<td>Ring generators</td>
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<table>
<thead>
<tr>
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<th><strong>Automatic voltage control</strong></th>
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<tbody>
<tr>
<td>BT: Automation</td>
<td>UF: AVC</td>
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<td>Control systems</td>
<td>BT: Voltage control</td>
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<td>Power generation</td>
<td>RT: Voltage</td>
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<td>Voltage measurement</td>
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<thead>
<tr>
<th><strong>Automatic indexing</strong></th>
<th><strong>Automation</strong></th>
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<tbody>
<tr>
<td>USE: Machine assisted indexing</td>
<td>BT: Robotics and automation</td>
</tr>
<tr>
<td></td>
<td>RT: Bagging</td>
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<tr>
<td></td>
<td>Biometrics (access control)</td>
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<td>Flash memories</td>
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<td>Substation automation</td>
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<td>Zigbee</td>
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<td>NT: Automated highways</td>
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<td>Automatic generation control</td>
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<td>Automatic testing</td>
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<td>Building automation</td>
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<td>Manufacturing automation</td>
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<td>Office automation</td>
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<td>Storage automation</td>
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<td>Vehicular automation</td>
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<thead>
<tr>
<th><strong>Automatic logic units</strong></th>
<th><strong>Automobile engineering</strong></th>
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<tbody>
<tr>
<td>BT: Microprocessors</td>
<td>USE: Automotive engineering</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Automatic meter reading</strong></th>
<th><strong>Automatic protection switching</strong></th>
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</thead>
<tbody>
<tr>
<td>UF: Automated meter reading</td>
<td>USE: Protection switching</td>
</tr>
<tr>
<td>BT: Meter reading</td>
<td></td>
</tr>
<tr>
<td>RT: Flowmeters</td>
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<tr>
<td>Smart meters</td>
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<table>
<thead>
<tr>
<th><strong>Automatic optical inspection</strong></th>
<th><strong>Automatic repeat request</strong></th>
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<tbody>
<tr>
<td>BT: Inspection</td>
<td>UF: ARQ</td>
</tr>
<tr>
<td>RT: Machine vision</td>
<td>BT: Feedback communications</td>
</tr>
<tr>
<td>Manufacturing automation</td>
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<tr>
<td>Pattern recognition</td>
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<thead>
<tr>
<th><strong>Automatic pilot</strong></th>
<th><strong>Automatic speech recognition</strong></th>
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</thead>
<tbody>
<tr>
<td>USE: Autopilot</td>
<td>UF: ASR</td>
</tr>
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<td>BT: Speech recognition</td>
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<thead>
<tr>
<th><strong>Automatic programming</strong></th>
<th><strong>Automatic test equipment</strong></th>
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</thead>
<tbody>
<tr>
<td>UF: Program generators</td>
<td>BT: Test equipment</td>
</tr>
<tr>
<td>BT: Programming</td>
<td>RT: Automatic testing</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Automatic protection switching</strong></th>
<th><strong>Automobile manufacture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Protection switching</td>
<td>BT: Manufacturing systems</td>
</tr>
</tbody>
</table>

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Automotive materials
USE: Automotive materials

Automobile parts
USE: Automotive components

Automobiles
UF: Cars
BT: Road vehicles
RT: Automobile manufacture
Automobile components
Automotive components
Automotive engineering
Automotive materials

Automotive
USE: Automotive engineering

Automotive applications
BT: Automotive engineering

Automotive components
UF: Air bags
Airfoils
Automobile parts
Radiators (automotive)
Starter motors (automotive)
Windscreen wipers
Windscreens
Windshield wipers
Windshields
BT: Mechanical products
RT: Automobile manufacture
Automobiles
Automotive components
Automotive engineering
Axles
Belts
Brakes
Camshafts
Gears
Hoses
Internal combustion engines
Shock absorbers
Steering systems
Suspensions (mechanical systems)
Tires
Torque converters
Water pumps
Wheels

Automotive electronics
BT: Automotive engineering

Automotive engineering
UF: Automobile engineering
Automotive
BT: Vehicular and wireless technologies
RT: Automobile manufacture
Automobiles
Automotive components
Diesel engines
Road safety
Wheels
NT: Automotive applications
Automotive electronics
Power steering
Vehicle crash testing
Vehicle detection
Vehicle driving
Vehicle dynamics
Vehicle safety

Automotive materials
UF: Automobile materials
BT: Production materials
RT: Automobile manufacture
Automobiles

Autonomic nervous system
BT: Nervous system
NT: Parasympathetic nervous system
Sympathetic nervous system

Autonomic systems
BT: Network operating systems

Autonomous aerial vehicles
BT: Unmanned autonomous vehicles

Autonomous agents
BT: Software agents

Autonomous automobiles
UF: Autonomous cars
Driver free automobiles
Driver free cars
Driver-free car
Driverless automobiles
Driverless cars
Robot automobiles
Robot cars
2021 IEEE Thesaurus

Self-driving automobiles
Self-driving car
BT: Intelligent transportation
Mobile robots
RT: Artificial intelligence

Autonomous cars
USE: Autonomous automobiles
AND Autonomous vehicles

Autonomous driving
USE: Autonomous vehicles

Autonomous mental development
BT: Computational and artificial intelligence

Autonomous navigation
USE: Autonomous robots

Autonomous robots
UF: Autonomous navigation
BT: Artificial intelligence
Autonomous systems
Robots
RT: Cognitive robotics
Intelligent robots

Autonomous systems
BT: Intelligent systems
Robots and automation
NT: Autonomous robots
Autonomous vehicles

Autonomous trucks
USE: Autonomous vehicles

Autonomous underwater vehicles
UF: Underwater autonomous vehicles
BT: Unmanned autonomous vehicles
RT: Marine robots

Autonomous vehicles
UF: Automated guided vehicles
Autonomous cars
Autonomous driving
Autonomous trucks
Unmanned autonomous vehicle
BT: Autonomous systems
Intelligent vehicles
RT: Artificial intelligence

Autopilot
UF: Auto-pilot
Automatic pilot
BT: Control systems

Autopsy
BT: Medical diagnosis
RT: Pathology

Autoregressive moving average models
USE: Autoregressive processes

Autoregressive processes
UF: Autoregressive moving average models
BT: Statistics
RT: Noise
Time series analysis

Auxetic materials
UF: Auxetics
BT: Materials

Auxetics
USE: Auxetic materials

Auxiliary transmitters
BT: Transmitters

Availability
UF: System availability
BT: Reliability
RT: Maintenance engineering

Avalanche breakdown
BT: Electric breakdown

Avalanche photodiodes
UF: APDs
BT: Photodiodes
RT: Optical fiber communication
Photomultipliers
NT: Single-photon avalanche diodes

Avatars
BT: Graphical user interfaces
Virtual reality

**AVC**
USE: Automatic voltage control

**Avionics**
USE: Aerospace electronics

**Awards**
BT: IEEE indexing
RT: IEEE Awards activities

**AWG device**
USE: Arrayed waveguide gratings

**AWGN**
BT: Additive noise
Gaussian noise
White noise

**AWGN channels**
BT: Gaussian channels
RT: Intersymbol interference
White noise

**Axilla**
UF: Armpit
Underarm
BT: Shoulder

**Axles**
BT: Mechanical products
Automotive components
Wheels

**Axons**
BT: Nerve fibers
Action potentials
Myelin
White matter

**Azimuth**
BT: Mathematics
Azimuthal angle
Azimuthal component
Azimuthal current
Azimuthal harmonics
Azimuthal plane

**Azimuthal current**
BT: Azimuth

**Azimuthal harmonics**
BT: Azimuth

**Azimuthal plane**
BT: Azimuth

**Azobenzene**
BT: Polymers
RT: Smart materials

**B-ISDN**
UF: Broadband ISDN
BT: Broadband communication
ISDN
RT: Asynchronous transfer
mode
Data communication
Frame relay
Image communication
Multimedia communication

**B-Spline**
USE: Splines (mathematics)

**Ba**
USE: Barium

**Babies**
USE: Pediatrics

**Baby**
USE: Pediatrics

**Back**
BT: Body regions

**Back propagation**
USE: Backpropagation

**Background noise**
BT: Acoustic noise

**Backplanes**
BT: Data buses

**Backpropagation**
UF: Back propagation
Backward propagation
Backwards propagation of errors

BT: Learning systems
RT: Backpropagation algorithms
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Neural networks</th>
<th>RT: Milling machines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backpropagation algorithms</strong></td>
<td><strong>Ball screws</strong></td>
</tr>
<tr>
<td>BT: Algorithms</td>
<td>USE: Mechanical products</td>
</tr>
<tr>
<td>RT: Backpropagation</td>
<td><strong>Ballasts</strong></td>
</tr>
<tr>
<td><strong>Backscatter</strong></td>
<td>USE: Electronic ballasts</td>
</tr>
<tr>
<td>BT: Reflection</td>
<td><strong>Ballistic magnetoresistance</strong></td>
</tr>
<tr>
<td>RT: Meteorological radar</td>
<td>BT: Magnetoresistance</td>
</tr>
<tr>
<td><strong>Backscattering</strong></td>
<td><strong>Ballistic transport</strong></td>
</tr>
<tr>
<td>USE: Scattering</td>
<td>BT: Electron emission</td>
</tr>
<tr>
<td><strong>Backstepping</strong></td>
<td>NT: Electronic ballasts</td>
</tr>
<tr>
<td>BT: Control nonlinearities</td>
<td><strong>Baluns</strong></td>
</tr>
<tr>
<td><strong>Backtracking</strong></td>
<td>BT: Electromagnetic devices</td>
</tr>
<tr>
<td>BT: Algorithm design and theory</td>
<td>Impedance matching</td>
</tr>
<tr>
<td><strong>Backward propagation</strong></td>
<td>Microwave technology</td>
</tr>
<tr>
<td>USE: Backpropagation</td>
<td>Transformers</td>
</tr>
<tr>
<td><strong>Backwards propagation of errors</strong></td>
<td>RT: Transmission lines</td>
</tr>
<tr>
<td>USE: Backpropagation</td>
<td><strong>Bamboo</strong></td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td>BT: Natural fibers</td>
</tr>
<tr>
<td>USE: Microorganisms</td>
<td>Plants (biology)</td>
</tr>
<tr>
<td><strong>Bacterial content</strong></td>
<td><strong>Band gap</strong></td>
</tr>
<tr>
<td>USE: Microorganisms</td>
<td>USE: Photonic band gap</td>
</tr>
<tr>
<td><strong>Bacterial infections</strong></td>
<td><strong>Band pass filters</strong></td>
</tr>
<tr>
<td>BT: Diseases</td>
<td>USE: Band-pass filters</td>
</tr>
<tr>
<td><strong>Bagging</strong></td>
<td><strong>Band-gap</strong></td>
</tr>
<tr>
<td>BT: Packaging</td>
<td>USE: Photonic band gap</td>
</tr>
<tr>
<td>RT: Automation</td>
<td><strong>Band-pass filters</strong></td>
</tr>
<tr>
<td>Packaging machines</td>
<td>UF: BPF</td>
</tr>
<tr>
<td>Plastic packaging</td>
<td>Band pass filters</td>
</tr>
<tr>
<td><strong>Baidu</strong></td>
<td>Bandpass filters</td>
</tr>
<tr>
<td>USE: Web and internet services</td>
<td>USE: Band-pass filters</td>
</tr>
<tr>
<td><strong>Ball bearings</strong></td>
<td><strong>Band-stop filters</strong></td>
</tr>
<tr>
<td>BT: Machinery</td>
<td>USE: Notch filters</td>
</tr>
<tr>
<td>RT: Mechanical bearings</td>
<td><strong>Bandgap</strong></td>
</tr>
<tr>
<td>Metal products</td>
<td>USE: Photonic band gap</td>
</tr>
<tr>
<td>Rolling bearings</td>
<td><strong>Bandpass filters</strong></td>
</tr>
<tr>
<td><strong>Ball grid arrays</strong></td>
<td>USE: Band-pass filters</td>
</tr>
<tr>
<td>USE: Electronics packaging</td>
<td><strong>Bandwidth</strong></td>
</tr>
<tr>
<td><strong>Ball milling</strong></td>
<td>BT: Frequency</td>
</tr>
<tr>
<td>BT: Production</td>
<td></td>
</tr>
<tr>
<td>RT: Admission control</td>
<td>BT: Barium oxide</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Coherence time</td>
<td></td>
</tr>
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<td>Computer network</td>
<td></td>
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<td>Direct sequence spread</td>
<td></td>
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<td>Information theory</td>
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<td>Radio communication</td>
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<tr>
<td>Signal processing</td>
<td></td>
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<td>Spectral efficiency</td>
<td></td>
</tr>
<tr>
<td>Spectroscopy</td>
<td></td>
</tr>
<tr>
<td>NT: Narrowband</td>
<td></td>
</tr>
<tr>
<td>Wideband</td>
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</tr>
</tbody>
</table>

**Bandwidth allocation**

USE: Channel allocation

**Bandwidth efficiency**

USE: Spectral efficiency

**Bang bang control**

USE: Bang-bang control

**Bars**

BT: Structural shapes
NT: Billets

**Basal cell carcinoma**

USE: Skin cancer

**Basal ganglia**

BT: Brain

**Base stations**

BT: Radio communication equipment
RT: Device-to-device communication
NT: Femtocell networks

**Baseband**

BT: Digital communication radio communication
RT: Passband

**Basis algorithms**

BT: Algorithms

**Batch manufacturing**

USE: Batch production systems

**Batch processing**

USE: Batch production systems

**Batch production systems**

UF: Batch manufacturing
BT: Manufacturing systems

**Bathymetry**

BT: Measurement
Sea floor

**Bar codes**

UF: QR codes
BT: Optical detectors
RT: Product codes
RT: Internet of Things
RT: Inventory management

**Barges**

USE: Boats

**Barium**

UF: Ba
BT: Metals
NT: Barium compounds

**Banking**

BT: Financial industry
RT: Finance
NT: Online banking

**Bankruptcy**

BT: Finance
RT: Business
RT: Commercial law
RT: Economics

**Baroreceptor reflex**

USE: Baroreflex

**Baroreflex**

UF: Baroreceptor reflex
BT: Cardiovascular system

**Bang bang control**

USE: Bang-bang control

**Bang-bang control**

UF: Bang bang control
BT: Optimal control
RT: Time factors

**Batch manufacturing**

USE: Batch production systems

**Batch processing**

USE: Batch production systems

**Barium compounds**
### Batteries

**UF:** Flow batteries  
Secondary cells  
Storage batteries  
Storage battery  

**BT:** Electrochemical devices  
Energy conversion  
Energy storage  

**RT:** Battery charge  
measurement  

**NT:** Lead acid batteries  
Lithium batteries  
Lithium-ion batteries  
Lithium-sulfur batteries  
Nickel cadmium batteries  
Solid state batteries  

**Bayes methods**

- Bayesian approach  
- Bayesian belief networks  
- Bayesian estimation  
- Bayesian inference  
- Bayesian learning  
- Bayesian methods  
- Bayesian networks  

**Bayesian approach**

- USE: Bayes methods  
- Bayesian belief networks

**Bayesian estimation**

- USE: Bayes methods  
- Recursive estimation

**Bayesian inference**

- USE: Bayes methods

**Bayesian learning**

- USE: Bayes methods

**Bayesian methods**

- USE: Bayes methods

**BCI**

- USE: Brain-computer interfaces

**Beak**

- BT: Animal structures  
- RT: Birds

### Battery charge measurement

**BT:** Charge measurement  

**RT:** Batteries  
Battery chargers  
Battery powered vehicles

### Battery chargers

**UF:** Charging devices  
Device chargers  

**BT:** Power supplies  

**RT:** Batteries  
Battery charge  
measurement

**NT:** Electric vehicle charging  
State of charge

### Battery management systems

**BT:** Electrochemical devices

### Battery powered vehicles

**BT:** Electric vehicles  

**RT:** Battery charge  
measurement

**NT:** Solar powered vehicles  
Traction motors  
Vehicle-to-grid

### Beam steering

- Microwave technology  
- Antennas  
- Steerable antennas

### Beams

- Electromagnetic beams  
- Physics  
- Acoustic beams
2021 IEEE Thesaurus

Laser beams
Molecular beams
Optical beams
Particle beams

Belts
UF: Cambelts
BT: Seat belts
RT: Machine components
Machinery
Automotive components
Camshafts
Fasteners

Bean model
UF: Pry and Bean model
BT: Superconductivity

Bearing estimation
USE: Direction-of-arrival

Bench to bedside
USE: Translational research

Behavioral sciences
BT: Social sciences
Systems, man, and cybernetics
RT: Affective computing
Bio-inspired computing
Cyberethics
Digital intelligence
Emotion recognition
Ergonomics
Human factors
Medical services
Mental health
Persuasive systems
Social computing
System dynamics
NT: Animal behavior
Cognition
Consumer behavior
Psychiatry
Psychology
Social intelligence

Belief functions
USE: Evidence theory

Belief propagation
UF: Sum product message
passing
BT: Inference mechanisms
RT: Bayes methods
Evidence theory
Graph theory
Iterative methods
Markov processes
Message passing
Probability

Berlinerium
BT: Chemical elements

Bending
BT: Mechanical factors

Benign masses
USE: Benign tumors

Benign tumors
UF: Benign masses
BT: Tumors

BER
USE: Bit error rate

BER analysis
USE: Bit error rate

BER performance
USE: Bit error rate

Berry phase
BT: Waves
BERT
USE: Bit error rate

Beryllium
BT: Chemical elements

Bespoke production
USE: Job production systems

Best practices
BT: Management
RT: Quality assurance
RT: Business communication
RT: Enterprise architecture
management

Beta rays
BT: Nuclear physics
RT: Electrons

Betavoltaic power sources
USE: Radioactive materials

Bevel gears
USE: Gears

Beverage industry
BT: Industries
RT: Bottling
RT: Food industry

Beyond CMOS
BT: Integrated circuit
technology

BI
USE: Business intelligence

Bi
USE: Bismuth

Bi-stable circuits
USE: Bistable circuits

Bibliographies
BT: Writing
RT: Publishing

Bibliometrics
BT: Publishing
NT: Citation analysis

BiCMOS integrated circuits
UF: BiCMOS integrated circuits

Bills of materials
BT: Inventory management

Bipolar transistors
BT: Bipolar transistor circuits

Bicycles
BT: Land vehicles
RT: Sports equipment

Bidirectional communication
USE: Bidirectional control

Bidirectional control
UF: Bidirectional communication
BT: Bidirectional reflectance
BT: Control systems

Bidirectional power flow
BT: Power system control

Bidirectional reflectance
USE: Bidirectional control

Bifurcation
BT: Nonlinear equations
RT: Chaos

Big Data
BT: Data collection
RT: Data handling
Data mining
Data storage systems
Information management
Information processing
Information retrieval
Linked data
Neuroinformatics
NoSQL databases
NT: Big Data applications

Big Data applications
BT: Big Data
Computer applications
RT: Cloud computing
Data analysis
Data systems
Information analysis
Information systems

Bilinear systems
USE: Nonlinear systems

Billets
BT: Bars

Bills of materials
BT: Inventory management

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Materials requirements

BIM
USE: Building information management

BiMOS integrated circuits
USE: BiCMOS integrated circuits

Binary codes
BT: Codes
NT: Reflective binary codes

Binary decision diagrams
BT: Data structures

Binary phase shift keying
UF: BPSK
BT: Phase shift keying

Bio-inspired engineering
UF: Biologically inspired engineering
BT: Engineering - general
RT: Biology
Biomimetics
Complex systems
NT: Bio-inspired computing
Bio-inspired control
Bio-inspired robotics

Bio-inspired robotics
UF: bioinspired robotics
BT: Bio-inspired engineering
Robots

Bio-MEMS
USE: Biomedical microelectromechanical systems

Bio-nanotechnology
USE: Bionanotechnology

Bioacoustics
USE: Biomedical acoustics

Bioceramics
BT: Biological materials
Biomedical materials
Ceramics
RT: Ceramics industry
Prosthetics

Biochemical analysis
BT: Biochemistry
RT: Biochips

Biochemistry
UF: Enzymes
Hormones
Metabolic networks
Metabolism
BT: Biology
Chemistry
Biological cells
Bioreactors
Cell signaling
Computational biochemistry
Drugs
Entomology
Molecular biophysics
Pharmaceutical technology
Pharmaceuticals

Bio-inspired control
UF: Biologically inspired control

Bio-inspired engineering

Bio-inspired robotics

Bio-MEMS

Bio-nanotechnology

Bioacoustics

Bioceramics

Biochemical analysis

Biochemistry

Bio-inspired control
2021 IEEE Thesaurus

NT: Amino acids
Biochemical analysis
Peptides
Proteins
Receptor (biochemistry)

Biochips
BT: Molecular biology
RT: Biochemical analysis
Microfluidics
NT: Digital microfluidic biochips

Biocomputing
USE: Bio-inspired computing

Biocontrol
USE: Biological control systems

Biocybernetics
USE: Cybernetics

Biodegradable materials
BT: Biodegradation

Biofeedback
USE: Biological control systems

Biofuels
BT: Fuels
RT: Food waste

Biogeography
BT: Biodiversity

Biographies
BT: Writing
RT: Engineering profession
NT: Autobiographies

Biohazards
UF: Germ warfare
BT: Hazards
RT: Chemical hazards
Medical products
Terrorism

Bioimpedance
BT: Biomedical engineering
RT: Blood flow

Bioinformatics
UF: Biomedical informatics
Health informatics
BT: Biomedical computing
Informatics
RT: Biology
Computational biochemistry
Computational biology
Computational biophysics
NT: Neuroinformatics

Bioinspired computing
USE: Bio-inspired computing

Bioinspired robotics
USE: Bio-inspired robotics

Biological cells
USE: Cell biology
Chromosomes
BT: Biology
RT: Biochemistry
Biological materials
DNA
Microorganisms
Self-assembly

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NT: Cell signaling
Cells (biology)
Chromosome mapping
Endothelial cells
Fibroblasts
RNA
Stem cells

RT: Biological cells
Biomedical materials
Fats
Tissue engineering

NT: Bioceramics

Biological clocks
USE: Chronobiology

Biological control systems
UF: Biocontrol
Biofeedback
BT: Systems, man, and cybernetics
RT: Immune system
Legged locomotion
Prosthetics
NT: Biomarkers

Biological effects of protons
USE: Proton effects

Biological effects of radiation
UF: Biological radiation effects
BT: Radiation effects
RT: Biomedical applications of radiation
Neutron capture therapy
Occupational health
Proton therapy
Radiation protection

Biological information theory
BT: Biology
Information theory
RT: DNA
Genetic communication

Biological interactions
BT: Biological processes

Biological macromolecules
USE: Molecular biophysics

Biological markers
USE: Biomarkers

Biological materials
BT: Materials

Biological techniques
BT: Biomedical engineering

Biological membranes
USE: Biomembranes

Biological neural networks
UF: Neuronal networks
BT: Neural networks
Neurophysiology

Biological organs
USE: Biological systems

Biological processes
BT: Biology
NT: Biological interactions
Chronobiology
Circadian rhythm
Coagulation
Molecular biology
Symbiosis

Biological radiation effects
USE: Biological effects of radiation

Biological sensors
USE: Biosensors

Biological system modeling
BT: Biology
RT: Mechanobiology
Synthetic biology

Biological systematics
USE: Systematics

Biological systems
UF: Biological organs
Organs (biological)
BT: Biology
RT: Animals
Artificial biological organs
Biomedical engineering
NT: Anatomy
Molecular communication
Organisms

(telecommunication)
<table>
<thead>
<tr>
<th>Category</th>
<th>Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological equipment</td>
<td>Biomedical equipment</td>
</tr>
<tr>
<td>Biological tissue</td>
<td>Biological tissues</td>
</tr>
<tr>
<td><strong>Biological tissues</strong></td>
<td><strong>Biological tissue</strong></td>
</tr>
<tr>
<td><strong>UF:</strong> Tissues</td>
<td><strong>BT:</strong> Anatomy</td>
</tr>
<tr>
<td><strong>NT:</strong> Bone tissue</td>
<td><strong>Breast tissue</strong></td>
</tr>
<tr>
<td><strong>Cardiac tissue</strong></td>
<td><strong>Connective tissue</strong></td>
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<tr>
<td><strong>Glands</strong></td>
<td><strong>Neoplasms</strong></td>
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<tr>
<td><strong>Biologically inspired computing</strong></td>
<td><strong>Bio-inspired computing</strong></td>
</tr>
<tr>
<td><strong>USE:</strong> Bio-inspired computing</td>
<td><strong>BT:</strong> Biology</td>
</tr>
<tr>
<td><strong>Biologically inspired control</strong></td>
<td><strong>RT:</strong> Biomedical computing</td>
</tr>
<tr>
<td><strong>USE:</strong> Bio-inspired control</td>
<td><strong>Computers and information</strong></td>
</tr>
<tr>
<td><strong>Biologically inspired engineering</strong></td>
<td><strong>processing</strong></td>
</tr>
<tr>
<td><strong>USE:</strong> Bio-inspired engineering</td>
<td><strong>Bioluminescence</strong></td>
</tr>
<tr>
<td><strong>BT:</strong> Luminescence</td>
<td><strong>Biomagnetics</strong></td>
</tr>
<tr>
<td><strong>UF:</strong> Biomagnetism</td>
<td><strong>BT:</strong> Biophysics</td>
</tr>
<tr>
<td><strong>NT:</strong> Magnetic fields</td>
<td><strong>Magnetism</strong></td>
</tr>
<tr>
<td><strong>Magnetic materials</strong></td>
<td><strong>Biomarkers</strong></td>
</tr>
<tr>
<td><strong>Magnetic particles</strong></td>
<td><strong>USE:</strong> Biomarkers</td>
</tr>
<tr>
<td><strong>NT:</strong> Magnetoencephalography</td>
<td><strong>Biomass</strong></td>
</tr>
<tr>
<td><strong>BT:</strong> Renewable energy sources</td>
<td><strong>Biomass</strong></td>
</tr>
<tr>
<td><strong>RT:</strong> Biomedical computing</td>
<td><strong>BT:</strong> Mechanical factors</td>
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<td><strong>Anthropometry</strong></td>
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<td><strong>Cell signaling</strong></td>
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<td><strong>Mechanobiology</strong></td>
<td><strong>Wearable robots</strong></td>
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<tr>
<td><strong>NT:</strong> Fall detection</td>
<td><strong>Biomechanics</strong></td>
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<tr>
<td><strong>Fell detection</strong></td>
<td><strong>BT:</strong> Mechatronics</td>
</tr>
<tr>
<td><strong>Biomechatronics</strong></td>
<td><strong>UF:</strong> Bioacoustics</td>
</tr>
<tr>
<td><strong>Biomedical acoustics</strong></td>
<td><strong>Biomedical ultrasonics</strong></td>
</tr>
</tbody>
</table>
## Biomedical applications of electromagnetic radiation

**USE:** Biomedical applications of radiation

**UF:** Biomedical applications of electromagnetic radiation

- **RT:** Angiography
  - Biological effects of radiation
  - Biomedical imaging
  - Cancer
  - Collimators
  - Computed tomography
  - Gamma-ray detectors
  - Medical treatment
  - Positron emission tomography
  - Radiation effects
  - Radiography
  - Synchrotron radiation

## Biomedical communication

**BT:** Communication systems

**RT:** Engineering in medicine and biology

- **NT:** Biomedical telemetry

*Biological communication systems*

- **NT:** Biomedical telemetry

## Biomedical computing

**UF:** Medical computing

**BT:** Engineering in medicine and biology

- **RT:** Biology computing

*Biomedical computing*

- **NT:** Biomedical telemetry

## Biomedical electronics

**BT:** Biomedical engineering and biology

- **RT:** Biomedical electronics

*Biomedical electronics*

## Biomedical engineering education

**BT:** Engineering education

**RT:** Biomedical engineering

*Biomedical engineering education*

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# 2021 IEEE Thesaurus

<table>
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<tr>
<th>UF: Clinical equipment</th>
<th>NT: Imaging phantoms</th>
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<tbody>
<tr>
<td>Medical equipment</td>
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## Biomedical imaging

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<tr>
<td>Picture archiving and</td>
</tr>
<tr>
<td>communication systems</td>
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<tr>
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<td>Photoacoustic imaging</td>
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</tbody>
</table>

## Biomedical informatics

| USE: Bioinformatics |

## Biomedical infrared imaging

| USE: Biomedical optical imaging |

## Biomedical instruments

| USE: Biomedical measurement |

## Biomedical materials

| USE: Materials | BT: Materials |

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2021 IEEE Thesaurus

RT: Biological materials
Diamond-like carbon
Molecular biophysics

NT: Bioceramics
Biomembranes

Biomedical measurement
UF: Biomedical instruments
Biomedical measurements
BT: Measurement
RT: Anthropometry
Biomedical electrodes
Biomedical equipment
Biosensors
Pulse oximetry

NT: Biomarkers
Biomedical monitoring
Electroencephalography
Electromyography
Electrooculography
Electrophysiology
Photoplethysmography
Plethysmography
Pulse oximeter
Reproducibility of results
Sensitivity and specificity

Biomedical measurements
USE: Biomedical measurement

Biomedical microelectromechanical systems
UF: Bio-MEMS
BT: Micromechanical devices
RT: Biomedical equipment

Biomedical monitoring
BT: Biomedical measurement
RT: Biomedical engineering
Epidemiology
Phonocardiography

NT: Nanomedicine

Biomedical MRI
USE: Magnetic resonance imaging

Biomedical optical imaging
UF: Biomedical imaging
BT: Biomedical engineering
RT: Biomedical image
processing
Endomicroscopy
Endoscopes
Infrared imaging

Biomedical signal processing
BT: Biomedical engineering
RT: Biomedical computing
Fall detection
Neurophysiology
Time-frequency analysis

NT: Biomedical image processing

Biomedical telemetry
UF: Biotelemetry
BT: Biomedical communication
Biomedical equipment
Telemetry

Biomedical transducers
BT: Biomedical equipment
Transducers

Biomedical ultrasonics
USE: Biomedical acoustics

Biomedical X-ray imaging
USE: Biomedical imaging

Biomembranes
UF: Biological membranes
Membranes
BT: Biomedical materials
RT: Biological cells

Biometric systems
USE: Biometrics (access control)

Biometrics (access control)
UF: Biometric systems
BT: Identification of persons
RT: Access control
Algorithms
Automation
Handwriting recognition
Information technology
Security
Speaker recognition

NT: Face recognition
Fingerprint recognition
Gait recognition
Iris recognition
Keystroke dynamics
Palmprint recognition
### Biomimetic materials
- **BT:** Biomimetics
- **Smart materials**

### Biomimetic microelectronics
- **USE:** Biomimetics

### Biomimetics
- **UF:** Biomimetic microelectronics
- **Biomimicry**
- **Bionics**
- **BT:** Microprocessors
- **RT:** Bio-inspired engineering
  - **Whale optimization**

### Biomolecular electronics
- **USE:** Molecular electronics

### Biomolecules
- **USE:** Molecular biophysics

### Bionanotechnology
- **UF:** Bio-nanotechnology
- **BT:** Engineering in medicine
  - **and biology**
  - **Nanotechnology**

### Bionics
- **USE:** Biomimetics

### Biophotonics
- **BT:** Biology
  - **Photonics**

### Biophysics
- **BT:** Biology
  - **Physics**
  - **RT:** Computational biophysics
  - **NT:** Aerospace biophysics
  - **Biomagnetics**
    - **Cellular biophysics**
    - **Molecular biophysics**

### Biopolymers
- **BT:** Polymers

### Biopsy
- **BT:** Medical tests

### Bioreactors
- **BT:** Chemical reactors
- **RT:** Biochemistry

### Biorthogonal modulation
- **BT:** Wavelet transforms

### Biosensors
- **UF:** Biological sensors
- **BT:** Chemical and biological sensors
- **RT:** Biomedical measurement
  - **Nanobiophotonics**

### Biosphere
- **BT:** Environmental factors
  - **Geoscience**

### Biotechnology
- **BT:** Biomedical engineering
- **RT:** Genetic engineering

### Biotelemetry
- **USE:** Biomedical telemetry

### Bioterrorism
- **BT:** Engineering in medicine
  - **and biology**
  - **Terrorism**

### Bipartite graph
- **BT:** Graph theory

### Bipolar integrated circuits
- **BT:** Bipolar transistor circuits
- **RT:** Bipolar transistors

### Bipolar transistor circuits
- **BT:** Circuits
  - **RT:** Parameter extraction
  - **NT:** BiCMOS integrated circuits
    - **Bipolar integrated circuits**

### Bipolar transistors
- **BT:** Power semiconductor switches
  - **RT:** Bipolar integrated circuits
    - **Proton radiation effects**
    - **Semiconductor epitaxial layers**
  - **Transistors**
    - **NT:** Insulated gate bipolar transistors
Kirk field collapse effect

Birds
BT: Animals
RT: Beak

Birefringence
BT: Optics
RT: Photorefractive effect
Photorefractive materials
Refractive index
Thermooptic effects

Birth disorders
BT: Amniocentesis

Bismuth
UF: Bi
BT: Metals
RT: Bismuth compounds

Bismuth compounds
UF: BSCCO
BT: Compounds
RT: Alloying
Bismuth

BIST
USE: Built-in self-test

Bistability (optical)
USE: Optical bistability

Bistable circuits
UF: Bi-stable circuits
BT: Circuits
NT: Latches

Bistable multivibrator
USE: Pulse circuits

Bistatic radar
BT: Radar

Bit allocation
USE: Bit rate

Bit error rate
UF: BER
BER analysis
BER performance
BERT
Bit error rate test
BT: Error analysis

Bit error rate test
USE: Bit error rate

Bit interleaved coded
USE: Interleaved codes

Bit rate
UF: Bit allocation
BT: Timing
RT: Communication system signaling

Bitr率
USE: Bit rate

Bitcoin
BT: Cryptocurrency
RT: Blockchain
Cryptography
Finance
Online banking

Bitrate
USE: Bit rate

Bitumen
USE: Asphalt

Bixby
USE: Virtual assistants

Black lead
USE: Graphite

BlackBerry
USE: Handheld computers

Blacklist
USE: Blacklisting

Blacklisting
UF: Blacklist
BT: Access control
RT: Computer security
Countermeasures
Whitelists

Bladder
BT: Urogenital system

Blades
2021 IEEE Thesaurus

UF: Vanes
BT: Mechanical products
RT: Agricultural machinery
Cutting tools
Fans
Impellers
Propellers
Turbomachinery

Blindness
BT: Medical conditions
RT: Visual prosthesis

Blob detection
BT: Computer vision
RT: Image processing

Blanking
BT: Manufacturing systems
RT: Metal products
Metals
Sheet metal processing

Block chain

Block codes
UF: Block coding
BT: Channel coding
RT: Mobile communication
NT: Linear codes
Polar codes

Blast furnaces
BT: Furnaces
RT: Smelting

Bleaching
BT: Materials processing
RT: Manufacturing systems
Paper making
Process control
Textile technology

Block coding
USE: Block codes

Blended learning
USE: Hybrid learning

Blind channel estimation
USE: Blind equalizers

Block signaling
USE: Block signalling

Bleeding
USE: Hemorrhaging

Blind equalisers
USE: Blind equalizers

Blind equalizers
UF: Blind channel estimation
BT: Equalizers

Block chain

Blind signal separation
USE: Blind source separation

Blind source separation
UF: Blind signal separation
BT: Source separation
RT: Adaptive signal detection
Array signal processing
Independent component

Blogging
USE: Blogs

analysis
Signal analysis
Signal detection

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2021 IEEE Thesaurus

Twitter
Weibo
BT: Information retrieval
RT: Electronic mail
Internet
Social networking (online)

Blood
BT: Blood vessels
NT: Blood platelets
Coagulation
Red blood cells
White blood cells

Blood clots
USE: Coagulation

Blood flow
BT: Blood pressure
RT: Bioimpedance
NT: Hemodynamics

Blood platelets
BT: Blood
RT: Coagulation

Blood pressure
UF: Arterial pressure
BT: Blood vessels
NT: Blood flow
Blood pressure
measurement
Blood pressure variability

Blood pressure measurement
BT: Blood pressure

Blood pressure variability
BT: Blood pressure

Blood vessels
BT: Cardiovascular system
RT: Endothelial cells
NT: Arteries
Blood
Blood pressure
Veins

Bluetooth
BT: Personal area networks
Radio communication
Cellular radio
Communication equipment
Digital communication
IEEE 802.11 Standard

BT: Information retrieval
RT: Electronic mail
Internet
Social networking (online)

Blood clots
USE: Coagulation

Blood flow
BT: Blood pressure
RT: Bioimpedance
NT: Hemodynamics

Blood platelets
BT: Blood
RT: Coagulation

Blood pressure
UF: Arterial pressure
BT: Blood vessels
NT: Blood flow
Blood pressure
measurement
Blood pressure variability

Blood pressure measurement
BT: Blood pressure

Blood pressure variability
BT: Blood pressure

Blood vessels
BT: Cardiovascular system
RT: Endothelial cells
NT: Arteries
Blood
Blood pressure
Veins

Bluetooth
BT: Personal area networks
Radio communication
Cellular radio
Communication equipment
Digital communication
IEEE 802.11 Standard

BNCT
USE: Neutron capture therapy

BNSC
UF: British National Space Centre
BT: Organizations

Boat building industry
USE: Shipbuilding industry

Boats
UF: Barges
Yachts
BT: Marine vehicles
RT: Marine robots

Body area networking
USE: Body area networks

Body area networks
UF: Body area networking
BT: Personal area networks

Body borne computers
USE: Wearable computers

Body regions
BT: Anatomy
NT: Abdomen
Back
Breast
Extremities
Head
Neck
Pelvis
Perineum
Thorax
Torso
Viscera

Body sensor networks
BT: Personal area networks
Wireless sensor networks

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2021 IEEE Thesaurus

Boilers
RT: Fall detection
BT: Heating systems
RT: Heat recovery
Steam engines
Turbines
Waste heat

Bolometers
BT: Radiation detectors
RT: Infrared detectors
Temperature measurement

Bolts
USE: Fasteners

Boltzmann distribution
BT: Statistics
NT: Lattice Boltzmann methods

Boltzmann equation
UF: Boltzmann transport equation
BT: Equations

Boltzmann transport equation
USE: Boltzmann equation

Bomb
USE: Weapons

Bonding
BT: Bonding processes
RT: Manufacturing
Materials processing
NT: Adhesives

Bonding forces
BT: Materials testing

Bone diseases
BT: Diseases
NT: Osteoarthritis
Osteoporosis

Bone mineral density
USE: Bone density

Bone tissue
BT: Biological tissues
RT: Bone tissue
Skull
NT: Bone density
Pelvic bones

Bones
BT: Skeleton
RT: Bone tissue
Skull
NT: Bone density
Pelvic bones

Bonuses
USE: Incentive schemes

Book reviews
BT: IEEE indexing

Boolean algebra
BT: Algebra
RT: Logic
Logic gates
Set theory
NT: Boolean functions

Boolean functions
BT: Boolean algebra
RT: Fault trees
NT: Logic functions

Boosting
BT: Machine learning
Supervised learning

Booting
BT: Operating systems

Boring
BT: Machining
RT: Drilling
Milling
Turning

Bone density
UF: Bone mineral density
BT: Bones
RT: Density measurement

Boron
BT: Chemical elements
Metals
### 2021 IEEE Thesaurus

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<td>WWW robot</td>
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Brakes
BT: Control systems
Mechanical products
RT: Automotive components

Brand management
BT: Marketing management
RT: Market research
Product development

Brazing
BT: Soldering
RT: Welding

Breadboard
UF: Plugboard
Solderless breadboard
BT: Electronic circuits
Prototypes

Breakdown
USE: Electric breakdown

Breakdown voltage
BT: Voltage
RT: Current
Diodes
Insulators

Breast
BT: Body regions
NT: Breast biopsy
Breast cancer
Breast tissue
Breast tumors

Breast biopsy
BT: Breast

Breast cancer
UF: Breast-cancer
BT: Breast
Cancer

Breast neoplasms
UF: Mammary neoplasms
BT: Neoplasms

Breast tissue
UF: Breast tissues
BT: Biological tissues
Breast

Breast tumors
USE: Breast tissue

Brilouin scattering
BT: Scattering

Bring your own device
UF: BYOD
BT: Information technology
RT: Mobile computing
Office automation
Personnel
Security
Smart phones

British National Space Centre
USE: BNSC

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## Broadband amplifiers

**UF:** Wideband amplifiers  
**BT:** Amplifiers  
**RT:** Broadband communication

## Broadband antennas

**UF:** Wideband antennas  
**BT:** Antennas  
**RT:** Antenna arrays  
**NT:** Ultra wideband antennas  
**Vivaldi antennas**

## Broadband communication

**mode**  
Web TV

**multiaccess**  
*Broadcasts*  
**USE:** Broadcasting

**BT:** Chemical elements  
**NT:** Bromine compounds

**Bromine compounds**  
**UF:** Organobromine compounds  
**BT:** Bromine  
**RT:** Chemical compounds  
**RT:** Flame retardants

**Bronchi**  
**USE:** Respiratory system

**Bronchoscopy**  
**BT:** Medical diagnosis

**Brownian motion**  
**UF:** Fractional brownian motion  
**BT:** Random processes  
**RT:** Diffusion processes

## Broadcast technology

**NT:** Broadcasting

## Brushes

**BT:** Contacts  
**RT:** Rotating machines

## Broadband ISDN

**USE:** B-ISDN

## Broadcast networks

**USE:** Broadband communication

## Broadcasting

**UF:** Broadcasts  
**BT:** Broadcast technology  
**RT:** Entertainment industry  
**RT:** Journalism  
**NT:** Digital audio broadcasting  
**NT:** Digital multimedia  
**NT:** Digital video broadcasting  
**NT:** Motion pictures  
**NT:** Radio broadcasting  
**NT:** Satellite broadcasting  
**BSCCO**  
**USE:** Bismuth compounds

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Buck converters
BT: DC-DC power converters

Buckyballs
USE: Fullerenes

Buckminsterfullerene
USE: Fullerenes

Buckyballs
USE: Fullerenes

Buckytubes
USE: Fullerenes

Buffer layers
BT: Thin films
RT: Diffusion processes
Semiconductor films
Semiconductor growth

Buffer overflows
BT: Computer crashes

Buffer storage
BT: Memory
RT: Data handling
Telecommunication buffers
NT: Computer buffers

Bugs
USE: Computer bugs

Building automation
BT: Automation
Building services
RT: Construction industry

Building information management
UF: BIM
Building information modelling
BT: Buildings
Modelling
Architecture
Building management
Building services
Design engineering
Facilities management
Project management
Structural engineering

Building integrated photovoltaics
UF: Building-integrated photovoltaics
Roof mounted photovoltaics
Roof mounted solar cell arrays
BT: Photovoltaic systems
RT: Building services
Solar power generation

Building management systems
BT: Buildings
Management
RT: Building information management

Building materials
BT: Buildings
Materials
RT: Aggregates
Construction
Construction industry
Prefabricated construction
Structural beams
NT: Asphalt
Concrete
Floors
Mortar
Tiles
Windows

Building services
BT: Buildings
RT: Access control
Air conditioning
Building information management
Furnaces
Lighting
Space heating
Wiring
Elevators
Facilities management

Building integrated photovoltaics
USE: Building integrated photovoltaics

Buildings
2021 IEEE Thesaurus

UF: Space habitats

BT: Construction

RT: Air conditioning

Architecture

Civil engineering

Construction industry

Elevators

Escalators

Industrial power systems

Lighting

Modular construction

Prefabricated construction

Smart cities

Space cooling

Vents

NT: Building information

management

Building materials

Building services

Flexible structures

Intelligent structures

Smart buildings

Smart homes

Built-in self-test

UF: BIST

Self-testing

BT: Testing

RT: Circuit testing

Design for testability

Bulk acoustic wave devices

BT: Acoustic devices

Film bulk acoustic

resonators

Bulk storage

BT: Material storage

Containers

Bundle adjustment

BT: Three-dimensional displays

Buoyancy

BT: Fluid dynamics

RT: Fluids

Physics

Buried object detection

UF: Buried objects

Underground object

detection

Underground objects

Business

UF: Commerce

Trade

BT: Engineering management

RT: Bankruptcy

Business process

integration

management

Commercial law

Consortia

Contracts

Employment

Enterprise resource

Business communication

BT: Organizational aspects

RT: Best practices

Buried objects

USE: Buried object detection

Burnishing

BT: Surface finishing

RT: Machining

Burst switching

BT: Packet switching

NT: Optical burst switching

Bushings

USE: Insulators

Built-in self-test

UF: BIST

Self-testing

BT: Testing

RT: Circuit testing

Design for testability

Bulk acoustic wave devices

BT: Acoustic devices

Film bulk acoustic

resonators

Bulk storage

BT: Material storage

Containers

Bundle adjustment

BT: Three-dimensional displays

Buoyancy

BT: Fluid dynamics

RT: Fluids

Physics

Buried object detection

UF: Buried objects

Underground object

detection

Underground objects

Business

UF: Commerce

Trade

BT: Engineering management

RT: Bankruptcy

Business process

integration

management

Commercial law

Consortia

Contracts

Employment

Enterprise resource

Business communication

BT: Organizational aspects

RT: Best practices
<table>
<thead>
<tr>
<th>Business continuity</th>
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<tbody>
<tr>
<td>BT: Management</td>
<td>USE: Writing</td>
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<tr>
<td>RT: Security</td>
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<td>System recovery</td>
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<td>Venture capital</td>
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<td>BT: Business</td>
<td>USE: Butler matrices</td>
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<td>Data processing</td>
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<td>RT: Data governance</td>
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<tr>
<td>Data analysis</td>
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<td>RT: Competitive intelligence</td>
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<td>USE: Organizational aspects</td>
<td>USE: Bring your own device</td>
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<td>BT: Enterprise resource planning</td>
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<td>RT: Process planning</td>
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<td>NT: Task analysis</td>
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<td>Cable shielding</td>
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<td>BT: Insulation</td>
<td>USE: Calcium</td>
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<tr>
<td>RT: Cables</td>
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<tr>
<td>Oil filled cables</td>
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</tr>
<tr>
<td>NT: Power cable insulation</td>
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<tr>
<td>Cable shielding</td>
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</tbody>
</table>
2021 IEEE Thesaurus

**Cable splicing**

*USE:* Splicing

**Cable TV**

*UF:* Community antenna

**Cables**

*BT:* Transmission lines
  *RT:* Cable insulation
  *Cable shielding*
  *Conductors*
  *Fault location*
  *Winches*
  *Wiring*

*NT:* Coaxial cables
  *Communication cables*
  *Mechanical cables*
  *Optical fiber cables*
  *Power cables*
  *Underwater cables*

**Cables (mechanical)**

*USE:* Mechanical cables

**Cache memory**

*BT:* Memory
  *NT:* Cache storage

**Cache storage**

*BT:* Cache memory
  *RT:* Computer buffers

**CAD**

*USE:* Design automation

**Cadaver**

*UF:* Corpse
  *BT:* Pathological processes

**CADCAM**

*BT:* Computer aided manufacturing
  *RT:* Computer integrated manufacturing systems
  *USE:* Design automation

**Calibration**

*UF:* Intercalibration
  *BT:* Measurement techniques

**Calculus**

*BT:* Mathematics
  *NT:* Differential equations
  *Integral equations*
  *Level set*

**Calculation**

*BT:* Heat treatment
  *RT:* Kilns

**Calcium compounds**

*UF:* Calcium carbonate
  *BT:* Calcium phosphates
  *NT:* Calcium compounds

**Cadmium**

*BT:* Metals
  *NT:* Cadmium compounds

**Caesium**

*USE:* Cesium

**CAE**

*USE:* Computer aided engineering

**CAD**

*USE:* Design automation

**Calculators**

*BT:* Computers
  *RT:* Digital arithmetic
  *NT:* Difference engines

**Calculation**

*BT:* Heat treatment
  *RT:* Kilns

**Calcium compounds**

*UF:* Calcium carbonate
  *BT:* Calcium phosphates
  *NT:* Calcium compounds

**Cadmium**

*BT:* Metals
  *NT:* Cadmium compounds
<table>
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<tr>
<td>Cams</td>
<td>Machine components</td>
<td>Engines</td>
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</table>

**Camshafts**
- Cams
- Shafts
- Automotive components
- Belts
- Engines

**Canadian Standards Association**
- USE: CSA Group

**Cancellous bone**
- Bone tissue
- Osteoporosis

**Cancer**
- Malignancy
- Malignant
- Diseases
- Biomedical applications of radiation
- Chemotherapy
- Medical diagnostic imaging
- Oncological surgery
- Oncology
- Single photon emission computed tomography
- Tumors
- Breast cancer
- Cervical cancer
- Lung cancer
- Metastasis
- Ovarian cancer
- Prostate cancer
- Skin cancer

**Cancer detection**
- Medical tests

**Cancer drugs**
- Drugs

**Cancer treatment**
- Medical treatment

**Canning**
- Packaging
- Containers
- Material storage
- Materials handling
- Materials processing
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<td>Capacitive sensors</td>
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<td>Capacitive transducers</td>
<td>Transducers</td>
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<td>Carbon capture and storage</td>
<td>Carbon dioxide</td>
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Pacemakers
Phonocardiography
NT: Cardiac tissue
Cardiopulmonary arrest
USE: Cardiac arrest
Cardiovascular diseases
BT: Diseases
NT: Cardiac arrest
Cardiac disease
Cardiovascular system
BT: Anatomy
NT: Baroreflex
Blood vessels
Heart
Career development
BT: Education
NT: Continuing education
Jobs listings
Mentoring
Careers
USE: Engineering profession
Cargo handling
USE: Freight handling
Carotid arteries
UF: Carotoid arteries
BT: Arteries
Carotid arteries
USE: Carotid arteries
Carrier confinement
BT: Charge carrier processes
Carrier density
USE: Charge carrier density
Carrier lifetime
USE: Charge carrier lifetime
Carrier processes
USE: Charge carrier processes
Carrier sense multiaccess
USE: Multiaccess communication
Cars
USE: Automobiles
Cartilage
BT: Musculoskeletal system
Cascade lasers
USE: Quantum cascade lasers
Cascading style sheets
BT: Style sheet languages
RT: Markup languages
Casimir effect
UF: Casimir energy
Casimir force
BT: Electric fields
Nanotechnology
RT: Atomic force microscopy
Elementary particle vacuum
Vacuum systems
Casimir energy
USE: Casimir effect
Casimir force
USE: Casimir effect
Cast iron
BT: Iron
RT: Casting
Production materials
Castellations
USE: Flip chip solder joints
Casting
BT: Materials processing
RT: Cast iron
Foundries
NT: Die casting
Tape casting
Catalysis
BT: Chemical reactors
NT: Electrocatalysis
Photocatalysis
Catalysts
BT: Materials
NT: Electrocatalysts
Photocatalysts
Catalytic converters
USE: Exhaust systems
Catalytic convertors
USE: Exhaust systems
Cataracts
  BT: Eyes
  Medical conditions
  RT: Aging

Catheterization
  BT: Medical services
  RT: Catheters

Catheters
  BT: Biomedical equipment
  RT: Catheterization
  Surgery

Cathode ray tubes
  UF: CRT
  BT: Displays
  Electron devices
  RT: Flyback transformers

Cathode-ray oscilloscopes
  USE: Oscilloscopes

Cathodes
  UF: Photocathodes
  BT: Electrodes
  RT: Electron emission
  Electron tubes

Cats
  UF: Felines
  BT: Animals

Cattle
  USE: Cows

Cause effect analysis
  UF: Fishbone diagrams
  Ishikawa diagrams
  BT: Process planning
  RT: Expert systems
  Failure analysis
  Fault diagnosis
  Pareto analysis
  Testing

Cavity perturbation methods
  BT: Perturbation methods
  RT: Cavity resonators

Cavity resonators
  BT: Resonators
  RT: Cavity perturbation methods

Klystrons
  Microcavities
  Resonance
  NT: Laser cavity resonators

CD
  USE: Charge coupled devices

CCD image sensors
  BT: Image sensors
  RT: Digital photography

CD recording
  UF: Compact disk
  BT: Optical recording
  RT: Laser applications
  NT: CD-ROMs

CD-ROM
  USE: CD-ROMs

CD-ROM reviews
  BT: IEEE indexing

CD-ROMs
  UF: CD-ROM
  BT: CD recording
  RT: Electronic publishing
  Information systems

CDMA
  USE: Multiaccess communication

Cell biology
  USE: Biological cells

Cell clones
  USE: Cloning

Cell phones
  USE: Cellular phones

Cell signaling
  UF: Cell signaling
  BT: Biological cells
  RT: Biochemistry
  Biomechanics
  Mechanobiology

Cells (biology)
  BT: Biological cells
  NT: Extracellular
  Ganglia
  Glial cells
  Membrane potentials
| Term                                      | Synonyms                                                                
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<td>Progenitor cells</td>
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<td>Cellular biophysics</td>
<td>Biophysics, Molecular biophysics, Nanomedicine</td>
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<td><strong>Cellular land mobile radio</strong></td>
<td>USE: Cellular radio</td>
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<td>Cellular manufacturing</td>
<td>BT: Manufacturing systems, Flexible manufacturing systems, Production control</td>
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<tr>
<td>Cellular neural networks</td>
<td>BT: Neural networks</td>
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<tr>
<td>Cellular phones</td>
<td>UF: Cell phones, BT: Telephone equipment</td>
</tr>
<tr>
<td>Cellular radio</td>
<td>UF: Cellular land mobile radio, Land mobile radio cellular, Land-mobile radio cellular systems</td>
</tr>
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<td>Cement industry</td>
<td>BT: Manufacturing industries</td>
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<td>Censorship</td>
<td>BT: Law, RT: Consumer protection, Government policies, Law enforcement, Legal factors</td>
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<td>Central air conditioning</td>
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<td>Central air-conditioning</td>
<td>USE: Central air conditioning</td>
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<tr>
<td>Central nervous system</td>
<td>BT: Nervous system, RT: Hypothalamus, NT: Grey matter, Midbrain, White matter</td>
</tr>
<tr>
<td>Central office</td>
<td>BT: Communication networks</td>
</tr>
<tr>
<td>Central Processing Unit</td>
<td>UF: CPU</td>
</tr>
</tbody>
</table>

**BT**: Broad Term, **RT**: Related Term, **NT**: Narrow Term, **USE**: Use, **UF**: Uniform Format
2021 IEEE Thesaurus

Centralized control
UF: Integrated control
BT: Control systems

Cepstral analysis
BT: Acoustics
RT: Music information retrieval
Speech analysis
Speech recognition
NT: Cepstrum
Mel frequency cepstral coefficient

Ceramic glazes
BT: Glazes

Ceramic products
BT: Manufactured products
Ceramics
Glass products
Insulators
Porcelain
Tiles

Ceramics
UF: Glass ceramics
BT: Insulation
Materials
RT: Aluminum oxide
Ceramic products
Ceramics industry
Cermet
Dielectric materials
Diffusion bonding
Electrets
Firing
Glass
Glass products
Glazes
High-temperature superconductors
Magnesium oxide
Powders
Tape casting
Tiles
NT: Bioceramics
Porcelain

Ceramics industry
BT: Manufacturing industries
RT: Bioceramics
Ceramics
Porcelain

Cerebellum
BT: Brain

Cerebral cortex
BT: Brain

Cerebrospinal fluid
BT: Fluids and secretions
Spinal cord
RT: Brain

Cerebrum
BT: Brain

Cerenkov lasers
USE: Free electron lasers

Cerium
BT: Chemical elements

Cermet
BT: Composite materials
Ceramics
Metallic materials

Certification
BT: Training
RT: Conformance testing

Cervical cancer
BT: Cancer

Cesium
UF: Caesium
BT: Chemical elements

CFD
USE: Computational fluid dynamics

CGM
USE: Computer generated music

Chalcogenides
BT: Chemical compounds

Change detection algorithms
BT: Algorithms
# 2021 IEEE Thesaurus

## Channel allocation
- **UF:** Bandwidth allocation
- **BT:** Communication channels
- **NT:** Spectral efficiency

## Channel bank filters
- **BT:** Filters

## Channel capacity
- **BT:** Communication channels
- **RT:** Quantum communication

## Channel coding
- **BT:** Encoding
- **RT:** Communication channels
- **NT:** Block codes
- **NT:** Combined source-channel coding

## Channel estimation
- **UF:** Channel state estimation
- **BT:** Communication channels
- **RT:** Cellular radio
- **NT:** Combined source-channel coding

## Channel hot electron injection
- **UF:** Channel hot-electron injection
- **BT:** Hot carrier injection

## Channel models
- **BT:** Communication channels

## Channel rate control
- **BT:** Rate distortion theory

## Channel spacing
- **BT:** Communication channels

## Chaos
- **BT:** Nonlinear systems
- **RT:** Bifurcation
- **RT:** Econophysics
- **RT:** Fractals
- **RT:** Nonlinear circuits
- **RT:** Nonlinear dynamical systems
- **NT:** Pattern formation
- **NT:** Predator prey systems
- **NT:** Random media
- **NT:** Chaotic communication
- **NT:** Complexity theory
- **NT:** Spatiotemporal phenomena

## Character generation
- **BT:** Graphics
- **RT:** Computer graphics
- **RT:** Displays
- **RT:** Printing

## Character recognition
- **UF:** Print readers
- **BT:** Pattern recognition
- **RT:** Text recognition

## Characteristic mode analysis
- **BT:** Electromagnetic analysis

## Charge carrier density
- **UF:** Carrier density
- **BT:** Charge carriers

## Charge carrier lifetime
- **UF:** Carrier lifetime
- **BT:** Charge carriers

## Rate distortion theory
- **RT:** Optical fiber applications
### 2021 IEEE Thesaurus

**Charge carrier mobility**
- **BT:** Charge carriers

**Charge carrier processes**
- **UF:** Carrier processes
  - Charge carrier trapping
  - Electron carriers
  - Hole carriers
  - Semiconductor charge
- **BT:** Charge carriers
  - Diffusion processes
- **RT:** Semiconductor impurities
- **NT:** Carrier confinement
  - Charge transfer
  - Electron mobility
  - Electron traps
  - Excitons
  - Space charge
- **USE:** Charge carrier processes

**Charge carrier trapping**
- **USE:** Charge carrier processes

**Charge carriers**
- **BT:** Elementary particles
  - Conductivity
  - Impact ionization
  - Semiconductor impurities
  - Semiconductor materials
- **RT:** Semiconductor impurities
- **NT:** Charge carrier density
  - Charge carrier lifetime
  - Charge carrier mobility
  - Charge carrier processes
  - Hot carriers

**Charge coupled devices**
- **UF:**
  - Charge injection devices
  - Charge transfer devices
  - Charge-injection devices
  - Charge-transfer devices
- **BT:** MIS devices

**Charge injection devices**
- **USE:** Charge coupled devices

**Charge measurement**
- **BT:** Electrostatic measurements
  - Pulsed electroacoustic methods
- **RT:**
- **NT:** Battery charge

**Charge pumps**
- **UF:** Charge-pumping

**Charge transfer**
- **BT:** Charge carrier processes

**Charge transfer devices**
- **USE:** Charge coupled devices

**Charge-coupled image sensors**
- **BT:** Image sensors
  - Optoelectronic devices
- **USE:** Charge coupled devices

**Charge-injection devices**
- **USE:** Charge coupled devices

**Charge-pumping**
- **USE:** Charge pumps

**Charge-transfer devices**
- **USE:** Charge coupled devices

**Charged device model**
- **USE:** Electrostatic discharges

**Charging devices**
- **USE:** Battery chargers

**Charging stations**
- **BT:** Power supplies
  - Battery chargers
  - Battery powered vehicles
  - Electric vehicles
  - Hybrid electric vehicles
  - Plug-in hybrid electric vehicles
- **RT:**

**Chatbot**
- **BT:** Human computer interaction
  - Natural language processing
  - Speech synthesis
  - Auditory system
  - Human factors

**Charge measurement**
- **BT:**
  - Electrostatic measurements
  - Pulsed electroacoustic methods

**Charge pumps**
- **BT:** System recovery

**Checkpointing**
- **BT:** System recovery

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Cheese
USE: Dairy products

Chemical analysis
BT: Chemistry
Materials science and technology
RT: Chemical technology
Drugs
Fractionation
NT: Activation analysis
Chemical processes
Chemicals
Electronic noses
pH measurement

Chemical and biological sensors
BT: Sensors
NT: Biosensors
Gas detectors

Chemical compounds
BT: Chemistry
NT: Anti-freeze
Bromine compounds
Chalcogenides
Ethanol
Methanol
Radiotracer

Chemical elements
BT: Chemicals
Materials, elements, and compounds
NT: Actinium
Aluminum
Americium
Antimony
Arsenic
Astatine
Berkelium
Beryllium
Boron
Bromine
Californium
Carbon
Cerium
Cesium
Chlorine
Curium
Darmstadtium
Dysprosium
Europium
Fluorine
Francium
Gadolinium
Hafnium
Helium
Holmium
Hydrogen
Iodine
Iridium
Isotopes
Krypton
Lutetium
Mercury (metals)
Molybdenum
Neon
Neptunium
Nitrogen
Osmium
Oxygen
Phosphorus
Plutonium
Polonium
Potassium
Praseodymium
Promethium
Protactinium
Radium
Radon
Rhenium
Rhodium
Roentgenium
Rubidium
Ruthenium
Scandium
Selenium
Sodium
Sulfur
Tantalum
Technetium
Tellurium
Terbium
Thallium
Thorium
Thulium
Titanium
Uranium
Vanadium
Ytterbium
Yttrium
Zirconium

Chemical engineering
BT: Engineering - general
RT: Chemical industry
Chemical products
Chemical technology
2021 IEEE Thesaurus

Process design

Chemical hazards
BT: Hazards
RT: Biohazards
Contamination
Explosions
Hazardous materials
Toxicology
NT: Toxic chemicals

Chemical industry
BT: Industries
RT: Chemical engineering
Chemical reactors
Chemical technology
Electrochemical processes
Petrochemicals
Petroleum industry
Pipelines
Plastic products
Plastics industry
Rubber industry

Chemical reactors
UF: CSTR
BT: Chemical technology
RT: Chemical industry
Crystallizers
Process control
Water splitting
NT: Bioreactors
Catalysis
Continuous-stirred tank reactor
Ignition

Chemical sensors
BT: Chemical technology
RT: Detectors

Chemical technology
BT: Industry applications
RT: Chemical analysis
Chemical engineering
Chemical industry
Chemistry
Decontamination
Refining
NT: Chemical reactors
Chemical sensors
Crystallizers
Distillation equipment
Fluidization
Pharmaceutical technology
Vitrification

Chemical transducers
BT: Transducers
RT: Gas detectors

Chemical vapor deposition
UF: CVD
BT: Plasma materials
RT: Coatings
2021 IEEE Thesaurus

Epitaxial layers
Films

NT: Atmospheric pressure
chemical vapor deposition

Atomic layer deposition
MOCVD
Pulsed laser deposition

Chemicals
BT: Chemical analysis
NT: Chemical elements

Chemistry
BT: Science - general
Chemical products
Chemical technology
Drugs
Petrochemicals
Pharmaceutical technology
Pharmaceuticals
Pickling
Plastic products
NT: Astrochemistry
Biochemistry
Chemical analysis
Chemical compounds
Electrochemistry
Geochemistry
Inorganic chemicals
Interstellar chemistry
Organic chemicals
Photochemistry
Quantum chemistry

Chemotherapy
BT: Medical treatment
Cancer
Drugs
Medical services
Oncology
Patient monitoring

Chest medicine
USE: Pulmonology

Child
USE: Pediatrics

Children
USE: Pediatrics

Chip design
USE: Chip scale packaging

Chip development
USE: Chip scale packaging

Chip fabrication
USE: Chip scale packaging

Chip scale packaging
UF: CSP
Chip design
Chip development
Chip fabrication
Chip-making process
BT: Electronics packaging
RT: Integrated circuit packaging

Chip-making process
USE: Chip scale packaging

Chirp
BT: Signal processing

Chirp modulation
UF: Linear frequency
modulation
BT: Modulation
RT: Sonar
communication
Spread spectrum
Spread spectrum radar

Chlorine
BT: Chemical elements
NT: Chlorine compounds

Chlorine compounds
UF: Chlorine dioxide
Chloroform
Hydrogen chloride
Sodium chloride
BT: Chlorine

Chlorine dioxide
USE: Chlorine compounds

Chloroform
USE: Chlorine compounds

Chokes
USE: Inductors

Choppers (circuits)
BT: Switching circuits
RT: Power conversion

CHP
USE: Cogeneration
Chromatic dispersion  
BT: Dispersion

Chrome plating  
BT: Plating
RT: Coatings

Chromium  
UF: Cr
BT: Metals
NT: Chromium alloys

Chromium alloys  
BT: Chromium

Chromosome mapping  
BT: Biological cells

Chromosomes  
USE: Biological cells

Chronobiology  
UF: Biological clocks
BT: Biological processes

CIM  
USE: Common Information Model
(computing) AND
Common Information Model
(electricity) AND
Computer integrated manufacturing

Cinema  
USE: Motion pictures

Cinematography  
BT: Motion pictures
RT: Object tracking

Ciphers  
UF: Cyphers
BT: Cryptography
RT: Algorithms
Codes
Encryption

Circadian rhythm  
UF: Circadian rhythms
BT: Biological processes

Circuit analysis  
BT: Circuits
RT: Frequency-domain analysis
SPICE
Sensitivity
Tolerance analysis
Yield estimation
NT: Circuit analysis computing
Coupled mode analysis
Nonlinear network analysis

Circuit analysis computing  
BT: Circuit analysis

Circuit boards  
USE: Printed circuits

Circuit breakers  
BT: Switchgear
RT: Interrupters
Power system protection
Protection
Switching circuits
NT: Molded case circuit breakers

Circuit CAD  
USE: Design automation

Circuit complexity  
USE: Complexity theory

Circuit design  
USE: Circuit synthesis

Circuit design (CAD)  
USE: Design automation

Circuit design (logic)  
USE: Logic design

Circuit faults  
BT: Circuits
NT: Electrical fault detection

Circuit feedback  
USE: Feedback circuits

Circuit layout CAD  
USE: Design automation

Circuit noise  
BT: Circuits
RT: Transmission lines
2021 IEEE Thesaurus

NT: Thermal noise

Circuit optimisation
USE: Circuit optimization
UF: Circuit optimisation
Circuit performance
Circuit tuning
BT: Optimization methods
RT: Tolerance analysis

Circuit performance
USE: Circuit optimization
NT: Active circuits
Adders

Circuit simulation
BT: Circuits
RT: Design automation
Semiconductor process
integrated circuits
modeling

Circuit stability
BT: Stability
RT: Grounding
Jitter

Circuit subsystems
BT: Solid state circuits
RT: Circuits and systems

Circuit synthesis
UF: Circuit design
BT: Circuits
RT: Control system synthesis
Logic design
Solid state circuit design
NT: High level synthesis
Integrated circuit synthesis

Circuit testing
BT: Testing
RT: Built-in self-test
NT: Integrated circuit
measurements

Circuit theory
BT: Solid state circuits

Circuit tolerance analysis
USE: Tolerance analysis

Circuit topology
BT: Digital circuits
circuits
RT: Graph theory
Tree graphs

Current mirrors

Circuit tuning
USE: Circuit optimization

Circuits
BT: Circuits and systems
Flow graphs
Impedance matching
Oscillators
Phase transformers
Poles and zeros
Scattering parameters

Asynchronous circuits
Bipolar transistor circuits
Bistable circuits
Bridge circuits
Charge pumps
Circuit analysis
Circuit faults
Circuit noise
Circuit simulation
Circuit synthesis
Coprocessors
Counting circuits
Coupling circuits
Digital circuits
Digital signal processors
Distributed parameter
drivers
Electronic circuits
Equivalent circuits
Feedback
Hybrid integrated circuits
Integrated circuits
Isolators
Large scale integration
Linear circuits
Logic arrays
Logic circuits
MOSFET circuits
Magnetic circuits
Microprocessors
Microwave circuits
Millimeter wave circuits
Millimeter wave integrated
Monolithic integrated
2021 IEEE Thesaurus

Multiplying circuits
Neural circuits
Nonlinear circuits
Passive circuits
Phase shifters
Power dissipation
Power integrated circuits
Printed circuits
Programmable circuits
Programmable logic arrays
Programmable logic
devices
Pulse circuits
Quantum circuit
RLC circuits
Radiation detector circuits
Rectifiers
Sampled data circuits
Sequential circuits
Silicon-on-insulator
Submillimeter wave circuits
Summing circuits
Switched circuits
Switching circuits
Thick film circuits
Thin film circuits
Thyristor circuits
Time varying circuits
Trigger circuits
UHF circuits
UHF integrated circuits
Ultra large scale integration
VHF circuits
Very large scale integration
Voltage multipliers
Wafer scale integration

Circular polarization
USE: Polarization

Circular waveguides
BT: Electromagnetic
waveguides

Circulators
BT: Ferrite devices
Microwave technology
RT: Electromagnetic technology
Waveguide components

Circulatory system
UF: Vascular system
BT: Anatomy

Citation analysis
UF: Citation studies
BT: Bibliometrics

Citation studies
USE: Citation analysis

Cities and towns
USE: Urban areas

City
USE: Urban areas

City planning
USE: Urban planning

Civil engineering
BT: Engineering - general
RT: Bridges
Buildings
Construction
Energy resources
Environmental factors
Power systems
Road transportation
Roads
Transmission lines
Geotechnical engineering
Geotechnical structures
Railway engineering
Structural engineering

Circuits and systems
RT: Circuit subsystems
Formal verification
Solid state circuits
NT: Circuits
Contacts
Filtering
Integrated circuit

technology
Logic devices
Oscillators
Single electron devices
Tunable circuits and

devices

Cladistics
USE: Phylogeny

Circular polarisation
USE: Polarization

Clamping
USE: Clamps
<table>
<thead>
<tr>
<th>Term</th>
<th>UF</th>
<th>BT</th>
<th>RT</th>
<th>NT</th>
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<tbody>
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<td>Environmental factors</td>
<td>Global warming</td>
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<td>Climbing robots</td>
<td>Mobile robots</td>
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Closed captioning
BT: Assistive technology
Communication aids
RT: Media
TV

Closed form solution
USE: Closed-form solutions

Closed loop systems
UF: Closed-loop systems
BT: Control systems
RT: H infinity control

Closed-form expression
USE: Closed-form solutions

Closed-form solutions
UF: Closed form solution
Closed-form expression
BT: Mathematics

Closed-loop systems
USE: Closed loop systems

Clothing
UF: Garments
BT: Consumer products
Clothing industry
Fabrics
Wool
NT: Footwear
Protective clothing

Clothing industry
UF: Garment industry
BT: Manufacturing industries
RT: Clothing
Footwear
Footwear industry
Protective clothing
Textile industry

Clotting
USE: Coagulation

Cloud computing
BT: Internet
Big Data applications
Dew computing
Distributed computing
Edge computing
Grid computing
Internet of Things

Cloud computing security
UF: Cloud security
BT: Cloud computing
Computer security

Cloud gaming
UF: Gaming on demand
BT: Cloud computing
Games
RT: Online services

Cloud radio access networks
BT: Network function
virtualization
Radio access networks
RT: Cellular networks

Cloud security
USE: Clinical neuroscience AND
Cloud computing security

Cloud-dew architecture
USE: Dew computing

Cloud-dew computing
USE: Dew computing

Clouds
BT: Terrestrial atmosphere

Cluster computing
UF: Apache hadoop
Apache spark
Network of workstations
Workstation clusters
BT: Distributed computing
RT: Distributed processing
Message systems
Parallel processing
Peer-to-peer computing
Resource management
Workstations
Clustering algorithms
BT: Algorithms

Clustering methods
BT: Pattern recognition
RT: Extreme learning machines
NT: Pattern clustering

Clutter
BT: Interference
RT: Echo interference

CMM
USE: Coordinate measuring machines

CMOS analog integrated circuits
UF: Analog CMOS integrated circuits
Analogue CMOS integrated circuits
CMOS analogue integrated circuits
BT: Analog integrated circuits
CMOS integrated circuits

CMOS analogue integrated circuits
USE: CMOS analog integrated circuits

CMOS digital integrated circuits
BT: CMOS integrated circuits
CMOS logic circuits
NT: CMOS logic circuits

CMOS image sensors
BT: Image sensors

CMOS integrated circuits
BT: Integrated circuits
CMOSFETs
Neuromorphic engineering
NT: CMOS analog integrated circuits
CMOS digital integrated circuits
CMOS memory circuits
Transconductors

CMOS logic circuits
BT: CMOS digital integrated circuits
CMOS integrated circuits
RT: Application specific integrated circuits

CMOS memory circuits
UF: CMOS memory integrated circuits
BT: CMOS integrated circuits
RT: Memory
SRAM chips

CMOS memory integrated circuits
USE: CMOS memory circuits

CMOS process
BT: CMOS technology

CMOS technology
BT: Integrated circuit technology
RT: MOSFET
Microcontrollers
Microprocessors
Transistors
NT: CMOS process
Silicon on sapphire

CMOSFET circuits
BT: MOSFET circuits
RT: Rail to rail operation

CMOSFET devices
BT: CMOSFETs
RT: MISFETs
MOSFET
P-i-n diodes

CMOSFETs
BT: MOSFET
RT: CMOS integrated circuits
Semiconductor-insulator interfaces
NT: CMOSFET logic devices

CNC
USE: Computer numerical control

CNFETs
USE: CNTFETs

CNTFETs
UF: CNFETs
Carbon nanotube FETs
Carbon nanotube field-effect transistors
Carbon nanotube field-effect transistors
<table>
<thead>
<tr>
<th><strong>2021 IEEE Thesaurus</strong></th>
</tr>
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<tbody>
<tr>
<td>Carbon-nanotube FETs</td>
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<tr>
<td>Carbon-nanotube field</td>
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<td>effect transistors</td>
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<tr>
<td>Carbon-nanotube field-</td>
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<tr>
<td>effect transistors</td>
</tr>
<tr>
<td>BT: Field effect transistors</td>
</tr>
<tr>
<td>RT: Carbon nanotubes Quantum capacitance</td>
</tr>
<tr>
<td>Co-channel interference</td>
</tr>
<tr>
<td>USE: Interchannel interference</td>
</tr>
<tr>
<td>Coagulate</td>
</tr>
<tr>
<td>USE: Coagulation</td>
</tr>
<tr>
<td>Coagulation</td>
</tr>
<tr>
<td>UF: Blood clots Clotting Coagulate</td>
</tr>
<tr>
<td>BT: Biological processes Blood</td>
</tr>
<tr>
<td>RT: Blood platelets</td>
</tr>
<tr>
<td>Coal</td>
</tr>
<tr>
<td>BT: Fuels</td>
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<tr>
<td>RT: Coal gas Coal mining</td>
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</tr>
<tr>
<td>UF: Coal gasification Illumination gas Town gas</td>
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<tr>
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<tr>
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<td>USE: Fuel processing industries</td>
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<td>Coatings</td>
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Optical code division

Communication switching
Multiplexing
Cellular radio
Codes
Multicarrier code division

Optical fiber applications
Software radio
Spread spectrum

Code refractoring
Refactoring
Encoding
Information theory
Software engineering

Code-division multiple access
Multiaccess communication

Code-division multiple-access
Multiaccess communication

Codecs
Coder-decoders
Communication equipment
Decoding
Encoding
Speech codecs
Video codecs

Coder-decoders
Codecs

Codes
Parity check
Information theory
Ciphers
Code division multiplexing
Cryptography
Decoding
Encoding
Error correction
Redundancy
Sequences
Vector quantization
Binary codes
Convolutional codes
Cyclic redundancy check

Error correction codes
Parity check codes
Product codes

Coding
Encoding
Information theory

Coercive force
Coercivity
Magnetic forces

Cogeneration
CHP
Cogeneration
Combined heat and power
Heating systems
Power generation
Trigeneration
Waste heat

Cogging
Forging

Cognition
Reasoning
Behavioral sciences
Active perception
Brain
Cognitive systems
Digital intelligence
Psychology
Activity recognition
Cognitive neuroscience
Cognitive processes
Self-aware

Cognitive computing
Cognitive systems

Cognitive informatics
Cybernetics
Informatics
Brain

Cognitive neuroscience
Cognition
Neuroscience

Cognitive processes
BT: Cognition

Cognitive radar
BT: Adaptive systems
Radar

Cognitive radio
UF: Cognitive radio network
BT: Wireless communication

Cognitive radio network
USE: Cognitive radio

Cognitive robotics
BT: Robots
RT: Autonomous robots

Cognitive science
UF: Mental models
BT: Cybernetics
RT: Brain
Computational and artificial intelligence

Cognitive systems
UF: Cognitive computing
Reasoning
Artificial intelligence
Learning systems
Adaptive control
Affective computing
Automata
Cognition
Cybernetics
Fuzzy cognitive maps
Machine learning

Coherence
UF: Coherent detection
BT: Electromagnetic scattering
RT: Interference
Quantum decoherence
NT: Coherence time

Coherent detection
USE: Coherence
cold guns
BT: Electromagnetic launching

Coils
UF: Electric coils
BT: Electronic components
RT: Electromagnets
Generators
Inductance
Inductors
Magnetic circuits
Motors
Rotating machines
Transformers
Windings
NT: Superconducting coils

Cold plates
BT: Cooling

Collaboration
BT: Professional communication
RT: Collective intelligence
Cyber-physical systems
Information sharing
Interoperability
Wikipedia
NT: Collaborative tools
Discussion forums
Teamwork
Virtual groups

Collaborative filtering
BT: Filtering theory
RT: Recommender systems

Collaborative intelligence
BT: Collaborative work
Multi-agent systems
RT: Distributed management
Intelligent systems

Collaborative learning
USE: Collaborative work
2021 IEEE Thesaurus

Collaborative networking
USE: Collaborative work

Collaborative problem solving
USE: Collaborative work

Collaborative software
UF: Groupware
BT: Collaborative tools
RT: Collaborative work
Communication system
software

Collaborative tools
BT: Collaboration
NT: Call conference
Collaborative software
Videoconferences

Collaborative work
UF: Collaborative learning
Collaborative networking
Collaborative problem solving
Cooperative work
Federated learning
BT: Distributed computing
RT: Collaborative software
Communication effectiveness
Multimedia computing
Professional communication
NT: Collaborative intelligence
Cooperative communication
Crowdsourcing
Social computing

Collective bargaining
USE: Industrial relations

Collective intelligence
BT: Decision making
Intelligent systems
RT: Collaboration
Crowdsensing
Crowdsourcing
Sociology

Colleges
USE: Educational institutions

Colliding beam accelerators
BT: Colliding beam devices

Colliding beam devices
BT: Nuclear and plasma sciences
RT: Particle accelerators
NT: Colliding beam accelerators
Muon colliders

Collimators
UF: Multileaf collimators
BT: Optical devices
RT: Biomedical applications of radiation
Biomedical equipment
Dosimetry
Gamma-rays
Linear accelerators
Single photon emission
computed tomography
X-ray applications
X-rays

Collision avoidance
UF: Collision detection
Obstacle avoidance
Sense and avoid
BT: Motion control
RT: Advanced driver assistance systems
Block signalling
Lane departure warning
NT: Lane detection

Collision detection
USE: Collision avoidance

Collision mitigation
BT: Motion control

Collision theory
USE: Kinetic theory

Colloidal crystals
BT: Crystals
RT: Crystallizers

Colloidal lithography
BT: Lithography
Nanopatterning
RT: Biomedical engineering

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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>BT:</th>
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<tbody>
<tr>
<td>Nanobioscience</td>
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<td>Medical tests</td>
<td>Virtual colonoscopy</td>
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<td>Color</td>
<td>Optics Electrochromism Imaging Photochromism Pigmentation</td>
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<td>Color blindness</td>
<td>Vision defects</td>
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<td>Colored noise</td>
<td>Coloured noise Noise</td>
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<td>Comb filters</td>
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<td>Combinational circuits</td>
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<td>Command and control systems</td>
<td>Military command and control BT:</td>
<td>Aerospace and electronic systems RT:</td>
</tr>
<tr>
<td>Combustion</td>
<td>Oxidation Exhaust gases Plasma-assisted combustion</td>
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<tr>
<td>Combined heat and power</td>
<td>USE:</td>
<td>Cogeneration</td>
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<tr>
<td>Combined heat, cooling and power</td>
<td>USE:</td>
<td>Trigeneration</td>
</tr>
<tr>
<td>Combined heat, cooling, and power</td>
<td>USE:</td>
<td>Trigeneration</td>
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<td>Combined source-channel coding</td>
<td>USE:</td>
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<tr>
<td>Combined source-channel coding</td>
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<tr>
<td>Combined source-channel coding</td>
<td>USE:</td>
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</tbody>
</table>
Communication channels
UF: Air interface
Telecom channels
Telecommunication
channels
BT: Information theory
RT: Channel coding
Communication systems
IEEE 802.11e Standard
IEEE 802.11n Standard
Multicarrier code division
multiple access OFDM
Synapses
NT: Channel allocation
Channel capacity
Channel estimation
Channel models
Channel spacing
Channel state information
Gaussian channels
Multipath channels
Multiuser channels
Partial response channels
Quantum channel
Throughput
Time-varying channels

Communication complexity
USE: Complexity theory

Communication effectiveness
BT: Professional
communication
RT: Collaborative work
Cooperative communication

Communication engineering education
BT: Engineering education

Communication equipment
BT: Communications
technology
RT: Bluetooth
Communication systems
Multiplexing equipment
Satellite ground stations
Auditory displays
Codecs
Modems
On board unit
Optical communication

Communication cables (optical)
equipment

Communication cables
UF: Underground
communication cables
BT: Cables
RT: Fault location
Wire

Communicable disease
USE: Infectious diseases

Communication aids
BT: Professional
communication
RT: Assistive technology
Auditory displays
NT: Closed captioning

Common Information Model (computing)
UF: CIM
BT: Analytical models
Information management
RT: DMTF Standards
Information exchange

Common Information Model (electricity)
UF: CIM
BT: Information management
Power transmission
RT: IEC Standards
Information exchange
Interoperability
Open systems
Unified modeling language

Commercial power systems
USE: Industrial power systems

Commercial law
BT: Law
Bankruptcy
Business
Consumer products
Consumer protection
Economics

Commercialization
BT: Engineering management

Common Information Model (computing)
UF: CIM
BT: Analytical models
Information management
RT: DMTF Standards
Information exchange

Common Information Model (electricity)
UF: CIM
BT: Information management
Power transmission
RT: IEC Standards
Information exchange
Interoperability
Open systems
Unified modeling language

Communication aids
BT: Professional
communication
RT: Assistive technology
Auditory displays
NT: Closed captioning

Communication cables
UF: Underground
communication cables
BT: Cables
RT: Fault location
Wire
2021 IEEE Thesaurus

Communication equipment
- Radio communication equipment
- Receivers
- Repeaters
- Speech codecs
- TV equipment
- Telephone equipment
- Transceivers
- Transmitters
- Transponders
- Video codecs
- Video equipment
- Vocoders

Communication industry
- BT: Industries
- RT: Communication systems

Communication network reliability
- USE: Telecommunication network reliability

Communication networks
- UF: PSTN
- Public switched telephone network
- BT: Communication systems
- RT: Network security
- NT: Central office

Communication protocols
- USE: Protocols

Communication satellites
- USE: Satellite communication

Communication standards
- UF: Telecommunication standards
- BT: Standards categories
- RT: Communication systems
- FDDI
- IEC
- ISO
- ISO Standards
- Radio spectrum
- NT: Data over cable service interface specification

Communication switching
- BT: Communications technology
- RT: IEEE 802.3 Standard
- NT: Code division multiplexing
- Electronic switching systems
- Frame relay
- Handover
- Multiprotocol label switching
- Packet switching

Communication symbols
- BT: Professional communication
- RT: Pragmatics
- Semiotics
- Syntactics
- NT: Semiotics

Communication system control
- BT: Communication systems
- RT: Control systems
- NT: Telecommunication control

Communication system operations and management
- BT: Management
- RT: Communication system signaling
- Communication systems

Communication system privacy
- USE: Communication system security

Communication system security
- UF: Communication system privacy
- BT: Communication systems
- RT: Access control
- Cryptography
- Data security
- Electronic warfare

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<td>NT: Received signal strength</td>
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<td>technology</td>
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2021 IEEE Thesaurus

SIMO communication
SISO communication
Satellite communication
Satellite ground stations
Spatial diversity
Submillimeter wave

Subscriber loops
Switching systems
Synchronous digital

Telecommunications
Teleconferencing
Telegraphy
Telephony
Teleprinting
Teletext
Token networks
UHF communication
Underwater communication
Vehicle-to-everything
Videophone systems
Videotex
Visual communication
Wide area networks
Wideband
Wireless communication
Wireless mesh networks
Wireless sensor networks

Communications computing
USE: Telecommunication

Communications technology
RT: Antennas and propagation
NT: Communication equipment
Communication switching
Communication systems
Couplers
High-speed electronics
Image communication
Information and communication technology
Message systems
Modulation
Multiplexing
Network topology
Presence network agents
TV
UHF technology
Ultra wideband technology
VHF devices

Commutation
BT: Motors

Commutators
BT: DC motors

Compact disk
USE: CD recording

Compaction
BT: Waste reduction
RT: Materials handling

Companies
BT: Organizations

Company reports
BT: Publishing
RT: Competitive intelligence
Management
Management accounting

Compass
UF: Compasses
BT: Instruments
RT: Magnetic fields
Navigation

Compasses
USE: Compass

Competitive intelligence
BT: Information management
RT: Business intelligence
Company reports
Decision support systems
Digital intelligence
Knowledge management
Market research

Compilers (program)
USE: Program processors

Complex networks
BT: Network topology
RT: Social network theory
Social sciences
System dynamics
System of systems

Complex systems
BT: Systems engineering and theory
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>RT:</th>
<th>NT:</th>
<th>Composite media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-inspired engineering</td>
<td>Cermet</td>
<td>USE: Nonhomogeneous media</td>
</tr>
<tr>
<td>Configuration management</td>
<td></td>
<td>Composite systems</td>
</tr>
<tr>
<td>Large-scale systems</td>
<td>USE: Interconnected systems</td>
<td></td>
</tr>
</tbody>
</table>

**Complexity**

**USE:** Complexity theory

**Complexity constrained detection**

**USE:** Maximum likelihood detection

**Complexity theory**

**UF:** Circuit complexity

Communication complexity

Complexity

**BT:** Chaos

**RT:** Computation theory

Econophysics

**NT:** Computational complexity

NP-complete problem

NP-hard problem

**Compliance testing**

**USE:** Conformance testing

**Compliant mechanisms**

**USE:** Manufacturing processes

**Component architectures**

**UF:** Component-based systems

**BT:** Components, packaging, and manufacturing technology

**Component-based systems**

**USE:** Component architectures

**Components, packaging, and manufacturing technology**

**NT:** Component architectures

Electronic components

Electronic equipment

**manufacture**

Electronics packaging

Environmentally friendly manufacturing techniques

**manufacture**

Integrated circuit

**packaging**

Integrated circuit packaging

Semiconductor device

**packaging**

Thermal management of electronics

**Composite materials**

**BT:** Materials

**Compressed sensing**

**UF:** Compressive sensing

**BT:** Algorithms

**Compression algorithms**

**BT:** Production

**RT:** Injection molding

**Compression moulding**

**USE:** Compression molding

**Compressive sensing**

**USE:** Compressed sensing

**Compressive stress**

**BT:** Stress

**Compressors**

**BT:** Electric machines

**RT:** Air conditioning

Pumps

Turbines

Turbomachinery

**Computation complexity**

**USE:** Computational complexity

**Computation theory**

**BT:** Computational intelligence

**RT:** Complexity theory

**NT:** Computational complexity

**Concurrent computing**
Greedy algorithms
Support vector machines

Computational and artificial intelligence
RT: Cognitive science
Digital systems
NT: Artificial intelligence
Autonomous mental development
Computational intelligence
Logic
Machine intelligence
Neural networks

Computational biochemistry
BT: Computational biology
RT: Biochemistry
Bioinformatics

Computational biology
BT: Engineering in medicine
and biology
RT: Bioinformatics
Biology
Computational neuroscience
Synthetic biology
NT: Computational biochemistry
Computational biophysics
Computational systems biology

Computational biophysics
BT: Computational biology
RT: Bioinformatics
Biophysics

Computational complexity
UF: Computation complexity
BT: Complexity theory
Computation theory
RT: Algorithmic efficiency
NT: Time complexity

Computational cultural dynamics
USE: Computational cultural modeling

Computational efficiency
BT: Mathematics

Computational electrodynamics
USE: Computational electromagnetics

Computational electromagnetics
UF: Computational electrodynamics
BT: Electromagnetic analysis
RT: Computer applications
Electromagnetic field theory
Electromagnetic fields
Finite difference methods
Monte Carlo methods
Stochastic processes

Computational ethics
USE: Machine ethics

Computational fluid dynamics
UF: CFD
BT: Fluid dynamics
RT: Isosurfaces

Computational geometry
BT: Geometry
RT: Computer graphics
Layered manufacturing
Surface fitting
NT: Fractals

Computational intelligence
BT: Computational and artificial intelligence
RT: Artificial intelligence
Synapses
NT: Computation theory
Evolutionary computation
Fuzzy systems
Genetic algorithms

Computational life sciences
USE: Computational modeling AND Life sciences

Computational linguistics
BT: Systems, man, and cybernetics
RT: Context modeling
NT: Machine translation
Sentiment analysis
### 2021 IEEE Thesaurus

#### Computational modeling
- **UF:** Computational life sciences
  - Life sciences computing
- **ZINDO**
- **BT:** Modeling
- **RT:** Neuroinformatics
  - Time complexity
- **NT:** Agent-based modeling
  - Computational cultural modeling
- **USE:** Reversible computing

#### Computational neuroscience
- **UF:** Theoretical neuroscience
- **BT:** Computer science
  - Neuroscience
- **RT:** Computational biology
  - Nervous system

#### Computational science
- **USE:** Scientific computing

#### Computational social and behavioral modeling
- **USE:** Computational cultural modeling

#### Computational systems biology
- **BT:** Computational biology

#### Computed microtomography
- **USE:** Computed tomography

#### Computed tomography
- **UF:** CT scan
  - Computed microtomography
  - Computerised axial tomography
  - Computed tomography
- **BT:** Computer applications
  - Radiological technology
  - Medical imaging
  - Computerized axial tomography

#### Computer aided instruction
- **UF:** CAI
  - Computer aided learning
  - Computer-assisted instruction
  - Computer-aided instruction
  - Teaching machines
  - Computer applications
  - Educational technology
  - Authoring systems
  - Continuing education
  - Courseware
  - Educational courses
  - Electronic learning
  - Matlab
  - Technology acceptance

#### Computer aided learning
- **USE:** Computer aided instruction

#### Computer aided manufacturing
- **UF:** CAM
  - Industrial electronics
  - Manufacturing automation
  - Computer integrated manufacturing
  - Integrated manufacturing systems
  - CADCAM
  - Silicon compiler

#### Computer aided software engineering
- **BT:** Software engineering
  - Programming environments

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<th>Software tools</th>
<th>Telecommunication computing</th>
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<tr>
<td>Computer animation</td>
<td>Virtual assistants</td>
</tr>
<tr>
<td>USE: Animation</td>
<td>Virtual enterprises</td>
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<td></td>
<td>Virtual manufacturing</td>
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<tr>
<td>Computer applications</td>
<td>Web sites</td>
</tr>
<tr>
<td>UF: Volunteer computing</td>
<td>World Wide Web</td>
</tr>
<tr>
<td>BT: Computers and information processing</td>
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<tr>
<td>RT: Biomedical computing</td>
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<tr>
<td>Computational electromagnetics</td>
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<td>Computerized monitoring</td>
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<td>Edge computing</td>
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<td>Flexible manufacturing</td>
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<td>Learning management</td>
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<td>Software agents</td>
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<td>Software packages</td>
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<td>Application virtualization NT:</td>
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<td>Big Data applications</td>
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<tr>
<td>Blockchain</td>
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<tr>
<td>Bot (Internet)</td>
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<tr>
<td>Computer aided analysis</td>
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<td>Computer aided engineering</td>
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<td>Computer aided instruction</td>
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<td>Computer generated music</td>
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<td>Computer integrated manufacturing</td>
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<td>Control engineering</td>
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<td>computing instrumentation</td>
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<td>Green computing</td>
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<td>High energy physics</td>
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<td>Knowledge management</td>
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<td>Mathematics computing</td>
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<td>Military computing</td>
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<td>Mobile applications</td>
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<td>Physics computing</td>
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<td>Power engineering</td>
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<td>computing</td>
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<td>Power system analysis</td>
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<td>publishing</td>
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<td>Scientific computing</td>
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<tr>
<td>Computer architecture</td>
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<tr>
<td>UF: Architecture (computer)</td>
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<tr>
<td>BT: Computers and information processing</td>
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<tr>
<td>RT: Microprogramming</td>
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<tr>
<td>NT: Accelerator architectures</td>
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<tr>
<td>Data structures</td>
<td></td>
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<tr>
<td>Dynamic voltage scaling</td>
<td></td>
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<tr>
<td>Memory architecture</td>
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<td>Memory management</td>
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<tr>
<td>Multiprocessor</td>
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<td>interconnection architectures</td>
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<td>Parallel architectures</td>
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<tr>
<td>Reconfigurable</td>
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<tr>
<td>Computer arithmetic</td>
<td></td>
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<tr>
<td>USE: Digital arithmetic</td>
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<tr>
<td>Computer assisted diagnosis</td>
<td></td>
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<tr>
<td>USE: Computer aided diagnosis</td>
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<tr>
<td>Computer automated measurement and control USE:</td>
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<tr>
<td>CAMAC</td>
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<tr>
<td>Computer buffers</td>
<td></td>
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<tr>
<td>BT: Buffer storage</td>
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<tr>
<td>RT: Cache storage</td>
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<tr>
<td>Computer bugs</td>
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<tr>
<td>UF: Bugs</td>
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<tr>
<td>BT: Computer crashes</td>
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<tr>
<td>Computer buses</td>
<td></td>
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<tr>
<td>USE: Data buses</td>
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<tr>
<td>Computer control</td>
<td></td>
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<tr>
<td>USE: Digital control</td>
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<tr>
<td>Computer crashes</td>
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<tr>
<td>BT: Computer errors</td>
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<tr>
<td>NT: Buffer overflows</td>
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<tr>
<td>Computer bugs</td>
<td></td>
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<tr>
<td>Computer crime</td>
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</tr>
<tr>
<td>UF: Cyber crime</td>
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<tr>
<td>Cyber-crime</td>
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</tbody>
</table>
2021 IEEE Thesaurus

Cybercrime
DDoS attack
DoS attack
Hacking
Piracy (software)
Software piracy
BT: Computer security
RT: Botnet
Computer viruses
Computer worms
Control system security
Data security
Digital rights management
Distributed denial-of-service
attack
Privacy-invasive software
Unsolicited e-mail
NT: Counterfeiting
Cyber terrorism
Cyberattack
SQL injection

Computer displays
BT: Displays
RT: Computer graphics
Computer peripherals
Workstations
NT: Mesh generation
Touch sensitive screens

Computer documentation
USE: Documentation

Computer engineering education
USE: Computer science

Computer errors
BT: Computer performance
NT: Computer crashes

Computer generated music
UF: CGM
Computer music
BT: Computer applications
Music

Computer graphics
BT: Graphics
RT: Animation
Art
Character generation
Computational geometry
Computer displays
Computer peripherals

Curve fitting
Fractals
Graphics processing units
Mesh generation
Modeling
Multimedia computing
Ray tracing
Simulation
Surface fitting
Visual effects
Workstations
NT: Data visualization
Rendering (computer graphics)
Shadow mapping
Sprites (computer)
Video sequences
Virtual reality
Visualization
X3D

Computer hacking
UF: Hacker
Hacks
BT: Computer security

Computer hardware
USE: Hardware

Computer industry
UF: DP industry
BT: Industries
RT: Computers and information processing

Computer integrated manufacturing
UF: CIM
BT: Computer applications
Manufacturing automation
RT: Agile manufacturing
CADCAM
Computer aided manufacturing
Virtual manufacturing

Computer interfaces
UF: Docking stations
BT: Computers and information processing
RT: Computer peripherals
Data buses
Interface management
User interfaces
NT: Application programming interfaces
2021 IEEE Thesaurus

Browsers
Computer ports
Field buses
Firewire
Haptic interfaces
Hypertext systems
Input devices
Interface phenomena
Interface states
Musical instrument digital

Computer languages
UF: Programming languages
BT: Formal languages
RT: Data structures
Natural languages
Software
NT: Architecture description

languages
C languages
Command languages
Database languages
Hardware design
High level languages
Markup languages
Python
R language
Specification languages
Style sheet languages
Systems Modeling

Language
Visual BASIC
WS-BPEL

Computer mediated communication
UF: Computer-mediated communication
BT: Social networking (online)

communication
interconnection

Computer music
USE: Computer generated music
AND
Music

Computer network management
BT: Computer networks
RT: Bandwidth
Computer security
Data security
Software defined

networking
Traffic control

Computer network reliability
BT: Computer network management

Computer networks
UF: Mice flows
BT: Communication systems
processing

networking

Computer network management
BT: Computer networks
NT: Ad hoc networks

management

Data security
Software defined

networks

Content distribution

Cyberspace

diffserv networks

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2021 IEEE Thesaurus

Domain Name System
Ethernet
Heterogeneous networks
IP networks
Internet
Intserv networks
Metropolitan area networks
Multiprocessor

interconnection networks
Network function

virtualization
Network security
Network servers
Next generation networking
Overlay networks
Peer-to-peer computing
Software defined

networking
Storage area networks
Token networks
Unicast
Virtual private networks
Wide area networks
Wireless access points

Computer numerical control
UF: CNC
NC machines
BT: Manufacturing automation
RT: Digital control
Industrial control

Computer operating systems
USE: Operating systems

Computer performance
BT: Computers and information processing
NT: Computer errors
Hardware acceleration
Performance loss

Computer peripherals
UF: Computer terminals
Peripheral equipment
BT: Computers and information processing
RT: Computer displays
Computer graphics
Computer interfaces
Device drivers
Firewire
Flash memories
User interfaces
NT: Disk drives

Keyboards
Modems
Printers

Computer pipeline processing
USE: Pipeline processing

Computer ports
BT: Computer interfaces
RT: Computer networks
Hardware
Information exchange

Computer programming profession
USE: Programming profession

Computer science
BT: Computers and information processing
NT: Computational neuroscience
Formal languages
Network theory (graphs)
Programming

Computer science education
UF: Computer engineering
t USE: Operating systems

Computer security
BT: Computers and information processing
Security
RT: Access control
Blacklisting
Blockchain
Computer network
management
Cryptography
Data protection
Data security
Digital forensics
Eavesdropping
Operating systems
Privacy
Privacy-invasive software
Trust management

Remote access

Cloud computing security
Computer crime
Computer hacking
Countermeasures
Cross-site scripting
Cyber espionage
Cyber warfare
Cyberattack
Data integrity
Denial-of-service attack
Firewalls (computing)
Honey pot (computing)
Identity management
Internet security
Mobile security
Password
Penetration testing
Permission
Phishing
Proof of Work
Trusted computing

Computer simulation
BT: Simulation
RT: EMTP
Human in the loop

Computer software
USE: Software

Computer terminals
USE: Computer peripherals

Computer viruses
UF: Viruses (computer)
BT: Malware
RT: Anti-virus software
Computer crime
Computer worms

Computer vision
BT: Robots
RT: Activity recognition
Distributed vision networks
Gaze tracking
Image capture
Indoor navigation
Pattern recognition
Pose estimation
NT: Active appearance model
Blob detection
Corner detection
Face detection
Feature detection
Interest point detection

Computer worms
UF: Worms (computer)
BT: Malware
RT: Computer crime
Computer viruses

Computer-aided design
USE: Design automation

Computer-aided diagnosis
USE: Computer aided diagnosis

Computer-aided instruction
USE: Computer aided instruction

Computer-aided learning
USE: Computer aided instruction

Computer-assisted diagnosis
USE: Computer aided diagnosis

Computer-mediated communication
USE: Computer mediated communication

Computerised axial tomography
USE: Computed tomography

Computerised instrumentation
USE: Computerized instrumentation

Computerised monitoring
USE: Computerized monitoring

Computerised tomography
USE: Computed tomography

Computerized axial tomography
USE: Computed tomography

Computerized instrumentation
USE: Computerised instrumentation

Computerized monitoring
USE: Computerised monitoring

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**Computerized tomography**

**USE:** Computed tomography

**Computers**

**UF:** Computing technology

**BT:** Computers and information processing

**RT:** Cyberspace

**NT:** Analog computers

Calculators

Digital computers

Microcomputers

Parallel machines

Supercomputers

Tablet computers

Wearable computers

**Computers and information processing**

**RT:** Associative processing

Biology computing

Computer industry

Data processing

Electronic learning

Home computing

Information systems

Logic circuits

Multimedia computing

Multiprocessing systems

**NT:** Approximate computing

Computer applications

Computer architecture

Computer interfaces

Computer networks

Computer performance

Computer peripherals

Computer science

Computer security

Computers

Concurrency control

DNA computing

Data systems

Database machines

Digital systems

Distributed computing

File servers

Hardware

High performance

Image processing

Memory

Mobile computing

Molecular computing

Multitasking

Open systems

Optical computing

Parallel processing

Pattern recognition

Pervasives computing

Petascale computing

Platform virtualization

Probabilistic computing

Probability computing

Quantum computing

Real-time systems

Software

Software engineering

System recovery

Time sharing computer systems

Virtual machine monitors

**Computing technology**

**USE:** Computers

**Concatenated codes**

**BT:** Programming

**Concave programming**

**BT:** Optimization methods

**Concrete**

**BT:** Building materials

**RT:** Pressure vessels

**Concurrency**

**USE:** Concurrent computing

**Concurrency control**

**BT:** Computers and information processing

**RT:** Distributed computing

Distributed databases

Multiprocessing systems

Parallel processing

Protocols

Synchronization

**NT:** Processor scheduling

**Concurrent computing**

**UF:** Concurrency

**BT:** Computation theory

**RT:** Granular computing

Model checking

**Concurrent engineering**

**BT:** Engineering - general

**RT:** Product design

Project management

Quality function deployment
Research and development
Time to market
Virtual manufacturing

Condition monitoring
BT: Preventive maintenance

Conditions of employment
USE: Employee welfare
transmission
Wiring

Conducting bodies
USE: Conductors

Conducting materials
BT: Materials
RT: Conductivity
Conductors
Semiconductor materials
NT: Electrolytes

Conductive adhesives
BT: Adhesives

Conductive films
BT: Films
NT: Anisotropic conductive films

Conductivity
UF: Electric conductivity
Electrical conductivity
Resistivity
BT: Electric variables
RT: Charge carriers
Conducting materials
Conductivity measurement
Grain boundaries
Impact ionization
Transmission line theory
NT: Photoconductivity
Semiconductivity
Transconductance

Conductivity measurement
UF: Resistivity measurement
BT: Electric variables
measurement
RT: Conductivity

Conductors
UF: Conducting bodies
BT: Electric machines
RT: Cables
Conducting materials
Core loss

Power cables
Power distribution lines
Power transmission lines
Proximity effects
Skin effect
Thermal noise
Three-phase electric power
Wire
Wireless power

Conference management
BT: Management

Conferences
UF: Meetings (technical)
Symposia
Workshops

Configuration management
BT: Systems engineering and theory
RT: Complex systems
Maintenance engineering
System analysis and design

Conformal mapping
BT: Mathematics
RT: Coplanar waveguides
Wave functions
Waveguide components
Waveguide theory

Conformance testing
UF: Compliance testing
Conformity assessment
Type testing
BT: Testing
RT: Accreditation
Certification
Quality of service
Standards
Surveillance

Conformity assessment
USE: Conformance testing

Congestive heart failure
BT: Medical conditions

Connected cars
USE: Connected vehicles
2021 IEEE Thesaurus

Connected vehicles
UF: Connected cars
BT: Vehicles
RT: Intelligent vehicles

Connecting
USE: Joining processes

Connective tissue
BT: Biological tissues

Connectors
BT: Electronic components
NT: Plugs
Sockets

Consensus algorithm
BT: Algorithm design and theory

Consensus control
BT: Decentralized control
RT: Swarm robotics

Consensus protocol
BT: Blockchain Protocols
RT: Ecosystems

Consortia
BT: Engineering management
RT: Business

Constellation diagram
UF: Signal constellation
BT: Digital modulation

Constraint handling
UF: Constraint programming
BT: Logic programming

Constraint optimization
BT: Design optimization
RT: Electronics packaging

Constraint programming
USE: Constraint handling

Constraint theory
BT: Integer linear programming

Construction
UF: Erection
BT: Industries
RT: Building materials

Construction industry
BT: Industries
RT: Building automation
Building materials
Buildings
Construction
Excavation
Floors
Mortar
Shipbuilding industry
Smart cities
NT: Prefabricated construction

Consumer behavior
UF: Consumer behaviour
BT: Behavioral sciences
RT: Consumer products
Customer profiles
Customer relationship management
Food waste
Market opportunities
Technology acceptance
model

Consumer electronics
UF: Kindle
RT: Consumer products
Digital systems
Firewire
Flat panel displays
Microcomputers
Video equipment
NT: Ambient intelligence
Audio systems
Home automation
Home computing
Low-power electronics
Microwave ovens
Multimedia systems

Consumer products
BT: Manufactured products
2021 IEEE Thesaurus

RT: Commercial law
Consumer behavior
Consumer electronics
Domestic safety
Electrical products
Food industry
Food manufacturing
Food products
Footwear industry
Market research
Plastic products
Product liability
Product safety
Watches

NT: Clothing
Games
Home appliances
Microwave ovens

Consumer protection
BT: Law
Product safety engineering
RT: Censorship
Commercial law
Customer relationship
management
Quality assurance

Consumer-generated media
USE: User-generated content

Contact resistance
BT: Contacts

Contactors
BT: Switches

Contacts
BT: Circuits and systems
RT: Semiconductor devices
NT: Brushes
Contact resistance
Ohmic contacts

Containers
BT: Material storage
Materials handling
equipment
RT: Bulk storage
Canning
Filling
Fuel storage
Loading
Measurement
Pallets

Production
Stacking

Contamination
BT: Materials science and
technology
RT: Chemical hazards
Decontamination
Hazards
Impurities
Microfiltration
Pollution
Quality control
Radiation protection
NT: Surface contamination

Content addressable memory
USE: Associative memory

Content addressable storage
BT: Memory
RT: Content-based retrieval

Content based retrieval
USE: Content-based retrieval

Content delivery networks
USE: Content distribution networks

Content distribution networks
UF: Content delivery networks
BT: Computer networks

Content management
BT: Electronic publishing
Management
RT: Blockchain
Document handling
MPEG 7 Standard
Multimedia computing
Publish subscribe systems
Semantic Web
Web design
Web sites

Content-based retrieval
UF: Content based retrieval
BT: Information retrieval
RT: Content addressable storage

Content-centric networking
2021 IEEE Thesaurus

USE: Information-centric networking

Context
BT: Professional communication
RT: Pragmatics

Context aware*
USE: Context-aware services

Context awareness
BT: Artificial intelligence
RT: Intelligent control
Intelligent systems
Knowledge acquisition
Learning systems
Pervasive computing
Semantic search

Context modeling
BT: Modeling
RT: Computational linguistics

Context-aware applications
USE: Context-aware services

Context-aware computing
USE: Context-aware services

Context-aware services
UF: Context aware*
Context-aware applications
Context-aware computing
BT: Ubiquitous computing

Continents
BT: Geoscience
NT: Africa
Asia
Australia
Europe
North America
South America

Contingency management
BT: Management
NT: Crisis management
Disaster management
Mission critical systems

Continuing education
UF: Further education
BT: Career development
Educational programs

RT: Computer aided instruction
Engineering education
Management training
Training

Continuing professional development
UF: Life long learning
BT: Human resource management
RT: Qualifications
Training

Continuous improvement
UF: Kaizen
BT: Total quality management
RT: Production management
Quality awards

Continuous phase modulation
BT: Phase modulation

Continuous production
BT: Flow production systems
Production control
RT: Process control
Production management

Continuous systems
USE: Continuous time systems

Continuous time models
USE: Continuous time systems

Continuous time systems
UF: Continuous systems
Continuous time models
BT: Time factors

Continuous wavelet transforms
BT: Wavelet transforms

Continuous-stirred tank reactor
BT: Chemical reactors

Continuously variable transmission
USE: Mechanical power transmission

Contract law
BT: Law
RT: Contracts
Employment law

Contract management
BT: Contracts
Management
RT: Risk management

Contracts
BT: Management
RT: Business
Contract law
Procurement
Proposals
NT: Contract management
Forward contracts
Licenses
Service level agreements
Smart contracts
Subcontracting

Control charts
UF: Cusum charts
Shewhart charts
BT: Production management
RT: Control systems
Quality management

Control design
BT: Control systems
RT: Feedback
Lyapunov methods

Control engineering
BT: Control systems
RT: Control engineering
education
Predictive control
NT: Control system security

Control engineering computing
BT: Computer applications
RT: Control engineering
education
Hardware-in-the-loop

Control system analysis
BT: System analysis and design
RT: Piecewise linear techniques
NT: State-space methods

Control system security
BT: Control engineering
Security
RT: Computer crime
Control systems
Cyber-physical systems
Industrial control
National security
Power system control
Safety
NT: Physical unclonable function

Control system synthesis
UF: Control systems synthesis
BT: Control systems
RT: Circuit synthesis
Hardware-in-the-loop
simulation
Linearization techniques
Piecewise linear techniques

Control systems
RT: Active perception
Actuators
Adaptive control
Air traffic control
Communication system

Control equipment
BT: Control systems
RT: Manipulators
Mechatronics
Robots
NT: Actuators
Fasteners
### Converters

**UF:** Convertors
- Switching convertors

**BT:** Power electronics
- Data conversion
- Pulse width modulation

**RT:** Pulse width modulation
- Rectennas
- Space vector pulse width modulation

**NT:** AC-AC converters
- DC-AC power converters
- Digital-to-frequency converters

### Convex functions

**UF:** Convex optimization
- Mathematics

**BT:** Mathematics
- Convex optimization

**USE:** Convex functions

### Convolution

**BT:** Signal processing
- Deconvolution
- Numerical analysis

**RT:** Convolvers

**NT:** Convolvers

### Convolutional codes

**UF:** Trellis codes
- Codes

**BT:** Codes
- Channel coding
- Digital multimedia

**RT:** Channel coding
- Error correction codes
- Error correction

**broadcasting:**
- Radio communication
- Satellite communication
- Telecommunications

### Convolutional neural networks

**USE:** Convolutional neural networks

### Convolvers

**BT:** Convolution

### Coolants

**UF:** Antifreeze materials
- Cooling

**BT:** Cooling
- Space cooling

**RT:** Space cooling
- Refrigerants

**NT:** Refrigerants
- Air conditioning
- Cold plates

### Cooling

**BT:** Temperature control
- Electronics cooling

**RT:** Electronics cooling
- HVAC
- Heat pipes

**NT:** HVAC
- Thermal engineering
- Water pumps

### Cooperative cache

**USE:** System performance

### Cooperative caching

**BT:** System performance

### Cooperative communication

**UF:** Amplify-and-forward cooperative communication

**BT:** Collaborative work
- Wireless communication

**RT:** Communication
- Effectiveness
- Professional communication
<table>
<thead>
<tr>
<th>Term</th>
<th>USE</th>
<th>NT</th>
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<td>Cooperative networks</td>
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<td>Cooperative systems</td>
<td>Cooperative networks</td>
<td>Core dumps</td>
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<td>System recovery</td>
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<td>Artificial intelligence</td>
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<td>Energy loss</td>
<td>Conductors</td>
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<td>Artificial bee colony</td>
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<td>Transformers</td>
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<td>Cooperative work</td>
<td>Collaborative work</td>
<td>Core losses</td>
<td>Core loss</td>
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<td>Coordinate measuring machines</td>
<td>CMM</td>
<td>Core-sheath nanostructures</td>
<td>Nanostructured materials</td>
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<td>Measurement</td>
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<td>Quality control</td>
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<td>Coplanar transmission lines</td>
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<td>Corner detection</td>
<td>Computer vision</td>
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<td>Image processing</td>
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<td>Image edge detection</td>
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<td>Motion detection</td>
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<td>Coplanar waveguides</td>
<td>CPW</td>
<td>Corona</td>
<td>Electric breakdown</td>
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<td>Planar transmission lines</td>
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<td>Partial discharges</td>
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<td>Conformal mapping</td>
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<td>Electromagnetic</td>
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<td>Copper</td>
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<td>Corona virus*</td>
<td>Coronaviruses</td>
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<td>Metals</td>
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<td>Coprocessors</td>
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<td>AI accelerators</td>
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<td>Digital arithmetic</td>
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<td>Copyright protection</td>
<td>Legal factors</td>
<td>Corpse</td>
<td>Cadaver</td>
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<td>Plagiarism</td>
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<td>Public domain software</td>
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<td><strong>Corpus amygdaloideum</strong></td>
<td><strong>Cosmic rays</strong></td>
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<tr>
<td>USE: Amygdala</td>
<td>BT: Extraterrestrial phenomena</td>
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<table>
<thead>
<tr>
<th><strong>Corpus callosum</strong></th>
<th><strong>Cost accounting</strong></th>
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<tbody>
<tr>
<td>UF: Callosal commissure</td>
<td>BT: Valuation</td>
</tr>
<tr>
<td>BT: Brain</td>
<td>RT: Management accounting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Correlation</strong></th>
<th><strong>Cost analysis</strong></th>
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<tbody>
<tr>
<td>BT: Statistics</td>
<td>USE: Cost benefit analysis</td>
</tr>
<tr>
<td>RT: Correlation coefficient</td>
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<tr>
<td>NT: Autocorrelation</td>
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<table>
<thead>
<tr>
<th><strong>Correlation coefficient</strong></th>
<th><strong>Cost function</strong></th>
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<tbody>
<tr>
<td>BT: Statistics</td>
<td>BT: Optimization</td>
</tr>
<tr>
<td>RT: Correlation</td>
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<tr>
<td>Regression analysis</td>
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<thead>
<tr>
<th><strong>Correlators</strong></th>
<th><strong>Cost benefit analysis</strong></th>
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<tbody>
<tr>
<td>BT: Electromagnetic radiation</td>
<td>USE: Cost analysis</td>
</tr>
<tr>
<td>RT: Signal detection</td>
<td>Cost-benefit analysis</td>
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<tr>
<td>Signal processing</td>
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<thead>
<tr>
<th><strong>Corrosion</strong></th>
<th><strong>Cost of living index</strong></th>
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<tbody>
<tr>
<td>BT: Surfaces</td>
<td>USE: Economic indicators</td>
</tr>
<tr>
<td>RT: Coatings</td>
<td>Cost-benefit analysis</td>
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<tr>
<td>Corrosion inhibitors</td>
<td>Cost-of-living index</td>
</tr>
<tr>
<td>Galvanizing</td>
<td>USE: Economic indicators</td>
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<td>Grain boundaries</td>
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<td>Magnetic flux leakage</td>
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<td>Passivation</td>
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<thead>
<tr>
<th><strong>Corrosion inhibitors</strong></th>
<th><strong>Costing</strong></th>
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<tbody>
<tr>
<td>BT: Inhibitors</td>
<td>UF: Capital cost reduction</td>
</tr>
<tr>
<td>Materials</td>
<td>Operating cost reduction</td>
</tr>
<tr>
<td>RT: Corrosion</td>
<td>BT: Financial management</td>
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<tr>
<td>Galvanizing</td>
<td>NT: Cost accounting</td>
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<tr>
<td>Materials preparation</td>
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<td>Materials processing</td>
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<thead>
<tr>
<th><strong>Corrugated surfaces</strong></th>
<th><strong>Costs</strong></th>
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<tbody>
<tr>
<td>BT: Rough surfaces</td>
<td>BT: Economics</td>
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<tr>
<td>Surfaces</td>
<td>RT: Cost accounting</td>
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<table>
<thead>
<tr>
<th><strong>Cortana</strong></th>
<th><strong>Cotton</strong></th>
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<tr>
<td>USE: Virtual assistants</td>
<td>BT: Agricultural products</td>
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<thead>
<tr>
<th><strong>Cortical bone</strong></th>
<th><strong>Textiles</strong></th>
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<tbody>
<tr>
<td>BT: Bone tissue</td>
<td>RT: Natural fibers</td>
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<tr>
<th><strong>Cortical plasticity</strong></th>
<th><strong>Cosmic gamma ray bursts</strong></th>
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</thead>
<tbody>
<tr>
<td>USE: Neuroplasticity</td>
<td>USE: Gamma-ray bursts</td>
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<tr>
<th>Term</th>
<th>UF</th>
<th>BT</th>
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<td>Textile fibers</td>
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<td>Textile industry</td>
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<td>Weaving</td>
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<td><strong>Counseling</strong></td>
<td><strong>Employee welfare</strong></td>
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<td><strong>Counselling</strong></td>
<td><strong>Employee welfare</strong></td>
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<td><strong>Counterfeit goods</strong></td>
<td><strong>Counterfeiting AND Manufactured products</strong></td>
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<td><strong>Counterfeiting</strong></td>
<td><strong>Counterfeit goods</strong></td>
<td><strong>Computer crime</strong></td>
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<td><strong>Countermeasures (computer)</strong></td>
<td><strong>Computer security</strong></td>
<td><strong>Data protection</strong></td>
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<td><strong>Course correction</strong></td>
<td><strong>Course-correction</strong></td>
<td><strong>Navigation</strong></td>
<td><strong>Aircraft navigation</strong></td>
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<td><strong>Educational technology</strong></td>
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<td><strong>Covariance matrices</strong></td>
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<td><strong>Covariance matrices</strong></td>
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<td><strong>Diseases</strong></td>
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<td><strong>Pandemics</strong></td>
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<td><strong>Chromium</strong></td>
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<td><strong>Coupled mode analysis</strong></td>
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<td><strong>Coupling (process)</strong></td>
<td><strong>Joining processes</strong></td>
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<td><strong>Coupling circuits</strong></td>
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<td><strong>Counters</strong></td>
<td><strong>Radiation detectors</strong></td>
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<td><strong>Cows</strong></td>
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Cramer Rao bounds
USE: Cramer-Rao bounds

Cramer-Rao bounds
UF: Cramer Rao bound
Cramer Rao bounds
Cramer-Rao inequality
Information inequality
BT: Estimation theory

Cramer-Rao inequality
USE: Cramer-Rao bounds

Cranes
BT: Lifting equipment

Cranial
BT: Nervous system
NT: Cranial pressure

Cranial pressure
BT: Cranial
NT: Intracranial system

Cranium
BT: Head

Crawlers
BT: Web search
RT: Bot (Internet)

CRC codes
USE: Cyclic redundancy check codes

Creativity
BT: Innovation management

Credit cards
UF: American Express
Mastercard
Visa gold
BT: Financial management

Creep
BT: Material properties

Criminal law
BT: Law

Crimping
BT: Joining processes

Crisis management
BT: Contingency management

Critical current density
BT: Critical current density
(superconductivity)
RT: Silicon compounds
Superconducting materials
Thermal factors

Critical current density (superconductivity)
BT: Superconductivity
RT: Magnetic fields
NT: Critical current density

Critical infrastructure
UF: Critical national infrastructure
BT: Public infrastructure

Critical national infrastructure
USE: Critical infrastructure

Crops
BT: Agricultural products
Vegetation
RT: Fertilizers
Greenhouses
Irrigation
Water storage
Yield estimation

Cross cultural communication
USE: Cross-cultural communication

Cross layer design
BT: Communication systems
Ad hoc networks
Cellular radio
IEEE 802.16 Standard
Military communication
Radio communication

Cross platform virtualization
USE: Application virtualization

Cross reality
USE: X reality

Cross-cultural communication
UF: Cross cultural communication
BT: Global communication
RT: Cultural differences

Cross-platform virtualization
2021 IEEE Thesaurus

**Cross-site scripting**
- **USE:** Application virtualization
- **UF:** XSS
- **BT:** Computer security
- **RT:** Cryogenic electronics
- **NT:** Liquid nitrogen

**Crosstalk**
- **USE:** Crosstalk
- **UF:** Crosstalk noise
- **BT:** Interference
- **RT:** Electromagnetic interference

**Cryogenic electronics**
- **BT:** Industrial electronics security
- **RT:** Cryogenics Superconducting devices Superconducting materials

**Cryogenics**
- **UF:** Cryonics
- **BT:** Industry applications function
### Cultural differences
- **BT:** Cultural aspects
- **Social implications of technology**
- **RT:** Cross-cultural
- **Developing countries**
- **Digital divide**
- **Memetics**
- **Social intelligence**

### Curing
- **BT:** Materials processing
- **Heat treatment**
- **Kilns**

### Curium
- **BT:** Chemical elements

### Currencies
- **BT:** Finance
- **NT:** Cryptocurrency

### Current
- **UF:** Electric current
- **BT:** Electric variables
- **RT:** Breakdown voltage
- **Current control**
- **Current limiters**
- **Current measurement**
- **Current supplies**
- **Current transformers**
- **NT:** Bioimpedance
- **Current slump**
- **Dark current**
- **Fault currents**
- **Leakage currents**
- **Persistent currents**
- **Short-circuit currents**
- **Threshold current**

### Current control
- **UF:** Current regulation
- **BT:** Electric variables control
- **RT:** Current
- **Current measurement**
- **Regulators**
- **Switches**
- **Switchgear**
- **Electric current control**
- **Electrical ballasts**

### Current density
- **BT:** Current measurement
- **RT:** Density measurement
- **Particle measurements**
- **NT:** Skin effect

### Current distribution
- **BT:** Current measurement
- **RT:** Antenna theory

### Current limiters
- **BT:** Power electronics
- **RT:** Current
- **Current measurement**
- **NT:** Fault current limiters

### Current measurement
- **UF:** Electric current measurement
- **BT:** Electric variables measurement
- **RT:** Ammeters
- **Current**
- **Current control**
- **Current limiters**
- **NT:** Current density
- **Current distribution**

### Current measurement (water)
- **USE:** Sea measurements

### Current mirrors
- **BT:** Circuit topology

### Current mode circuits
- **USE:** Current-mode circuits

### Current regulation
- **USE:** Current control

### Current slump
- **BT:** Current

### Current supplies
- **BT:** Power supplies
- **RT:** Current

### Current transformers
- **BT:** Transformers
- **RT:** Current

### Current voltage characteristics
- **USE:** Current-voltage characteristics AND Electric variables

---

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Current-mode circuits
UF: Current mode circuits
BT: Integrated circuits
NT: Current-voltage characteristics
UF: Current voltage
BT: Electric variables
CBT: Integrated circuits
Current-voltage characteristics
UF: Current voltage
BT: Electric variables
CBT: Integrated circuits
Curriculum development
BT: Educational courses
RT: Educational programs
STEM

Curve fitting
BT: Approximation methods
Visualization
RT: Computer graphics
Interpolation
Least squares
approximations
Splines (mathematics)
Surface fitting

Custom integrated circuits
USE: Application specific
integrated circuits
Customer profiles
BT: Customer relationship
management
RT: Consumer behavior
Market opportunities
Customer relationship management
BT: Management
Consumer behavior
Consumer protection
Data-driven modeling
Management information
systems
Public relations
Quality management
Supply chain management
NT: Customer profiles
Customer satisfaction
Customer services
Market research
Stakeholders
Customer satisfaction
BT: Customer relationship
management
RT: Customer services

Customer services
BT: Customer relationship
management
RT: Customer satisfaction

Cutting fluids
USE: Lubricants

Cutting tools
BT: Production equipment
Blades
Dies
Machine tools
Metalworking machines
Milling machines
Metal cutting tools
Water jet cutting

Cutoff frequency
BT: Integrated circuit modeling

CVD
USE: Chemical vapor deposition

Cyber attack
USE: Cyberattack

Cyber attacks
USE: Cyberattack

Cyber crime
USE: Computer crime

Cyber espionage
USE: Eavesdropping

Cyber ethics

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USE: Cyberethics

Cyber sickness
USE: Cybersickness

Cyber spying
USE: Cyber espionage

Cyber terrorism
UF: Cyberterrorism
BT: Computer crime
Terrorism
RT: Computer networks
Cyberattack
National security

Cyber warfare
UF: Cyberwarfare
BT: Computer security
RT: Computer networks
Cyberattack
National security

Cybercrime
USE: Computer crime

Cyberethics
UF: Cyber ethics
BT: Ethics
RT: Behavioral sciences
Cyberattack
Intellectual property
Privacy
Social implications of technology

Cyberethics
UF: Cyber ethics
BT: Ethics
RT: Behavioral sciences

Cybernetics
UF: Biocybernetics
BT: Systems, man, and cybernetics
RT: Automata
Cognitive systems
Control systems
Cytberspace
Econometrics
Ergonomics
Information theory
Learning systems
Man-machine systems
Neural networks
Radial basis function

Cyber-physical systems
UF: Cyberphysical
BT: System of systems
Control system security
Embedded systems
Human computer
internet
Internet of Things
Operating systems
Smart cities
Smart grids
Wireless sensor networks
NT: Digital twin

Cyberspace
USE: Cyberspace

Cyberattack
UF: Cyber attack
BT: Computer crime
Computer security
RT: Cyber warfare

Cyberphysical
USE: Cyber-physical systems

Homeland Security
Cybersickness
UF: Cyber sickness

Cybercare
BT: Medical services
Medical conditions
Virtual reality
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>UF</th>
<th>BT</th>
<th>RT</th>
<th>NT</th>
</tr>
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<tbody>
<tr>
<td><strong>Cyberspace</strong></td>
<td>Cyber-space</td>
<td>Communication networks</td>
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<td>Error analysis</td>
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<tr>
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<tr>
<td><strong>D2D</strong></td>
<td>Device-to-device communication</td>
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<tr>
<td><strong>Dairy products</strong></td>
<td>Butter</td>
<td>Cheese</td>
<td>Milk</td>
<td>Agricultural products</td>
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<tr>
<td><strong>Damascene integration</strong></td>
<td>Electronic equipment manufacture</td>
<td></td>
<td>Very large scale integration</td>
<td></td>
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<tr>
<td><strong>Dampers</strong></td>
<td>Shock absorbers</td>
<td></td>
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<tr>
<td><strong>Damping</strong></td>
<td>Mechanical factors</td>
<td>Hysteresis</td>
<td>Impedance</td>
<td>Oscillators</td>
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<tr>
<td><strong>Cyclones</strong></td>
<td>Polar cyclones</td>
<td>Geoscience</td>
<td>Hurricanes</td>
<td>Tropical cyclones</td>
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<td><strong>Cyclonic storms</strong></td>
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<td><strong>Cyclotrons</strong></td>
<td>Particle accelerators</td>
<td></td>
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<tr>
<td><strong>Dams</strong></td>
<td>Geotechnical structures</td>
<td></td>
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</table>
2021 IEEE Thesaurus

RT: Ad hoc networks
B-ISDN
CAMAC
Computer networks
Cyclic redundancy check
Data dissemination
Data security
Digital communication
Distributed computing
Extranets
Fastbus
File servers
Firewire
IEEE 1394 Standard
ISDN
Modems
Multiprocessor interconnection
Office automation
Packet loss
Personal area networks
TCP/IP
Telecontrol equipment
Teletext
Videotex
NT: Asynchronous communication
Asynchronous transfer
Data buses
Data transfer
Telecommunication buffers
Telemetry
Teleprinting
Visible light communication

Data conversion
BT: Data systems
RT: Converters
NT: Analog-digital conversion
Digital-analog conversion

Data dissemination
BT: Data handling
Information sharing
RT: Data communication
Data integration
Mobile computing

Data encapsulation
BT: Data handling

Data engineering
BT: Data systems

Data envelopment analysis
BT: Linear programming

Data flow computing
BT: Multiprocessing systems

Data flow graphs
USE: Flow graphs

Data freshness
USE: Data integrity

Data fusion
USE: Data integration

Data gloves
BT: Haptic interfaces

Data governance
BT: Data handling
Organizational aspects
RT: Business data processing
Data integrity
Data models
Data privacy
Data protection
Data security
Database systems
Quality management
NT: Government policies

Data handling
UF: Electronic data interchange
BT: Data systems
RT: Big Data

Data confidentiality
USE: Data privacy
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Buffer storage</th>
<th>Cryptography</th>
<th>Data models</th>
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<tr>
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<td>Data security</td>
<td>Encoding</td>
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<tr>
<td>General Data Protection</td>
<td>Data assimilation</td>
<td>Data over cable service interface specification</td>
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<tr>
<td>Data dissemination</td>
<td>Data governance</td>
<td>Data preprocessing</td>
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<td>Document handling</td>
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<td>Sorting</td>
<td>NT: Data-driven modeling</td>
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### Data integration

<table>
<thead>
<tr>
<th>UF: Data fusion</th>
<th>BT: Data processing</th>
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<td>Data governance</td>
<td>Data integration</td>
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<td>Data quality</td>
<td>Computer security</td>
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<tr>
<td>Quality control</td>
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### Data mining

<table>
<thead>
<tr>
<th>BT: Artificial intelligence</th>
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<td>Big Data</td>
<td>Data analysis</td>
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<td>Predictive analytics</td>
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### Data security

<table>
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<td>Data collection</td>
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<td>Data transfer</td>
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<td>Spreadsheet programs</td>
<td>Text processing</td>
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<tr>
<td>Virtual enterprises</td>
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</tbody>
</table>
### Data protection
- **BT:** Data privacy
- **RT:** Computer security
- **NT:** Countermeasures
- **Regulation:** General Data Protection

### Data science
- **BT:** Data analysis
- **RT:** Knowledge discovery
- **Neuroinformatics**

### Data security
- **UF:** Security of data
- **System privacy**
- **Management**
- **BT:** Security
- **RT:** Communication system
- **Security management**
- **Computer crime**
- **Computer network**

### Data spill
- **USE:** Data breach

### Data storage
- **USE:** Memory

### Data storage systems
- **BT:** Data systems
- **RT:** Big Data
- **Storage area networks**

### Data structures
- **NT:** Triples (Data structure)

### Data systems
- **BT:** Computers and information processing
- **RT:** Big Data applications
- **NT:** Data acquisition
- **Data centers**
- **Data compression**
- **Data conversion**
- **Data engineering**
- **Data handling**
- **Data processing**
- **Data storage systems**
- **Data warehouses**

### Data transfer
- **BT:** Data communication
- **RT:** Packet switching
- **NT:** Handover

### Data transmission
- **USE:** Data communication

### Data visualisation
- **USE:** Data visualization

### Data visualization
- **UF:** Data visualisation
- **BT:** Computer graphics
- **User interfaces**
- **RT:** Biomedical imaging
- **Data mining**
- **Modeling**
- **R language**
- **NT:** Isosurfaces

---

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RT: NoSQL databases

Data-driven modeling
BT: Data models
Modeling
RT: Customer relationship management

Database languages
UF: Query languages
BT: Computer languages
RT: Database systems
NT: Structured Query Language

Database machines
BT: Computers and information processing
RT: Database systems
Information systems

Database management systems
USE: Database systems

Database systems
UF: Database management systems
Technical data
BT: Databases
Information systems
RT: Data aggregation
Data governance
Data models
Data processing

Data structures
Database languages
Database machines
File systems
Hypertext systems
Information architecture
Linked data
Triples (Data structure)
NT: Audio databases
Deductive databases
Image databases
Indexes
Multimedia databases
NoSQL databases
Object oriented databases
Query processing

Databases
BT: Professional communication
NT: Database systems

Daylighting
BT: Lighting

DBR
USE: Distributed Bragg reflectors

DBS
USE: Satellite broadcasting

DC distribution systems
BT: Network systems
Power distribution
RT: DC power transmission
HVDC transmission
Power transmission lines

DC generators
UF: Direct current generators
BT: DC machines
Generators
RT: Pulse width modulation
Rotating machines

DC machines
UF: Direct current machines
BT: Electric machines
RT: Pulse width modulation
Sensorless control
NT: DC generators
DC motors
Homopolar machines

DC motors
UF: Direct current motors
BT: DC machines
Motors
RT: Pulse width modulation

modulation
inverters
Space vector pulse width
modulation
NT: Brushless DC motors
Commutators

DC power transmission
| UF: | Direct current power transmission | USE: | Noise reduction |
| BT: | Power transmission | BT: | Navigation |

**DC-AC power converters**

| UF: | DC-AC power convertors | USE: | DC-AC power converters |
| BT: | Converters | BT: | Power conversion |

**Dead reckoning**

| BT: | Navigation |

**Deadlocks (computers)**

| USE: | System recovery |

**Deafness**

| BT: | Medical conditions |
| RT: | Sign language |

**Death**

| BT: | Pathological processes |
| NT: | Asphyxia |

**Debugging**

| BT: | System recovery |

**Deburring**

| BT: | Surface finishing |
| RT: | Drilling |
| Machining |
| Polishing machines |

**Decarbonisation**

| USE: | Low-carbon economy |

**Decarbonised economy**

| USE: | Low-carbon economy |

**Decarbonization**

| USE: | Low-carbon economy |

**Decarbonized economy**

| USE: | Low-carbon economy |

**Decentralised control**

| USE: | Decentralized control |

**Decentralized control**

| UF: | Decentralised control |
| Distributed control |
| Distributed generation |
| Distributed modeling |
| BT: | Control systems |
| RT: | Flexible structures |
| NT: | Consensus control |
| Distributed parameter systems |

**De-noising**

| USE: | Matter waves |

**De Broglie hypothesis**

| USE: | Matter waves |

**De Broglie methods**

| USE: | Matter waves |

**Decision analysis**

| BT: | Decision making |
| Information analysis |
**2021 IEEE Thesaurus**

<table>
<thead>
<tr>
<th>Decision feedback equalizers</th>
<th>Signal processing</th>
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<td></td>
<td>Speech codecs</td>
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<td>Video codecs</td>
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**Decision making**

<table>
<thead>
<tr>
<th>BT: Management</th>
<th>NT: Maximum likelihood decoding</th>
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</thead>
<tbody>
<tr>
<td>RT: Decision support systems</td>
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<tr>
<td>Expert systems</td>
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<td>Fuzzy cognitive maps</td>
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<td>Risk analysis</td>
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<td>Stakeholders</td>
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<td>Strategic planning</td>
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<tr>
<td>TOPSIS</td>
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<tr>
<td>NT: Analytic hierarchy process</td>
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<td>Collective intelligence</td>
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<tr>
<td>Decision analysis</td>
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<td>Pattern classification</td>
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<td>Persuasive systems</td>
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**Decision support systems**

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>RT: Competitive intelligence</td>
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<tr>
<td>Knowledge based systems</td>
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**Decision theory**

<table>
<thead>
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<tbody>
<tr>
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</tr>
<tr>
<td>NT: Decision trees</td>
<td>TOPSIS</td>
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**Decision trees**

<table>
<thead>
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<th>UF: Tree searching</th>
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<td>BT: Decision theory</td>
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<tr>
<td>RT: Random forests</td>
<td>Classification tree analysis</td>
</tr>
<tr>
<td>NT: Classification tree analysis</td>
<td>Regression tree analysis</td>
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**Decoder**

<table>
<thead>
<tr>
<th>USE: Decoding</th>
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</table>

**Decoding**

<table>
<thead>
<tr>
<th>UF: Decoder</th>
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</thead>
<tbody>
<tr>
<td>BT: Information theory</td>
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<tr>
<td>RT: Codecs</td>
</tr>
<tr>
<td>Codes</td>
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<td>Cyclic redundancy check</td>
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<td>codes</td>
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<tr>
<td>Demodulation</td>
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<td>Parity check codes</td>
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<td>Product codes</td>
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**Deconvolution**

<table>
<thead>
<tr>
<th>BT: Inverse problems</th>
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<tbody>
<tr>
<td>RT: Convolution</td>
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<tr>
<td>Integral equations</td>
</tr>
<tr>
<td>Numerical analysis</td>
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<td>Signal processing</td>
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<td>Signal restoration</td>
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**Decontamination**

<table>
<thead>
<tr>
<th>BT: Chemical technology</th>
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<tbody>
<tr>
<td>RT: Contamination</td>
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<tr>
<td>Environmental monitoring</td>
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<tr>
<td>Pollution control</td>
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<td>Purification</td>
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</table>

**Decorrelation**

| BT: Signal processing |

**Dedicated short range communication**

<table>
<thead>
<tr>
<th>UF: DSRC</th>
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</thead>
<tbody>
<tr>
<td>BT: Wireless communication</td>
</tr>
<tr>
<td>RT: Intelligent vehicles</td>
</tr>
<tr>
<td>On board unit</td>
</tr>
<tr>
<td>Vehicular ad hoc networks</td>
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</table>

**Deductive databases**

<table>
<thead>
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<th>UF: Intelligent databases</th>
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<tbody>
<tr>
<td>BT: Database systems</td>
</tr>
<tr>
<td>Databases</td>
</tr>
<tr>
<td>RT: Knowledge based systems</td>
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**Deep architecture**

<table>
<thead>
<tr>
<th>BT: Software architecture</th>
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</thead>
<tbody>
<tr>
<td>Systems architecture</td>
</tr>
<tr>
<td>RT: Machine learning</td>
</tr>
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<td>Neural networks</td>
</tr>
<tr>
<td>NT: Deep learning</td>
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</table>

**Deep brain stimulation**

<table>
<thead>
<tr>
<th>BT: Brain stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Neurosurgery</td>
</tr>
<tr>
<td>Neural implants</td>
</tr>
<tr>
<td>Neurostimulation</td>
</tr>
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</table>

**Deep etching**

| USE: Etching |

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<table>
<thead>
<tr>
<th>Deep learning</th>
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<td>UF: Deep structured learning</td>
<td>UF: Time delay</td>
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<td>Hierarchical learning</td>
<td>BT: Electromagnetic analysis</td>
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<tr>
<td>BT: Deep architecture</td>
<td>RT: Delay lines</td>
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<td>Delay systems</td>
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<td>Deep level transient spectroscopy</td>
<td>Distortion</td>
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<td>BT: Semiconductor materials</td>
<td>Phase distortion</td>
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<tr>
<td>Spectroscopy</td>
<td>NT: Propagation delay</td>
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<td>Deep space</td>
<td>Delay estimation</td>
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<td>USE: Deep-space communications</td>
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<td>Deep structured learning</td>
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<tr>
<td>UF: Deep space</td>
<td>BT: Delay systems</td>
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<tr>
<td>BT: Space communications</td>
<td>RT: Delay effects</td>
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<tr>
<td>RT: Telemetry</td>
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<td>Defence industry</td>
<td>USE: Tracking loops</td>
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<td>USE: Defense industry</td>
<td>Delay systems</td>
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<tr>
<td>Defence industry</td>
<td>BT: Control systems</td>
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<tr>
<td>UF: Defence industry</td>
<td>RT: Delay effects</td>
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<tr>
<td>BT: Industries</td>
<td>Telerobotics</td>
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<td>RT: Military equipment</td>
<td>NT: Added delay</td>
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<td>BT: Medical treatment</td>
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<tr>
<td>Definitions</td>
<td>Delta modulation</td>
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<tr>
<td>USE: Terminology</td>
<td>BT: Analog-digital conversion</td>
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<td>USE: Sigma-delta modulation</td>
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<td>BTC: Modeling</td>
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<td>USE: Strain</td>
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<td>BT: Materials science and technology</td>
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<td>Delamination</td>
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<tr>
<td>BT: Materials testing</td>
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2021 IEEE Thesaurus

Demand forecasting
BT: Forecasting
RT: Production planning

Demand response
BT: Power demand

Demand side management
BT: Energy management
RT: Power system planning
Vehicle-to-grid

Dementia
BT: Diseases
NT: Alzheimer's disease

Demodulation
UF: Demodulators
BT: Modulation
RT: Amplitude modulation
Decoding
Detectors
Frequency modulation
Mixers
Modems
Phase modulation
Pulse modulation
Receivers
Signal detection

Demodulators
USE: Demodulation

Demography
BT: Social factors

Dempster-Shafer theory
USE: Evidence theory

Demultiplexing
BT: Multiplexing
RT: Arrayed waveguide gratings

Dendrites (neurons)
UF: Dendrons
BT: Neurons

Dendrons
USE: Dendrites (neurons)

Denial-of-service attack
UF: DDoS attack
DoS attack

Dependability management
BT: Management
RT: Reliability
Safety management

Depletion-mode HEMTs
USE: D-HEMTs

Deployable structures

BT: Magnetics

Communication system security
Computer security
Proof of Work
Distributed denial-of-service attack

Denoising
USE: Noise reduction

Density estimation robust algorithm
UF: DER
BT: Algorithms

Density function
USE: Density functional theory

Density function theory
USE: Density functional theory

Density functional theory
UF: Density function
Density function theory
Density-function
BT: Quantum mechanics

Density measurement
BT: Measurement
RT: Bone density
Current density
Pressure gauges
NT: Hydrometers

Dentistry
USE: Dentistry

Dental
USE: Dentistry

UF: Dental
BT: Medical treatment

Dentistry
USE: Dentistry

UF: Dental
BT: Medical treatment

Dependability management
BT: Management
RT: Reliability
Safety management

Depletion-mode HEMTs
USE: D-HEMTs

Deployable structures

2021 IEEE Thesaurus

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE: Flexible structures</th>
<th>RT: Building information management</th>
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<tbody>
<tr>
<td>Depression</td>
<td>RT: Design optimization</td>
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<td>UF: Major depressive disorder</td>
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<td><strong>DER</strong></td>
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<td>BT: Knowledge representationOntologies</td>
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### Dielectric constant
- BT: Dielectrics
- RT: Capacitors
- NT: High-k gate dielectrics

### Dielectric devices
- BT: Dielectrics
- RT: Dielectric materials
- NT: High-k gate dielectrics
- antennas:
  - Electrets
  - Capacitors
  - Ferroelectric devices
  - Piezoelectric devices

### Dielectric elastomer actuators
- BT: Actuators
- NT: Dielectric elastomers

### Dielectric elastosmrs
- UF: Smart elastomers
- BT: Dielectric elastomer
- RT: Smart materials

### Dielectric electroactive polymer actuators
- USE: Actuators

### Dielectric films
- BT: Dielectric materials
- RT: Planarization
- NT: Dielectric thin films

### Dielectric liquids
- UF: Liquid insulation
- BT: Dielectric materials

### Dielectric loss measurement
- BT: Dielectric measurement

### Dielectric losses
- UF: Dielectric loss
- BT: Dielectrics
- RT: Dielectric loss measurement
- Insulation

### Dielectric materials
- UF: Antiferroelectric materials
- BT: Materials
- RT: Ceramics

### Dielectric electroactive polymer actuators
- USE: Dielectric measurement

### Dielectric measurement
- UF: Dielectric measurements
- BT: Electric variables
- RT: Capacitance measurement
- NT: Capacitance measurement
- Electrokinetics
- Permittivity
- Plastic insulation
- NT: Dielectric films
- Dielectric liquids
- Electrets
- Epoxy resins
- High-k dielectric materials
- Piezoelectric materials
- Dielectric strength
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Differential privacy
BT: Data privacy
Statistics
RT: Data protection
Information security
Privacy

Differential quadrature phase shift keying
BT: Quadrature phase shift keying

Differentiated services networks
USE: Diffserv networks

Diffraction
UF: Wave diffraction
BT: Interference
RT: Bragg gratings
Crystallography
Fourier transforms
X-ray detection

Diffraction gratings
BT: Optical diffraction
RT: Bragg gratings

DiffServ
USE: Diffserv networks

Diffserv networks
UF: DiffServ
BT: Differentiated services networks
RT: Computer networks
Distributed computing
Internet
Multimedia communication

Diffusion bonding
BT: Bonding processes
RT: Ceramics

Diffusion processes
BT: Semiconductor device manufacture
RT: Brownian motion
Buffer layers
Charge carrier processes
Image denoising
Image processing
Stochastic processes
NT: Electromigration

Diffusion tensor imaging
UF: DT-MRI
DTI
Diffusion tensor magnetic resonance imaging
BT: Magnetic resonance imaging
RT: Brain

Diffusion tensor magnetic resonance imaging
USE: Diffusion tensor imaging

Digestive system
BT: Anatomy
RT: Endomicroscopy
NT: Colon
Esophagus
Gallbladder
Gastrointestinal tract
Intestines
Liver
Mouth
Pancreas
Pharynx
Stomach
Tongue

Digital age
USE: Information age

Digital agriculture
UF: Smart farming
e-agriculture
BT: Agriculture
Information processing
RT: Food industry
Food products
Food technology

Digital alloys
BT: Metals

Digital arithmetic
UF: Computer arithmetic
BT: Arithmetic
RT: Calculators
Coprocessors

Digital art
BT: Art

Digital audio broadcasting
UF: Digital audio broadcasts
Podcast
BT: Broadcasting
Digital communication
RT: Audio systems
Portable media players

NT: Digital Radio Mondiale
Digital audio players

Digital audio broadcasts
USE: Digital audio broadcasting

Digital audio players
UF: MP3
BT: Digital audio broadcasting

Digital camera
USE: Digital cameras

Digital cameras
UF: Digital camera
BT: Cameras
RT: Digital photography

Digital circuits
BT: Circuits
RT: Digital computers
Logic circuits
Pulse circuits
Switching circuits
NT: Circuit topology
Digital integrated circuits

Digital communication
UF: Digital radio
BT: Communication systems
RT: Bluetooth
Data communication
Digital recording
Musical instrument digital
interfaces
Synchronous digital
hierarchy
TCP/IP
Teleprinting
NT: Baseband
DICOM
DSL
Digital audio broadcasting
Digital images
Digital multimedia
broadcasting
Digital video broadcasting
ISDN
Passband
Portable media players
SONET
Spread spectrum

Digital computers
BT: Computers
RT: Digital circuits
Digital systems
Digital-analog conversion
Parallel processing
Programming
Turing machines
NT: Mainframes

Digital control
UF: Computer control
BT: Control systems
RT: Computer numerical control
NT: Programmable control

Digital currency
USE: Online banking

Digital divide
BT: Sociology
RT: Cultural differences
Developing countries
Economics
Ethical aspects
Gender issues
Social factors
Social implications of technology

Digital elevation modeling
USE: Digital elevation models

Digital elevation models
UF: Digital elevation modeling
Digital terrain model
Digital terrain modeling
Digital terrain models
BT: Modeling
Terrain mapping

Digital factories
USE: Virtual manufacturing

Digital filters
BT: Filters
RT: Frequency response
Line enhancers
Optical resonators
Transversal filters
NT: Finite impulse response

Digital forensics
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT:</th>
<th>Digital modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT:</td>
<td>Modulation</td>
</tr>
<tr>
<td></td>
<td>Constellation diagram</td>
</tr>
<tr>
<td></td>
<td>Partial response signaling</td>
</tr>
</tbody>
</table>

**Digital health**

**USE:** Electronic healthcare

**Digital healthcare**

**USE:** Electronic healthcare

**Digital image**

**USE:** Digital images

**Digital images**

**UF:** Digital image

**BT:** Digital imaging

**NT:** Pixel

**Digital imaging**

**USE:** Digital images

**Digital Imaging and Communications in Medicine**

**USE:** DICOM

**Digital integrated circuits**

**BT:** Digital circuits

**Integrated circuits**

**RT:** Adders

**Logic circuits**

**Multiplying circuits**

**NT:** Integrated memory circuits

**Digital intelligence**

**BT:** Human intelligence

**Man-machine systems**

**RT:** Behavioral sciences

**Cognition**

**Competitive intelligence**

**Digital systems**

**Ethics**

**Human factors**

**Psychology**

**Social intelligence**

**Digital magnetic recording**

**BT:** Magnetic recording

**Digital microfluidic biochips**

**BT:** Biochips

**Digital micromirror devices**

**USE:** Micromirrors

**Digital multimedia broadcasting**

**UF:** DMB

**Digital multimedia broadcasts**

**BT:** Broadcasting

**Digital communication**

**RT:** Cellular radio

**Convolutional codes**

**Digital TV**

**MPEG 4 Standard**

**MPEG 7 Standard**

**MPEG standards**

**Multimedia communication**

**Radio broadcasting**

**Video on demand**

**Digital multimedia broadcasting**

**USE:** Digital multimedia broadcasting

**Digital photography**

**BT:** Photography

**RT:** CCD image sensors

**Cameras**

**Digital cameras**

**Transform coding**

**Digital preservation**

**BT:** Digital systems

**Information management**

**RT:** Data integrity

**Digital printing**

**BT:** Printing

**RT:** Publishing

**Digital publishing**

**USE:** Electronic publishing

**Digital radio**

**USE:** Digital communication

**Digital Radio Mondiale**

**BT:** Digital audio broadcasting

**Digital recording**

**BT:** Recording

**RT:** Digital communication

**Digital systems**
2021 IEEE Thesaurus

Digital relays
BT: Relays

Digital representation
BT: Encoding
Image representation
Information representation
RT: Augmented reality
Quantization (signal)
Virtual reality

Digital rights management
BT: Intellectual property
RT: Computer crime
Software protection

Digital sequences
USE: Sequences

Digital signal processing
UF: DSP
BT: Signal processing
Aerospace and electronic systems
Digital TV
Fast Fourier transforms
OFDM
NT: Delta modulation
Digital signal processing

Digital signal processing chips
BT: Digital signal processing

Digital signal processors
BT: Circuits
RT: Signal processing

Digital signatures
BT: Security
RT: Message authentication
Message systems

Digital simulation
BT: Simulation
Computer aided analysis
Modeling
Power system analysis
Computing
Digital twin
Discrete event simulation

Digital storage
BT: Digital systems

Digital subscriber lines
USE: DSL

Digital subscriber loops
USE: DSL

Digital systems
BT: Computers and information processing
RT: Communication systems
Computational and artificial intelligence
Consumer electronics
Cryptocurrency
Digital computers
Digital intelligence
Digital recording
Persistent identifiers
Personal communication

Digital terrain model
USE: Digital elevation models

Digital terrain modeling
USE: Digital elevation models

Digital terrain models
USE: Digital elevation models

Digital to analog conversion
USE: Digital-analog conversion

Digital to analog converters
USE: Digital-analog conversion

Digital transformation
BT: Digital systems
Augmented reality
Internet of Things
Virtual reality

Digital TV

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2021 IEEE Thesaurus

BT: TV
RT: Digital multimedia

Digital twin
BT: Cyber-physical systems
Digital simulation
RT: Augmented reality
Internet of Things
Virtual reality

Digital versatile discs
USE: DVD

Digital video broadcasting
UF: Digital video broadcasts
BT: Broadcasting
Digital communication

Digital video broadcasts
USE: Digital video broadcasting

Digital video discs
USE: DVD

Digital watermarking
USE: Watermarking

Digital-analog
USE: Digital-analog conversion

Digital-analog conversion
UF: D/A
D/A conversion
D/A converters
Digital to analog conversion
Digital to analog converters
Digital-analog
Digital-analog converters
Digital-analogue conversion
Digital-analogue converters
Digital-to-analog conversion
Digital-to-analog converters
BT: Data conversion
RT: Digital computers
Interpolation

Digital-analog converters
USE: Digital-analog conversion

Digital-analogue conversion
USE: Digital-analog conversion

Digital-analogue converters
USE: Digital-analog conversion

Digital-controlled oscillators
BT: Oscillators

Digital-to-analog conversion
USE: Digital-analog conversion

Digital-to-analog converters
USE: Digital-analog conversion

Digital-to-frequency converters
BT: Converters

Dike
USE: Levee

DIL
USE: Electronics packaging

Dimension reduction
USE: Dimensionality reduction

Dimensionality reduction
UF: Dimension reduction
BT: Information retrieval
Machine learning
Statistics
NT: Manifold learning

Dinosaurus
BT: Animals

Diode lasers
UF: Laser diodes
BT: Diodes
Lasers

Diodes
BT: Electronic components
Voltage multipliers
RT: Breakdown voltage
Optical transmitters
Semi-conductor diodes
NT: Diode lasers

DIP
USE: Electronics packaging

Dip coating
BT: Coatings

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Dipole antennas
  BT: Antennas

Direct broadcast satellites
  USE: Satellite broadcasting

Direct current generators
  USE: DC generators

Direct current machines
  USE: DC machines

Direct current motors
  USE: DC motors

Direct current power transmission
  USE: DC power transmission

Direct sequence CDMA
  USE: Direct-sequence code-division multiple access

Direct sequence code-division multiple access
  USE: Direct-sequence code-division multiple access

Direct sequence spread spectrum communication
  BT: Radio spectrum
  RT: Bandwidth
  Modulation

Direct-sequence CDMA
  USE: Direct-sequence code-division multiple access

Direct-sequence code-division multiple access
  USE: Direct-sequence code-division multiple access
  BT: Multiaccess communication

Directed acyclic graph
  BT: Graph theory
  RT: Blockchain

Directed graphs
  BT: Graph theory
  NT: Fuzzy cognitive maps

Direction of arrival
  USE: Direction-of-arrival estimation

Direction of arrival estimation
  USE: Direction-of-arrival estimation

Direction-finding
  USE: Navigation

Direction-of-arrival estimation
  UF: Bearing estimation
  DOA estimation
  Direction of arrival
  BT: Parameter estimation
  RT: Array signal processing
  Position measurement
  Spectral analysis
  Time of arrival estimation

Directional antennas
  BT: Antennas

Directional couplers
  BT: Couplers
  RT: Hybrid junctions

Directive antennas
  BT: Antennas

Discharge lamps
  BT: Lamps
  NT: High intensity discharge lamps

Discharges (electric)
  UF: Dielectric barrier discharges
  Gas discharges
  Ozone generators
  Ozonizers

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<table>
<thead>
<tr>
<th>BT: Dielectric breakdown</th>
<th>RT: Asymptotic stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Electrostatic processes</td>
<td>Control systems</td>
</tr>
<tr>
<td>Gas discharge devices</td>
<td>Difference equations</td>
</tr>
<tr>
<td>Gases</td>
<td></td>
</tr>
<tr>
<td>Ionization</td>
<td></td>
</tr>
<tr>
<td>Plasmas</td>
<td></td>
</tr>
</tbody>
</table>

**Discussion forums**

<table>
<thead>
<tr>
<th>BT: Collaboration</th>
</tr>
</thead>
</table>

**Diseases**

<table>
<thead>
<tr>
<th>BT: Medical conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Epidemics</td>
</tr>
<tr>
<td>Medical diagnosis</td>
</tr>
<tr>
<td>Metastasis</td>
</tr>
<tr>
<td>Pandemics</td>
</tr>
<tr>
<td>Pathology</td>
</tr>
<tr>
<td>NT: Acquired immune deficiency syndrome</td>
</tr>
</tbody>
</table>

Alcoholism
Arteriosclerosis
Arthritis
Bacterial infections
Bone diseases
COVID-19
Cancer
Cardiovascular diseases
Degenerative diseases
Dementia
Epilepsy
Human immunodeficiency virus
Infectious diseases
Influenza
Multiple sclerosis
Neurological diseases
Parasitic diseases
Parkinson's disease
Pathogens
Pulmonary diseases
Retinopathy

**Disk drives**

<table>
<thead>
<tr>
<th>BT: Computer peripherals</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Disk recording</td>
</tr>
<tr>
<td>Perpendicular magnetic recording</td>
</tr>
</tbody>
</table>

**Disk recording**

<table>
<thead>
<tr>
<th>BT: Recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Disk drives</td>
</tr>
</tbody>
</table>

**Disks (structures)**

| USE: Structural discs |

**Discrete cosine transforms**

<table>
<thead>
<tr>
<th>UF: DCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Discrete transforms</td>
</tr>
<tr>
<td>RT: Chebyshev approximation</td>
</tr>
</tbody>
</table>

**Discrete element method**

| USE: Finite element analysis |

**Discrete event simulation**

<table>
<thead>
<tr>
<th>BT: Digital simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT: Time warp simulation</td>
</tr>
</tbody>
</table>

**Discrete event systems**

| USE: Discrete-event systems |

**Discrete Fourier transforms**

<table>
<thead>
<tr>
<th>UF: DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Fourier transforms</td>
</tr>
<tr>
<td>RT: Signal processing</td>
</tr>
</tbody>
</table>

**Discrete Fourier transforms**

| USE: Discrete transforms |

**Discrete time systems**

| USE: Discrete-time systems |

**Discrete transforms**

<table>
<thead>
<tr>
<th>BT: Discrete Fourier transforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT: Transforms</td>
</tr>
<tr>
<td>NT: Discrete cosine transforms</td>
</tr>
</tbody>
</table>

**Discrete wavelet transforms**

<table>
<thead>
<tr>
<th>BT: Wavelet transforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Finite impulse response</td>
</tr>
</tbody>
</table>

**Discrete-event systems**

<table>
<thead>
<tr>
<th>BT: Discrete event systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Control systems</td>
</tr>
<tr>
<td>Manufacturing</td>
</tr>
<tr>
<td>Petri nets</td>
</tr>
<tr>
<td>Production systems</td>
</tr>
</tbody>
</table>

**Discrete-time systems**

<table>
<thead>
<tr>
<th>BT: Time factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Dismissal (employment)</td>
</tr>
</tbody>
</table>

| USE: Termination of employment |

---

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Dispatching
  BT: Object oriented
  RT: Materials handling

Dispersion
  UF: Dispersion effect
  Dispersion measurement
  Dispersion relations
  BT: Signal processing
  RT: Refractive index
  NT: Chromatic dispersion
  Optical fiber dispersion

Dispersion effect
  USE: Dispersion

Dispersion measurement
  USE: Dispersion

Dispersion relations
  USE: Dispersion

Dispersive
  USE: Dispersion

Displacement control
  BT: Mechanical variables
  control

Displacement measurement
  BT: Mechanical variables
  measurement

Display systems
  BT: Displays

Displays
  BT: Optical devices
  Character generation
  Graphics
  Thin film transistors
  User interfaces
  NT: Active matrix technology
  Cathode ray tubes
  Computer displays
  Display systems
  Flat panel displays
  Head-mounted displays

Disruption tolerant networking
  BT: Computer network
  management

Disruptive innovation
  BT: Business
  RT: Disruptive technologies
  Entrepreneurship
  Market opportunities
  Technological innovation

Disruptive technologies
  BT: Technology
  RT: Disruptive innovation
  Market opportunities
  Technological innovation

Dissolved air flotation
  USE: Wastewater treatment

Dissolved gas analysis
 BT: Fault diagnosis

Distance
  USE: Distance measurement

Distance learning
  UF: Remote learning
  BT: Learning (artificial intelligence)
  RT: Adaptive learning
  Electronic learning
  Mobile learning

Distance measurement
  USE: Protective relaying
  Distance relays
  USE: Distillation equipment

Distillation columns

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### Distillation equipment
- **UF:** Distillation columns
- **BT:** Chemical technology
- **BT:** Computers and information processing

### Distortion
- **UF:** Distortion information
- **BT:** Signal processing
- **RT:** Delay effects
- **RT:** Distortion measurement
- **RT:** Image restoration
- **RT:** Interference
- **RT:** Noise
- **RT:** Rate distortion theory
- **RT:** Signal restoration
- **NT:** Acoustic distortion
- **NT:** Four-wave mixing
- **NT:** Jitter
- **NT:** Nonlinear distortion
- **NT:** Phase distortion

### Distortion information
- **USE:** Distortion

### Distortion measurement
- **UF:** Acoustic distortion measurement
- **UF:** Electric distortion measurement
- **UF:** Optical distortion measurement
- **BT:** Measurement
- **RT:** Distortion
- **NT:** Noise measurement
- **NT:** Total harmonic distortion

### Distributed control
- **USE:** Decentralized control

### Distributed algorithms
- **BT:** Algorithms

### Distributed amplifiers
- **BT:** Amplifiers

### Distributed antennas
- **USE:** Antenna arrays

### Distributed Bragg reflectors
- **UF:** DBR
- **BT:** Mirrors
- **RT:** Integrated optics
- **RT:** Vertical cavity surface

### Distributed computing
- **USE:** Distributed power generation

---

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### Distributed generation

**USE:** Decentralized control AND Distributed power

**BT:** Power generation
**RT:** Hybrid power systems
Microgrids
Vehicle-to-grid

### Distributed information systems

**BT:** Distributed computing
Information systems
**NT:** Distributed management
Publish-subscribe

**UF:** DLT
Hyper ledger
Hyperledger
Shared ledger

**BT:** Online banking
**RT:** Blockchain
Cryptocurrency
Distributed computing
Distributed databases
Peer-to-peer computing

### Distributed ledger

**BT:** Distributed information systems
Management

**RT:** Collaborative intelligence

**USE:** Decentralized control

### Distributed management task force

**USE:** DMTF

### Distributed modeling

**USE:** Decentralized control

### Distributed parameter circuits

**BT:** Decentralized control

**USE:** Distribution functions

**BT:** Statistical distributions

**RT:** Probability
Probability density function

### Distribution networks

**BT:** Supply chains

**USE:** Distribution of electric power

**BT:** Marketing management

### Distribution strategy

**BT:** Observers

**RT:** Adaptive control
Robust control

### Disturbance observers

**BT:** Diversity gain

**USE:** Diversity methods

**BT:** Diversity gain
**RT:** Transmitters
Fading channels
Multipath channels
<table>
<thead>
<tr>
<th>Radio communication</th>
<th>USE: Direction-of-arrival estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOA estimation</td>
<td></td>
</tr>
<tr>
<td>Docking stations</td>
<td>USE: Computer interfaces</td>
</tr>
<tr>
<td>DOCSIS</td>
<td>USE: Data over cable service interface specification</td>
</tr>
<tr>
<td>Doctor</td>
<td>USE: Medical services</td>
</tr>
<tr>
<td>Document delivery</td>
<td>BT: Information services</td>
</tr>
<tr>
<td></td>
<td>NT: Ask IEEE</td>
</tr>
<tr>
<td>Diving equipment</td>
<td>USE: Underwater equipment</td>
</tr>
<tr>
<td>DLT</td>
<td>USE: Distributed ledger</td>
</tr>
<tr>
<td>DMB</td>
<td>USE: Digital multimedia</td>
</tr>
<tr>
<td>broadcasting</td>
<td></td>
</tr>
<tr>
<td>DMTF</td>
<td>UF: Distributed management</td>
</tr>
<tr>
<td></td>
<td>BT: Standards organizations</td>
</tr>
<tr>
<td>DMTF Standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BT: Standards publications</td>
</tr>
<tr>
<td></td>
<td>RT: Common Information Model (computing)</td>
</tr>
<tr>
<td>DNA</td>
<td>BT: Genetics</td>
</tr>
<tr>
<td></td>
<td>RT: Biological cells</td>
</tr>
<tr>
<td></td>
<td>Biological information</td>
</tr>
<tr>
<td></td>
<td>theory</td>
</tr>
<tr>
<td></td>
<td>Cloning</td>
</tr>
<tr>
<td></td>
<td>DNA computing</td>
</tr>
<tr>
<td></td>
<td>Epigenetics</td>
</tr>
<tr>
<td></td>
<td>Genetic communication</td>
</tr>
<tr>
<td></td>
<td>Molecular biophysics</td>
</tr>
<tr>
<td></td>
<td>NT: Genetic mutations</td>
</tr>
<tr>
<td>DNA computing</td>
<td>BT: Computers and information processing</td>
</tr>
<tr>
<td></td>
<td>RT: Nanobioscience</td>
</tr>
<tr>
<td></td>
<td>DNA</td>
</tr>
<tr>
<td></td>
<td>Molecular computing</td>
</tr>
<tr>
<td>DOA estimation</td>
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</table>

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Domain Name System</th>
<th>BT: Computer networks</th>
</tr>
</thead>
</table>

### Domain specific languages

- **UF:** Domain-specific languages  
- **BT:** Specification languages

### Domain-specific languages

- **USE:** Domain specific languages

### Domestic appliances

- **USE:** Home appliances

### Domestic induction appliances

- **USE:** Home appliances

### Domestic safety

- **UF:** Safety in the home  
- **BT:** Safety  
- **RT:** Accidents  
- **Consumer products**  
- **Electrical safety**  
- **Occupational health**  
- **Occupational safety**  
- **Smoke detectors**  
- **NT:** Fall detection

### Doped fiber amplifiers

- **UF:** DFA  
- **BT:** Optical amplifiers

### Doping

- **BT:** Materials preparation  
- **RT:** Semiconductor device  
- **doping**  
- **Silicon devices**  
- **NT:** Doping profiles

### Doping profiles

- **BT:** Doping  
- **RT:** Optimization  
- **Thin film devices**

### Doppler

- **USE:** Doppler effect

### Doppler effect

- **UF:** Doppler  
- **BT:** Waves  
- **RT:** Doppler measurement  
- **Doppler radar**  
- **NT:** Doppler shift

### Doppler radar

- **BT:** Radar  
- **RT:** Doppler effect  
- **Doppler measurement**

### Doppler shift

- **BT:** Doppler effect

### DoS attack

- **USE:** Computer crime AND Denial-of-service attack

### Dosimetry

- **UF:** Radiation dosimetry  
- **BT:** Measurement  
- **RT:** Collimators  
- **Neutron capture therapy**  
- **Phantoms**  
- **Radiation detectors**  
- **Radiation monitoring**  
- **Radiation protection**

### Double gate FETs

- **USE:** Double-gate FETs

### Double heterojunction bipolar transistors

- **UF:** DHBTs  
- **BT:** Heterojunction bipolar transistors

### Double heterojunction HEMTs

- **USE:** DH-HEMTs

### Double-gate FETs

- **UF:** Double gate FETs  
- **BT:** Field effect transistors  
- **RT:** Silicon-on-insulator

### Doubly fed induction generators

- **UF:** DFIG  
- **BT:** Induction generators  
- **RT:** Wind turbines

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT: Satellite communication</th>
<th>Driver circuits</th>
<th>BT: Circuits RT: Power transistors</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Cellular radio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP industry USE: Computer industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPKS USE: Differential phase shift keying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drag BT: Fluid dynamics RT: Friction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain avalanche hot carrier injection UF: Drain avalanche hot-carrier injection BT: Hot carrier injection USE: Drain avalanche hot carrier injection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRAM USE: DRAM chips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRAM chips UF: DRAM BT: Random access memory RT: Solid state drives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dredging USE: Excavation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drift velocity USE: Electron mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling UF: Drilling (machining) BT: Machining RT: Boring Deburring Drilling machines Geotechnical Oil drilling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling (machining) USE: Drilling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling machines BT: Machine tools RT: Drilling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling oil USE: Oil drilling</td>
<td></td>
<td></td>
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<tr>
<td>Driver free automobiles USE: Autonomous automobiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver free cars USE: Autonomous automobiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver-free car USE: Autonomous automobiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driverless automobiles USE: Autonomous automobiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driverless cars USE: Autonomous automobiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drives BT: Machinery RT: Mechanical power transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensorless control Torque converters NT: Hydraulic drives Motor drives Variable speed drives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drones BT: Unmanned aerial vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug delivery UF: Drug delivery systems BT: Biomedical engineering RT: Nanocarriers NT: Targeted drug delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug delivery systems USE: Drug delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drugs BT: Pharmaceuticals RT: Biochemistry Chemical analysis Chemistry Chemotherapy Molecular biomarkers NT: Antibiotics Antidepressants Aspirin Cancer drugs Insulin</td>
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</tr>
<tr>
<td>Term</td>
<td>BT:</td>
<td>RT:</td>
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<td>-----------------------------</td>
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<tr>
<td><strong>Dry etching</strong></td>
<td>Etching</td>
<td>Video recording</td>
</tr>
<tr>
<td><strong>DSL</strong></td>
<td>Digital subscriber lines</td>
<td>DVD-ROM</td>
</tr>
<tr>
<td></td>
<td>Digital subscriber loops</td>
<td>USE: DVD</td>
</tr>
<tr>
<td></td>
<td>Digital communication</td>
<td>Dynamic algorithms</td>
</tr>
<tr>
<td></td>
<td>DSL</td>
<td>USE: Heuristics</td>
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<tr>
<td><strong>DSP</strong></td>
<td>Digital signal processing</td>
<td>Dynamic compiler</td>
</tr>
<tr>
<td></td>
<td>USE: DSP</td>
<td>Runtime</td>
</tr>
<tr>
<td><strong>DSRC</strong></td>
<td>Dedicated short range communication</td>
<td>Dynamic equilibrium</td>
</tr>
<tr>
<td></td>
<td>USE: DSRC</td>
<td>BT: Measurement techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NT: Steady-state</td>
</tr>
<tr>
<td><strong>DT-MRI</strong></td>
<td>Diffusion tensor imaging</td>
<td>Dynamic program analysis</td>
</tr>
<tr>
<td></td>
<td>USE: DT-MRI</td>
<td>USE: Performance analysis</td>
</tr>
<tr>
<td><strong>DTI</strong></td>
<td>Diffusion tensor imaging</td>
<td>Dynamic programming</td>
</tr>
<tr>
<td><strong>Dual band</strong></td>
<td>Dual-band</td>
<td>Dynamic range</td>
</tr>
<tr>
<td></td>
<td>Mobile communication</td>
<td>BT: Algorithms</td>
</tr>
<tr>
<td></td>
<td>GSM</td>
<td>RT: Markov processes</td>
</tr>
<tr>
<td></td>
<td>Mobile handsets</td>
<td>Neural networks</td>
</tr>
<tr>
<td></td>
<td>Roaming</td>
<td>Viterbi algorithm</td>
</tr>
<tr>
<td><strong>Dual inline packaging</strong></td>
<td>Electronics packaging</td>
<td>Dynamic scheduling</td>
</tr>
<tr>
<td></td>
<td>USE: Dual inline packaging</td>
<td>Dynamic service delivery</td>
</tr>
<tr>
<td><strong>Dual-band</strong></td>
<td>Dual band</td>
<td>USE: Network resource management</td>
</tr>
<tr>
<td><strong>Dualband</strong></td>
<td>Dual band</td>
<td>Dynamic spectrum access</td>
</tr>
<tr>
<td><strong>Ducts</strong></td>
<td>Structural shapes</td>
<td>BT: Radio transceivers</td>
</tr>
<tr>
<td></td>
<td>Air conditioning</td>
<td>RT: Telecommunication network topology</td>
</tr>
<tr>
<td></td>
<td>Vents</td>
<td>Wireless communication</td>
</tr>
<tr>
<td><strong>Dusty plasma</strong></td>
<td>Dusty plasmas</td>
<td>Dynamic systems</td>
</tr>
<tr>
<td><strong>Dusty plasmas</strong></td>
<td>Dusty plasma</td>
<td>USE: Dynamical systems</td>
</tr>
<tr>
<td></td>
<td>Plasma properties</td>
<td>Dynamic voltage scaling</td>
</tr>
<tr>
<td><strong>DVD</strong></td>
<td>DVD-ROM</td>
<td>UF: Self-dynamic voltage scaling</td>
</tr>
<tr>
<td></td>
<td>Digital versatile discs</td>
<td>BT: Computer architecture</td>
</tr>
<tr>
<td></td>
<td>Digital video discs</td>
<td>Voltage</td>
</tr>
<tr>
<td></td>
<td>Video coding</td>
<td>Dynamic systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BT: Mathematics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NT: Nonlinear dynamical systems</td>
</tr>
</tbody>
</table>
# 2021 IEEE Thesaurus

## Dynamics
- **BT:** Mechanical factors  
- **RT:** Control theory  
- **Force**  
- **Friction**  
- **Vibrations**  
- **NT:** Aerodynamics  
- **Elastodynamics**  
- **Electrodynamics**  
- **Hydrodynamics**  
- **Magnetohydrodynamics**  

### E-health records
- **USE:** Electronic medical records

### E-learning
- **USE:** Electronic learning

### E-mail
- **USE:** Electronic mail

### E-publishing
- **USE:** Electronic publishing

### Dynamo
- **USE:** Generators

### Dynamometers
- **UF:** Dyno  
- **BT:** Force measurement  
- **Meters**  
- **Power measurement**  
- **Torque measurement**  

### Dyno
- **USE:** Dynamometers

### Dysprosium
- **BT:** Chemical elements  
- **NT:** Dysprosium compounds

### Dysprosium compounds
- **BT:** Dysprosium

### E health
- **USE:** Electronic healthcare

### E learning
- **USE:** Electronic learning

### e-agriculture
- **USE:** Digital agriculture

### E-banking
- **USE:** Online banking

### E-books
- **USE:** Electronic publishing

### E-commerce
- **USE:** Electronic commerce

### E-currency
- **USE:** Online banking

### E-government
- **USE:** Electronic government

### Ear
- **BT:** Head  
- **Sense organs**  
- **RT:** Cochlear implants

### Earphones
- **USE:** Headphones

### Earth
- **BT:** Geoscience  
- **Planets**  
- **RT:** Geophysics  
- **Remote sensing**  
- **Soil**  
- **Terrain factors**  
- **Terrain mapping**

### Earth atmosphere
- **USE:** Terrestrial atmosphere

### Earth observation system
- **USE:** Earth Observing System

### Earth Observing System
- **UF:** EOS  
- **BT:** Artificial satellites  
- **Observers**  
- **NT:** Global Earth Observation  
- **System of Systems**


**Earth science**
- USE: Geoscience

**Earthing**
- USE: Grounding

**Earthquake engineering**
- UF: Seismic retrofitting
- BT: Earthquakes
- RT: Seismology

**Earthquakes**
- BT: Geoscience
- RT: Seismic waves
- Seismology
- NT: Earthquake engineering

**Eavesdropping**
- UF: Cyber eavesdropping
- BT: Privacy
- RT: Computer security

**ECC**
- USE: Elliptic curve cryptography

**AND**
- Error correction codes

**ECCM**
- USE: Electronic countermeasures

**ECG**
- USE: Electrocardiography

**Echo cancellation**
- USE: Echo cancellers

**Echo cancellers**
- UF: Echo cancellation
- BT: Active noise reduction

**Echo interference**
- BT: Interference
- RT: Clutter
- TV interference

**Echocardiography**
- UF: ECHOEG
- BT: Cardiography

**ECHOEG**
- USE: Echocardiography

**Eco design**
- USE: Ecodesign

**Eco-design**
- USE: Ecodesign

**Ecodesign**
- UF: Eco design
- BT: Green design
- RT: Energy conservation
- Environmental factors

**Ecology**
- BT: Environmental factors
- RT: Entomology

**Ecommerce**
- USE: Electronic commerce

**Econometrics**
- BT: Economics
- RT: Costs
- Cybernetics
- Mathematics
- Profitability
- Regression analysis
- Statistics
- Economic forecasting

**Economic forecasting**
- BT: Econometrics
- Forecasting
- Economic indicators

**Economic indicators**
- UF: Cost of living index
- Cost-of-living index
- GDP
- GNP
- Gross domestic product
- Gross national product
- Harmonised index of consumer prices

**Echo interference**
- BT: Interference
- RT: Clutter
- TV interference

**Echocardiography**
- UF: ECHOEG
- BT: Cardiography

**ECHOEG**
- USE: Echocardiography

**ECM**
- USE: Electronic countermeasures

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2021 IEEE Thesaurus

NT: Share prices
RT: Consensus protocol
      Low-carbon economy
NT: Wetlands

Economics

BT: Bankruptcy
RT: Commercial law
Cost accounting
Digital divide
Econophysics
Finance
Planning
NT: Access charges
Costs
Developing countries
Econometrics
Economic indicators
Electronic commerce
Environmental economics
Exchange rates
Fuel economy
International trade
Macroeconomics
Microeconomics
Monopoly
Oligopoly
Power generation
Profitability
Sharing economy
Stock markets
Supply and demand
Trade agreements
Venture capital
Virtual enterprises

Econophysics

BT: Cybernetics
RT: Chaos
Complexity theory
Economics
Fractals
Information theory
Knowledge acquisition
Nonlinear dynamical
Philosophical
Science - general

Ecosystems

BT: Environmental factors

EDA
USE: Electronic design automation and methodology

Eddy current losses
USE: Eddy currents

Eddy current testing
BT: Eddy currents
RT: Finite element analysis

Eddy currents
UF: Eddy current losses
BT: Electromagnetic induction
RT: Magnetic losses
NT: Eddy current testing

EDFA
USE: Erbium-doped fiber amplifiers

Edge computing
UF: Fog computing
BT: Application virtualization
Distributed processing
RT: Cloud computing
Computer applications
Dew computing
Mobile computing
Wireless sensor networks

Edge detection
USE: Image edge detection

EDTV
USE: HDTV

Education
UF: Inverted classroom
Reverse teaching
Teaching
RT: Personnel
Adaptive learning
Career development
Educational courses
Educational institutions
Educational programs
Educational technology
Engineering education
Training

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2021 IEEE Thesaurus

Educational courses

- **BT**: Education
- **RT**: Computer aided instruction
- **STEM**: Curriculum development
- **NT**: Computer aided instruction

**Effluents**

- **BT**: Waste materials
- **RT**: Industrial waste
- **NT**: Waste disposal
- **Resources**: Water pollution

Educational institutions

- **UF**: Colleges
- **BT**: Schools
- **NT**: Open Educational
- **UE**: Universities

**Ehealth**

- **USE**: Electronic healthcare

Educational programs

- **BT**: Curriculum development
- **RT**: Educational courses
- **NT**: Accreditation
- **STEM**: Continuing education
- **Schools**: Pre-college engineering
- **Universities**: STEM
- **Self-study courses**: Scholarships
- **Seminars**: Self-study courses
- **Tutorials**: Self-study courses

**Eigenfunctions**

- **USE**: Eigenvalues and eigenfunctions

Educational robots

- **BF**: Robots
- **RT**: Engineering education

**Eigenfunctions and eigenvalues**

- **UF**: Eigenfunctions
- **BT**: Eigenvalues and eigenfunctions

Educational technology

- **UF**: Audio-visual instructional aids
- **IST**: Instructional aids
- **BT**: Programmed instruction
- **RT**: Education
- **STEM**: Audio-visual systems
- **Visualization**: Computer aided instruction
- **NT**: Courseware
- **USE**: Electronic learning

**EKG**

- **USE**: Electroencephalography

**EEPROM**

- **USE**: EPROM

Effective mass

- **BT**: Energy states
- **RT**: Strain

**Elastodynamics**

- **EFF**: Field-flow fractionation

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<table>
<thead>
<tr>
<th>Electric current measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Current measurement</td>
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</table>

<table>
<thead>
<tr>
<th>Electric distortion measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Distortion measurement</td>
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</table>

<table>
<thead>
<tr>
<th>Electric fences</th>
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<tbody>
<tr>
<td>BT: Electric machines</td>
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</table>

<table>
<thead>
<tr>
<th>Electric field</th>
</tr>
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<tbody>
<tr>
<td>USE: Electric fields</td>
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</table>

<table>
<thead>
<tr>
<th>Electric fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Electric field</td>
</tr>
<tr>
<td>BT: Electromagnetic fields</td>
</tr>
<tr>
<td>RT: Electrohydrodynamics</td>
</tr>
<tr>
<td>Electrokinetics</td>
</tr>
<tr>
<td>Electrostatic analysis</td>
</tr>
<tr>
<td>Electrostatic processes</td>
</tr>
<tr>
<td>Maxwell equations</td>
</tr>
<tr>
<td>Synchrotrons</td>
</tr>
<tr>
<td>NT: Acoustoelectric effects</td>
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<tr>
<td>Casimir effect</td>
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<td>Nonuniform electric fields</td>
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<table>
<thead>
<tr>
<th>Electric generators</th>
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</thead>
<tbody>
<tr>
<td>BT: Generators</td>
</tr>
<tr>
<td>RT: Nanogenerators</td>
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</table>

<table>
<thead>
<tr>
<th>Electric heating</th>
</tr>
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<tbody>
<tr>
<td>USE: Resistance heating</td>
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<table>
<thead>
<tr>
<th>Electric impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Impedance</td>
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</table>

<table>
<thead>
<tr>
<th>Electric machines</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Machinery</td>
</tr>
<tr>
<td>RT: Windings</td>
</tr>
<tr>
<td>NT: AC machines</td>
</tr>
<tr>
<td>Alternators</td>
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<td>Brushless machines</td>
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<td>Compressors</td>
</tr>
<tr>
<td>Conductors</td>
</tr>
<tr>
<td>DC machines</td>
</tr>
<tr>
<td>Electric fences</td>
</tr>
<tr>
<td>Generators</td>
</tr>
<tr>
<td>Permanent magnet</td>
</tr>
</tbody>
</table>
Rotating machines
  Rotors
  Stators
  Washing machines

Electric motors
  BT: Motors
  NT: Planar motors

Electric potential
  BT: Electric variables

Electric power
  USE: Power electronics AND
      Power systems

Electric resistance
  UF: Electrical resistivity
  BT: Resistance

Electric sensing devices
  BT: Sensor systems and
      applications

Electric shock
  UF: Shock
  BT: Bioelectric phenomena
  RT: Accidents
      Electrical accidents
      Grounding
      Occupational health
      Occupational safety
      Safety

Electric stimulation therapy
  USE: Electrical stimulation

Electric utilities
  USE: Electricity supply industry
      Power industry

Electric variables
  UF: Current voltage
  BT: Electric characteristics
      Electrical characteristics
      Instrumentation and
      measurement
  RT: Electric variables control
      Electric variables
      measurement
  NT: Admittance measurement
      Ammeters
      Attenuation measurement
      Capacitance measurement
      Conductivity measurement
      Current measurement
      Dielectric measurement
      Electrical resistance
      Measurement

Capacitance-voltage characteristics
  Conductivity
  Current
  Current-voltage characteristics
  Electric potential
  Gain
  Impedance
  Impedance matching
  Inductance
  Permittivity
  Piezoresistance
  Q-factor
  Resistance
  Voltage
  Wiring

Electric variables control
  BT: Power engineering and
      energy
  RT: Electric variables
      Frequency control
      Phase control
      Regulators
  NT: Current control
      Gain control
      Power control
      Power system control
      Reactive power control
      Voltage control

Electric variables measurement
  BT: Measurement
  RT: Electric variables
      Electromagnetic measurements
      Frequency measurement
      Gain measurement
      Integrated circuit measurements
      Noise measurement
      Oscilloscopes
      Phase measurement
      Pulse measurements
      Transducers
      Admittance measurement
      Ammeters
      Attenuation measurement
      Capacitance measurement
      Conductivity measurement
      Current measurement
      Dielectric measurement
      Electrical resistance

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Electrostatic measurements
Energy measurement
Impedance measurement
Inductance measurement
Partial discharge

Phasor measurement units
Power measurement
Q measurement
Ryder atoms
Transmission line

Voltage measurement

Electric vehicle charging
UF: EV charging
BT: Battery chargers

Electric vehicles
BT: Land vehicles
RT: Charging stations
NT: Battery powered vehicles
Electric vehicle charging
Fuel cell vehicles
Hybrid electric vehicles
Plug-in electric vehicles
Solar powered vehicles
Vehicle-to-grid

Electric accidents
BT: Accidents
RT: Bioelectric phenomena
Electric shock
Electrical safety

Electrical appliances
USE: Electrical products

Electrical ballast
USE: Electronic ballasts

Electrical ballasts
BT: Current control
Lighting
RT: High intensity discharge

Inductors
Resistors

Electrical brain stimulation
USE: Electrical stimulation

Electrical capacitance tomography
BT: Tomography

Electrical characteristics
USE: Electric variables

Electrical conductivity
USE: Conductivity

Electrical double layer capacitors
USE: Supercapacitors

Electrical engineering
BT: Engineering - general
RT: Engineering profession
NT: Electrical engineering computing

Electrical engineering computing
BT: Electrical engineering
RT: Computer applications

Electrical engineering education
BT: Engineering education
NT: Electronics engineering education

Electrical engineering industry
BT: Industries

Electrical equipment industry
BT: Power industry
RT: Electrical products industry
Electricity supply industry
Electronics industry

Electrical fault detection
BT: Circuit faults

Electrical impedance tomography
BT: Tomography

Electrical insulation
USE: Dielectrics

Electrical products
UF: Electrical appliances
BT: Electrical products industry
Manufactured products
RT: Consumer products
NT: Washing machines

Electrical products industry
BT: Manufacturing industries
RT: Electrical equipment industry
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>NT:</th>
<th>Electrical products</th>
<th>Electricity market</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT:</td>
<td>Power industry</td>
<td>Power supply industry</td>
</tr>
<tr>
<td>RT:</td>
<td>Electrical equipment industry</td>
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</table>

## Electrical resistance measurement

<table>
<thead>
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<th>UF:</th>
<th>Ohmmeters</th>
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<tbody>
<tr>
<td>BT:</td>
<td>Electric variables</td>
</tr>
<tr>
<td>RT:</td>
<td>Resistance</td>
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</table>

**USE:** Electric resistance

## Electrical safety

<table>
<thead>
<tr>
<th>BT:</th>
<th>Power system protection</th>
</tr>
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<tbody>
<tr>
<td>RT:</td>
<td>Domestic safety</td>
</tr>
<tr>
<td></td>
<td>Electrical accidents</td>
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<td></td>
<td>Islanding</td>
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<td>Partial discharge</td>
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<table>
<thead>
<tr>
<th>NT:</th>
<th>Fault protection</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Grounding</td>
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</table>

**Electricity supply industry deregulation**

<table>
<thead>
<tr>
<th>UF:</th>
<th>Electricity supply industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>liberalisation</td>
</tr>
<tr>
<td></td>
<td>liberalization</td>
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<td>privatization</td>
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<td>privatisation</td>
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<td>Power generation</td>
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<td></td>
<td>Power system economics</td>
</tr>
<tr>
<td></td>
<td>Power markets</td>
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</table>

**Electricity supply industry liberalisation**

**Electricity supply industry privatisation**

**Electricity supply industry privatization**

## Electrical stimulation

<table>
<thead>
<tr>
<th>UF:</th>
<th>Electric stimulation therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electrical brain stimulation</td>
</tr>
<tr>
<td></td>
<td>Microelectronic stimulation</td>
</tr>
<tr>
<td></td>
<td>Spinal cord stimulation</td>
</tr>
</tbody>
</table>

| BT: | Medical treatment |

**Electrically alterable read only memory**

**Electrically erasable programmable read only memory**

**Electricity**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Science - general</th>
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<tbody>
<tr>
<td>NT:</td>
<td>Photoelectricity</td>
</tr>
<tr>
<td></td>
<td>Piezoelectricity</td>
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<td>Pyroelectricity</td>
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<td></td>
<td>Thermoelectricity</td>
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<td>Triboelectricity</td>
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</tbody>
</table>

## Electricity grids

**Electricity market**

**Electricity markets**

**Electricity supply industry**

| UF: | Electric utilities |

<table>
<thead>
<tr>
<th>USE:</th>
<th>Power grids</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Electricity supply industry</td>
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<tr>
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<td>Power markets</td>
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<tr>
<td></td>
<td>Power markets</td>
</tr>
</tbody>
</table>

**Electricity trading**

**Electro hydraulics**

**Electro oculography**

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Electro-chromic devices
  USE: Electrochromic devices

Electro-fluid dynamics
  USE: Electrohydrodynamics

Electro-oculography
  USE: Electrooculography

Electro-optic deflectors
  USE: Electrooptic deflectors

Electro-optic effects
  USE: Electrooptic effects

Electro-optic modulators
  USE: Electrooptic modulators

Electro-optical devices
  UF: Electrooptical devices
  BT: Lasers and electrooptics
  RT: Electroluminescent devices
  Electrophotic effects
  Optical bistability
  Optoelectronic devices
  Electrochromic devices
  Electrooptic deflectors
  Electrooptic modulators

Electro-osmosis
  BT: Osmosis

Electroacoustic devices
  USE: Acoustoelectric devices

Electroacoustic effects
  USE: Acoustoelectric effects

Electroactive polymer actuators
  USE: Actuators

Electroactive polymers
  USE: Polymers

Electrobiology
  USE: Bioelectric phenomena

Electrocardiography
  UF: ECG
  EKG
  BT: Cardiography
  RT: Biomedical equipment

Electrocatalysis
  BT: Catalysis
  Electrochemistry
  RT: Electrocatalysts

Electrocatalysts
  BT: Catalysts
  RT: Electrocatalysis
  Electrochemistry
  Mesoporous materials

Electrochemical deposition
  UF: Electroplating
  BT: Surface treatment
  RT: Materials processing

Electrochemical devices
  BT: Industry applications
  RT: Electrochemical processes
  Energy
  Synapses
  Amperometric sensors
  Batteries
  Battery management
  Fuel cells
  Supercapacitors

Electrochemical impedance spectroscopy
  BT: Spectroscopy
  RT: Electrochemical processes

Electrochemical machining
  UF: Electrolytic machining
  BT: Machining
  RT: Micromachining

Electrochemical processes
  UF: Electrolysis
  BT: Industry applications
  RT: Chemical industry
  Electrochemical devices
  Electrochemical impedance spectroscopy
  Electrolytes

Electrochemistry
  BT: Chemistry
  RT: Electrocatalysts
  NT: Electrocatalysis

Electrochromic devices
  UF: Electro-chromic devices
  BT: Electro-optical devices
2021 IEEE Thesaurus

RT: Electrochromism
Electrochromism

BT: Electrooptic effects
RT: Color
Electrochromic devices

Electrodeless lamps
BT: Lamps

Electrodes
BT: Electronic components
RT: Air gaps
Electron emission
Electron tubes
Electrophysiology
Metal-insulator structures
Spark gaps

NT: Anodes
Cathodes
Microelectrodes

Electrodynamics
BT: Dynamics
Waves
RT: Electromagnetic fields
Electron beams
Electron optics
Electron tubes
Ion beams
Particle beam optics

NT: Electromagnetic wave polarization

Electroencephalography
UF: EEG
BT: Biomedical measurement
RT: Bioelectric phenomena
Biomedical equipment
Brain
Electrooculography
Medical diagnosis

Electrofluid dynamics
USE: Electrohydrodynamics

Electrohydraulics
UF: Electro hydraulics
BT: Hydraulic systems
RT: Fluid flow
Liquids
Magnetohydrodynamics

Electrohydrodynamics
UF: Electro-fluid dynamics

Electrophysiology

Electrostrictive hydrodynamics

Electrokinetics
BT: Dielectrics
RT: Dielectric materials
Electric fields
Electrokinetics

Electroluminescence
BT: Luminescence
RT: Electrooptic effects
Organic light emitting diodes

NT: Electroluminescent devices

Electrolysis
USE: Electrochemical processes

Electrolytes
BT: Conducting materials
RT: Electrochemical processes
Supercapacitors

Electrolytic machining
USE: Electrochemical machining

Electromagnetic absorbers
BT: Electromagnetic wave absorption

Electromagnetic analysis
BT: Electromagnetics
RT: Electrostatic analysis
Magnetic analysis
Mie scattering

NT: Air gaps
Characteristic mode analysis
Computational electromagnetics
Delay effects
Electromagnetic fields
Electromagnetic forces
Electromagnetic refraction
Permeability
Spark gaps
Time-domain analysis

Electromagnetic beams
USE: Beams

Electromagnetic compatibility
UF: EMC
BT: Electromagnetic
compatibility and interference
NT: Immunity testing
Reverberation chambers

Electromagnetic compatibility and interference
RT: Electromagnetic interference
Open area test sites
TEM cells
NT: Electromagnetic compatibility
Electromagnetics
Interference

Electromagnetic coupling
BT: Electromagnetics
RT: Circulators
Coupless
Electromagnetic induction
Electromagnetic shielding
NT: Mutual coupling
Optical coupling

Electromagnetic devices
BT: Electromagnetics
RT: Magnetic gears
NT: Baluns

Electromagnetic diffraction
BT: Electromagnetic propagation
RT: Electromagnetic fields
NT: Optical diffraction
Physical theory of diffraction
X-ray diffraction

Electromagnetic field theory
BT: Electromagnetic fields
RT: Computational electromagnetics
Optical fiber theory

Electromagnetic fields
BT: Electromagnetic analysis
RT: Computational electromagnetics
Electrodynamics
Electromagnetic diffraction
Electromagnetic propagation
Electromagnetic radiation
Electromagnetic reflection
Electromagnetic refraction
Electromagnetic scattering
Magnetic fields
Mie scattering
NT: Electric fields
Electromagnetic field theory
Electromagnetic spectrum
Windoings

Electromagnetic forces
BT: Electromagnetic analysis
RT: Electromagnetic launching
Magnetic forces
Mie scattering

Electromagnetic guns
USE: Electromagnetic launching

Electromagnetic heating
UF: Microwave heating
BT: Heating systems
RT: Hyperthermia
Induction heating

Electromagnetic induction
UF: Induction (electromagnetic)
BT: Electromagnetics
RT: Electromagnetic coupling
Geomagnetism
Magnetic communication
NT: Eddy currents
Inductive power
transmission

Electromagnetic interference
UF: EMI
Electromagnetic noise
RF interference
Radio interference
BT: Interference
RT: Crosstalk
Electromagnetic compatibility and interference
Environmental factors

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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Type</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Immunity testing</td>
<td>BT: Electromagnetic measurements</td>
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<tr>
<td>Noise</td>
<td>Electromagnetic interference</td>
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</tr>
<tr>
<td>Open area test sites</td>
<td>Electromagnetic noise</td>
<td></td>
</tr>
<tr>
<td>TEM cells</td>
<td>Electromagnetic interference</td>
<td></td>
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<tr>
<td>Radiofrequency</td>
<td>Electromagnetic interference</td>
<td></td>
</tr>
<tr>
<td>Specific absorption rate</td>
<td>Electromagnetic interference</td>
<td></td>
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</table>

#### Electromagnetic launching

<table>
<thead>
<tr>
<th>UF: Electromagnetic guns</th>
<th>Electromagnetic propulsion</th>
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<tbody>
<tr>
<td>Launching</td>
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<table>
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<tr>
<th>Electromagnetic measurements</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>BT: Measurement</td>
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</tr>
<tr>
<td>RT: Anechoic chambers</td>
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</tr>
<tr>
<td>Antenna measurements</td>
<td></td>
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<tr>
<td>Electric variables</td>
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<tr>
<td>Frequency measurement</td>
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<tr>
<td>Mie scattering</td>
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<td>Reflectometry</td>
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<tr>
<td>Wavelength measurement</td>
<td></td>
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<tr>
<td>NT: Electromagnetic modeling</td>
<td></td>
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<tr>
<td>Linearity</td>
<td></td>
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<tr>
<td>Microwave measurement</td>
<td></td>
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<tr>
<td>Millimeter wave</td>
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<tr>
<td>Parameter extraction</td>
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<td>Polarimetry</td>
<td></td>
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<td>Radiometry</td>
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<tr>
<td>Submillimeter wave</td>
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<tr>
<td>Electromagnetic modeling</td>
<td>USE: Electromagnetic modeling</td>
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<tr>
<td>Electromagnetic noise</td>
<td>USE: Electromagnetic noise interference</td>
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#### Electromagnetic propagation

<table>
<thead>
<tr>
<th>Electromagnetic wave propagation</th>
<th>Antennas and propagation</th>
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<tbody>
<tr>
<td>BT: Antennas and propagation</td>
<td></td>
</tr>
<tr>
<td>RT: Electromagnetic fields</td>
<td></td>
</tr>
<tr>
<td>NT: Electromagnetic diffraction</td>
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<tr>
<td>Magnetic waves</td>
<td></td>
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<tr>
<td>Mie scattering</td>
<td></td>
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<tr>
<td>Waves</td>
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<td>Optical propagation</td>
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<td>Propagation constant</td>
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<td>Propagation losses</td>
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<tr>
<td>Radio propagation</td>
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<tr>
<td>Radiowave propagation</td>
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<tr>
<td>Submillimeter wave</td>
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</table>

#### Electromagnetic propagations in absorbing media

<table>
<thead>
<tr>
<th>Electromagnetic pulse propagation</th>
<th>Microwave propagation</th>
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</thead>
<tbody>
<tr>
<td>BT: Microwaves</td>
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<tr>
<td>NT: Mie scattering</td>
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<tr>
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<tr>
<td>Optical propagation</td>
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<tr>
<td>Submillimeter wave</td>
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#### Electromagnetic modeling

<table>
<thead>
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<th>Electromagnetic modeling</th>
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<table>
<thead>
<tr>
<th>Electromagnetic pulse scattering</th>
<th>Electromagnetic transients</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Electromagnetic transients</td>
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</tr>
</tbody>
</table>

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### Electromagnetic radiation
- **BT:** Electromagnetics
- **RT:** Electromagnetic fields
- **NT:** Formaldehyde
- **UF:** Formaldehyde detectors
- **Polarization:**
  - Waves
  - X-ray detection
  - X-rays
- **Absorption:**
  - Frequency
  - Gamma-rays
  - Line-of-sight propagation
  - Terahertz radiation

### Electromagnetic radiative interference
- **BT:** Electromagnetics
- **RT:** Electromagnetic fields

### Electromagnetic reflection
- **BT:** Electromagnetic fields
- **NT:** Formaldehyde
- **Reflection:**
  - Scattering
  - Reflection

### Electromagnetic refraction
- **BT:** Electromagnetic analysis
- **RT:** Electromagnetic fields
- **NT:** Formaldehyde

### Electromagnetic scattering
- **UF:** Electromagnetic waves
- **BT:** Scattering
- **RT:** Coherence time
- **Waves:**
  - Electromagnetic waves
  - Formaldehyde detectors
  - Optical scattering
  - Polarization
  - Radar scattering
  - Raman scattering
  - Rayleigh scattering

### Electromagnetic shielding
- **BT:** Electromagnetics
- **RT:** EMP radiation effects
- **NT:** Cable shielding
- **Magnetic shielding:**
  - Bremsstrahlung
  - Correlators
  - Electromagnetic wave

### Electromagnetic spectrum
- **BT:** Electromagnetic fields

### Electromagnetic transient program
- **USE:** EMTP

### Electromagnetic transients
- **UF:** Electromagnetic pulse
- **NT:** EMP radiation effects

### Electromagnetic transients DC
- **USE:** EMTDC

### Electromagnetic transients including DC
- **USE:** EMTDC

### Electromagnetic wave absorption
- **BT:** Electromagnetic radiation
- **NT:** Electromagnetic absorbers

### Electromagnetic wave attenuation
- **USE:** Attenuation

### Electromagnetic wave polarisation
- **USE:** Electromagnetic wave polarisation

### Electromagnetic wave propagation
- **USE:** Electromagnetic propagation
2021 IEEE Thesaurus

Electromagnetic wave reflection
USE: Electromagnetic reflection

Electromagnetic wave scattering
USE: Electromagnetic scattering

Electromagnetic waveguides
BT: Transmission lines
RT: Coaxial cables
Coplanar waveguides
Electromagnetic propagation
Helical antennas
Microwave devices
Microwave propagation
Optical fibers
Propagation
Waveguide discontinuities
NT: Circular waveguides
Gap waveguide
Hollow waveguides
Loaded waveguides
Planar waveguides
Rectangular waveguides
Waveguide components
Waveguide lasers
Waveguide theory

Electromagnetic waves
USE: Electromagnetic scattering

Electromagnetics
BT: Electromagnetic compatibility and interference
RT: Cyberspace
Neuroradiology
NT: Electromagnetic analysis
Electromagnetic coupling
Electromagnetic devices
Electromagnetic induction
Electromagnetic
metamaterials
Electromagnetic radiation
Electromagnetic shielding
Electromagnetic transients
Proximity effects

Electromagnets
BT: Magnets
RT: Coils
Magnetic confinement
Magnetic levitation
Magnetic levitation vehicles
NT: Superconducting magnets

Electromechanical devices
BT: Electromechanical systems
NT: Armature
SAW filters

Electromechanical sensors
BT: Sensors
NT: Microsensors

Electromechanical systems
BT: Industry applications
NT: Cruise control
Electromechanical devices

Electromigration
BT: Diffusion processes

Electromyography
UF: EMG
BT: Biomedical measurement
RT: Bioelectric phenomena

Electron accelerators
BT: Particle accelerators
RT: Electron beams
Electron sources
Electrons

Electron beam applications
BT: Electron beams
RT: Flyback transformers
Scanning electron microscopy

Electron beam pumping
USE: Laser excitation

Electron beams
BT: Particle beams
RT: Electrodynamics
Electron accelerators
Electron emission
Electron sources
Electrons
Flyback transformers
Free electron lasers
Gyrotrons
Relativistic effects
Transmission electron

Electron carriers
USE: Charge carrier processes

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### Electron devices

**RT:** Threshold current  
**NT:** Cathode ray tubes  
Electron guns  
Electron multipliers  
Electron tubes  
Mechatronics  
Microelectromechanical systems  
Microfluidics  
Micromechanical devices  
Photoelectricity  
Photovoltaic cells  
Quantum computing  
Quantum well devices  
Semi-conductivity  
Semi-conductor devices  
Single electron devices  
Thick film devices  
Thin film devices  
Tunneling  
Vacuum technology  

### Electron mobility

**UF:** Drift velocity  
**BT:** Charge carrier processes  
**RT:** Plasma properties  

### Electron multipliers

**BT:** Electron devices  
**RT:** Electron emission  
Electron tubes  
Photomultipliers  

### Electron optics

**BT:** Optics  
**RT:** Particle beam optics  

### Electron paramagnetic resonance

**UF:** Biological EPR  
**BT:** Electron spin resonance  
**USE:** Electron paramagnetic resonance  

### Electron sources

**BT:** Electrons  
**RT:** Electron accelerators  
Electron beams  
Electron emission  

**Electron spin resonance**  
**USE:** Electron paramagnetic resonance  

### Electron traps

**BT:** Charge carrier processes  
**RT:** Leakage currents  
Reliability  

### Electron tubes

**UF:** Thermionic valves  
**BT:** Electron devices  
**RT:** Anodes  
Cathodes  
Electrodes  
Electrody-namics  
Electron emission  
Electron multipliers  
Gettering  

### Electron guns

**BT:** Electron devices  
**RT:** Electron emission  

### Electron microscopy

**BT:** Microscopy  
**NT:** Photoelectron microscopy  
Scanning electron microscopy  
Transmission electron microscopy  

**NT:** Field emitter arrays  
Klystrons  
Magnetrons  
Thyratrons  
Traveling wave tubes  

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### Electronic ballasts
- **UF:** Ballasts, Electric ballast, Electrical ballast
- **BT:** Ballistic transport

### Electronic banking
- **USE:** Online banking

### Electronic books
- **USE:** Electronic publishing

### Electronic circuits
- **BT:** Circuits
- **NT:** Central Processing Unit, Multivibrators, Stripboard circuit
- **RT:** Economies, Internet, Marketing management, Online banking, Supply chain management, Virtual enterprises

### Electronic commerce
- **UF:** E-commerce, Online shopping
- **BT:** Economics, Internet, Marketing management, Online banking, Supply chain management, Virtual enterprises
- **RT:** Financial management, Internet, Marketing management, Online banking, Supply chain management, Virtual enterprises

### Electronic components
- **BT:** Components, packaging, and manufacturing technology
- **NT:** Capacitors, Coils, Connectors, Diodes, Electrodes, Fuses, Inductors, Resistors, Structural plates, Switches, Transducers

### Electronic counter-countermeasures
- **USE:** Electronic countermeasures

### Electronic countermeasures
- **UF:** ECCM, ECM, Electronic counter-countermeasures
- **BT:** Electronic warfare
- **RT:** Jamming, Military communication, Radar countermeasures, Radio communication, Spread spectrum, Spread spectrum radar, Weapons

### Electronic currency
- **USE:** Online banking

### Electronic data interchange
- **USE:** Data handling

### Electronic design automation and methodology
- **UF:** EDA, VHDL
- **NT:** Design automation, Design methodology

### Electronic equipment
- **BT:** Electronics industry, Electronic equipment, Electronic equipment manufacture, Electronic equipment testing
- **RT:** Electronic equipment, Electronics industry, Electronic equipment manufacture, Optical device fabrication, Radiation hardening, Semiconductor device manufacture
- **NT:** Design automation, Design methodology, Electronic equipment manufacture, Optical device fabrication, Radiation hardening, Semiconductor device manufacture

### Electronic equipment manufacture
- **BT:** Components, packaging, and manufacturing technology
- **RT:** Electronic equipment, Electronics industry, Optical device fabrication
- **NT:** Damascene integration, Micromachining, Radiation hardening

### Electronic equipment testing
- **BT:** Testing
- **RT:** Electronic equipment, TEM cells
- **NT:** Immunity testing
### Electronic government
- **UF:** E-government
- **BT:** Government

### Electronic healthcare
- **UF:** Digital health
- **BT:** Information processing
- **RT:** Smart healthcare

### Electronic learning
- **UF:** E learning
- **BT:** Educational technology
- **RT:** Computer aided instruction

### Electronic messaging
- **UF:** Text messaging
- **BT:** Message systems
- **RT:** Instant messaging

### Electronic music
- **BT:** Music
- **NT:** Synthesizers

### Electronic noses
- **BT:** Chemical analysis
- **RT:** Intelligent sensors

### Electronic packaging thermal management
- **BT:** Thermal management of electronics

### Electronic portfolios
- **USE:** Portfolios

### Electronic publishing
- **UF:** Digital publishing
- **BT:** Publishing
- **RT:** CD-ROMs

### Electronic switching systems
- **BT:** Communication switching

### Electronic textiles
- **USE:** Smart textiles
Electronic visual prosthesis

USE: Visual prosthesis

Electronic voting

UF: E-voting
Online voting
BT: Voting

Electronic voting systems

BT: Electronic equipment
NT: Optical scan voting systems

Electronic warfare

BT: Aerospace and electronic systems
RT: Communication system
security
Radio communication
countermeasures
communication
Spread spectrum
Spread spectrum radar
NT: Electronic countermeasures
Jamming
Radar countermeasures

Electronic waste

UF: E-waste
WEEE
Waste electrical and electronic equipment
BT: Waste materials

Electronics cooling

BT: Thermal management of electronics
RT: Cooling

Electronics engineering education

BT: Electrical engineering education

Electronics industry

UF: Integrated circuits industry
Semiconductor electronics
industry
Semiconductor industry
BT: Manufacturing industries
RT: Electrical equipment
industry
Electrical products industry
Electronic equipment
manufacture
Toy manufacturing industry
NT: Electronic equipment

Electronics packaging

UF: Ball grid arrays
DIL
DIP
Dual inline packaging
PGA
Pin grid arrays
QFP
Quad flat packs
BT: Components, packaging, and manufacturing technology
RT: Constraint optimization
Cooling
Plastic packaging
Printed circuits
NT: Chip scale packaging

Electrons

BT: Elementary particles
RT: Beta rays
Cosmic rays
Electron accelerators
Electron beams
Electron emission
Elementary particle exchange interactions
Impact ionization
Phonons
Schrödinger equation
NT: Electron sources
Quantum wells
Trions

Electrooculography

UF: EOG
BT: Biomedical measurement
Electro oculography
Electro-oculography
Gaze tracking
RT: Bioelectric phenomena
Electroencephalography
Eyes

Electrooptic (EO) waveguides

USE: Electrooptical waveguides

Electrooptic deflectors

UF: Electro-optic deflectors
BT: Electro-optical devices

Electrooptic devices

USE: Electro-optical devices

Electrooptic effects
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>UF: Electro-optic effects</th>
<th>BT: Lasers and electrooptics</th>
<th>RT: Electro-optical devices</th>
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<tbody>
<tr>
<td>Electroluminescence</td>
<td>Nonlinear optics</td>
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<tr>
<td>Kerr effect</td>
<td>Optical bistability</td>
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<td>Stark effect</td>
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**Electrooptic modulators**

<table>
<thead>
<tr>
<th>UF: Electro-optic modulators</th>
<th>BT: Optical devices</th>
<th>RT: Integrated optics</th>
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<tr>
<td>Pockels readout optical</td>
<td>Optical modulation</td>
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**Electrooptic waveguides**

<table>
<thead>
<tr>
<th>USE: Electrooptical waveguides</th>
<th>USE: Electro-optical devices</th>
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**Electrooptical devices**

<table>
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**Electrooptical waveguides**

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**Electropermeabilization**

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**Electrophotography**

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**Electrophysiology**

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<tr>
<th>BT: Biomedical measurement</th>
<th>RT: Biomedical electrodes</th>
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<td>Electrodes</td>
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**Electroplating**

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<th>USE: Electrochemical deposition</th>
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**Electroporation**

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<th>BT: Medical treatment</th>
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**Electrostatic actuation**

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**Electrostatic actuators**

<table>
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<th>BT: Actuators</th>
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**Electrostatic analysis**

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<tr>
<th>BT: Electrostatic processes</th>
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**Electrostatic charges**

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<th>USE: Electrostatic discharges</th>
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**Electrostatic devices**

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<th>BT: Industry applications</th>
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**Electrostatic discharges**

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<tr>
<th>USE: Charged device model</th>
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**Electrostatic induction**

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**Electrostatic interference**

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<th>BT: Interference</th>
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**Electrostatic levitation**

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</table>

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## Electrostatic measurements
- **BT:** Electric variables
- **RT:** Electrostatic analysis
- **NT:** Charge measurement

## Electrostatic precipitators
- **BT:** Industry applications
- **RT:** Pollution control

## Electrostatic processes
- **BT:** Industry applications
- **RT:** Discharges (electric)
- **Electric fields**
- **Electrostatic devices**
- **Lightning**
- **NT:** Aerosols
- **Electrophotography**
- **Electrostatic analysis**
- **Electrostatic induction**
- **Electrostatics**
- **Particle charging**
- **Particle production**
- **Space charge**
- **Surface charging**
- **Triboelectricity**

## Electrostatic self assembly
- **USE:** Electrostatic self-assembly
- **UF:** Electrostatic self assembly
- **BT:** Self-assembly

## Electrostatic self-assembly
- **UF:** Electrostatic self assembly
- **BT:** Element particles
- **RT:** Casimir effect

## Electrostatics
- **UF:** Electrostatic charges
- **BT:** Electrostatic processes
- **RT:** Poisson equations
- **NT:** Electrostatic levitation

## Electrostriction
- **BT:** Dielectrics
- **RT:** Mechanical factors
- **Piezoelectricity**

## Electrostrictive hydrodynamics
- **USE:** Electrohydrodynamics

## Electrostrictive polymer actuators
- **USE:** Actuators

## Electrothermal actuators
- **BT:** Actuators
- **RT:** Thermal sensors
- **Resistence heating**

## Electrostatic self assembly
- **USE:** Electrostatic self-assembly

## Electrothermic effects
- **BT:** Thermoelectricity
- **RT:** Electrothermal launching
- **NT:** Proton effects

## Electrothermal launching
- **UF:** Launching (electrothermal)
- **BT:** Propulsion
- **RT:** Electromagnetic launching
- **NT:** Electrothermal effects

## Elemental semiconductors
- **BT:** Semiconductor materials
- **RT:** Silicon

## Elementary particle exchange interactions
- **BT:** Elementary particles
- **RT:** Electrons
- **Ions**
- **Proton effects**
- **Wave functions**

## Elementary particle vacuum
- **UF:** Instanton vacuum
- **QCD vacuum**
- **Quantum vacuum**
- **String vacuum**
- **Superstring vacuum**
- **Vacuum energy**
- **BT:** Elementary particles
- **RT:** Casimir effect

## Elementary particles
- **UF:** Particles (elementary)
- **BT:** Nuclear and plasma sciences
- **RT:** Cosmic rays
- **High energy physics instrumentation computing**
- **Microwave photonics**
- **Nuclear thermodynamics**
- **Proton effects**
- **NT:** Charge carriers
- **Electrons**
- **Elementary particle exchange interactions**
- **Elementary particle vacuum**
- **Ions**
- **Mesons**
- **Neutrino sources**
- **Neutrons**
- **Particle beams**
- **Particle collisions**
2021 IEEE Thesaurus

Phonons
Positrons
Protons

Elevators
BT: Building services
RT: Buildings
Stairs

Ellipsoids
BT: Elliptic design

Ellipsometry
BT: Optical variables
measurement
RT: Polarimetry

Elliptic curve cryptography
UF: ECC
 BT: Elliptic curve cryptosystems
 USE: Elliptic curve cryptography

Elliptic curves
BT: Geometry

Elliptic design
UF: Elliptical design
BT: Geometry
NT: Ellipsoids

Elliptical design
USE: Elliptic design

Elongation
BT: Material properties
RT: Strain

Email
USE: Electronic mail

eMBB
USE: Enhanced mobile broadband

Embedded computing
BT: Embedded systems
RT: Distributed vision networks

Embedded multicore processing
BT: Multicore processing

Embedded software
BT: Software

Embedded systems
UF: Embedded system
BT: Operating systems
RT: Cyber-physical systems
 USE: Embedded systems
 NT: Hardware-in-the-loop simulation
 NT: Microprocessors

Embolization
BT: Medical treatment
Noninvasive treatment

Embossing
BT: Manufacturing
Production
RT: Injection molding
Micromachining
Sheet metal processing
Watermarking

Embryo
BT: Embryonic structures

Embryonic structures
BT: Anatomy
NT: Embryo
Fetus

EMC
USE: Electromagnetic compatibility

Emergency lighting
BT: Lighting
RT: High intensity discharge lamps

Emergency management
USE: Emergency services

Emergency medical services
USE: Medical services

Emergency power generators
USE: Standby generators

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## 2021 IEEE Thesaurus

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<thead>
<tr>
<th>Emergency power supplies</th>
<th>EMP radiation effects</th>
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<tbody>
<tr>
<td><strong>UF:</strong> Standby power supplies</td>
<td><strong>UF:</strong> Electromagnetic pulse</td>
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<tr>
<td><strong>BT:</strong> Power supplies</td>
<td><strong>BT:</strong> Electromagnetic transients</td>
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<td><strong>RT:</strong> Batteries</td>
<td><strong>RT:</strong> Electromagnetic shielding</td>
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<td>Standby generators</td>
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<table>
<thead>
<tr>
<th>Emergency response</th>
<th>Employee rights</th>
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<tbody>
<tr>
<td><strong>USE:</strong> Emergency services</td>
<td><strong>BT:</strong> Employment</td>
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<table>
<thead>
<tr>
<th>Emergency services</th>
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<tbody>
<tr>
<td><strong>UF:</strong> Emergency management</td>
<td><strong>UF:</strong> Conditions of employment</td>
</tr>
<tr>
<td>Emergency response</td>
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<tr>
<td><strong>BT:</strong> Safety</td>
<td>Counselling</td>
</tr>
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<td><strong>RT:</strong> Accidents</td>
<td>Maternity benefits</td>
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<tr>
<td>Fires</td>
<td>Sick pay</td>
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<td>Medical services</td>
<td>Working conditions</td>
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<td>Rescue robots</td>
<td>Human resource</td>
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<tr>
<th>Emergent phenomena</th>
<th>Employment</th>
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<tbody>
<tr>
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<td><strong>UF:</strong> Work-place</td>
</tr>
<tr>
<td><strong>RT:</strong> System of systems</td>
<td>Workplace</td>
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</table>

<table>
<thead>
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<th>Emissions trading</th>
<th>Employment law</th>
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<td><strong>UF:</strong> Cap and trade</td>
<td><strong>BT:</strong> Law</td>
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<td><strong>BT:</strong> Environmental economics</td>
<td><strong>RT:</strong> Contract law</td>
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<td>Pollution</td>
<td>Employment</td>
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<td><strong>RT:</strong> Carbon emissions</td>
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<table>
<thead>
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<th>Emotion recognition</th>
<th>EMTDC</th>
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<tbody>
<tr>
<td><strong>BT:</strong> User interfaces</td>
<td><strong>UF:</strong> Electromagnetic transients</td>
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<td>Affective computing</td>
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<tr>
<td>Behavioral sciences</td>
<td><strong>DC:</strong> Electromagnetic transients</td>
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<td>Image recognition</td>
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<td>Psychology</td>
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<td>Sentiment analysis</td>
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<td>Speech recognition</td>
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### 2021 IEEE Thesaurus

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<tr>
<th>BT: Electromagnetic transients</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>RT: Design automation</td>
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<td>PSCAD</td>
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#### EMTP

<table>
<thead>
<tr>
<th>UF: Electromagnetic transient program</th>
<th>End effectors</th>
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</thead>
<tbody>
<tr>
<td>BT: Electromagnetic transients</td>
<td>UF: End-effectors</td>
</tr>
<tr>
<td>RT: Computer simulation</td>
<td>BT: Manipulators</td>
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<tr>
<td></td>
<td>RT: Grippers</td>
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<tr>
<td><strong>End-effectors</strong></td>
<td>USE: End effectors</td>
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#### Emulation

<table>
<thead>
<tr>
<th>BT: Modeling</th>
<th>Endocrine glands</th>
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<tbody>
<tr>
<td>RT: Application virtualization</td>
<td>USE: Glands</td>
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<tr>
<td>Simulation</td>
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#### Encapsulation

<table>
<thead>
<tr>
<th>BT: Packaging</th>
<th>Endocrine system</th>
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<tbody>
<tr>
<td>RT: Integrated circuit packaging</td>
<td>BT: Anatomy</td>
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<tr>
<td>Plastic packaging</td>
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#### Encephalography

<table>
<thead>
<tr>
<th>BT: Biomedical imaging</th>
<th>Endomicroscopy</th>
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<tbody>
<tr>
<td>RT: Brain</td>
<td>BT: Endoscopes</td>
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</table>

<table>
<thead>
<tr>
<th>Endoscopes</th>
<th>Endomicroscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Biomedical equipment</td>
<td>USE: Endoscopes</td>
</tr>
<tr>
<td>RT: Biomedical optical imaging</td>
<td>Endomicroscopy</td>
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<tr>
<td>Image sensors</td>
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<tr>
<td>Laser applications</td>
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<tr>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>NT: Endomicroscopy</td>
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</table>

#### Encoding

<table>
<thead>
<tr>
<th>UF: Coding</th>
<th>Endoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Information theory</td>
<td>USE: Endoscopy</td>
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<tr>
<td>RT: Codecs</td>
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<tr>
<td>Codes</td>
<td>Biomedical equipment</td>
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<td>Cryptography</td>
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<td>Data compression</td>
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<td>Data handling</td>
<td>Laser applications</td>
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<td>Hash functions</td>
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<td>Modulation</td>
<td>NT: Endomicroscopy</td>
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<td>Modulation coding</td>
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<td>Quantization (signal)</td>
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<td>Semantic technology</td>
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<td>Signal processing</td>
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<td>Vector quantization</td>
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#### Endoscopic equipment

<table>
<thead>
<tr>
<th>NT: Audio coding</th>
<th>Endothelial cells</th>
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</thead>
<tbody>
<tr>
<td>Channel coding</td>
<td>BT: Biological cells</td>
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<tr>
<td>Code refactoring</td>
<td>RT: Blood vessels</td>
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<td>Digital representation</td>
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<td>Entropy coding</td>
<td>Energy</td>
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<tr>
<td>Precoding</td>
<td>BT: Power engineering and energy</td>
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<td>Source coding</td>
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<td>Speech coding</td>
<td>NT: Energy barrier</td>
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<td>Transcoding</td>
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<td>Energy consumption</td>
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<td>Energy dissipation</td>
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<td>Energy exchange</td>
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<td>Energy harvesting</td>
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#### Energy

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<th>BT: Cryptography</th>
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<td>RT: Ciphers</td>
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<th>Energy management</th>
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<tr>
<td>Energy resources</td>
<td>UF: Energy transfer</td>
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<tr>
<td>Energy states</td>
<td>BT: Energy</td>
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<tr>
<td>Energy storage</td>
<td>NT: Inductive charging</td>
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<tr>
<th>Energy barrier</th>
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<td>BT: Energy</td>
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<td>BT: Energy</td>
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<td>NT: Nanogenerators</td>
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<tr>
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<td>RT: Energy efficiency</td>
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<td></td>
<td>Global warming</td>
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<td></td>
<td>Green design</td>
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<td>Information and</td>
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<tr>
<td>BT: Energy management</td>
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<td>RT: Ecodesign</td>
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<td>Energy resources</td>
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<td>Power demand</td>
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<td>Waste heat</td>
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<td>NT: Green computing</td>
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<td>Potential energy</td>
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<td>Renewable energy sources</td>
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<th>Energy consumption</th>
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<td>BT: Energy measurement</td>
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<td>NT: Core loss</td>
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<table>
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<td>BT: Energy</td>
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<td>NT: Atomic batteries</td>
<td>NT: Demand side management</td>
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<td>Batteries</td>
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<td>Fuel cells</td>
<td>Energy efficiency</td>
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<td>Motors</td>
<td>Energy informatics</td>
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<td>Photovoltaic cells</td>
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<td>Potential well</td>
<td>Load management</td>
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<td>Solar heating</td>
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<td>Thermoelectricity</td>
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<td>Waste heat</td>
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<td>Wave energy conversion</td>
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<td>Wind energy conversion</td>
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<table>
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<th>Energy efficiency</th>
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<td>UF: EtherEEE</td>
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<td>BT: Energy efficiency</td>
<td>RT: Nuclear medicine</td>
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<tr>
<th>Energy resources</th>
<th>Engine cylinders</th>
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<tr>
<td><strong>Solid scintillation detectors</strong></td>
<td><strong>BT:</strong> Machine components</td>
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<td><strong>RT:</strong> Engines</td>
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<td><strong>Energy resources</strong></td>
<td><strong>Pistons</strong></td>
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<td><strong>NT:</strong> Wind farms</td>
<td><strong>Wind farms</strong></td>
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</table>

### Energy scavenging

**USE:** Energy harvesting

### Energy states

**UF:** Energy levels
- Levels, energy
**BT:** Energy
- Effective mass
- Orbital calculations
- Polaritons
- Surface states

### Energy storage

**UF:** Energy storage systems
- Stored energy
**BT:** Energy
- Aging
- Battery powered vehicles
- Fuel cell vehicles
- Fuel storage
- Hybrid electric vehicles
- Load management
- Material storage
- Pulsed power systems
- Solar powered vehicles
**NT:** Batteries
- Flywheels
- Fuel cells
- Hydrogen storage
- Supercapacitors
- Superconducting magnetic

### Energy storage systems

**USE:** Energy storage

### Energy transfer

**USE:** Energy exchange

### Engineering - general

**RT:** STEM Technology
- Acoustical engineering
- Agricultural engineering
- Bio-inspired engineering
- Chemical engineering
- Civil engineering
- Concurrent engineering
- Design engineering
- Electrical engineering
- Engineering profession
- Environmental engineering
- Maintenance engineering
- Mechanical engineering
- Optical engineering
- Precision engineering
- Production engineering
- Research and development
- Reverse engineering
- Sanitary engineering
- Standardization
- Thermal engineering

### Engineering drawings

**BT:** Graphics
- Documentation
- Technical drawing
**NT:** Flowcharts

### Engineering education

**BT:** Education
- Continuing education
- Educational robots
- Laboratories
- Logic design
**NT:** Biomedical engineering education
- Communication engineering education
- Computer science education
- Control engineering education
- Electrical engineering education
- Engineering students
Physics education
Power engineering

education
Student experiments
Systems engineering

Education in medicine and biology
NT: Biology
Biomedical communication
Biomedical computing
Biomedical engineering
Biomedical equipment
Biomedical imaging
Bionanotechnology
Bioterrorism
Computational biology
Genetic engineering
Medical services
Medical specialties
Nuclear medicine
Synthetic biology

Engineering management
NT: Business
Commercialization
Consortia
Economics
Innovation management
Legal factors
Market research
Planning
Product development
Project engineering
Research and development
Research initiatives
Software development

Engineering profession
UF: Careers
BT: Engineering - general
RT: Biographies
Electrical engineering
Employment
Ethics
Programming profession
Research and development
Research and development
Professional aspects

Engineering students
UF: Student engineers
BT: Engineering education

Engineering writing
USE: Writing

Engines
BT: Industry applications
RT: Aircraft propulsion
Automobile manufacture
Cams
Camshafts
Engine cylinders
Exhaust systems
Fuel pumps
Gaskets
Machine components
Manifolds
Mechanical power
transmission
Oils
Pistons
Propellers
Propulsion
Rockets
Torque converters
Turbomachinery
Heat engines
Internal combustion
Jet engines

Enhanced magnetoresistance
BT: Magnetoresistance
RT: Nanocontacts

Enhanced mobile broadband
UF: eMBB
BT: 5G mobile communication
RT: 4G mobile communication

Entangled states
USE: Quantum entanglement

Enterprise architecture management
BT: Information architecture
Information management
Best practices
Enterprise resource planning

Enterprise resource planning
BT: Management
<table>
<thead>
<tr>
<th>RT: Business</th>
<th>NT: Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data handling</td>
<td>Software</td>
</tr>
<tr>
<td>Data processing</td>
<td>System integration</td>
</tr>
<tr>
<td>Enterprise architecture</td>
<td>Venture capital</td>
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</table>

**Entertainment industry**

<table>
<thead>
<tr>
<th>BT: Industries</th>
<th>RT: Broadcasting</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Films</td>
<td>Games</td>
</tr>
<tr>
<td>Games</td>
<td>Motion pictures</td>
</tr>
<tr>
<td>TV</td>
<td></td>
</tr>
<tr>
<td>NT: Sports</td>
<td></td>
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**Enthalpy**

<table>
<thead>
<tr>
<th>BT: Thermodynamics</th>
<th>RT: Energy measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Energy measurement</td>
<td>Thermal management</td>
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**Entomology**

<table>
<thead>
<tr>
<th>BT: Zoology</th>
<th>RT: Biochemistry</th>
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<tr>
<td>RT: Biomechanics</td>
<td>Ecology</td>
</tr>
<tr>
<td>Ecology</td>
<td>Insects</td>
</tr>
<tr>
<td>Insects</td>
<td>Morphology</td>
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<tr>
<td>Morphology</td>
<td>Physiology</td>
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</table>

**Entrepreneurial**

| USE: Entrepreneurship | |

**Entrepreneurship**

<table>
<thead>
<tr>
<th>UF: Entrepreneurial</th>
<th>BT: Business</th>
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<tbody>
<tr>
<td>BT: Business</td>
<td>RT: Disruptive innovation</td>
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<td>Disruptive innovation</td>
<td>Innovation management</td>
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**Entropy**

<table>
<thead>
<tr>
<th>BT: Physics</th>
<th>RT: Heating systems</th>
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</thead>
<tbody>
<tr>
<td>RT: Heating systems</td>
<td>Nuclear thermodynamics</td>
</tr>
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</table>

**Entropy coding**

<table>
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<tr>
<th>BT: Encoding</th>
<th>NT: Huffman coding</th>
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</thead>
<tbody>
<tr>
<td>NT: Huffman coding</td>
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</tr>
</tbody>
</table>

**Entry, descent and landing**

| USE: Aircraft navigation | |

**Envelope detectors**

| BT: Detectors | |

**Environmental design**

| USE: Green design | |

**Environmental economics**

<table>
<thead>
<tr>
<th>BT: Economics</th>
<th>RT: Energy resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy resources</td>
<td>Environmental</td>
</tr>
<tr>
<td>Environmental management</td>
<td>Pollution</td>
</tr>
<tr>
<td>NT: Carbon tax</td>
<td>Emissions trading</td>
</tr>
</tbody>
</table>

**Environmental engineering**

<table>
<thead>
<tr>
<th>BT: Engineering - general</th>
<th>RT: Environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental factors</td>
<td>Environmental management</td>
</tr>
<tr>
<td>Resource management</td>
<td></td>
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</table>

**Environmental factors**

<table>
<thead>
<tr>
<th>UF: Environmental problems</th>
<th>BT: Geoscience and remote sensing</th>
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</thead>
<tbody>
<tr>
<td>Environmental problems</td>
<td>Social implications of technology</td>
</tr>
<tr>
<td>RT: Acoustic noise</td>
<td>Air quality</td>
</tr>
<tr>
<td>Air quality</td>
<td>Carbon footprint</td>
</tr>
<tr>
<td>Carbon footprint</td>
<td>Carbon sequestration</td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td>Civil engineering</td>
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<td>Civil engineering</td>
<td>Ecodesign</td>
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<tr>
<td>Ecodesign</td>
<td>Electromagnetic interference</td>
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<td>Environmental engineering</td>
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<tr>
<td>Environmental engineering</td>
<td>Epidemiology</td>
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<tr>
<td>Epidemiology</td>
<td>Green buildings</td>
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<td>Green buildings</td>
<td>Green computing</td>
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<td>Green computing</td>
<td>Greenhouse effect</td>
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<td>Greenhouse effect</td>
<td>Health and safety</td>
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<td>Health and safety</td>
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<td>International collaboration</td>
<td>Meteorology</td>
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<td>Occupational health</td>
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<td>Ozone</td>
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<td>Safety</td>
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<td>Biosphere</td>
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<tr>
<td>Climate change</td>
<td>Ecology</td>
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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Global warming</th>
<th>USE: Electrooculography</th>
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<tbody>
<tr>
<td>Green manufacturing</td>
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<tr>
<td>Green products</td>
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<tr>
<td>Green transportation</td>
<td></td>
</tr>
<tr>
<td>Pollution</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental management**

- **BT:** Industry applications
- **RT:** Dams
- Environmental economics
- Environmental engineering
- Global warming
- International collaboration
- Low-carbon economy
- Public infrastructure
- Sanitary engineering
- **NT:** Biodegradation
- Land use planning
- Pest control
- Pollution control
- Recycling
- Renewable energy sources
- Sustainable development
- Waste management
- Water conservation
- Water resources

**EOS**

- **USE:** Earth Observing System

**Epidemics**

- **BT:** Epidemiology
- **RT:** Coronaviruses
- Diseases
- Influenza
- Pathogens
- Virology
- **NT:** Pandemics

**Epidemiology**

- **BT:** Science - general
- **RT:** Biomedical monitoring
- Environmental factors
- Public healthcare
- **NT:** Epidemics

**Epidermal**

- **USE:** Epidermis

**Epidermis**

- **UF:** Epidermal
- **BT:** Skin

**Epigenetics**

- **BT:** Genetics
- **RT:** DNA

**Epilepsy**

- **BT:** Diseases

**Epitaxial growth**

- **UF:** Epitaxy
- **BT:** Thin films
- **RT:** Crystal growth
- Crystals
- Gallium
- Germanium
- Molecular beams
- Nanotechnology
- Photonics
- Semiconductor devices
- Semiconductor thin films
- Silicon
- Substrates
- **NT:** Molecular beam epitaxial growth

**Enzymatic fuel cells**

- **USE:** Fuel cells

**Enzymes**

- **USE:** Biochemistry
- **NT:** Molecular beam epitaxial growth

**EO waveguides**

- **USE:** Electrooptical waveguides

**Epitaxial layers**

- **BT:** Coatings
- Films
2021 IEEE Thesaurus

RT: Chemical vapor deposition
   Semiconductor growth
   Thin films
NT: Superconducting epitaxial layers

Epitaxy
USE: Epitaxial growth

EPON
UF: Ethernet passive optical networks
   BT: Ethernet
   RT: Passive optical networks

Epoxy resins
BT: Dielectric materials
    Plastics
    Resins

EPROM
UF: EAROM
   EEPROM
   Electrically alterable read only memory
   Electrically erasable programmable read only memory
   BT: PROM

Epublishing
USE: Electronic publishing

Equal opportunities
BT: Human resource management
   RT: Industrial relations
     Labor resources
     Personnel
     Recruitment
   NT: Gender equity
     Gender issues

Equalisers
USE: Equalizers

Equalizers
UF: Equalisers
   BT: Filters
   RT: Channel estimation
     Impedance matching
     Intersymbol interference
   NT: Adaptive equalizers
     Blind equalizers

Decision feedback
equalizers

Equations
BT: Mathematics
   NT: Boltzmann equation
   Difference equations
   Integrodifferential equations
   Maxwell equations
   Nonlinear equations
   Polynomials
   Riccati equations

Equipment failure
BT: Failure analysis

Equivalent circuits
BT: Circuits

Er
USE: Erbium

Er-doped fiber amplifier
USE: Erbium-doped fiber amplifiers

Er-doped fiber lasers
USE: Erbium-doped fiber lasers

Erasable programmable read only memory
USE: EPROM

Erbium
UF: Er
   BT: Metals
   RT: Erbium-doped fiber amplifiers

Lasers and electrooptics
Optical amplifiers
Optics

Erbium-doped fiber amplifiers
UF: EDFA
   BT: Optical amplifiers
   RT: Erbium

Erbium-doped fiber laser
USE: Erbium-doped fiber lasers

Erbium-doped fiber lasers
UF: Er-doped fiber lasers
   BT: Fiber lasers
2021 IEEE Thesaurus

Erbium-doped fiber laser
USE: Erbium-doped fiber lasers

Erection
USE: Construction

Ergonomics
UF: Human engineering
Human factors engineering
BT: Systems, man, and cybernetics
RT: Anthropometry
Behavioral sciences
Cybernetics
Design methodology
Human factors
Keyboards
Man-machine systems
Occupational health
Working environment noise
NT: Job design
Smart spaces
User experience

Error analysis
UF: Error estimation
Error rate
Error rates
Error statistics
BT: Testing
RT: Cyclic redundancy check
Cyclic redundancy check
codes
Error correction
Estimation
Mean square error methods
Measurement errors
Numerical analysis
Roundoff errors
NT: Bit error rate
Finite wordlength effects

Error compensation
BT: Information theory
RT: Error correction

Error correcting codes
USE: Error correction codes

Error correction
BT: Signal processing
RT: Codes
Convolutional codes
Cyclic redundancy check

Cyclic redundancy check
codes
Error analysis
Error compensation
Error correction codes
Linear codes
Power system faults
Product codes
Turbo codes

Error correction codes
UF: ECC
Error correcting codes
Error-correcting codes
Error-correction codes
Error-correction codes
BT: Codes
RT: Convolutional codes
Error correction
Polar codes
NT: Forward error correction
Reed-Muller codes
Reed-Solomon codes

Error estimation
USE: Error analysis

Error free operation
USE: Error-free operations

Error probability
BT: Probability

Error rate
USE: Error analysis

Error rates
USE: Error analysis

Error recovery (computers)
USE: System recovery

Error statistics
USE: Error analysis

Error-correcting codes
USE: Error correction codes

Error-correction codes
USE: Error correction codes

Error-free operations
UF: Error free operation
BT: Testing
### 2021 IEEE Thesaurus

**Error correction codes**

<table>
<thead>
<tr>
<th>USE:</th>
<th>Error correction codes</th>
<th>USE:</th>
<th>Interferometers</th>
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**Escalators**

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<thead>
<tr>
<th>BT:</th>
<th>Transportation</th>
<th>BT:</th>
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<td>Buildings</td>
<td>RT:</td>
<td>Fabrication</td>
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<td>Mechanical products</td>
<td>RT:</td>
<td>Micromachining</td>
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<tr>
<td></td>
<td>Stairs</td>
<td>NT:</td>
<td>Dry etching</td>
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<td></td>
<td></td>
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<td>Wet etching</td>
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**ESD**

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**Esophagus**

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<th>BT:</th>
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**Estimation**

<table>
<thead>
<tr>
<th>UF:</th>
<th>Signal estimation</th>
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<tbody>
<tr>
<td>BT:</td>
<td>Mathematics</td>
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<tr>
<td>RT:</td>
<td>Control systems</td>
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<tr>
<td></td>
<td>Error analysis</td>
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<td></td>
<td>Filtering theory</td>
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<td></td>
<td>Kalman filters</td>
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<td></td>
<td>Measurement uncertainty</td>
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<td></td>
<td>Prediction methods</td>
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<tr>
<td></td>
<td>Prediction theory</td>
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<td>Reduced order systems</td>
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<td>Signal processing</td>
</tr>
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<td>Spectral analysis</td>
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<td>NT:</td>
<td>Estimation error</td>
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<td>Estimation theory</td>
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<td>Functional point analysis</td>
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<td>Life estimation</td>
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<td>Maximum likelihood</td>
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<td>Pose estimation</td>
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<td>State estimation</td>
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<td>Yield estimation</td>
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**Estimation error**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Estimation</th>
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**Estimation of the direction of arrival**

<table>
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<th>USE:</th>
<th>Direction-of-arrival</th>
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**Estimation theory**

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<tr>
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<td>Mean square error methods</td>
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<td>Statistics</td>
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<td>NT:</td>
<td>Cramer-Rao bounds</td>
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<td>Maximum a posteriori</td>
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**Etalons**

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**Etching**

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<thead>
<tr>
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<td>NT:</td>
<td>Dry etching</td>
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<td>Wet etching</td>
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**Ethanol**

<table>
<thead>
<tr>
<th>UF:</th>
<th>Ethyl alcohol</th>
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<tbody>
<tr>
<td>BT:</td>
<td>Grain alcohol</td>
</tr>
<tr>
<td></td>
<td>Chemical compounds</td>
</tr>
<tr>
<td>NT:</td>
<td>Alcoholic beverages</td>
</tr>
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**Ether**

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<th>USE:</th>
<th>Energy efficient ethernet</th>
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</table>

**Ethernet**

<table>
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<tr>
<th>BT:</th>
<th>Computer networks</th>
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<td>IEEE 802.3 Standard</td>
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<td>Local area networks</td>
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<tr>
<td>NT:</td>
<td>EPON</td>
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<td>Energy efficient ethernet</td>
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**Ethernet passive optical networks**

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**Ethical aspects**

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<th>Social implications of technology</th>
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<td>RT:</td>
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</tr>
<tr>
<td></td>
<td>Ethics</td>
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<td>Genetic engineering</td>
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<td>Legal factors</td>
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<td>Philosophical considerations</td>
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**Ethics**

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<td>Ethical aspects</td>
</tr>
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<td>General Data Protection</td>
</tr>
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<td>NT:</td>
<td>Cyberethics</td>
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**Ethyl alcohol**

<table>
<thead>
<tr>
<th>USE:</th>
<th>Ethanol</th>
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</table>
## 2021 IEEE Thesaurus

### ETSI
- **UF:** European
- **BT:** Standards organizations
- **NT:** Standards publications
- **SONET:** Synchronous digital

### ETSI Standards
- **BT:** Standards publications
- **NT:** HbbTV Standards

### Euclidean distance
- **UF:** Euclidean measurement
- **BT:** Distance measurement
- **NT:** Hilbert space

### Euclidean measurement
- **USE:** Euclidean distance

### Euclidean metric
- **USE:** Euclidean distance

### Europe
- **BT:** Continents

### European Telecommunications Standards Institute
- **USE:** ETSI

### Europium
- **BT:** Chemical elements

### EUV Lithography
- **USE:** Extreme ultraviolet

### EV charging
- **USE:** Electric vehicle charging

### Event detection
- **BT:** Wireless sensor networks

### Everyware
- **USE:** Pervasive computing

### Evidence theory
- **UF:** Belief functions
- **BT:** Dempster-Shafer theory
- **RT:** Uncertainty

### Evolution
- **USE:** Evolution (biology)

### Evolution (biology)
- **UF:** Evolution
- **BT:** Biology
- **NT:** Memetics
- **Phylogeny**

### Evolutionary algorithm
- **USE:** Evolutionary computation

### Evolutionary computation
- **UF:** Evolutionary algorithm
- **BT:** Computational intelligence
- **NT:** Evolutionary robotics
- **Particle swarm optimization**

### Evolutionary robotics
- **BT:** Evolutionary computation

### Exascale computing
- **BT:** High performance computing
- **Supercomputers**

### Excavation
- **UF:** Dredging
- **BT:** Geotechnical engineering
- **RT:** Construction industry
- **Marine technology
- **Mining industry
- **Rivers
- **Roads
- **Soil**

### Exchange rates
- **BT:** Economics
- **RT:** Costs
- **Economic indicators
- **International trade**

### Excitation of lasers
- **USE:** Laser excitation

### Excitons
- **BT:** Charge carrier processes
- **RT:** Semiconductor materials

### Executive programs
- **USE:** Operating systems

### Exhaust gases
- **BT:** Gases

---

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RT: Air pollution
Ash
Combustion
Exhaust systems
Flue gases
Internal combustion
engines
Jet engines

Exhaust manifolds
USE: Manifolds

Exhaust systems
UF: Catalytic converters
Catalytic convertors
Mufflers
BT: Machine components
Production systems
RT: Engines
Exhaust gases
Manifolds

Exo planets
USE: Extrasolar planets

Exo-planets
USE: Extrasolar planets

Exocrine glands
USE: Glands

Exoplanets
USE: Extrasolar planets

Exoskeletons
BT: User interfaces

Expectation-maximisation algorithms
USE: Expectation-maximization algorithms

Expectation-maximization algorithms
UF: Expectation-maximisation algorithms
BT: Iterative methods

Expert systems
BT: Knowledge based systems
Decision making
Intelligent systems
Knowledge acquisition
Knowledge representation
NT: Diagnostic expert systems
Medical expert systems

Explosion protection
BT: Protection
Safety
RT: Accident prevention
Flammability
Hazardous areas
Safety
Seismic waves

Explosions
BT: Hazards
RT: Accidents
Chemical hazards
Flammability
Hazardous areas
Safety
Seismic waves
NT: Explosives

Explosives
BT: Explosions

Exponential distribution
BT: Probability distribution

Extended definition TV
USE: HDTV

Extended reality
UF: HumanXR
BT: Human computer
interaction
Man-machine systems
Virtual reality
RT: Augmented reality

Extensible Markup Language
USE: XML

External stimuli
UF: PhysiStimuli
BT: Interactive systems
Physiology

Extinction coefficients
BT: Optics
NT: Extinction ratio

Extinction ratio
BT: Extinction coefficients

Extra solar planets
USE: Extrasolar planets

Extra-solar planets
2021 IEEE Thesaurus

USE: Extrasolar planets

Extracellular
BT: Cells (biology)

Extranets
BT: Virtual private networks
RT: Data communication
Information systems
Internet
Web sites

Extraordinary magnetoresistance
BT: Magnetoresistance

Extrapolation
BT: Approximation methods
RT: Statistics

Extrasolar planetary atmospheres
BT: Extrasolar planets

Extrasolar planetary mass
BT: Extrasolar planets

Extrasolar planets
UF: Exo planets
Exo-planets
Exoplanets
Extra solar planets
Extra-solar planets
Super earths
BT: Astronomy
RT: Extraterrestrial
measurements
Extraterrestrial phenomena
NT: Extrasolar planetary
atmospheres
Extrasolar planetary mass

Extremities
BT: Body regions
NT: Arms
Buttocks
Elbow
Fingers
Foot
Hip
Knee
Leg
Shoulder
Thigh

Eye protection
UF: Goggles
BT: Safety devices
RT: Occupational health
Occupational safety
Protective clothing
Safety

Eyebrows
BT: Hair

Eyelashes
BT: Eyes
Hair

Eyelids
BT: Eyes

Eyes
BT: Sense organs
Gaze tracking
Ophthalmology
Optical coherence

Extraterrestrial measurements
UF: Planetary composition
Space measurements
BT: Measurement
Astronomy
Extraterrestrial planets
Extraterrestrial phenomena
Interstellar chemistry

Extraterrestrial phenomena
UF: Space phenomena
BT: Geophysics
tomography
RT: Extrasolar planets
Extraterrestrial
measurements
Cataracts
Cornea
Eylashes

Extreme learning machines
BT: Feedforward neural networks
Clustering methods

Extreme ultraviolet lithography
UF: EUV Lithography
BT: Lithography

Extremities
BT: Body regions
NT: Arms
Buttocks
Elbow
Fingers
Foot
Hip
Knee
Leg
Shoulder
Thigh
2021 IEEE Thesaurus

Eyelids
Iris
Pupils
Retina

Faces
BT: Head
RT: Stomatognathic system
NT: Facial muscles

Facial animation
BT: Animation
RT: Face detection

Facial attributes
USE: Facial features

Fabrication
UF: Federal Aviation
Administration
BT: US Government agencies

Facial features
UF: Facial attributes
BT: Face detection

Facial muscles
BT: Faces

Facial recognition
USE: Face recognition

Facilities management
BT: Building services
Management
Organizational aspects
RT: Building information
management

Facsimile
BT: Communication systems
Image communication

Factories
USE: Production facilities

Fabrics
UF: Knitted fabric composites
Woven fabric composites
BT: Textiles
Clothing
Weaving
Wool

Factory automation
USE: Manufacturing automation

Fabry-Perot
BT: Interferometry
NT: Fabry-Perot interferometers

Factories
USE: Production facilities

Fabry-Perot interferometers
BT: Fabry-Perot

FACTS
USE: Flexible AC transmission
systems

Face detection
BT: Computer vision
RT: Facial animation
NT: Facial features

Fading channels
BT: Signal processing
Diversity methods
Diversity schemes
Intercell interference
Meteorological factors
Multipath channels
Radio propagation
Frequency-selective fading
Rayleigh channels
Weibull fading channels

Face recognition
UF: Facial recognition
BT: Biometrics (access control)
Identification of persons
Pattern recognition
RT: Gaze tracking
Image recognition

Facebook
USE: Social networking (online)
Failure analysis

UF: Failure analytics
Failure mechanisms
Testing
Cause effect analysis
Diagnostic expert systems
Fatigue
Fault diagnosis
Fault trees
Green's function methods
Life estimation
Quality control
Reliability
Remaining life assessment
Root cause analysis
Weibull distribution
Equipment failure
Semiconductor device

NT: Equipment failure
breakdown

Failure analytics

USE: Failure analysis

Failure mechanisms

USE: Failure analysis

Fall detection

BT: Biomechanics
Domestic safety
Accelerometers
Alarm systems
Assisted living
Biomedical communication
Biomedical signal

processing

Body sensor networks
Detectors
Geriatrics
Home automation
Image motion analysis
Image recognition
Injuries
Patient monitoring
Video signal processing
Wearable computers

NT: Assistive technologies

Fastenings

USE: Joining processes

Fastening

Faraday effect

UF: Faraday rotation
BT: Magnetooptic effects
RT: Gyromagnetism
Gyrotropism

Faraday rotation

USE: Faraday effect

Fascia

BT: Musculoskeletal system

Fast Fourier transforms

BT: Fourier transforms
RT: Digital signal processing
Harmonic analysis

Fast light

BT: Light sources

Fastbus

BT: Data acquisition
RT: Data buses
Data communication
Data processing
Nuclear measurements

Fasteners

UF: Bolts
Hinges
Nuts (fasteners)
Screws
Zip fasteners

RT: Belts
Couplings
Joining processes
Welding

Fatigue

BT: Mechanical factors
RT: Failure analysis
Life estimation

Fatigue

Fats

BT: Chemical products
Food products

RT: Biological materials
Lipidomics
Oils
## 2021 IEEE Thesaurus

### Fault current limiters

- **BT:** Current limiters

### Fault currents

- **BT:** Current
- **RT:** Electric breakdown
- **Grounding**
- **Leakage currents**
- **NT:** Fault protection

### Fault detection

- **BT:** System analysis and design

### Fault diagnosis

- **BT:** Reliability
- **RT:** Cause effect analysis
- **Diagnostic expert systems**
- **Failure analysis**
- **Maintenance engineering**
- **Testing**
- **NT:** Dissolved gas analysis
- **Fault location**

### Fault location

- **BT:** Fault diagnosis
- **RT:** Cables
- **Communication cables**
- **Fault trees**
- **Insulation testing**

### Fault protection

- **BT:** Electrical safety
- **Fault currents**

### Fault tolerance

- **UF:** System resilience
- **BT:** Reliability
- **NT:** Fault tolerant control
- **Redundancy**

### Fault tolerant control

- **BT:** Control systems
- **Fault tolerance**

### Fault tolerant systems

- **BT:** System analysis and design

### Fault trees

- **BT:** Risk analysis
- **RT:** Boolean functions
- **Failure analysis**
- **Fault location**

### Feature detection

- **BT:** Computer vision
- **Image processing**
- **RT:** Feature extraction
- **Saliency detection**

### Feature extraction

- **BT:** Image processing

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2021 IEEE Thesaurus

RT: Blob detection
Feature detection
Image annotation
Image edge detection
Image recognition
Independent component analysis

Feedback communications
BT: Telecommunications
RT: Feedback circuits
NT: Automatic repeat request
Feedback control
Feedback loop

Feedback control
BT: Feedback communications
NT: Windup

Feedback linearization
BT: Control nonlinearities
Control systems

Feedback loop
BT: Feedback communications
NT: Negative feedback loops

Feedback neural nets
USE: Feedforward neural networks

Feedback neural networks
UF: Feedforward neural nets
BT: Neural networks
RT: Artificial intelligence
Pattern recognition
Self-organizing feature maps
Support vector machines
NT: Extreme learning machines
Multilayer perceptrons

Feedback systems
BT: Intelligent control
RT: Forward error correction
Open loop systems

Feedback amplifiers
UF: NFB
Negative feedback amplifier
BT: Operational amplifiers

Feedback circuits
UF: Circuit feedback
BT: Feedback
RT: Control theory

FeFETs
UF: Ferroelectric FETs
BT: Field effect transistors

Felines
USE: Cats

Federal Aviation Administration
USE: FAA

Federal Communications Commission
USE: FCC

Federated learning
USE: Collaborative work

Federated search
USE: Metasearch

Federated searching
USE: Metasearch

Feedback
UF: Saturation detection
BT: Circuits
Control systems
RT: Control design
Positive train control
SIMO communication
Scrum (Software development)

System dynamics
Feedback circuits
Negative feedback
Neurofeedback

Federal Aviation Administration
USE: FAA

Federal Communications Commission
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## 2021 IEEE Thesaurus

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<tr>
<td>MESFET integrated circuits</td>
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</tbody>
</table>

**Fetal heart**
- BT: Heart

**Fetal heart rate**
- BT: Heart rate

**FETs**
- USE: Field effect transistors

**Fetus**
- BT: Embryonic structures

**FFF**
- USE: Field-flow fractionation

**Fiber Bragg gratings**
- USE: Bragg gratings

**Fiber distributed data interface**
- USE: FDDI

**Fiber gratings**
- UF: Fibre gratings
- BT: Bragg gratings

**Fiber lasers**
- UF: Fibre lasers
- BT: Ring lasers
- NT: Erbium-doped fiber lasers
  - High power fiber lasers

**Fiber nonlinear optics**
- BT: Fiber optics
- Nonlinear optics

**Fiber optic sensors**
- USE: Optical fiber sensors

**Fiber optics**
- UF: Fibre optics
- BT: Optics
- NT: Fiber nonlinear optics
  - Optical fibers

**Fiber reinforced plastics**
- UF: Fibre reinforced plastics
- BT: Plastics
- RT: Plastic insulators

**Fiber-Bragg gratings**
- USE: Optical fiber subscriber loops

**Fibers**
- USE: Textile fibers

**FFB**
- USE: Field-flow fractionation

**Fibre gratings**
- USE: Fiber gratings

**Fibre lasers**
- USE: Fiber lasers

**Fibre optic sensors**
- USE: Optical fiber sensors

**Fibre optics**
- USE: Fiber optics

**Fibre reinforced plastics**
- USE: Fiber reinforced plastics

**Fibrillation**
- BT: Medical treatment
- RT: Defibrillation
- NT: Atrial fibrillation

**Fibroblasts**
- BT: Biological cells

**Fiducial markers**
- UF: Imagimarkers
- BT: Image processing
- RT: Microfabrication
  - Semiconductor device manufacture

**Field buses**
- UF: Instrumentation buses
- BT: Computer interfaces
- RT: Industrial control
  - Local area networks

**Field effect MMIC**
- BT: FET integrated circuits

**Field effect transistors**
- UF: FETs
- BT: Transistors
- RT: FET integrated circuits
  - Graphene devices
  - Semiconductor devices
- NT: CNTFETs
<table>
<thead>
<tr>
<th>Term</th>
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<td>Fill factor (solar cell)</td>
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<td>Filling</td>
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<tr>
<td>Film bulk acoustic resonators</td>
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</tbody>
</table>
RT: Bulk acoustic wave devices  
Cellular radio  
Mobile communication  
Radio communication  
Resonance  
Telecommunications

BT: Filters  
RT: Estimation  
Line enhancers  
Matched filters  
Maximum likelihood detection

Films

BT: Materials  
RT: Chemical vapor deposition  
Coatings  
Entertainment industry  
Human image synthesis  
Sputtering  
NT: Conductive films  
Dielectric films  
Epitaxial layers  
Ferrimagnetic films  
Ferrite films  
Garnet films  
Magnetic films  
Optical films  
Piezoelectric films  
Plastic films  
Polymer films  
Semiconductor films  
Thick films  
Thin films

Filters

BT: Filtering  
RT: Signal processing  
Passive filters  
Signal to noise ratio  
NT: Active filters  
Anisotropic Bragg gratings  
Channel bank filters  
Comb filters  
Digital filters  
Equalizers  
Filtering theory  
Gabor filters  
Harmonic filters  
IIR filters  
Kalman filters  
Low-pass filters  
Matched filters  
Microstrip filters  
Nonlinear filters  
Notch filters  
Particle filters  
Power filters  
Resonator filters  
Spatial filters  
Superconducting filters  
Transversal filters

Filter banks

UF: Filterbank  
BT: Band-pass filters

Filter-theory

USE: Filtering theory

Filterbank

USE: Filter banks

Filtering

BT: Circuits and systems  
Noise cancellation  
Filters  
Information filtering

Filtering algorithms

UF: Loop-filtering algorithm  
Post-filtering algorithm  
BT: Algorithms

Filtering theory

USE: Filter-theory

Filtration

UF: Nanofiltration  
BT: Materials science and technology

Finance

UF: Taxes  
BT: Financial management  
Banking  
Bitcoin  
Business  
Cryptocurrency  
Economics  
Currencies

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Finance sector
USE: Financial industry

Financial industry
UF: Finance sector
BT: Industries
NT: Banking
Financial services

Financial management
UF: Financial planning
Money management
Management
Electronic commerce
Profitability
Public finance
Costing
Credit cards
Finance
Insurance
Investment
Loans and mortgages
Management accounting
Mutual funds
Pricing
Venture capital

Financial planning
USE: Financial management

Financial services
BT: Financial industry

FinFETs
BT: MOSFET

Fingerprint identification
USE: Fingerprint recognition

Fingerprint images
USE: Image matching

Fingerprint indexing
USE: Fingerprint recognition

Fingerprint matching
USE: Fingerprint recognition

Fingerprint modality
USE: Fingerprint recognition

Fingerprint recognition
USE: Fingerprint identification
Fingerprint indexing

Fingerprint sensing
USE: Fingerprint recognition

Fingerprint sensors
USE: Fingerprint recognition

Fingerprints
USE: Fingerprint recognition

Fingers
BT: Extremities
NT: Thumb

Finishing
BT: Surface treatment
RT: Machining
Materials processing
Planing
NT: Surface finishing

Finite difference methods
UF: FDTD

FDTD domain analysis
Finite difference time

FDTD domain methods
Finite difference methods

FDTD domain methods
Finite-difference methods

FDTD domain methods
Perfectly matched layers

FDTD domain methods

Finite difference time domain analysis
USE: Finite difference methods

Finite difference time domain methods
USE: Finite difference methods
Finite element analysis
UF: Discrete element method
FEM
Finite element methods
Finite element modeling
Finite element modelling
Finite-element analysis
Finite-element methods
Finite-element modeling
Finite-element modelling
BT: Mathematics
Numerical analysis
RT: Eddy current testing
Perfectly matched layers

Finite element methods
USE: Finite element analysis

Finite element modeling
USE: Finite element analysis

Finite element modelling
USE: Finite element analysis

Finite fields
USE: Galois fields

Finite impulse response filters
UF: FIR
FIR filters
BT: Digital filters
RT: Discrete wavelet transforms
Frequency response

Finite state machines
USE: Automata

Finite volume methods
UF: Finite-volume method
BT: Numerical analysis
RT: Navier-Stokes equations

Finite wordlength effects
UF: Overflow oscillations
Truncation errors
BT: Error analysis
RT: Quantization (signal)
NT: Roundoff errors

Finite-difference methods
USE: Finite difference methods

Finite-difference time-domain methods
USE: Finite difference methods

Finline
BT: Planar transmission lines

FIR
USE: Finite impulse response filters

FIR filters
USE: Finite impulse response filters

Fire extinguishers
BT: Safety devices
RT: Fire safety

Fire retardants
USE: Flame retardants

Fire safety
BT: Safety
RT: Fire extinguishers

Fireproofing
USE: Flame retardants

Fires
UF: Flames
Wild fires
Wildfires
BT: Hazards
Accidents
RT: Emergency services
Flammability
Hazardous areas
Safety
Smoke detectors

Firewalls (computing)
BT: Computer security
RT: Computer networks
<table>
<thead>
<tr>
<th>Category</th>
<th>Term</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Countermeasures</td>
<td>Hardware</td>
<td>FireWire</td>
</tr>
<tr>
<td>Software</td>
<td>USE: Firewire</td>
<td>FireWire</td>
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<tr>
<td></td>
<td>BT: Computer interfaces</td>
<td>BT: Computer peripherals</td>
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<td></td>
<td>UF: FireWire</td>
<td>Consumer electronics</td>
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<td>RT: Data communication</td>
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<td>IEEE 1394 Standard</td>
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<tr>
<td></td>
<td>BT: Production equipment</td>
<td>Jigs</td>
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<td>RT: Machine tools</td>
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<td>Fixtures</td>
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<tr>
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<td>RT: Bromine compounds</td>
<td>Flammability</td>
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<td>Materials preparation</td>
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<td>Fish bone diagrams</td>
<td>USE: Cause effect analysis</td>
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<td>Fish</td>
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<td>RT: Ceramics</td>
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<td>Kilns</td>
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<td>Flammability</td>
<td>USE: Inflammability</td>
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<td></td>
<td>BT: Hazards</td>
<td>Explosion protection</td>
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<td>RT: Explosions</td>
<td>Fires</td>
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<td>Flame retardants</td>
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<td>Fish</td>
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<td>Flanges</td>
<td>BT: Mechanical products</td>
<td>Mechanical products</td>
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<td>RT: Rails</td>
<td>Structural plates</td>
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<td>Fisheries</td>
<td>USE: Aquaculture</td>
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<td>Flash memories</td>
<td>USE: NAND flash</td>
<td>NAND flash</td>
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<tr>
<td></td>
<td>BT: Memory</td>
<td>Memory</td>
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<tr>
<td></td>
<td>RT: Automation</td>
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<td>Solid state drives</td>
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<td>NT: Flash memory cells</td>
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<td>Fission reactors</td>
<td>USE: Nuclear fission</td>
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<td></td>
<td>BT: Nuclear reactors (fission)</td>
<td>Nuclear reactors (fission)</td>
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<td>RT: Nuclear power generation</td>
<td>Nuclear power generation</td>
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<td></td>
<td></td>
<td>Pressure vessels</td>
</tr>
<tr>
<td></td>
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<td>Radiation protection</td>
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<td>Flashover</td>
<td>BT: Dielectric breakdown</td>
<td>Dielectric breakdown</td>
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<td>Flash memory cells</td>
<td>BT: Flash memories</td>
<td>Flash memories</td>
</tr>
<tr>
<td></td>
<td>NT: Split gate flash memory</td>
<td>Split gate flash memory</td>
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<tr>
<td>Flat panel displays</td>
<td>USE: Fixed-point arithmetic</td>
<td>Fixed-point arithmetic</td>
</tr>
</tbody>
</table>
2021 IEEE Thesaurus

UF: Plasma display panel
BT: Displays
RT: Consumer electronics
TV

*Flex*
USE: Flexible printed circuits

*Flexible ac transmission systems*
USE: Flexible AC transmission systems

*Flexible electronics*
BT: Assembly systems
RT: Graphene devices
Soft electronics

*Flexible fuel vehicles*
USE: Land vehicles

*Flexible manufacturing systems*
BT: Manufacturing automation
RT: Agile manufacturing
Cellular manufacturing
Computer applications

*Flexible printed circuits*
UF: Flex
BT: Printed circuits

*Flexible structures*
UF: Deployable structures
BT: Buildings
Structural shapes
RT: Control systems
Decentralized control
Mechanical variables
control Structural engineering

*Flickr*
USE: Multimedia Web sites

*Flight control*
USE: Aerospace control

*Flight simulation*
USE: Aerospace simulation

*Flip chip*
USE: Flip-chip devices

*Flip chip solder joints*
UF: Castellations
BT: Soldering
RT: Flip-chip devices

*Flip-chip*
USE: Flip-chip devices

*Flip-chip devices*
UF: Flip chip
BT: Semiconductor device manufacture
RT: Flip chip solder joints
Microassembly
Microprocessor chips
Microprocessors

*Flip-flops*
BT: Pulse circuits
RT: Logic circuits

*FLL*
USE: Frequency locked loops

*Floating point arithmetic*
USE: Floating-point arithmetic

*Flooding*
BT: Hballs
Hydrology
RT: Land use planning
Rain
Rivers
Structural engineering

*Floors*
BT: Building materials
RT: Construction industry
Tiles

*Floppy disks*
BT: Magnetic memory

*Floatation devices*
USE: Underwater equipment
### Flow

**USE:** Fluid flow  
**UF:** Flow  
**BT:** Physics  
**RT:** Electrohydraulics

**Flow batteries**  
**USE:** Batteries  
**UF:** Batteries  
**BT:** Programmable control  
**RT:** Circuits  
**NT:** Fluid dynamics

**Flow graphs**  
**UF:** Data flow graphs  
**BT:** Programmable control  
**RT:** Circuits  
**NT:** Fluid dynamics

**Flow meters**  
**USE:** Flowmeters  
**UF:** Flowmeters  
**BT:** Meters  
**RT:** Automatic meter reading  
**NT:** Fluid dynamics

**Flow production systems**  
**UF:** Sequential production  
**BT:** Manufacturing systems  
**RT:** System dynamics  
**NT:** Continuous production  
**Fluid flow control**  
**BT:** Control systems  
**RT:** Valves

**Flowcharts**  
**BT:** Engineering drawings  
**RT:** Programming  
**System analysis and design**

**Flowmeters**  
**UF:** Flow meters  
**BT:** Meters  
**RT:** Automatic meter reading  
**Fluid flow**  
**Velocity measurement**

**Fluctuations**  
**BT:** Reliability

**Flue gases**  
**BT:** Gases  
**RT:** Air pollution  
**Effluents**  
**Exhaust gases**

**Fluid dynamics**  
**BT:** Fluid flow  
**Fluids**  
**Hydrodynamics**  
**Lattice Boltzmann methods**  
**Buoyancy**  
**Computational fluid dynamics**  
**Drag**  
**Navier-Stokes equations**  
**Rheology**

**Fluid flow**

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NT: Ferrofluid
Fluid dynamics
Gases
Hydraulic fluids
Liquids
Viscosity

Fluids and secretions
BT: Anatomy
NT: Amniotic fluid
Cerebrospinal fluid

Fluorescence
BT: Luminescence
Optics
RT: Fluorescent lamps
Judd-Ofelt theory

Fluorescent lamps
BT: Lamps
RT: Fluorescence
Lighting

Fluorine
BT: Chemical elements
NT: Fluorine compounds

Fluorine compounds
BT: Fluorine
NT: Hydrogen fluoride

Flux pinning
BT: Magnetic flux
Superconductivity
RT: Type II superconductors

Fluxtronics
USE: Spintronics

Fly ash
BT: Ash
RT: Slag

Flyback transformers
UF: FBT
LOPT
Line output transformer
BT: Transformers
RT: Cathode ray tubes
Electron beam applications
Electron beams
Ferrite devices

Flywheels
BT: Energy storage

FM
USE: Frequency modulation

fMRI
USE: Functional magnetic resonance imaging

Focusing
BT: Imaging
RT: Lenses

Fog computing
USE: Edge computing

Food and Drug Administration
USE: FDA

Food industry
BT: Manufacturing industries
RT: Beverage industry
Consumer products
Digital agriculture
Food preservation
Food products
Food technology
Sugar industry
Sugar refining
NT: Food manufacturing

Food loss
USE: Food waste

Food manufacturing
BT: Food industry
Manufacturing systems
RT: Consumer products
Digital agriculture
Food preservation
Food products
Food technology
Food waste
NT: Food manufacturing

Food packaging
BT: Food manufacturing
Packaging
RT: Food products
Food technology
Food waste

Food preservation
UF: Food preservatives
BT: Food technology
RT: Food industry
Food manufacturing
Food products
BT: Clothing
RT: Clothing industry
Footwear industry
UF: Shoe manufacture
BT: Manufacturing industries
RT: Clothing industry
Food preservatives
USE: Food preservation
Food products
BT: Manufactured products
Production
RT: Agricultural products
Consumer products
Digital agriculture
Food industry
Food manufacturing
Food packaging
Food preservation
Sugar industry
Sugar refining
Vegetable oils
NT: Dairy products
Fats
Food waste
Sugar
Food technology
BT: Industry applications
RT: Digital agriculture
Food industry
Food manufacturing
Food packaging
Sugar refining
NT: Food preservation
Food waste
UF: Food loss
BT: Food products
Waste materials
RT: Agriculture
Biofuels
Consumer behavior
Food manufacturing
Food packaging
Government policies
Recycling
Foot
BT: Extremities
Football
USE: Sports
Footprinting
USE: Network reconnaissance
Footwear
UF: Shoes

2021 IEEE Thesaurus
Forecast uncertainty
Technology forecasting

Forehead
BT: Head

Forensic photography
USE: Image forensics

Forensics
BT: Law
NT: Digital forensics
Image forensics

Forestry
BT: Geoscience
RT: Pulp and paper industry
Resource management
Vegetation
Vegetation mapping
Wood industry

Forgery
UF: Imposter signature
generation
BT: Handwriting recognition

Forging
UF: Cogging
BT: Manufacturing systems

Formal concept analysis
BT: Mathematical analysis
RT: Classification tree analysis
Data analysis
Knowledge representation
Unsupervised learning

Formal languages
BT: Computer science
NT: Computer languages
Runtime library

Formal logic
USE: Logic

Formal specifications
BT: Standardization
RT: Service-oriented systems
engineering

Formal verification
BT: Software engineering
RT: Circuits and systems
Model checking

Forward contracts
BT: Contracts

Forward error correction
BT: Error correction
RT: Feedforward systems

Fossil fuels
BT: Fuels
RT: Air pollution
NT: Natural gas

Foundries
BT: Production facilities
RT: Casting
Furnaces
Heat treatment
Materials processing

Four wave mixing
USE: Four-wave mixing

Four-wave mixing
UF: Four wave mixing
BT: Distortion
Optics

Fourier series
BT: Mathematics
RT: Data compression
Signal processing
Spectroscopy

Fourier transform infrared spectra
USE: Fourier transform infrared spectroscopy

Fourier transform infrared spectroscopy
UF: Fourier transform infrared spectra
BT: Fourier transforms
Spectroscopy

Fourier transforms
BT: Transforms
RT: Acoustics
Cepstrum
Diffraction
 Harmonic analysis
Optics
Partial differential equations
Probability
Statistics
Time-frequency analysis
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>NT:</th>
<th>Discrete Fourier transforms</th>
<th>Fast Fourier transforms</th>
<th>Fourier transform infrared</th>
<th>Protocols</th>
<th>Wide area networks</th>
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**Fast Fourier transforms**

<table>
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<tr>
<th>FPAA</th>
<th>USE: Field programmable analog</th>
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**Field programmable analog arrays**

<table>
<thead>
<tr>
<th>FPGA</th>
<th>USE: Field programmable gate</th>
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**Field programmable gate arrays**

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<tr>
<th>Fracching</th>
<th>USE: Fracking</th>
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**Fracking**

<table>
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<tr>
<th>UF:</th>
<th>Fracching</th>
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**Hydraulic fracking**

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<th>Hydrological techniques</th>
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**Mining industry**

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<tr>
<th>RT:</th>
<th>Natural gas</th>
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**Natural gas**

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<th>Fractal antennas</th>
<th>BT: Antennas</th>
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**Antennas**

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<tr>
<th>Fractal art</th>
<th>BT: Art</th>
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**Art**

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<tr>
<th>Fractals</th>
<th>BT: Computational geometry</th>
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**Antennas**

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<th>Chaos</th>
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**Computer graphics**

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<th>Econophysics</th>
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**Econophysics**

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<th>USE: Brownian motion</th>
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**Brownian motion**

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<th>Fractional calculus</th>
<th>BT: Mathematical analysis</th>
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**Mathematical analysis**

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<th>BT: Separation processes</th>
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**Chemical analysis**

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**Petroleum industry**

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**Filling**

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<th>Frame relay</th>
<th>BT: Communication switching</th>
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**Packet switching**

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<th>RT:</th>
<th>B-ISDN</th>
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**Computer networks**

| ISDN | |
|------||

**Franchises**

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<thead>
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<th>USE:</th>
<th>Franchising</th>
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**Franchising**

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<th>Franchises</th>
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**Franchise**

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**Franchising**

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**Electron beams**

| Relativistic effects | |
|----------------------||

**Undulators**

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<th>USE: Cerenkov lasers</th>
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**Laser beams**

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**Relativistic effects**

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**Nitrogen**

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**Franchises**

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<th>Chemical elements</th>
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**Free trade**

<table>
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<th>USE:</th>
<th>Trade agreements</th>
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**Free-space optical communication**

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<th>BT:</th>
<th>Optical fiber communication</th>
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**Free-space optical communication**

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<th>Freeware</th>
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**Freeware**

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**Free trade**

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<th>Freight containers</th>
<th>BT: Containers</th>
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**Freight containers**

<table>
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<th>RT:</th>
<th>Freight handling</th>
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**Freight handling**

<table>
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<th>BT:</th>
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**Freight handling**

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**Cargo handling**

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**Materials handling**

<table>
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**Freight containers**

<table>
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<th>BT:</th>
<th>Lifting equipment</th>
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**Lifting equipment**

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<th>Pulleys</th>
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**Pulleys**

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**Transmission line**

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**Filling**

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**Loading**

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**Electromagnetic radiation**

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**Band-pass filters**

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**Electric variables**

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**Transmission line theory**

| Frequency | | |
|-----------|| |

**Frequency dependence**

<table>
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<th>NT:</th>
<th>Bandwidth</th>
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**Bandwidth**

| Frequency | | |
|-----------|| |

**Frequency diversity**

| Frequency | | |
|-----------|| |

**Frequency synchronization**

| Frequency | | |
|-----------|| |

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# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>UF</th>
<th>BT</th>
<th>RT</th>
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<tbody>
<tr>
<td>Resonant frequency</td>
<td>Frequency allocation</td>
<td>Radio spectrum</td>
<td>Layered division multiplexing</td>
</tr>
<tr>
<td>Frequency allocation</td>
<td>USE: Radio spectrum</td>
<td>Frequency domain</td>
<td>Frequency-domain analysis</td>
</tr>
<tr>
<td>Frequency locked loops</td>
<td>USE: Frequency domain</td>
<td>Frequency-domain analysis</td>
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<td>Frequency control</td>
<td>Frequency domain analysis</td>
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<td>Frequency estimation</td>
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<td>Frequency hop communication</td>
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<td>Frequency dependence</td>
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<td>Frequency division multiplexing</td>
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<td>Frequency modulation</td>
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</table>

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Radio broadcasting

RT: Demodulation
NT: Frequency shift keying

Frequency multiplexing
USE: Frequency division

Frequency multiplication
USE: Frequency conversion

Frequency regulation
USE: Frequency control

Frequency response
BT: Testing
RT: Amplifiers
Digital filters
Finite impulse response
filters
Frequency measurement
Impulse testing

Frequency selective surfaces
UF: FSS
BT: Antenna theory

Frequency shift keying
UF: FSK
Frequency-shift modulation
Frequency-shift signaling
BT: Frequency modulation

Frequency synchronization
BT: Frequency
NT: Frequency synthesizers

Frequency synthesizers
BT: Frequency synchronization
RT: Frequency locked loops
Tuners

Frequency-domain analysis
UF: Frequency domain
Frequency domain analysis
BT: Frequency measurement
RT: Circuit analysis
Functional analysis
Signal analysis
NT: Time-frequency analysis

Frequency-hop communication
USE: Spread spectrum

Frequency-selective fading channels
BT: Fading channels

Frequency-shift modulation
USE: Frequency shift keying

Frequency-shift signaling
USE: Frequency shift keying

Fresnel integral
USE: Fresnel reflection

Fresnel lenses
USE: Fresnel reflection

Fresnel reflection
UF: Fresnel integral
Fresnel lenses
Fresnel zones
BT: Reflection

Fresnel zones
USE: Fresnel reflection

Friction
BT: Mechanical factors
RT: Drag
Dynamics
Lubrication
NT: Mechanical bearings

Friction stir processing
USE: Strain control

Frontal lobe
UF: BrainLobe
BT: Brain

Froth flotation
USE: Manufacturing processes

FSK
USE: Frequency shift keying

FSS
USE: Frequency selective surfaces

FTTH
USE: Optical fiber subscriber loops

Fuel additives
USE: Additives
# 2021 IEEE Thesaurus

## Fuel cell vehicles
- **BT:** Electric vehicles
- **RT:** Energy storage
  - Fuel cells
  - Traction motors
  - Vehicle-to-grid

## Fuel cells
- **UF:** Enzymatic fuel cells
  - Microbial electrolysis cells
  - Microbial fuel cells
  - Solid oxide electrolyzer
- **BT:** Electrochemical devices
  - Energy conversion
  - Energy storage
- **RT:** Fuel cell vehicles
  - Fuel storage
  - Power generation

## Fuel economy
- **BT:** Economics
  - Fuels

## Fuel processing industries
- **UF:** Coal tar
- **BT:** Manufacturing industries
- **RT:** Fuel storage
  - Fuels
  - Mining industry
  - Oil drilling
  - Oils
  - Petroleum
  - Petroleum industry

## Fuel pumps
- **BT:** Pumps
- **RT:** Engines
  - Fuels

## Fuel storage
- **UF:** Fuel tanks
  - Oil tanks
- **BT:** Material storage
  - Containers
  - Energy storage
  - Fuel cells
  - Fuel processing industries
  - Fuels
- **USE:** Fuel storage

## Fuels
- **BT:** Energy resources

---

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2021 IEEE Thesaurus

Functional point analysis
BT: Estimation
Size measurement
RT: Cost benefit analysis
Software engineering

Functional programming
BT: Programming
RT: Python

Fungi
BT: Organisms

Furnaces
BT: Machinery
RT: Building services
Foundries
Gas appliances
Heating systems
NT: Blast furnaces
Kilns

Further education
USE: Continuing education

Fuses
BT: Electronic components
Interrupters
Power system protection
Protection
Switchgear

Fusion power generation
BT: Nuclear and plasma
Nuclear power generation
RT: Fusion reactors
Magnetic confinement

Fusion reactor design
BT: Fusion reactors

Fusion reactors
UF: Nuclear reactors (fusion)
Thermonuclear fusion
BT: Nuclear and plasma
RT: Fusion power generation
NT: Fusion reactor design
Tokamaks

Fusion splicing
USE: Splicing

Futurism
USE: Technology forecasting

Fuzz testing
USE: Fuzzing

Fuzzing
UF: Fuzz testing
BT: Software testing

Fuzzy cognitive maps
BT: Directed graphs
Knowledge representation
RT: Cognitive systems
Decision making
Fuzzy logic
Fuzzy reasoning
Fuzzy set theory
Fuzzy systems
Inference mechanisms
Learning (artificial intelligence)
Neural networks

Fuzzy control
BT: Fuzzy systems
RT: Fuzzy logic
Fuzzy sets
Takagi-Sugeno model

Fuzzy inference
USE: Fuzzy logic

Fuzzy logic
UF: Fuzzy inference
BT: Logic
RT: Fuzzy cognitive maps
Fuzzy control
Fuzzy reasoning
Fuzzy sets
Fuzzy systems
Possibility theory
NT: Takagi-Sugeno model

Fuzzy neural nets
USE: Fuzzy neural networks

Fuzzy neural networks
UF: Fuzzy neural nets
Neuro fuzzy networks
Neuro-fuzzy networks
BT: Fuzzy systems

Fuzzy reasoning
BT: Inference mechanisms
2021 IEEE Thesaurus

RT: Fuzzy cognitive maps
Fuzzy logic

BT: Electric variables control

Gain measurement
BT: Measurement
RT: Electric variables measurement

RefRACTive index

Gait assessment
USE: Legged locomotion

Gait control
USE: Legged locomotion

Gait disorders
USE: Legged locomotion

Gait recognition
BT: Biometrics (access control)

Galerkin method
USE: Method of moments

Galbladder
BT: Digestive system

Gallium
UF: Ga
BT: Metals

Semiconductor materials
RT: Epitaxial growth
Gallium compounds
Molecular beam epitaxial growth

Gallium alloys
BT: Gallium
RT: Alloying
Wide band gap semiconductors

Gallium arsenide
UF: GaAs
BT: Gallium compounds
Gallium-arsenide (GaAs)
Gallium-arsenide (GaAs)

BT: Gallium compounds
Semiconductor materials

Gain
BT: Electric variables

Gain control
UF: Automatic gain control

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<table>
<thead>
<tr>
<th><strong>Gallium</strong></th>
<th><strong>NT:</strong> Aluminum gallium nitride</th>
<th><strong>NT:</strong> Cloud gaming</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Gallium arsenide</td>
<td>Serious games</td>
</tr>
<tr>
<td></td>
<td>Gallium nitride</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indium gallium arsenide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indium gallium nitride</td>
<td></td>
</tr>
</tbody>
</table>

**Gallium devices**

**USE:** Gallium compounds

**Gallium materials**

**USE:** Gallium compounds

**Gallium nitride**

**BT:** Gallium compounds

**Gallium-arsenide**

**USE:** Gallium arsenide

**Gallium-arsenide (GaAs)**

**USE:** Gallium arsenide

**Galois fields**

**UF:** Field multiplication

Finite fields

**BT:** Abstract algebra

**Gamma distribution**

**BT:** Statistics

**RT:** Probability

**Gamma phase iron**

**USE:** Austenite

**Gamma radiation detectors**

**USE:** Gamma-ray detectors

**Gamma ray bursters**

**USE:** Gamma-ray bursts

**Gamma ray bursts**

**USE:** Gamma-ray bursts

**Gamma ray detection**

**USE:** Gamma-ray detection

**Gamma ray detectors**

**USE:** Gamma-ray detectors

**Gamma ray effects**

**USE:** Gamma-ray effects

**Gamma rays**

**USE:** Gamma-rays

**Gamma-ray bursts**

**UF:** Cosmic gamma ray bursts

Gamma ray bursts

Gamma ray bursts

**BT:** Gamma-rays

**Game theory**

**BT:** Decision making

Control systems

Games

Minimax techniques

Oligopoly

Optimal control

Predator prey systems

**NT:** Differential games

Nash equilibrium

**Gamma-ray detection**

**UF:** Gamma ray detection

**BT:** Gamma-rays

**Gamma-ray detectors**

**UF:** Gamma radiation detectors

Gamma ray detectors

Gamma ray detectors

**BT:** Radiation detectors

**RT:** Astronomy

Biomedical applications of radiation

**X-ray detectors**

**X-ray imaging**

**Games**

**UF:** Video games

video-game

**BT:** Consumer products

**RT:** Entertainment industry

Game theory

Sports

**Gamma-ray effects**
## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>UF: Gamma ray effects</th>
<th>BT: Gamma-rays</th>
<th>Radiation effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas-ray imaging</strong></td>
<td>USE: Nuclear imaging</td>
<td></td>
</tr>
</tbody>
</table>

**Gas-ray effects**
- UF: Gamma rays
- BT: Electromagnetic radiation
- Nuclear and plasma sciences

**Collimators**
- RT: Nuclear medicine
- NT: Gamma-ray bursts
- Gamma-ray detection
- Gamma-ray effects

**GAN**
- USE: Generative adversarial networks

**Ganglia**
- UF: Ganglion
- BT: Cells (biology)
- Nervous system

**Ganglion**
- USE: Ganglia

**Gap waveguide**
- BT: Electromagnetic
- waveguides
  - RT: Waveguide components

**Garbage collection (computers)**
- USE: Memory management

**Garment industry**
- USE: Clothing industry

**Garments**
- USE: Clothing

**Garnet films**
- BT: Ferrimagnetic films
- Ferrimagnetic materials
  - Films
  - Garnets
  - Magnetic films
  - Magnetic materials

**Garnets**
- BT: Ferrimagnetic materials
  - Magnetic materials
  - NT: Sulfur hexafluoride

---

**Gas appliances**
- BT: Home appliances
  - RT: Furnaces
  - Space heating

**Gas chromatography**
- BT: Measurement

**Gas detectors**
- UF: Gas sensors
  - BT: Chemical and biological sensors
  - RT: Chemical transducers
  - NT: Amperometric sensors

**Gas discharge devices**
- BT: Nuclear and plasma sciences
  - RT: Discharges (electric)
  - Electrophotography
  - Gases
  - Lighting
  - Plasma devices
  - Thyatrons
  - NT: Glow discharge devices

**Gas discharges**
- USE: Discharges (electric)

**Gas flow**
- USE: Fluid flow

**Gas industry**
- BT: Industries
  - RT: Petroleum industry

**Gas insulated switchgear**
- USE: Gas insulation

**Gas insulated transmission lines**
- UF: GITL
  - Gas-insulated lines
  - Gas-insulated transmission
  - BT: Power transmission lines
  - RT: Gas insulation

**Gas insulation**
- USE: Gas insulated switchgear
  - BT: Insulation
  - RT: Gas insulated transmission
  - lines

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Gas lasers
UF: Atomic lasers
Metal vapor lasers
BT: Lasers
RT: Atom lasers
Chemical lasers
Gases

Gas platforms
USE: Offshore installations

Gas sensors
USE: Gas detectors

Gas-insulated lines
USE: Gas insulated transmission lines

Gas-insulated transmission
USE: Gas insulated transmission lines

Gases
BT: Fluids
RT: Discharges (electric)
Gas discharge devices
Gas insulation
Gas lasers
Materials science and technology
Natural gas
NT: Argon
Carbon emissions
Coal gas
Exhaust gases
Flue gases
Helium
Hydrogen
Nitrogen
Oxygen
Syngas
Xenon

Gaskets
BT: Seals
RT: Engine cylinders
Engines
Pistons

Gasoline
USE: Petroleum

Gastroenterology
UF: Gastroenterologists
BT: Medical specialties

Gastrointestinal
USE: Gastrointestinal tract

Gastrointestinal tract
UF: Gastrointestinal
BT: Digestive system

Gate drivers
BT: Power electronics
RT: High power amplifiers
MOSFET

Gate leakage
BT: Leakage currents
Solid state circuits
Tunneling

Gate leakage current
USE: Leakage currents

GATT
USE: Trade agreements

Gaussian approximation
BT: Gaussian distribution

Gaussian channels
BT: Communication channels
RT: Intersymbol interference
NT: AWGN channels

Gaussian distribution
UF: Normal distribution
BT: Statistical distributions
NT: Gaussian approximation

Gaussian mixture model
BT: Gaussian processes
Statistics

Gaussian noise
BT: Noise
RT: Additive white noise
Image denoising
Signal processing
TV interference
NT: AWGN

Gastroenterologists
USE: Gastroenterology

Gaussian processes
BT: Stochastic processes
2021 IEEE Thesaurus

RT: Inference mechanisms
Learning (artificial intelligence)
NT: Prediction methods
Gaussian mixture model

Gaze tracking
BT: Control systems
Human computer interaction
RT: Assistive technology
Computer vision
Eyes
Face recognition
Motion measurement
Position measurement
User interfaces
Video signal processing
NT: Electrooculography

GDP
USE: Economic indicators

GDPR
USE: General Data Protection Regulation

Ge Si
USE: Germanium silicon alloys

Gears
UF: Bevel gears
Differential gears
Helical gears
Spur gears
Worm gears
BT: Machinery
Mechanical products
RT: Automotive components
Machine components
Machine tools
Mechanical power
transmission
Mechanical splines
Mechanical systems
Production equipment
Shafts
Torque converters
NT: Magnetic gears

Gender issues
UF: Gender equality
Women's issues
BT: Equal opportunities
RT: Digital opportunities

Gene expression
BT: Gene therapy

Gene therapy
BT: Genetics
NT: Gene expression

General agreement on tariffs and trade
USE: Trade agreements

General Data Protection Regulation
UF: GDPR
BT: Data protection
Government policies
Legislation
RT: Data handling
Ethics
Privacy

Generation of electric power
USE: Power generation

Generation Y
USE: Millennials

Generative adversarial networks
UF: GAN
BT: Algorithm design and analysis
RT: Artificial intelligence
Convolutional neural networks
Machine learning
Neural networks
Unsupervised learning

Generators
UF: Dynamo
BT: Electric machines
Rotating machines
RT: Coils
Islanding
Power generation
NT: AC generators
DC generators
Electric generators
Standby generators

Gender equality
USE: Gender issues

Gender equity
BT: Equal opportunities
Genetic algorithms
BT: Algorithms
Computational intelligence
Job shop scheduling
Pareto optimization
Search methods
RT: Genetic algorithms

Genetic communication
BT: Genetics
Information theory
Biomedical engineering
DNA
RT: Biological information

Genetic engineering
UF: Genetically modified crops
BT: Engineering in medicine
and biology
RT: Agriculture
Biomedical engineering
Biotechnology
Ethical aspects
Genetics
Molecular biophysics
Tissue engineering

Genetic expression
BT: Genetics

Genetic mutations
BT: DNA

Genetic programming
BT: Genetics

Genetically modified crops
USE: Genetic engineering

Genetics
BT: Biology
Amniocentesis
Genetic engineering
Mammals
Memetics
Molecular biophysics
DNA
Epigenetics
Gene therapy
Genetic communication
Genetic expression
Genetic programming
Genomics

Genomes
USE: Genomics

Genomics
UF: Genomes
BT: Genetics
Molecular biomarkers

Geo tagging
USE: Location awareness

Geoacoustic inversion
BT: Sea measurements

Geochemistry
UF: Hydrochemistry
BT: Chemistry
Geoscience
RT: Geophysics
Salinity (geophysical)

Geodesy
BT: Geophysical measurements
RT: Position measurement
Theodolites
NT: Level measurement

Geodynamics
BT: Geophysics

Geoengineering
UF: Engineering geology
Geological engineering
BT: Geoscience
RT: Drilling
Geology
Geophysics
Hydrological techniques
Mining industry

Geographic information systems
UF: GIS
BT: Geoscience and remote sensing
Global communication
Intelligent transportation systems
RT: Image databases
NT: Geospatial analysis
Gunshot detection systems

Geography
BT: Geoscience
RT: Geospatial analysis
NT: Rural areas
Urban areas
Geologic measurements
BT: Measurement
RT: Geology
Geophysical measurements
Hyperspectral sensors
Remote sensing
Terrain mapping
Theodolites

Geological engineering
USE: Geoengineering

Geology
BT: Geoscience
RT: Geoengineering
Geologic measurements
Geophysics
NT: Landslides
Minerals
Rocks

Geophysical measurements
UF: Geophysical techniques
BT: Geoscience and remote sensing
RT: Laser radar
Magneto electrical resistivity imaging technique
Remote sensing
Theodolites
Tomography
Vegetation mapping
NT: Geophysical image processing

Geophysical signal processing
BT: Geoscience and remote sensing
RT: Signal processing

Geophysical techniques
USE: Geophysical measurements

Geophysics
BT: Geoscience
RT: Earth
Geochemistry
Geoengineering
Geology

Geomagnetic navigation
USE: Geomagnetism AND Navigation

Geomagnetism
UF: Geomagnetic navigation
Geomatics
BT: Magnetic fields
RT: Electromagnetic induction
Geophysical measurements
Geophysics
Magnetosphere

Geomagnetic signal processing
BT: Geoscience and remote sensing
RT: Signal processing

Geographical optics
BT: Optics
RT: Reflectivity
NT: Ray tracing

Geometry
BT: Mathematics
RT: Layout
Shape
NT: Computational geometry
Elliptic curves
Elliptic design
Information geometry
Projective geometry
Surface topography

Geophysical image processing

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2021 IEEE Thesaurus

Geomagnetism
Geophysical measurements
Hydrologic measurements
Hydrological techniques
Oceans
Terrestrial atmosphere

NT: EMTDC
Extraterrestrial phenomena
Geodynamics
Geophysics computing
Meteorology
Moisture
Seismology
Surface waves
Well logging

Geophysics computing
BT: Geophysics
RT: Computer aided analysis

Geoscience
UF: Earth science
BT: Geoscience and remote sensing
RT: Hydrological techniques
NT: Antarctica
Arctic
Atmosphere
Biosphere
Continents
Cyclones
Earth
Earthquakes
Forestry
Geochemistry
Geoengineering
Geography
Geology
Geophysics
Ice
Lakes
Land surface
Levee
Meteorological factors
Oceanography
Oceans
Rivers
Sediments
Soil
Tornadoes
Tsunami
Volcanoes
Wetlands

Geoscience and remote sensing
NT: Environmental factors
Geographic information systems
Geophysical measurement techniques
Geophysical measurements
Geophysical signal processing
Geoscience
Land surface temperature
Photometry
Radar
Radiometry
Remote sensing
Terrain mapping
Terrestrial atmosphere
Vegetation mapping

Geospatial analysis
BT: Geographic information systems
RT: Geography
Software

GEOSS
USE: Global Earth Observation System of Systems

Geostationary communication satellites
USE: Geostationary communication satellites

Geostationary satellites
UF: Geostationary communication satellites
BT: Satellites
RT: Orbits

Geosynchronous satellites
BT: Satellites

Geotechnical engineering
BT: Civil engineering
NT: Excavation

Geotechnical structures
BT: Civil engineering
NT: Dams

Geothermal energy
BT: Energy resources
RT: Geothermal power generation

Geothermal power generation

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2021 IEEE Thesaurus

BT: Power generation
RT: Geothermal energy

Geriatrics
BT: Medical treatment
RT: Assisted living
Fall detection
Gerontology
Senior citizens

Germ warfare
USE: Biohazards

Germanium
BT: Metals
Semiconductor materials
RT: Epitaxial growth
Semiconductor thin films
Silicon germanium
NT: Germanium alloys

Germanium alloys
BT: Germanium
RT: Alloying
NT: Germanium silicon alloys

Germanium silicon alloys
UF: Ge Si
BT: Germanium alloys
Silicon alloys

Germs
USE: Pathogens

Gerontechnology
BT: Biomedical equipment
Gerontology
RT: Assistive technology

Gerontology
BT: Medical specialties
Aging
Alzheimer's disease
Geriatrics
Senior citizens
NT: Gerontechnology

Gesture recognition
BT: Pattern recognition
NT: Sign language

Gettering
UF: Getters
BT: Vacuum systems
RT: Electron tubes

Giant magnetoresistance
BT: Magnetoresistance
RT: Hard disks
Magnetoresistive devices
Thin film devices

Girder
USE: Structural beams

GIS
USE: Geographic information systems

Github
USE: Software development management

GITL
USE: Gas insulated transmission lines

Glands
UF: Endocrine glands
Exocrine glands
BT: Biological tissues
Mammary glands
Pituitary gland
Salivary glands
Sebaceous glands
Sweat glands
Thyroid

Glass
BT: Amorphous materials
Glass products
RT: Ceramics
Dielectric materials
Glass industry
Insulation
Optical materials

Glass bottles
USE: Glass products
Glass ceramics
USE: Ceramics

Glass furnaces
USE: Glass manufacturing

Glass industry
BT: Manufacturing industries
RT: Glass
Glass manufacturing
Glass products

Glass manufacturing
UF: Glass furnaces
BT: Manufacturing systems
RT: Glass industry

Glass products
UF: Glass bottles
BT: Manufactured products
RT: Bottling
Ceramic products
Ceramics
Chemical products
Glass industry
Windows
NT: Glass

Glazes
BT: Coatings
RT: Ceramics
NT: Ceramic glazes

Glial cells
UF: Neuroglia
BT: Cells (biology)
Nervous system

Global communication
UF: Global groups
BT: Professional
communication
NT: Cross-cultural
communication
systems

Global Earth Observation System of Systems
UF: GEOSS
BT: Earth Observing System

Global markets
USE: Globalization

Global navigation satellite system
UF: GNSS
BT: Satellite navigation systems
RT: Global Positioning System

Global Positioning System
UF: DGPS
BT: Manufacturing systems
RT: Air transportation

Positioning System
BT: Satellite navigation systems
RT: Air transportation

Global System for Mobile Communications
USE: GSM

Global teams
USE: Global communication

Global warming
BT: Climate change
Environmental factors
Temperature measurement
Terrestrial atmosphere
RT: Air pollution
Atmospheric measurements
Carbon emissions
Carbon sequestration
Energy informatics
Environmental management
Greenhouse effect
Land surface temperature
Low-carbon economy
Ocean temperature
2021 IEEE Thesaurus

USE: Global Positioning System

**GPU**
USE: Graphics processing units

**Gradient methods**
BT: Mathematics
Numerical analysis
Optimization methods
RT: Level set
Search methods

**Grain alcohol**
USE: Ethanol

**Grain boundaries**
BT: Crystals
Conductivity
Corrosion
Grain size
Thermal conductivity
RT: Conductivity

**Grammar**
BT: Professional communication
Writing
RT: Writing

**Granular computing**
BT: Programming
RT: Concurrent computing
Information processing

**Granular superconductors**
BT: Superconducting materials
High-temperature superconductors

**Graph neural networks**
BT: Neural networks

**Graph theory**
BT: Combinatorial mathematics
Mathematics
RT: Ant colony optimization
Belief propagation
Circuit topology
Topology
NT: Bipartite graph
Directed acyclic graph
Directed graphs

**Graphene**
BT: Carbon
NT: Graphene devices

**Graphene devices**
BT: Graphene
RT: Field effect transistors
Flexible electronics
Molecular electronics
Nanoelectronics

**Graphic user interfaces**
USE: Graphical user interfaces

**Graphical models**
BT: Modeling

**Graphical user interfaces**
UF: GUI
Graphic user interfaces
BT: Product development
User interfaces
NT: Avatars

**Graphics**
BT: Design methodology
Displays
NT: Animation
Art
Character generation
Computer graphics
Engineering drawings
Layout
Shape
Symbols
Virtual reality
Visualization

**Graphics processing units**
UF: GPU

**Graphite**
UF: Black lead
Plumbago

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2021 IEEE Thesaurus

BT: Carbon
RT: Lead

Grasping
BT: Haptic interfaces

Gratings
UF: Optical gratings
BT: Periodic structures
RT: Optical devices

Gravimeter
USE: Gravity measurement

Gravimetric
USE: Gravity

Gravitational waves
BT: Astronomy
RT: Gravity

Gravitometer
USE: Gravity measurement

Green buildings
BT: Construction
RT: Green products

Green cleaning
BT: Green products

Green computing
BT: Computer applications
RT: Energy conservation
Green design
RT: Environmental factors
Sustainable development

Green design
UF: Environmental design
Sustainable design
BT: Design methodology
RT: Energy informatics
Green buildings
NT: Ecodesign
Green computing

Green function
USE: Green's function methods

Green manufacturing
BT: Environmental factors
Manufacturing

Green products
BT: Environmental factors
RT: Biohazards
Pollution
NT: Green buildings
Green cleaning

Green transportation
BT: Environmental factors
Transportation

Green’s function
USE: Green's function methods

Green’s function methods
UF: Green function
Green's function
Green's functions
BT: Modeling
RT: Failure analysis
Materials reliability

Green’s functions

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### 2021 IEEE Thesaurus

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### Gyration

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<td>Wearable robots</td>
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<td></td>
<td>Graphics processing units</td>
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| Harmonic analysis                         | Harmonics                       |                           |
|                                            | Mathematics                     |                           |
|                                            | Signal analysis                 |                           |
|                                            | Fast Fourier transforms         |                           |
|                                            | Fourier transforms              |                           |
|                                            | Spectral analysis               |                           |
|                                            | Wavelet transforms              |                           |

| Harmonic distortion                       | Nonlinear distortion            |                           |
|                                            | Power conversion                |                           |
|                                            | Harmonics suppression           |                           |
|                                            | Total harmonic distortion       |                           |

| Harmonic filters                          | Filters                         |                           |

| Harmonic generation                       | Frequency conversion            |                           |

| Harmonics                                 | Harmonic analysis               |                           |

| Harmonics suppression                     | Harmonic distortion             |                           |

| Harmonised index of consumer prices       | Economic indicators             |                           |
Harmonized index of consumer prices
USE: Economic indicators

Hash functions
BT: Algorithms
RT: Cryptography
NT: Cryptographic hash

Hashtag
USE: Tagging

Hazardous areas
BT: Hazards
RT: Accidents
Explosions
Fires
Hazardous materials
Industrial accidents
Protection
Radioactive pollution
Radioactive waste
Safety
Surveillance

Hazardous materials
UF: Hazmat
BT: Hazards
Materials
RT: Chemical hazards
Flammability
Hazardous areas
Radioactive waste
Toxicology

Hazmat
USE: Hazardous materials

HbbTV Standards
BT: ETSI Standards
RT: Digital TV
TV

HBT
USE: Heterojunction bipolar transistors

HCCI engines
USE: Internal combustion engines

HCI
USE: Human computer interaction

HD
USE: High definition video

HD video
USE: High definition video

HDL
USE: Hardware design languages

HD TV
UF: ATV
Extended definition TV
High-definition TV

Head
BT: Body regions
Auditory system
Brain
Visual systems

NT: Cranium
Ear
Faces
# 2021 IEEE Thesaurus

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<td>Scalp</td>
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<td>Skull</td>
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**Head sets**

<table>
<thead>
<tr>
<th>USE: Headphones</th>
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**Head-mounted displays**

<table>
<thead>
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<th>UF: Head-worn displays</th>
<th>Health physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helmet mounted displays</td>
<td>USE: Radiation monitoring</td>
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<tr>
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<tbody>
<tr>
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<td>USE: Medical services</td>
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**Head-up displays**

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<tr>
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<tbody>
<tr>
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**Head-worn displays**

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**Headphones**

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<tr>
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<td>Headsets</td>
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**Heads up displays**

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**Headsets**

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**Health (occupational)**

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**Health and safety**

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<tr>
<td>NT: Occupational health</td>
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<tr>
<td>Occupational safety</td>
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<td>Personal protective</td>
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**Health informatics**

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**Heart**

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<td>NT: Cardiac function</td>
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<td>Fetal heart</td>
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<td>Heart rate</td>
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<td>Heart valves</td>
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<td>Heart ventricles</td>
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**Heart beat**

<table>
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**Heart rate**

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<td>NT: Fetal heart rate</td>
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**Heart rate detection**

| BT: Heart rate |

**Heart rate interval**

| BT: Heart rate |

**Heart rate measurement**

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<th>Heart rate</th>
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## 2021 IEEE Thesaurus

### Heart rate variability
- **UF:** HRV
- **BT:** Heart rate

### Heart valves
- **BT:** Heart

### Heart ventricles
- **BT:** Heart

### Heartbeat
- **USE:** Heart beat

### Heat engines
- **BT:** Engines
- **NT:** Steam engines
- **Stirling engines**

### Heat islands
- **USE:** Thermal pollution

### Heat pipes
- **BT:** Heating systems
- **RT:** Cooling
- **Heat transfer**

### Heat pumps
- **UF:** Ground source heat pumps
- **BT:** Pumps
- **RT:** Refrigerants

### Heat recovery
- **UF:** Industrial heat recovery
- **BT:** Heating systems
- **RT:** Boilers
- **Thermal engineering**

### Heat sinks
- **UF:** Heatsinks
- **BT:** Cooling

### Heat transfer
- **BT:** Thermal conductivity
- **RT:** Heat pipes
- **NT:** Convection

### Heat treatment
- **BT:** Materials processing
- **RT:** Curing
- **Firing**
- **Foundries**
- **Kilns**
- **Smelting**
- **Thermal factors**

### Heat-assisted magnetic recording
- **UF:** HAMR
- **BT:** Magnetic recording

### Heating systems
- **BT:** Temperature control
- **RT:** Entropy
- **Furnaces**
- **HVAC**
- **High-temperature techniques**
- **Laser applications**
- **Rapid thermal processing**
- **Thermal engineering**
- **Boilers**
- **Cogeneration**
- **Electromagnetic heating**
- **Heat pipes**
- **Heat recovery**
- **Induction heating**
- **Infrared heating**
- **Resistance heating**
- **Solar heating**
- **Space heating**
- **Thermal energy**
- **Trigeneration**
- **Water heating**

### Heating, ventilation, and air conditioning
- **USE:** HVAC

### Heatsinks
- **USE:** Heat sinks

### Hebb's methods
- **USE:** Hebbian theory

### Hebb's rule
- **USE:** Hebbian theory

### Hebbian learning
- **USE:** Hebbian theory

### Hebbian principle
- **USE:** Hebbian theory

### Hebbian theory
- **UF:** Hebb's methods
- **Hebb's rule**
- **Hebbian learning**
- **Hebbian principle**
- **BT:** Artificial neural networks

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<td>Gases</td>
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<table>
<thead>
<tr>
<th>Helmet mounted displays</th>
<th>USE: Head-mounted displays</th>
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<table>
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<tr>
<th>Hemodynamics</th>
<th>UF: Hemorheology</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>BT: Blood flow</td>
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<table>
<thead>
<tr>
<th>Hemorheology</th>
<th>USE: Hemodynamics</th>
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<tr>
<th>Hemorrhaging</th>
<th>UF: Bleeding</th>
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<tr>
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</tr>
<tr>
<td></td>
<td>BT: Medical conditions</td>
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<thead>
<tr>
<th>HEMTs</th>
<th>UF: Heterostructure FETs</th>
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<tbody>
<tr>
<td></td>
<td>High electron mobility</td>
</tr>
<tr>
<td></td>
<td>High-electron-mobility</td>
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<tr>
<th>Hermetic seals</th>
<th>BT: Seals</th>
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<th>Hetero-nanocrystal memory</th>
<th>BT: Single electron memory</th>
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<th>Heterogeneous networks</th>
<th>BT: Computer networks</th>
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<tr>
<th>Heterojunction bipolar transistors</th>
<th>UF: HBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Transistors</td>
<td>RT: Heterojunctions</td>
</tr>
<tr>
<td>Integrated optoelectronics</td>
<td>Semiconductor devices</td>
</tr>
<tr>
<td>NT: Double heterojunction</td>
<td></td>
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<tr>
<td>bipolar transistors</td>
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<th>Heterojunctions</th>
<th>BT: Junctions</th>
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<td>RT: Heterojunction bipolar transistors</td>
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<tr>
<th>Heterostructure FETs</th>
<th>USE: HEMTs AND MODFETs</th>
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<tr>
<th>Heuristic algorithms</th>
<th>UF: Dynamic algorithms</th>
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<tbody>
<tr>
<td>BT: Algorithms</td>
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<table>
<thead>
<tr>
<th>HEV</th>
<th>USE: Hybrid electric vehicles</th>
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<table>
<thead>
<tr>
<th>HEVC</th>
<th>USE: High efficiency video coding</th>
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<table>
<thead>
<tr>
<th>Hf</th>
<th>USE: Hafnium</th>
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<th>HF radar</th>
<th>USE: High frequency radar</th>
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<tr>
<th>HFC</th>
<th>USE: Hybrid fiber coaxial cables</th>
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<th>Hg</th>
<th>USE: Mercury (metals)</th>
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<th>Hidden Markov models</th>
<th>BT: Modeling</th>
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<tbody>
<tr>
<td>RT: Markov processes</td>
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<tr>
<td>Pattern recognition</td>
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Hierarchical learning
USE: Deep learning

Hierarchical systems
BT: Systems engineering and theory
NT: Multilevel systems

High definition television
USE: HDTV

High definition video
UF: HD
HD video
BT: Video recording
NT: Ultra-high definition video

High efficiency video coding
UF: HEVC
High-efficiency video coding
BT: Video coding
RT: MPEG 4 Standard

High electron mobility transistors
USE: HEMTs

High electron-mobility transistors
USE: HEMTs

High energy physics
UF: Particle physics
BT: Physics

High energy physics instrumentation computing
BT: Computer applications
Instrumentation and measurement
Nuclear and plasma sciences
RT: Data acquisition
Elementary particles
Nuclear electronics
Particle measurements
Particle tracking
Position sensitive particle detectors
Proton effects
Radiation effects
Real-time systems
Synchrotrons
NT: Linear particle accelerator

High frequency
BT: Radio frequency

High frequency radar
UF: HF radar
BT: Radar

High frequency transformers
USE: High-frequency transformers

High intensity discharge lamps
BT: Discharge lamps
RT: Arc discharges
Electrical ballasts
Emergency lighting
Light sources
Lighting
Lighting control

High K
USE: High-k dielectric materials

High level languages
BT: Computer languages
RT: Page description languages
NT: Java
Linux
Parallel languages

High level synthesis
BT: Circuit synthesis
RT: Programmable logic devices

High performance computing
UF: HPC
High-performance computing
BT: Computers and information processing
NT: Exascale computing

High power amplifiers
BT: Power amplifiers
RT: Gate drivers

High power fiber lasers
UF: HPFL
High-power fiber lasers
BT: Fiber lasers

High power microwave generation
UF: HPM generation
High-power microwave generation
2021 IEEE Thesaurus

BT: Microwave generation
USE: High-resolution imaging

High resolution imaging
USE: High-resolution imaging

High speed electronics
USE: High-speed electronics

High speed integrated circuits
USE: High-speed integrated circuits

High speed networking
USE: High-speed networks

High speed networks
USE: High-speed networks

High speed optical methods
USE: High-speed optical techniques

High speed optical techniques
USE: High-speed optical techniques

High speed rail transportation
USE: High-speed rail transportation

High speed techniques
USE: High-speed electronics

High Tc superconductors
USE: High-temperature superconductors

High Tc superconductors
USE: High-temperature superconductors

High temperature superconductors
USE: High-temperature superconductors

High voltage
USE: High-voltage techniques

High-definition TV
USE: HDTV

High-efficiency video coding
USE: High efficiency video coding

High-electron mobility transistors
USE: HEMTs

High-electron-mobility transistors
USE: HEMTs

High-frequency transformers
USE: High-frequency transformers

High-frequency transformers
USE: High frequency transformers

High K
USE: High-k dielectric materials

High-k dielectric materials
UF: High K
BT: Dielectric materials
RT: Semiconductor materials

High-k gate dielectrics
BT: Dielectric constant

High-performance computing
USE: High performance computing

High-power fiber lasers
USE: High power fiber lasers

High-power microwave generation
USE: High power microwave generation

High-resolution imaging
UF: High resolution imaging
BT: Image resolution

High-speed electronics
UF: High speed electronics

High-speed electronics
BT: Communications technology

High-speed integrated circuits
USE: High speed integrated circuits

High-speed integrated circuits
BT: High-speed electronics
2021 IEEE Thesaurus

RT: Integrated circuit technology
Microcontrollers

High-speed networking
USE: High-speed networks

High-speed networks
UF: High speed networking
High speed networks
High-speed networking
BT: High-speed electronics
RT: Long Term Evolution

High-speed optical methods
USE: High-speed optical techniques

High-speed optical techniques
UF: High speed optical methods
High speed optical techniques
BT: Optical design techniques
RT: Light fidelity

High-speed rail transportation
UF: High speed rail transportation
BT: Rail transportation
RT: Magnetic levitation vehicles

High-speed techniques
USE: High-speed electronics

High-Tc superconductors
USE: High-temperature superconductors

High-Tc superconductors
USE: High-temperature superconductors

High-temperature effects
USE: Thermal factors

High-temperature superconductors
UF: HTS
High Tc superconductors
High Tc superconductors
High temperature superconductors

Superconductors (high temperature)
BT: Superconducting materials
RT: Ceramics

Granular superconductors
Persistent currents
Superconducting devices
Superconducting films
Superconducting transition
temperature
Surface impedance
Surface resistance
NT: Yttrium barium copper oxide

High-temperature techniques
BT: Industry applications
RT: Heating systems
NT: Rapid thermal processing

High-voltage techniques
UF: High voltage
BT: Power engineering
RT: Power electronics
Pulsed power systems

Higher order statistics
BT: Statistics
RT: Differential equations

Highways
USE: Road transportation

HIL simulation
USE: Hardware-in-the-loop simulation

Hilbert space
BT: Euclidean distance

Hilbert-Huang transforms
USE: Empirical mode decomposition

Hindbrain
UF: Rhombencephalon
BT: Brain
RT: Forebrain
Midbrain

Hinges
USE: Fasteners

Hip
BT: Extremities
Hip joint replacements
USE: Prosthetics

Hippocampus
BT: Temporal lobe
RT: Alzheimer's disease

Histograms
BT: Statistics

Histology
USE: Histopathology

Histopathology
UF: Histology
BT: Pathology

History
BT: Science - general

HITL
USE: Human in the loop

HIV
USE: Human immunodeficiency virus

Hobbing machines
BT: Machining
RT: Machine tools

Hockey
USE: Sports

Hoists
USE: Lifting equipment

Hole carriers
USE: Charge carrier processes

Holey fibers
UF: Holey fibres
BT: Photonic crystal fibers

Holey fibres
USE: Holey fibers

Hollow waveguides
BT: Electromagnetic waveguides
NT: Liquid waveguides

Holmium
BT: Chemical elements

Holographic optical components
BT: Optical devices
RT: Holography

Holography
BT: Imaging
RT: Holographic optical components

Home appliances
UF: Appliances
Domestic appliances
Domestic induction appliances
Household appliances
Consumer products
Microwave ovens
Ovens
Refrigerators
Washing machines

Home automation
UF: Home networks
BT: Consumer electronics
RT: Automation
Fall detection
Service robots
Portable media players
Refrigerators
Smart homes
Washing machines

Home computing
BT: Consumer electronics
RT: Computers and information processing
Firewire
Microcomputers

Home networks
USE: Home automation

Home phone
USE: Landline

Homeostasis
BT: Biology
Control systems

Homopolar machines
2021 IEEE Thesaurus

BT: DC machines

Honey pot (computing)
BT: Computer security

Honeycomb structures
BT: Structural shapes
RT: Lightweight structures
Sandwich structures
Structural panels
Thin wall structures

Hopfield networks
USE: Hopfield neural networks

Hopfield neural networks
UF: Hopfield networks
BT: Recurrent neural networks

Hormones
USE: Biochemistry

Horn antennas
BT: Antennas

Horses
BT: Animals

Hoses
BT: Mechanical products
RT: Automotive components
Rubber products

Hospitals
BT: Medical services
Medical treatment
RT: Biomedical engineering

Hot carrier effects
BT: Hot carriers

Hot carrier injection
UF: Hot-carrier injection
BT: Hot carriers
NT: Channel hot electron injection
Drain avalanche hot carrier injection
Secondary generated hot electron injection

Hot carriers
BT: Charge carriers

RT: Semiconductor devices
NT: Hot carrier effects
Hot carrier injection

Hot-carrier injection
USE: Hot carrier injection

Household appliances
USE: Home appliances

HPC
USE: High performance computing

HPFL
USE: High power fiber lasers

HPM generation
USE: High power microwave generation

HR
USE: Heart rate

HRV
USE: Heart rate variability

HTML
BT: Markup languages

HTS
USE: High-temperature superconductors

Huffman coding
BT: Data compression
RT: Entropy coding
Communication systems
Multimedia communication
Multimedia databases
Multimedia systems
Symbols

Human anatomy
BT: Anatomy

Human cloning
USE: Cloning

Human computer interaction
UF: HCI
Human machine interaction
Human-centered computing
2021 IEEE Thesaurus

Human-computer interaction

Human-computer interfaces
User friendliness
User interfaces
Adaptive learning
Cyber-physical systems
Human factors
Human-machine systems
User experience

Affective computing
Chatbot
Extended reality
Gaze tracking
Head-mounted displays
Head-up displays
Human in the loop
Immersive experience
Telepresence
Telexistence

Human factors

Human disease markers
USE: Biomarkers

Human engineering
USE: Ergonomics

Human factors engineering

Human immunodeficiency virus
UF: HIV
BT: Diseases
RT: Acquired immune deficiency syndrome

Human in the loop
UF: HITL
BT: Human computer interaction
RT: Simulation
Simulation
Computer simulation
Modeling

Human intelligence

Human machine interaction
USE: Human computer interaction

Human resource management
BT: Management
RT: Industrial psychology
NT: Appraisal
Continuing professional development
Employee welfare
Employment
Equal opportunities
Incentive schemes
Job specification
Labor resources
Leadership
Multiskilling
Personnel
Recruitment
Remuneration
Retirement
Termination of employment
Unemployment

**Human robot interaction**
USE: Human-robot interaction

**Human voice**
BT: Speech processing

**Human-centered computing**
USE: Human computer interaction

**Human-computer interaction**
USE: Human computer interaction

**Human-computer interfaces**
USE: Human computer interaction

**Human-robot interaction**
UF: Human robot interaction
BT: User interfaces
RT: Tactile Internet
Wearable robots

**Human-vehicle interaction**
USE: Human-vehicle systems

**Human-vehicle systems**
UF: Human-vehicle interaction
BT: User interfaces
RT: Human computer

**Humanitarian activities**
UF: Humanitarian aid
BT: IEEE Corporate activities
USE: Humanitarian activities

**Humanoid robotics**
USE: Humanoid robots

**Humanoid robots**
UF: Humanoid robotics
BT: Robots
RT: Mobile robots

**Humanoids**
USE: Humanoid robots

**HumanXR**
USE: Extended reality

**Humidity**
BT: Meteorology
RT: Humidity control
Humidity measurement
Trees - insulation

**Humidity control**
BT: Moisture control
RT: Humidity

**Humidity measurement**
BT: Moisture measurement
RT: Humidity

**Hurricanes**
BT: Cyclones

**HVAC**
UF: Heating, ventilation, and air conditioning
BT: Thermal variables control
RT: Air conditioning
Cooling
Heating systems
Ventilation

**HVDC transmission**
BT: Power transmission
RT: DC distribution systems
Voltage-source converters

**Hybrid automobiles**
USE: Hybrid electric vehicles

**Hybrid cars**
USE: Hybrid electric vehicles

**Hybrid electric vehicles**
UF: HEV
Hybrid automobiles
Hybrid cars
BT: Electric vehicles
Battery powered vehicles
Charging stations
Energy storage
Internal combustion engines
Traction motors
Vehicle-to-grid
NT: Plug-in hybrid electric vehicles
Hybrid fiber coaxial cables
UF: HFC
BT: Coaxial cables
USE: Hybrid fiber coaxial cables

Hybrid fibre coaxial cables
BT: Coaxial cables
RT: Hybrid fibre coaxial cables
USE: Hybrid fiber coaxial cables

Hybrid integrated circuits
BT: Circuits
Integrated circuits
RT: Thick film circuits
Thin film circuits

Hybrid intelligent systems
BT: Fuzzy systems
RT: Intelligent systems

Hybrid junctions
BT: Junctions
RT: Directional couplers

Hybrid learning
UF: Blended learning
BT: Learning systems

Hybrid power systems
BT: Power systems
Distributed power
generation
Photovoltaic systems

Hydraulic actuators
BT: Actuators
Hydraulic drives

Hydraulic diameter
BT: Fluid flow
Microchannels

Hydraulic drives
BT: Drives
Hydraulic actuators

Hydraulic equipment
BT: Hydraulic systems
Water pumps
Valves

Hydraulic fluids
UF: Hydraulic liquids
Hydraulic oils
BT: Fluids
Hydraulic systems

Hydraulic fracking
USE: Fracking

Hydraulic liquids
USE: Hydraulic fluids

Hydraulic oils
USE: Hydraulic fluids

Hydraulic systems
UF: Hydraulics
BT: Machinery
Fluid flow
Irrigation
NT: Electrohydraulics
Hydraulic equipment
Hydraulic fluids

Hydraulic turbines
BT: Turbines
Hydroelectric power
generation

Hydraulics
USE: Hydraulic systems

Hydrocarbon reservoirs
BT: Hydrocarbons

Hydrocarbons
UF: Oil sands
Oil shale
BT: Organic chemicals
Petroleum
NT: Hydrocarbon reservoirs

Hydrochemistry
USE: Geochemistry

Hydrodynamics
UF: Smoothed particle
hydrodynamics
BT: Dynamics
Mechanical factors
Fluid dynamics
Fluid flow
Microfluidics
Water
NT: Electrohydrodynamics
Magnetohydrodynamics

Hydroelectric power
2021 IEEE Thesaurus

Hydroelectric power generation
USE: Hydroelectric power generation
UF: Hydroelectric power
Hydroelectricity
Hydropower
Hydroelectric
BT: Power generation
RT: Dams
Hydraulic turbines
NT: Hydroelectric-thermal power generation
Microhydro power
Picohydro power
Wave energy conversion

Hydroelectric-thermal power generation
BT: Hydroelectric power generation

Hydroelectricity
USE: Hydroelectric power generation

Hydrogen
BT: Chemical elements
Gases
RT: Water splitting
NT: Deuterium

Hydrogen chloride
USE: Chlorine compounds

Hydrogen fluoride
BT: Fluorine compounds

Hydrogen powered vehicles
BT: Vehicles

Hydrogen storage
BT: Energy storage

Hydrologic measurements
BT: Hydrology
RT: Fluid flow measurement
Geophysics
Hydrological techniques
Oceanographic techniques
Water

Hydrological techniques
BT: Hydrology
RT: Geoengineering
Geophysics

Geoscience
Hydrologic measurements

Hydrology
BT: Fluid flow
RT: Water
Wetlands
NT: Floods
Hydrologic techniques
Ocean waves

Hydromagnetics
USE: Magnetohydrodynamics

Hydrometers
BT: Density measurement

Hydrophones
USE: Sonar equipment

Hydropower
USE: Hydroelectric power generation

Hyper ledger
USE: Distributed ledger

Hypercubes
BT: Multiprocessor interconnection
RT: Computer networks

Hyperdermic needles
USE: Hypodermic needles

Hyperledger
USE: Hyperledger

Hyperlinks
USE: Hypertext systems

Hypermedia
BT: Multimedia communication

Hyperspectral imaging
BT: Hyperspectral sensors

Hyperspectral sensors
BT: Remote sensing
RT: Geologic measurements
Military aircraft
Military communication
Military satellites
2021 IEEE Thesaurus

Mining industry
Submillimeter wave
NT: Wavelength measurement
Hyperspectral imaging

Hypertension
BT: Medical conditions

Hypertext systems
UF: Hyperlinks
BT: Computer interfaces
Information retrieval
RT: Database systems

Hypervisors
USE: Virtual machine monitors

Hypodermic needles
UF: Hyperdermic needles
BT: Biomedical equipment

Hypothalamus
BT: Brain
RT: Central nervous system

Hydroelectric
USE: Hydroelectric power
generation

Hysteresis
BT: Materials science and
technology
RT: Damping
Magnetic hysteresis
Magnetization processes
Spin valves

Hysteresis motors
BT: AC motors
Motors
Rotating machines
Synchronous machines
Synchronous motors

I/O programs
USE: Input-output programs

IC
USE: Integrated circuits

IC packaging
USE: Integrated circuit packaging

Ice
BT: Geoscience
RT: Meteorology
Snow
NT: Ice shelf
Ice surface
Ice thickness
Sea ice

Ice shelf
BT: Ice

Ice surface
BT: Ice

Ice thickness
BT: Ice

ICIC
USE: Intercell interference

ICP
USE: Iterative closest point
algorithm

ICs
USE: Integrated circuits

ICT
USE: Information and
communication technology

ID-based encryption
USE: Identity-based encryption

Identification of persons
BT: Systems, man, and
cybernetics
RT: Access control
Palmprint recognition
Security
NT: Biometrics (access control)
Face recognition
Fingerprint recognition
Handwriting recognition
Speaker recognition
Speech recognition

Identity management systems
BT: Computer security
Information systems
Identity-based cryptography
USE: Identity-based encryption

Identity-based encryption
UF: ID-based encryption
BT: Public key cryptography

IDTV
USE: HDTV

IEC
UF: International electrotechnical commission
BT: Standards organizations
RT: Communication standards
I E C Standards
Standardization
NT: Moving Pictures Experts Group

IEC publications
USE: IEC Standards

IEC Standards
UF: IEC publications
BT: Standards publications
RT: Common Information Model (electricity)
IEC
NT: MPEG standards

IEEE 1364
USE: Hardware design languages

IEEE 1394 Standard
UF: P1394
BT: IEEE Standards
RT: Data buses
Data communication
Firewire
Machine vision
Video signal processing

IEEE 802 LAN-MAN Standards
BT: IEEE Standards
NT: IEEE 802.11 Standard
IEEE 802.15 Standard
IEEE 802.16 Standard
IEEE 802.19 Standard
IEEE 802.22 Standard
IEEE 802.3 Standard

IEEE 802.11 Standard
UF: 802.11
P802.11
WiGig
BT: IEEE 802 LAN-MAN Standards
RT: Bluetooth
Butler matrices
Computer networks
MIMO communication
Modulation
Protocols
Radio communication
Wireless LAN

IEEE 802.11ax Standard
UF: 802.11ax
Wi-Fi 6
BT: IEEE 802.11 Standard

IEEE 802.11e Standard
UF: 802.11e
BT: IEEE 802.11 Standard
RT: Communication channels
Protocols
Quality assurance
Quality control
Quality of service
Streaming media
Wireless LAN

IEEE 802.11g Standard
UF: 802.11g
BT: IEEE 802.11 Standard
RT: Bluetooth
Butler matrices
Computer networks
MIMO communication
Modulation
Protocols
Radio communication
Wireless LAN

IEEE 802.11n Standard
UF: 802.11n
BT: IEEE 802.11 Standard
RT: Antennas
Bluetooth
### 2021 IEEE Thesaurus

| Communication channels | BT: IEEE 802 LAN-MAN Standards
| Computer networks | RT: Communication switching
| MIMO communication | Computer networks
| Modulation | Ethernet
| Protocols | Local area networks
| Radio communication | Packet switching
| Wireless LAN | Switches
| Wireless Access in Vehicular Environments | Wide area networks

#### IEEE 802.11p Standard
- BT: IEEE 802.11 Standard
- RT: Intelligent vehicles

#### IEEE 802.15 Standard
- UF: 802.15
- BT: IEEE 802 LAN-MAN Standards
- RT: Bluetooth
- Light fidelity
- Personal communication networks
- Radio communication
- Wireless LAN
- Zigbee

#### IEEE 802.16 Standard
- UF: 802.16
- BT: IEEE 802 LAN-MAN Standards
- RT: Broadband communication
- Computer networks
- Cross layer design
- Internet
- MIMO communication
- Metropolitan area networks
- Multimedia communication
- WiMAX

#### IEEE 802.19 Standard
- BT: IEEE 802 LAN-MAN Standards

#### IEEE 802.22 Standard
- BT: IEEE 802 LAN-MAN Standards
- RT: Regional area networks
- WRAN
- Wireless communication
- Wireless networks

#### IEEE 802.3 Standard
- UF: 802.3

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# 2021 IEEE Thesaurus

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**IEEE books**

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**IEEE bylaws**

**IEEE catalogs**

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**IEEE Center for the History of Electrical Engineering**

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**IEEE Chapters**

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**IEEE Communities**

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**IEEE Computer Society Press**

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| RT: | IEEE publishing |

**IEEE Conference activities**

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**IEEE conference proceedings**

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**IEEE Constitution**

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**IEEE Corporate activities**

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**IEEE Corporate recognitions**

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**IEEE directories**

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**IEEE Educational activities**

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**IEEE educational products**

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**IEEE governance**

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2021 IEEE Thesaurus

IEEE mission and vision
UF: Vision
BT: IEEE governance

IEEE news
UF: Announcements
BT: IEEE organization
NT: IEEE Chapter news
NT: IEEE Region news
NT: IEEE Section news
NT: IEEE Society news

IEEE newsletters
BT: IEEE publications

IEEE on-line publications
USE: IEEE online publications

IEEE online publications
UF: Electronic publications
BT: IEEE publications

IEEE organization
NT: IEEE activities
NT: IEEE entities
NT: IEEE governance
NT: IEEE indexing
NT: IEEE members
NT: IEEE news
NT: IEEE products

IEEE policy and procedures
UF: IEEE procedures
BT: IEEE governance

IEEE Press
BT: IEEE entities
RT: IEEE publishing

IEEE Prize Paper awards
BT: IEEE Recognitions

IEEE procedures
USE: IEEE policy and procedures

IEEE products
BT: IEEE organization
NT: IEEE Collabratec
NT: IEEE Xplore
NT: IEEE audio tapes
NT: IEEE catalogs
NT: IEEE educational products
NT: IEEE merchandise

IEEE history Center
USE: IEEE Center for the History of Electrical Engineering

IEEE indexing
BT: IEEE organization
NT: Awards
Book reviews
CD-ROM reviews
Interviews
Obituaries
Software reviews
Special issues and sections
Tutorials
Video reviews

IEEE Intersociety activities
BT: IEEE activities
RT: IEEE Professional activities

IEEE journals
BT: IEEE publications

IEEE Life Members
BT: IEEE members

IEEE Local activities
BT: IEEE activities

IEEE magazines
BT: IEEE publications

IEEE Medals
BT: IEEE Corporate awards

IEEE Member and Geographic activities
BT: IEEE activities

IEEE members
BT: IEEE organization
RT: IEEE Volunteer activities
NT: IEEE Associate Members
IEEE Fellows
IEEE Life Members
IEEE Senior Members
IEEE Student Members

IEEE merchandise
BT: IEEE products
## 2021 IEEE Thesaurus

**IEEE Professional activities**

| UF: Non-united-states activities | BT: IEEE activities |
| RT: IEEE Awards activities | BT: IEEE Corporate activities |
| IEEE Educational activities | IEEE Intersociety activities |
| IEEE Technical activities | IEEE United States activities |

**IEEE publications**

| BT: IEEE products | NT: IEEE books |
| BT: IEEE conferences | IEEE directories |
| NT: IEEE conference proceedings | IEEE journals |
| NT: IEEE magazines | IEEE newsletters |
| NT: IEEE online publications | IEEE standards |
| NT: IEEE standards publications | IEEE transactions |
| NT: Notice of Violation |

**IEEE publishing**

| BT: IEEE activities | IEEE Computer Society |
| BT: IEEE Press |

**IEEE Recognitions**

| BT: IEEE Corporate awards | NT: IEEE Corporate recognitions |
| IEEE Prize Paper awards | IEEE Service awards |
| IEEE Staff recognitions |

**IEEE Region news**

| BT: IEEE news | RT: IEEE Regions |

**IEEE Regions**

| BT: IEEE entities | RT: IEEE Region news |

**IEEE Section news**

| BT: IEEE news |

**IEEE Sections**

| BT: IEEE activities |
2021 IEEE Thesaurus

IEEE Student awards
BT: IEEE Awards activities
RT: IEEE Student Members

III-V semiconductor materials
BT: Semiconductor materials
RT: Aluminum gallium nitride

IEEE Student Members
BT: IEEE members
RT: IEEE Student activities
IEEE Student awards

IEEE Technical activities
BT: IEEE activities
IEEE Awards activities
IEEE Professional activities
IEEE Volunteer activities

IEEE Technical Field awards
BT: IEEE Corporate awards

IEEE United States activities
UF: US activities
BT: IEEE activities
IEEE Awards activities
IEEE Professional activities

IEEE Volunteer activities
BT: IEEE activities
IEEE Technical activities
IEEE members

IEEE Xplore
BT: IEEE products
RT: Information services
NT: IEL

IEEE/IEE Electronic Library
USE: IEL

Image annotation
UF: Image tagging
Linguistic indexing
Video annotation
Image processing
Feature extraction
Image classification
Image retrieval
Learning (artificial intelligence)
Metadata
Video signal processing

Image capture
BT: Image processing

RT: IEEE Student Members

IEEE transactions
BT: IEEE publications

IEEE United States activities
UF: US activities
BT: IEEE activities
IEEE Awards activities
IEEE Professional activities

IEEE Volunteer activities
BT: IEEE activities
IEEE Technical activities
IEEE members

IEEE Xplore
BT: IEEE Xplore

IEEE/IEE Electronic Library
USE: IEL

Image analysis
UF: Scene analysis
Scene classification
Image processing
Image recognition
Machine vision
Image classification
Image motion analysis
Image quality
Image sequence analysis
Image texture analysis
Object detection
Subtraction techniques

Image capture
BT: Image processing

IIOT
USE: Industrial Internet of Things

IIR filters
UF: Infinite impulse response
BT: Filters

Illumination
USE: Lighting

IEEE/IEE Electronic Library
USE: IEL

Ignition
BT: Chemical reactors
Internal combustion
Nuclear physics
Plasma materials

II-VI semiconductor materials
BT: Semiconductor materials

IEEE/IEE Electronic Library
USE: IEL

IEEE/IEE Electronic Library
USE: IEL

Image annotation
UF: Image tagging
Linguistic indexing
Video annotation
Image processing
Feature extraction
Image classification
Image retrieval
Learning (artificial intelligence)
Metadata
Video signal processing

IEEE/IEE Electronic Library
USE: IEL

Image capture
BT: Image processing
RT: Cameras
Computer vision
Image sensors
Photography

Image classification
BT: Image analysis
RT: Image annotation

Image coding
UF: Image compression
BT: Image processing
RT: Image communication
Image databases
Image storage
MPEG standards
Rate distortion theory
Transcoding
Vector quantization
Video codecs
Video coding

Image color analysis
UF: Image colour analysis
BT: Image processing
RT: Image filtering

Image communication
UF: Image transmission
BT: Communications
technology
RT: B-ISDN
Cable TV
ISDN
Image coding
Motion compensation
TV
Teleconferencing
Videophone systems
Visual communication
NT: Facsimile
Picture archiving and
communication systems

Image compression
USE: Image coding

Image converters
BT: Imaging
RT: Frequency conversion
Image sensors
NT: Image intensifiers

Image databases
BT: Database systems
Databases
RT: Geographic information
systems

Image de-noising
USE: Image denoising

Image deblurring
USE: Image restoration

Image decomposition
BT: Image processing

Image denoising
UF: Image de-noising
BT: Image processing
RT: Diffusion processes
Gaussian noise
Image enhancement
Image filtering
Image reconstruction
Image resolution
Image restoration

Image edge analysis
USE: Image edge detection

Image edge detection
UF: Edge detection
BT: Image recognition
RT: Corner detection
Feature extraction
Image segmentation
Thresholding (Imaging)

Image enhancement
BT: Image processing
RT: Image denoising
Image intensifiers
Image restoration

Image filtering
BT: Filtering theory
Image processing
RT: Image color analysis
Image denoising
Image segmentation
### 2021 IEEE Thesaurus

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2021 IEEE Thesaurus

USE: Image annotation

Image texture
BT: Image processing

Image texture analysis
BT: Image analysis

Image transmission
USE: Image communication

Image watermarking
USE: Watermarking

Imagimarkers
USE: Fiducial markers

Imaging
RT: Color
Motion pictures
Radiometry
Remote sensing
Robot vision systems
NT: Biomedical imaging
Cameras
Focusing
Ground penetrating radar
Holography
Image converters
Image sensors
Image storage
Infrared imaging
Magnetic resonance

Imaging resistivity imaging technique
Microscopy
Microwave imaging
Multispectral imaging
Nuclear imaging
Optical imaging
Photography
Radiation imaging
Radiography
Stereo vision
Terahertz wave imaging
Tomography

Imaging phantoms
BT: Biomedical image processing

Immersive audio
BT: Audio systems
Augmented reality
RT: Human computer
interaction
Virtual reality

Immersive experience
BT: Augmented reality
Human computer
interaction
Virtual reality

Immune system
UF: Immune systems
BT: Anatomy
RT: Biological control systems
Biology
Microorganisms
NT: Artificial immune systems

Immune systems
USE: Immune system

Immunity testing
BT: Electromagnetic compatibility
Electronic equipment
testing
Electrostatic interference
RT: Anechoic chambers
Electromagnetic
interference
Open area test sites

Impact ionisation
USE: Impact ionization

Impact ionization
UF: Impact ionisation
BT: Ionization
RT: Charge carriers
Conductivity
Electrons
Insulators

Impedance
UF: Electric impedance
BT: Electric variables
RT: Admittance
Damping
Impedance matching
Impedance measurement

Impedance matching
2021 IEEE Thesaurus

**Impedance measurement**

- **UF:** Impedance methods
- **BT:** Electric variables
- **RT:** Admittance measurement
- **NT:** Baluns

**Impedance methods**

- **USE:** Impedance measurement

**Impedance performance**

- **USE:** Impedance measurement

**Impellers**

- **BT:** Machine components
- **RT:** Blades
- **NT:** Propellers
- **PT:** Pumps

**Impersonation attacks**

- **BT:** Communication system

**Implantable biomedical devices**

- **USE:** Implants

**Implantable devices**

- **USE:** Implants

**Implantable electronics**

- **USE:** Implants

**Implants**

- **UF:** Implantable biomedical devices
- **BT:** Biomedical equipment
- **NT:** Auditory implants
- **PT:** Brainstem implants
- **CT:** Cochlear implants
- **ET:** Microelectronic implants
- **NT:** Neural implants

**Importance sampling**

- **USE:** Monte Carlo methods

**Imposter signature generation**

- **USE:** Forgery

**Improved definition TV**

- **USE:** HDTV

**Impulse generation**

- **USE:** Pulse generation

**Impulse measurements**

- **USE:** Pulse measurements

**Impulse testing**

- **BT:** Testing
- **RT:** Frequency response
- **NT:** Insulation testing

**Impurities**

- **BT:** Materials science and technology
- **RT:** Contamination
- **NT:** Semiconductor impurities

**IMT-2000**

- **USE:** 3G mobile communication

**In vitro**

- **BT:** Medical services
- **NT:** In vitro fertilization

**In vitro fertilization**

- **BT:** In vitro

**In vivo**

- **BT:** Medical services

**Incentive schemes**

- **UF:** Bonuses
- **BT:** Merit pay
- **NT:** Performance related pay
- **PT:** Profit sharing schemes
- **BT:** Human resource management
- **RT:** Remuneration
- **NT:** Appraisal
- **PT:** Employee welfare
- **PT:** Productivity

**Incineration**

- **UF:** Afterburners
- **BT:** Incinerators
- **NT:** Refuse incineration
- **NT:** Waste incineration
- **PT:** Waste disposal

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RT: Air pollution
Ash
Radioactive pollution
Radioactive waste
Radioactive waste disposal

Incinerators
USE: Incineration

Independent component analysis
BT: Numerical analysis
RT: Artificial intelligence
Blind source separation
Computer aided analysis
Feature extraction
Principal component analysis
Signal processing

Index of production
USE: Economic indicators

Indexes
BT: Database systems
RT: Information retrieval
Information systems
NT: Indexing
Machine assisted indexing
Spatial indexes

Indexing
UF: Online indexing
BT: Indexes
Information analysis
RT: Keyword search
Machine assisted indexing
Tagging

Indirect liquid cooling
BT: Liquid cooling

Indium
BT: Metals
RT: Indium compounds

Indium compounds
BT: Compounds
RT: Alloying
Indium
NT: Indium gallium arsenide
Indium tin oxide

Indium gallium arsenide
UF: InGaAs
BT: Gallium compounds

Indium gallium nitride
BT: Gallium compounds

Indium gallium zinc oxide
BT: Zinc oxide

Indium phosphide
UF: InP
BT: Semiconductor materials
RT: Phonons

Indium tin oxide
BT: Indium compounds
RT: Optical materials

Indoor air quality
BT: Air quality

Indoor communication
BT: Communication systems
RT: Mobile communication
Optical fiber communication
Optical modulation
NT: Indoor environment

Indoor environment
BT: Indoor communication

Indoor navigation
BT: Navigation
RT: Computer vision
Global Positioning System
Land mobile radio
Path planning
Radio navigation

Indoor radio
USE: Indoor radio communication

Indoor radio communication
UF: Indoor radio
BT: Radio communication

Indoor radio communications
USE: Indoor radio communication

Inductance
BT: Electric variables
RT: Coils
Inductance measurement
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<td>Inductive power transmission</td>
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<td></td>
<td>Inductive energy transfer</td>
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<td></td>
<td>Electromagnetic induction</td>
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<td></td>
<td>Power transmission</td>
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<tr>
<td>Industrial democracy</td>
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</tr>
<tr>
<td></td>
<td>Industrial relations</td>
<td></td>
</tr>
</tbody>
</table>
Industrial economics
UF: Manufacturing economics
Production economics
BT: Microeconomics
RT: Economies of scale
Privatization

Industrial electronics
NT: Assembly systems
Computer aided manufacturing
Cryogenic electronics
Industrial control
Integrated manufacturing systems
Machine control
Manufacturing automation
Testing

Industrial engineering
BT: Industry applications
Design methodology
Industrial control
Industrial plants
Industrial training
Precision engineering
Production engineering
Production management
Research and development
NT: Industrial communication

Industrial facilities
BT: Production facilities
Industrial plants
Manufacturing systems
Seaports

Industrial heat recovery
USE: Heat recovery

Industrial Internet of Things
UF: IIOT
Industrial IoT
BT: Internet of Things
Machine-to-machine communications
Robotics and automation

Industrial IoT
USE: Industrial Internet of Things

Industrial plants
UF: Plants (industrial)
BT: Production facilities

Industrial pollution
BT: Pollution
Air pollution
Industrial waste
Land pollution
Radioactive pollution
Thermal pollution
Water pollution

Industrial power systems
UF: Commercial power systems
BT: Power systems
Cogeneration
Industrial plants
Power distribution

Industrial psychology
BT: Psychology
Employee welfare
Human resource management
Productivity
Psychometric testing

Industrial relations
UF: Collective bargaining
Industrial democracy
Trade unions
BT: Business
Equal opportunities

Industrial training
BT: Training
Industrial engineering
Multiskilling
On the job training
Vocational training

Industrial waste
BT: Waste materials
Effluents
Industrial pollution
Slurries
Waste heat
Wastewater
### Industries

<table>
<thead>
<tr>
<th>NT:</th>
<th>Ash</th>
<th>Slag</th>
</tr>
</thead>
</table>

#### BT: Industry applications
- Business
- Industrial plants

#### RT: Agriculture
- Architecture
- Beverage industry
- Chemical industry
- Coal industry
- Communication industry
- Computer industry
- Construction
- Construction industry
- Defense industry
- Electrical engineering

### Industry applications

#### NT: Accident prevention
- Chemical technology
- Cryogenics
- Electrochemical devices
- Electrochemical processes
- Electromechanical systems

#### Chemical technology
- Electrostatic devices
- Electrostatic precipitators
- Electrostatic processes
- Engines

#### Cryogenics
- Environmental
- Food technology
- High-temperature

#### Electrochemical devices
- Industrial engineering

### Inertial confinement
- BT: Plasma confinement

### Inertial navigation
- BT: Navigation

### Inertial sensors
- BT: Sensors

### Infant
- USE: Pediatrics

### Infants
- USE: Pediatrics

### Infectious diseases
- UF: Communicable disease
- Transmissible disease
- BT: Diseases

### Inference algorithms
- BT: Algorithms

### Inference mechanisms
- UF: Model-based reasoning
- BT: Knowledge engineering
- RT: Cognitive science

#### Cognitive science
- Fuzzy cognitive maps
- Gaussian processes
- Learning systems

#### Knowledge engineering
- NT: Belief propagation
- Fuzzy reasoning

### Infinite horizon
- BT: Optimal control
- RT: Markov processes

### Infinite impulse response filters
- USE: IIR filters

### Inflammarility
- USE: Flammability

### Influenza
2021 IEEE Thesaurus

Information

BT: Diseases
Viruses (medical)
RT: Epidemics
Pandemics

Informatics

BT: Information processing
Information systems
NT: Bioinformatics
Cognitive informatics
Energy informatics
Neuroinformatics

Information age

UF: AOI
Age of information
Digital age
New media age
BT: Information technology

Information analysis

BT: Professional communication
RT: Big Data applications
Sentiment analysis
NT: Decision analysis
Indexing

Information and communication technology

UF: ICT
BT: Communications technology
RT: Energy informatics
NT: Ambient assisted living

Information architecture

BT: Information systems
RT: Database systems
NT: Enterprise architecture
management

Information centric networking

USE: Information-centric networking

Information centric networks

USE: Information-centric networking

Information entropy

BT: Information theory

Information exchange

BT: Data processing

Information processing
RT: Common Information Model
(computing)
Common Information Model
(electricity)
Computer ports
Information management
Information sharing
Tactile Internet

Information extraction

USE: Information retrieval

Information filtering

BT: Filtering
RT: Information retrieval
NT: Information filters
Recommender systems

Information filters

UF: Web filters
BT: Information filtering
RT: Information retrieval
NT: Whitelists

Information geometry

BT: Geometry
RT: Probability

Information industry

BT: Industries

Information inequality

USE: Cramer-Rao bounds

Information integrity

BT: Professional communication

Information management

BT: Information systems
Management
RT: Big Data
Data aggregation
Information exchange
Information services
Knowledge management
NT: Common Information Model
(computing)
Common Information Model
(electricity)
Competitive intelligence
Digital preservation
Document handling
2021 IEEE Thesaurus

Enterprise architecture
Information security
Information sharing
Knowledge transfer

Information processing
BT: Information systems
RT: Big Data
Business data processing
Data collection
Granular computing
Information sharing
Software as a service
Spectral efficiency
WS-BPEL
NT: Digital agriculture
Electronic healthcare
Informatics
Information exchange
Sonification

Information rates
UF: Throughput
BT: Information retrieval

Information representation
BT: Information technology
RT: Visual analytics
NT: Digital representation

Information resources
BT: Professional communication
RT: Information retrieval
Information systems

Information retrieval
UF: Information extraction
BT: Professional communication
RT: Abstracts
Big Data
Document handling
Indexes
Information filters
Information resources
Knowledge discovery
Persistent identifiers
Portals
Ranking (statistics)
Symbols
Triples (Data structure)
NT: Blogs

Information science
BT: Professional communication
NT: Quantum information science

Information security
BT: Information management
RT: Data protection
Differential privacy
Internet security
NT: Cyber espionage
Data breach
Intrusion detection
Phishing
Privacy breach
SQL injection
Social engineering
(security)
Trust management

Information services
BT: Professional communication
RT: Abstracts
IEEE Xplore
Information management
Journalism
NT: Ask IEEE
Dictionaries
Document delivery
Encyclopedias
Libraries
Teletext
Videotex
Wikipedia

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### Information sharing

<table>
<thead>
<tr>
<th>BT: Information management</th>
<th>RT: Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information exchange</td>
<td>Information processing</td>
</tr>
<tr>
<td>NT: Data dissemination</td>
<td></td>
</tr>
</tbody>
</table>

### Information systems

<table>
<thead>
<tr>
<th>BT: Professional communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Big Data applications</td>
</tr>
<tr>
<td>CD-ROMs</td>
</tr>
<tr>
<td>Computers and information</td>
</tr>
<tr>
<td>processing</td>
</tr>
<tr>
<td>Database machines</td>
</tr>
<tr>
<td>Extranets</td>
</tr>
<tr>
<td>File systems</td>
</tr>
<tr>
<td>Indexes</td>
</tr>
<tr>
<td>Information resources</td>
</tr>
<tr>
<td>Information technology</td>
</tr>
<tr>
<td>Management information</td>
</tr>
<tr>
<td>base</td>
</tr>
<tr>
<td>Multimedia computing</td>
</tr>
<tr>
<td>Office automation</td>
</tr>
<tr>
<td>Strategic planning</td>
</tr>
<tr>
<td>Technology acceptance</td>
</tr>
<tr>
<td>model</td>
</tr>
<tr>
<td>NT: Data systems</td>
</tr>
<tr>
<td>Database systems</td>
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<tr>
<td>Distributed information</td>
</tr>
<tr>
<td>systems</td>
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<tr>
<td>Identity management</td>
</tr>
<tr>
<td>Informatics</td>
</tr>
<tr>
<td>Information architecture</td>
</tr>
<tr>
<td>Information management</td>
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<tr>
<td>Information processing</td>
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<tr>
<td>Management information</td>
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<tr>
<td>systems</td>
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<tr>
<td>Medical information</td>
</tr>
<tr>
<td>systems</td>
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</tbody>
</table>

### Information technology

<table>
<thead>
<tr>
<th>BT: Professional communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Automation</td>
</tr>
<tr>
<td>Biometrics (access control)</td>
</tr>
<tr>
<td>Computer applications</td>
</tr>
<tr>
<td>Information systems</td>
</tr>
<tr>
<td>NT: Bring your own device</td>
</tr>
<tr>
<td>Information age</td>
</tr>
<tr>
<td>Information and</td>
</tr>
<tr>
<td>communication technology</td>
</tr>
<tr>
<td>Information representation</td>
</tr>
<tr>
<td>Printing</td>
</tr>
</tbody>
</table>

### Information theory

<table>
<thead>
<tr>
<th>UF: Coding theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Bandwidth</td>
</tr>
<tr>
<td>Communication systems</td>
</tr>
<tr>
<td>Cybernetics</td>
</tr>
<tr>
<td>Cyclic redundancy check</td>
</tr>
<tr>
<td>Econophysics</td>
</tr>
<tr>
<td>Modulation coding</td>
</tr>
<tr>
<td>Quantum communication</td>
</tr>
<tr>
<td>Statistics</td>
</tr>
<tr>
<td>Teleportation</td>
</tr>
<tr>
<td>Viterbi algorithm</td>
</tr>
<tr>
<td>NT: Audio coding</td>
</tr>
<tr>
<td>Biological information</td>
</tr>
</tbody>
</table>

### Information-centric networking

<table>
<thead>
<tr>
<th>UF: Content-centric networking</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Network architecture</td>
</tr>
<tr>
<td>RT: Telecommunication</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Term</th>
<th>USE:</th>
<th>Other Terms</th>
</tr>
</thead>
</table>
| Inhibitors                  | BT: Chemical products  
                           Retardants  
                           NT: Corrosion inhibitors |
| Inhomogeneous media         | USE: Nonhomogeneous media |
| Injected beams              | USE: Particle beam injection |
| Injection lasers            | USE: Semiconductor lasers |
| Injection locked oscillators | USE: Injection-locked oscillators |
| Injection locking           | USE: Injection-locked oscillators |
| Injection molding           | UF: Injection moulding  
                           Power injection molding |
                           BT: Production  
                           RT: Compression molding  
                           Embossing |
| Injection-locked oscillators| UF: Injection locked oscillators  
                           Injection locking  
                           BT: Oscillators |
| Injuries                    | UF: Injury  
                           BT: Medical conditions  
                           RT: Fall detection  
                           NT: Brain injuries  
                           Pain  
                           Wounds |
| Ink                         | BT: Production materials  
                           RT: Paints  
                           Printing  
                           NT: Ink jet printing |

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<table>
<thead>
<tr>
<th>Term</th>
<th>UF</th>
<th>BT</th>
<th>RT</th>
<th>NT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ink-jet printers</strong></td>
<td>Ink-jet printers</td>
<td>Inkjet printing</td>
<td>Three-dimensional printing</td>
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<tr>
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<td>Ink-jet printing</td>
<td>Inkjet printing</td>
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<td><strong>Innovation</strong></td>
<td>Innovation</td>
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<td><strong>Innovation management</strong></td>
<td>Innovation management</td>
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<td><strong>Inorganic chemicals</strong></td>
<td>Inorganic chemicals</td>
<td>Chemistry</td>
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<td><strong>Inorganic compounds</strong></td>
<td>Inorganic compounds</td>
<td>Compounds</td>
<td>Metals</td>
<td>Organic inorganic hybrid</td>
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<td><strong>Inorganic LEDs</strong></td>
<td>Inorganic LEDs</td>
<td>Light emitting diodes</td>
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<tr>
<td><strong>Inorganic light emitting diodes</strong></td>
<td>Inorganic light emitting diodes</td>
<td>Light emitting diodes</td>
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<td></td>
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<tr>
<td><strong>Inorganic materials</strong></td>
<td>Inorganic materials</td>
<td>Materials</td>
<td>Soft electronics</td>
<td></td>
</tr>
<tr>
<td><strong>Inorganic organic hybrid materials</strong></td>
<td>Organic inorganic hybrid materials</td>
<td>Organic inorganic hybrid materials</td>
<td></td>
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</tr>
<tr>
<td><strong>Inston vacuum</strong></td>
<td>Instanton vacuum</td>
<td>Elementary particle vacuum</td>
<td></td>
<td></td>
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<tr>
<td><strong>Instant messaging</strong></td>
<td>Instant messaging</td>
<td>IM</td>
<td>Electronic messaging</td>
<td>Internet</td>
</tr>
<tr>
<td><strong>Input devices</strong></td>
<td>Input devices</td>
<td>Computer interfaces</td>
<td>Operating systems</td>
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<td><strong>Input variables</strong></td>
<td>Input variables</td>
<td>Variable selection</td>
<td>Modeling</td>
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<td><strong>Input-output programs</strong></td>
<td>Input-output programs</td>
<td>I/O programs</td>
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<td>Program processors</td>
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<td><strong>Insertion loss</strong></td>
<td>Insertion loss</td>
<td>Propagation</td>
<td>Attenuation</td>
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<tr>
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<td>Inspection</td>
<td>Industry applications</td>
<td>Coordinate measuring</td>
<td>Coordinate measuring</td>
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<tr>
<td><strong>Inspection machines</strong></td>
<td>Inspection machines</td>
<td>Maintenance engineering</td>
<td>Testing</td>
<td>Automatic optical inspection</td>
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<tr>
<td><strong>Insect control</strong></td>
<td>Insect control</td>
<td>Pest control</td>
<td></td>
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<td><strong>Insects</strong></td>
<td>Insects</td>
<td>Animals</td>
<td>Entomology</td>
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<tr>
<td><strong>Insertion loss</strong></td>
<td>Insertion loss</td>
<td>Propagation</td>
<td>Attenuation</td>
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<tr>
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<td>Testing</td>
<td>Automatic optical inspection</td>
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<td><strong>Installment</strong></td>
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<td>Instant messaging</td>
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<td>Electronic messaging</td>
<td>Internet</td>
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<tr>
<td><strong>Instanton vacuum</strong></td>
<td>Instanton vacuum</td>
<td>Elementary particle vacuum</td>
<td></td>
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<tr>
<td><strong>Instruction repertory</strong></td>
<td>Instruction repertory</td>
<td>Instruction sets</td>
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<tr>
<td><strong>Instruction sets</strong></td>
<td>Instruction sets</td>
<td>Instruction repertory</td>
<td>Program processors</td>
<td>Out of order</td>
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</tbody>
</table>

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### Prefetching
- Reduced instruction set

### Instructional aids
- **USE**: Educational technology

### Instrument transformers
- **BT**: Transformers
- **RT**: Protective relaying
- **NT**: Voltage transformers

### Instrumentation and measurement
- **NT**: Computerized
- **electric variables**
- **high energy physics**
- **instruments**
- **measurement**
- **pulsed oximetry**
- **testing**

### Instrumentation buses
- **USE**: Field buses

### Instruments
- **BT**: Instrumentation and measurement
- **RT**: Design tools
- **NT**: Compass
- **medical instruments**
- **meters**
- **microscopy**
- **network analyzers**
- **oscilloscopes**
- **pressure gauges**
- **probes**
- **telescopes**
- **theodolites**
- **tuners**

### Insulated gate bipolar transistors
- **BT**: Bipolar transistors

### Insulation
- **BT**: Dielectrics and electrical insulation
- **RT**: Dielectric breakdown
- **dielectric losses**
- **dielectric materials**
- **glass**
- **insulation life**
- **insulation testing**
- **oils**
- **polymer foams**
- **power transformer**
- **spark gaps**
- **cable insulation**
- **ceramics**
- **gas insulation**
- **insulators**
- **isolation technology**
- **oil insulation**
- **plastic insulation**

### Insulation life
- **BT**: Testing
- **RT**: Fault location
- **insulation**
- **life estimation**
- **partial discharge**
- **trees - insulation**

### Insulation testing
- **BT**: Insulator testing
- **RT**: Partial discharge
- **methods**
- **pulsed electroacoustic**

### Insulator testing
- **BT**: Testing
- **RT**: Insulators
- **surface discharges**
- **insulation testing**

### Insulators
- **UF**: Bushings
- **BT**: Insulation
- **RT**: Breakdown voltage
- **ceramic products**
- **impact ionization**
- **insulator testing**
- **polymer foams**
- **temperature distribution**
- **metal-insulator structures**
- **plastic insulators**
- **rubber**
- **topological insulators**
- **trees - insulation**
### 2021 IEEE Thesaurus

**Insulin**
- **BT:** Drugs

**Insulin pumps**
- **BT:** Pumps
- **RT:** Biomedical equipment
- **Diabetes**

**Insurance**
- **BT:** Financial management

**Intake systems**
- **BT:** Machine components

**Integer linear programming**
- **BT:** Programming
- **NT:** Constraint theory
- **Mixed integer linear programming**

**Integer programming**
- **BT:** Linear programming

**Integral equations**
- **UF:** Antiderivatives
- **BT:** Calculus
- **RT:** Boundary-element methods
- **Deconvolution**
- **Integrodifferential equations**
- **Inverse problems**
- **Method of moments**
- **Numerical analysis**
- **NT:** Probability density function

**Integrated circuit measurements**
- **BT:** Circuit testing
- **RT:** Electric variables
- **measurement**

**Integrated circuit metallisation**
- **USE:** Integrated circuit metallization

**Integrated circuit metatllisation**
- **UF:** Integrated circuit metatllisation
- **BT:** Metallization

**Integrated circuit modeling**
- **UF:** Integrated circuit modelling
- **BT:** Integrated circuits
- **NT:** Cutoff frequency

**Integrated circuit modelling**
- **USE:** Integrated circuit modelling

**Integrated circuit noise**
- **BT:** Integrated circuits
- **RT:** Semiconductor device noise
- **NT:** Optical noise

**Integrated circuit packaging**
- **UF:** IC packaging
- **BT:** Components, packaging, and manufacturing technology
- **RT:** Chip scale packaging
- **Encapsulation**
- **Integrated circuits**
- **Plastic packaging**
- **Semiconductor device packaging**
- **NT:** Multichip modules
- **Plastic integrated circuit packaging**

**Integrated circuit reliability**
- **BT:** Reliability
- **RT:** Integrated circuit testing
- **Thermal stability**

**Integrated circuit synthesis**
- **UF:** Integrated circuit design
- **BT:** Circuit synthesis
- **Integrated circuits**
- **NT:** Integrated circuit layout
Integrated circuit technology

BT: Circuits and systems
RT: High-speed integrated circuits
NT: Beyond CMOS technology
Moore's Law

Integrated circuit testing

BT: Testing
RT: Integrated circuit reliability
NT: Integrated circuit yield
Logic testing

Integrated circuit yield

BT: Integrated circuit testing
circuits

Integrated circuits

UF: IC
ICs
Microchips
BT: Circuits
RT: Active inductors
Integrated circuit manufacture
Integrated circuit packaging
Integrated optoelectronics
Memory modules
Microelectronics
Neural network hardware
Planarization
SPICE
Semiconductor devices
Semiconductor memory
Silicon-on-insulator
VHDL
NT: Analog integrated circuits
Analog-digital integrated circuits
Application specific

Integrated circuits industry

USE: Electronics industry

Integrated control

USE: Centralized control

Integrated design

BT: Design methodology
Systems engineering and theory

Integrated manufacturing systems

BT: Industrial electronics
Manufacturing systems
RT: CADCAM
Computer aided manufacturing
System integration

Integrated memory circuits

BT: Digital integrated circuits
Semiconductor memory
RT: Solid state drives

Integrated optics

BT: Optics

Large scale integration
MESFET integrated circuits
Microprocessors
Microwave integrated circuits
Millimeter wave integrated circuits
Monolithic integrated circuits
Photonic integrated circuits
Power integrated circuits
Radiofrequency integrated circuits
Submillimeter wave integrated circuits
Superconducting integrated circuits
Thick film circuits
Thin film circuits
Three-dimensional integrated circuits
Through-silicon vias
UHF integrated circuits
Ultra large scale integration
Very high speed integrated circuits
Very large scale integration
Wafer scale integration

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### 2021 IEEE Thesaurus

**Intelligent agents**
- BT: Software agents

**Intelligent control**
- BT: Cybernetics
- RT: Context awareness
  - NT: H infinity control
  - NT: Mechatronics
  - NT: Feedforward systems
  - NT: Neurocontrollers

**Intelligent databases**
- USE: Deductive databases

**Intelligent manufacturing systems**
- BT: Manufacturing systems
- RT: Smart manufacturing

**Intelligent networks**
- BT: Telecommunication
  - USE: ISDN
  - USE: Intserv networks
- RT: Software defined networking

**Intelligent robots**
- BT: Intelligent systems
- RT: Autonomous robots
  - RT: Robot vision systems

**Intelligent sensors**
- UF: Smart sensors
- BT: Sensors
- RT: Electronic noses
  - NT: Mechatronics

**Intelligent structures**
- UF: Smart structures
- BT: Buildings
  - NT: Structural engineering
  - NT: Smart cities

**Intelligent systems**
- BT: Artificial intelligence
- RT: Ambient intelligence
  - NT: Collaborative intelligence
  - NT: Context awareness
  - NT: Expert systems
  - NT: Hybrid intelligent systems
  - NT: Intelligent structures
  - NT: Knowledge based systems

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Massive machine type communications

Mobile agents
Software agents
Autonomous systems
Collective intelligence
Intelligent robots

Intelligent transportation systems

RT: Smart transportation
NT: Automated highways
Autonomous automobiles
Geographic information

Intelligent vehicles

BT: Intelligent transportation systems
RT: Advanced driver assistance
Connected vehicles
Dedicated short range

Radiofrequency
Fade channels
Location awareness
Radio communication

Interchannel interference

UF: Adjacent channel interference
Co-channel interference
Cellular radio

Interconnected systems

UF: Composite systems
BT: System analysis and design
RT: Control systems
NT: Botnet

Interconnection networks

USE: Multiprocessor interconnection

Interest point detection

BT: Computer vision

Interest rates

USE: Economic indicators

Interface management

BT: Management
Systems engineering and theory
RT: Computer interfaces
Network interfaces

Interface phenomena

BT: Computer interfaces
RT: Adsorption
NT: Network interfaces

Interface states

BT: Computer interfaces
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Interference</th>
<th>MOSFET</th>
<th>RT: Silicon-on-insulator</th>
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**Interference**

<table>
<thead>
<tr>
<th>UF:</th>
<th>Interference (signal)</th>
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<tbody>
<tr>
<td>BT:</td>
<td>Electromagnetic</td>
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**compatibility and interference**

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<tr>
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<th>Coherence</th>
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<td>Crosstalk</td>
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<tr>
<td></td>
<td>Diffraction</td>
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<td></td>
<td>Echo interference</td>
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<tr>
<td></td>
<td>Electromagnetic interference</td>
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</table>

**interference**

<table>
<thead>
<tr>
<th>Electromagnetic radiative interference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostastic interference</td>
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<tr>
<td>Interchannel interference</td>
</tr>
<tr>
<td>Interference cancellation</td>
</tr>
<tr>
<td>Interference channels</td>
</tr>
<tr>
<td>Interference constraints</td>
</tr>
<tr>
<td>Interference elimination</td>
</tr>
<tr>
<td>Interference suppression</td>
</tr>
<tr>
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<tr>
<td>Rain fading</td>
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<tr>
<td>TV fading</td>
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<td>Terrain factors</td>
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**Interference (signal)**

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**Interference cancellation**

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**Interference channels**

<table>
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**Interference constraints**

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**Interference elimination**

<table>
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</table>

**Interference suppression**

<table>
<thead>
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<th>Interference</th>
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</table>

**Interferometers**

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<th>Etalons</th>
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<td>BT:</td>
<td>Interferometry</td>
</tr>
<tr>
<td>NT:</td>
<td>Mach-Zehnder interferometers</td>
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</table>

**Interferometric lithography**

| BT: | Lithography |

**Interferometry**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Measurement</th>
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<tr>
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<td>Micrometers</td>
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<td>Talbot effect</td>
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<td>NT:</td>
<td>Fabry-Perot interferometers</td>
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<td>Optical interferometry</td>
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<tr>
<td></td>
<td>Phase shifting</td>
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<td></td>
<td>Radar interferometry</td>
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<tr>
<td></td>
<td>Radio interferometry</td>
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**Interleaved codes**

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<thead>
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<th>Bit interleaved coded</th>
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<td>Modulation coding</td>
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</table>

**Intermetallic**

| BT: | Alloing |

**Intermodulation distortion**

| BT: | Nonlinear distortion |

**Internal combustion engines**

<table>
<thead>
<tr>
<th>UF:</th>
<th>HCCI engines</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT:</td>
<td>Engines</td>
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<tr>
<td></td>
<td>Automotive components</td>
</tr>
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<td>Exhaust gases</td>
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<tr>
<td>NT:</td>
<td>Diesel engines</td>
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**Internal stresses**

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<th>Stress</th>
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**International Atomic Time**

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<th>TAI</th>
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<tbody>
<tr>
<td>BT:</td>
<td>Standards categories</td>
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<tr>
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<td>Atomic clocks</td>
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</table>

**International collaboration**

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<thead>
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<th>Joint ventures</th>
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<tr>
<td>BT:</td>
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<td>Environmental factors</td>
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<td>Environmental management</td>
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<td>Globalization</td>
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<td>International relations</td>
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<td></td>
<td>International trade</td>
</tr>
<tr>
<td></td>
<td>Research and development</td>
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</table>
2021 IEEE Thesaurus

Social factors
Standards
Trade agreements

*International electrotechnical commission*
USE: IEC
switching

*International organization for standardization*
USE: ISO

*International relations*
BT: Social implications of technology
RT: Globalization
International collaboration
Social factors
communications

*International Space Station*
BT: Space stations

*International standards organization*
USE: ISO

*International System of Units*
BT: Measurement units
NT: Bot (Internet)
Botnet
Cloud computing
Crowdsourcing
Instant messaging
Internet of Things
Internet security
Internet telephony
Internet topology
Linked data
Middleboxes
Semantic Web
Social computing
Web 2.0
Web services

*International trade*
UF: Trade (international)
BT: Economics
RT: Business
Developing countries
Exchange rates
Globalization
International collaboration
Macroeconomics
Trade agreements

*Internet*
UF: Google
BT: Communication systems
Computer networks
Digital systems
Distributed computing
RT: ARPANET
Blogs
Cyberspace
DiffServ networks
Electronic commerce
Electronic learning
Extranets
 IEEE 802.16 Standard
IP networks

*Internet banking*
USE: Online banking

*Internet neutrality*
USE: Network neutrality

*Internet of Everything*
USE: Internet of Things

*Internet of Things*
UF: IOT
Internet of Everything
BT: Internet
RT: Ambient intelligence
Bar codes
Cloud computing
2021 IEEE Thesaurus

Cyber-physical systems
Digital transformation
Digital twin
Machine-to-machine communications
Middleware
Object detection
Protocols
Radiofrequency identification
Virtual environments
Watermarking
Wireless sensor networks
NT: Industrial Internet of Things
Tactile Internet

Interoperability
UF: Service composability
BT: Internetworking
RT: Collaboration
Common Information Model
(electricity)
Open systems

Interplanetary exploration
BT: Space exploration
RT: Space missions

Interpolating
USE: Interpolation

Interpolation
UF: Interpolating
BT: Approximation methods
RT: Curve fitting
Digital-analog conversion
Radial basis function

Interpolating
USE: Interpolation

Interpolating
UF: Approximation methods
BT: Curve fitting
RT: Digital-analog conversion
Radial basis function

Interpreters (program)
USE: Program processors

Interceptors
UF: Interruption
BT: Switchgear
RT: Circuit breakers
Fuses

Interception
USE: Interruption

Interstellar chemistry
BT: Chemistry
RT: Extraterrestrial measurements

Intersymbol interference
BT: Interference
RT: AWGN channels
Equalizers
Gaussian channels

Intersystem interference
USE: Interchannel interference

Interviews
2021 IEEE Thesaurus

**BT:** IEEE indexing

**USE:** Inverse problems

**Intestines**

**BT:** Digestive system

**Inverse methods**

**USE:** Inverse problems

**Intracranial pressure sensors**

**BT:** Biomedical equipment

Sensors

**Inverse modeling**

**USE:** Inverse problems

**RT:** Brain

Neutral engineering

**Inverse problem**

**USE:** Inverse problems

**Intracranial system**

**Inverse problems**

**UF:** Cranial pressure

**BT:** Cranial pressure

**Inverse methods**

**UF:** Inverse problems

**Inverse modeling**

**Inverse modeling**

**RT:** Brain

**Neutral engineering**

**Inverse problem**

**Inverse problem**

**NT:** Network intrusion detection

**Intrusion detection**

**Network function**

**Intrusion detection**

**virtualization**

**RT:** Network function

**Inverse scattering**

**USE:** Inverse problems

**Intserv networks**

**Network intrusion detection**

**UF:** Integrated services

**Integrated services**

**BT:** Computer networks

**Inverse scattering**

**RT:** Internet

**Internet**

**Multimedia communication**

**Inverse scattering**

**USE:** Inverse problems

**Invasion**

**Tracheal intubation**

**BT:** Medical treatment

**Medical treatment**

**RT:** Respiratory system

**Respiratory system**

**Ventilators**

**Inverse synthetic aperture radar**

**BT:** Synthetic aperture radar

**Inverse transforms**

**USE:** Laplace equations

**Invention**

**Privacy-invasive software**

**USE:** Technological innovation

**Inverted classroom**

**USE:** Education AND

**Online services**

**Inverters**

**BT:** Power electronics

**RT:** Maximum power point

**trackers**

**Zero current switching**

**Zero voltage switching**

**NT:** Multi-level inverters

**Pulse inverters**

**Resonant inverters**

**Voltage source inverters**

**Investment**

**BT:** Financial management

**RT:** Developing countries

**Iodine**

**BT:** Chemical elements
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>NT: Iodine compounds</th>
<th>USE: Particle beam optics</th>
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<tr>
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<td>BT: Iodine</td>
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<td><strong>Ion accelerators</strong></td>
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<tr>
<td>BT: Particle accelerators</td>
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<tr>
<td>RT: Ion beam effects</td>
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<tr>
<td>Ion beams</td>
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<td>Ion sources</td>
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<td>Ions</td>
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<td>Proton accelerators</td>
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<tr>
<td><strong>Ion beam applications</strong></td>
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<tr>
<td>BT: Nuclear and plasma sciences</td>
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<tr>
<td>RT: Ion beams</td>
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<tr>
<td>NT: Ion implantation</td>
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<tr>
<td><strong>Ion beam effects</strong></td>
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<tr>
<td>BT: Ion beams</td>
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<td>RT: Aerospace safety</td>
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<td>Ion accelerators</td>
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<td>Ion beam applications</td>
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<td>Ion emission</td>
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<td>Ion sources</td>
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<td>Ions</td>
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<td><strong>Ion beams</strong></td>
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<tr>
<td>BT: Particle beams</td>
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<td>RT: Electrodynamics</td>
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<td>Ion accelerators</td>
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<td>Ion beam applications</td>
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<td>Ions</td>
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<td><strong>Ion emission</strong></td>
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<td>UF: Field ion emission</td>
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<td>Secondary ion emission</td>
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<td>BT: Nuclear imaging</td>
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<td>RT: Ion beam effects</td>
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<td>Ion beams</td>
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<td>Ion sources</td>
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<td>Ions</td>
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<td>Thermonic emission</td>
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<td><strong>Ion implantation</strong></td>
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<td>BT: Ion beam applications</td>
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<td>Materials preparation</td>
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<td>RT: Plasma sources</td>
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<td>Semiconductor device</td>
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<td>manufacture</td>
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<td><strong>Ion optics</strong></td>
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<td>USE: Ionization</td>
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<td>BT: Photoionisation</td>
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<td>Ionizing radiation</td>
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<td>Single event transients</td>
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<td>Single event upsets</td>
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<td><strong>Ionization chambers</strong></td>
<td></td>
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<tr>
<td>UF: Ionisation chambers</td>
<td></td>
</tr>
<tr>
<td>BT: Ions</td>
<td></td>
</tr>
<tr>
<td>RT: Ionizing radiation</td>
<td></td>
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<tr>
<td>Smoke detectors</td>
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<tr>
<td><strong>Ionizing radiation</strong></td>
<td></td>
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<tr>
<td>UF: Ionising radiation</td>
<td></td>
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<td>BT: Ionization</td>
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<tr>
<td>RT: Ion radiation effects</td>
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<td>Ionization chambers</td>
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<td>Radiation hardening</td>
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<td>(electronics)</td>
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<td>Silicon radiation detectors</td>
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<tr>
<td><strong>Ionizing radiation sensors</strong></td>
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<tr>
<td>BT: Sensors</td>
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</tbody>
</table>
NT: Position sensitive particle detectors
Radiation detectors
X-ray detectors

Ionometric polymer-metal composite actuators
USE: Actuators

Ion sphere
BT: Terrestrial atmosphere
RT: Meteorology
Plasmas

Ions
BT: Elementary particles
RT: Alpha particles
Elementary particle exchange interactions
Ion accelerators
Ion beams
Ion emission
Protons
Storage rings
NT: Ion sources
Ionization

IOT
USE: Internet of Things

IP
USE: IP networks

IP networks
UF: IP
IP-networks
Internet Protocol networks
BT: Communication systems
Computer networks
Telecommunications
RT: IPTV
Internet
Machine-to-machine communications
Next generation networking
Quality of service
Transport protocols
NT: TCPIP

IP rights
USE: Intellectual property

IP telephony
USE: Internet telephony

IR Spectra
USE: Infrared spectra

IRE Standards
BT: IEEE Standards

Iridium
BT: Chemical elements

Iris
BT: Eyes
RT: Ophthalmology

Iris recognition
BT: Biometrics (access control)

Iris recognition
USE: Waveguide discontinuities

Iron
UF: Fe
BT: Metals
NT: Cast iron
Iron alloys

Iron alloys
BT: Iron
RT: Alloysing
Metallurgy
NT: Austenite

Irradiation
USE: Radiation effects

Irrigation
BT: Agriculture
<table>
<thead>
<tr>
<th>RT: Agricultural products</th>
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<tr>
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<tr>
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<td>Quality management</td>
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<td>Water pumps</td>
<td>Software standards</td>
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**Irtran 5**

<table>
<thead>
<tr>
<th>USE: Magnesium oxide</th>
<th>NT: MPEG standards</th>
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**Ischemic pain**

<table>
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<tr>
<th>BT: Pain</th>
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<tr>
<td>BT: Thermodynamics</td>
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**ISDN**

<table>
<thead>
<tr>
<th>UF: Integrated services digital networks</th>
<th>BT: Insulation</th>
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<tbody>
<tr>
<td>BT: Communication systems</td>
<td>RT: Vibration control</td>
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<tr>
<td>Digital communication</td>
<td></td>
</tr>
<tr>
<td>Digital systems</td>
<td></td>
</tr>
<tr>
<td>RT: Asynchronous transfer</td>
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<tr>
<td>Data communication</td>
<td></td>
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<tr>
<td>Frame relay</td>
<td></td>
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<tr>
<td>Image communication</td>
<td></td>
</tr>
<tr>
<td>Multimedia communication</td>
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<tr>
<td>NT: B-ISDN</td>
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**Ishikawa diagrams**

<table>
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<tr>
<th>USE: Cause effect analysis</th>
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**Islanding**

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<thead>
<tr>
<th>BT: Power supplies</th>
<th>Isolators</th>
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<tbody>
<tr>
<td>RT: Electrical safety</td>
<td>BT: Circuits</td>
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<td>Generators</td>
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**ISO**

<table>
<thead>
<tr>
<th>UF: International organization for standardization</th>
<th>BT: Thermodynamics</th>
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<tr>
<td>International standards</td>
<td></td>
</tr>
<tr>
<td>BT: Standards organizations</td>
<td></td>
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<tr>
<td>RT: Communication standards guidelines</td>
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<tr>
<td>ISO Standards</td>
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<tr>
<td>Measurement standards</td>
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<tr>
<td>Software standards</td>
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<td>Standardization</td>
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<td>NT: Moving Pictures Experts</td>
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**ISO 9000**

<table>
<thead>
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**ISO Standards**

<table>
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<tr>
<th>BT: Standards publications</th>
<th>BT: Control theory</th>
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<tr>
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<td>Iterative methods</td>
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<tr>
<td></td>
<td>Adaptive control</td>
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<td>Learning systems</td>
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<tr>
<td></td>
<td>Tracking</td>
</tr>
</tbody>
</table>
2021 IEEE Thesaurus

Iterative methods
BT: Mathematics
Numerical analysis
RT: Belief propagation
NT: Expectation-maximization
algorithms
Iterative algorithms
Iterative learning control

ITU
UF: International Telecommunications Union
BT: Standards organizations

ITU Standards
BT: Standards publications
RT: UHDTV

Jacks
USE: Lifting equipment

Jacobian matrices
UF: Jacobian matrix
BT: Matrices

Jacobian matrix
USE: Jacobian matrices

Jamming
BT: Electronic warfare
RT: Electronic countermeasures
Radar clutter
Radar countermeasures
Radio communication
countermeasures

Java
BT: High level languages

Jet engines
BT: Engines
RT: Aircraft propulsion
Exhaust gases
Fans

JFET circuits
BT: FET circuits
NT: JFET integrated circuits

JFET integrated circuits
BT: JFET circuits
RT: JFETs

JFETs

UF: Junction FETs
BT: Field effect transistors
RT: JFET integrated circuits

Jigs
USE: Fixtures

Jitter
BT: Distortion
RT: Circuit stability
NT: Timing jitter

Job design
BT: Ergonomics

Job production systems
UF: Bespoke production
BT: Manufacturing systems

Job rotation
USE: Multiskilling

Job shop scheduling
BT: Scheduling
RT: Genetic algorithms

Job specification
BT: Human resource management
RT: Multiskilling
Recruitment

Jobs listings
BT: Career development
RT: Employment

Johnson Nyquist noise
USE: Thermal noise

Joining materials
BT: Production materials
RT: Soldering equipment
NT: Filler metals
Sealing materials

Joining processes
UF: Connecting
Coupling (process)
Fastening
Linking

BT: Manufacturing systems
Materials processing

RT: Couplings
Fasteners
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
<th>Use</th>
<th>Example</th>
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<td>USE: Semiconductor lasers</td>
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<td>USE: Nanowires, Silicon-on-insulator</td>
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<td>USE: Superconductor devices</td>
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<td>USE: Josephson junctions</td>
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<td>RT: K-NN methods</td>
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<td>USE: Continuous improvement</td>
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<td>RT: Social sciences</td>
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<td>USE: Transform coding</td>
<td>USE: Kalman filters</td>
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<td>RT: Fluorescence, Photoluminescence</td>
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<tr>
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UF: Nephrolithiasis
Renal calculi
Urinary calculesis
BT: Kidney
Medical conditions
RT: Lithotripsy

BT: Furnaces
Calcination
Curing
Firing
Heat treatment

UF: Consumer electronics AND
Electronic publishing

BT: Kinematics
Kinematic analysis
Kinematic faults
Kinematic model
Kinematic noise
Kinematic analysis
Kinematic faults
Kinematic model
Kinematic noise
Kinematic analysis
Kinematic faults
Kinematic model
Kinematic noise
Kinematic analysis
Kinematic faults
Kinematic model
Kinematic noise
Kinetic energy
Kinetic theory
Collision theory
Kinetic molecular theory
Kinetic-molecular theory
Kinetics
Motion control
Physics
Kinetic energy
### Kinetic-molecular theory
- **USE:** Kinetic theory

### Kinetics
- **USE:** Kinetic theory

### Kirchhoff approximation
- **USE:** Kirchhoff's Law

### Kirchhoff current law
- **USE:** Kirchhoff's Law

### Kirchhoff scattering
- **USE:** Kirchhoff's Law

### Kirchhoff's Law
- **UF:** Kirchhoff approximation
- **UF:** Kirchhoff current law
- **UF:** Kirchhoff scattering
- **BT:** Spectroscopy

### Kirk effect
- **USE:** Kirk field collapse effect

### Kirk field collapse effect
- **UF:** Kirk effect
- **BT:** Bipolar transistors

### Klystrons
- **UF:** Gyroklystrons
- **BT:** Electron tubes
- **RT:** Amplifiers
- **RT:** Cavity resonators
- **RT:** Colliding beam accelerators
- **RT:** Oscillators
- **RT:** Relativistic effects

### Knee
- **BT:** Extremities

### Knee joint replacements
- **USE:** Prosthetics

### Knitted fabric composites
- **USE:** Fabrics

### Knowledge acquisition
- **BT:** Knowledge engineering
- **RT:** Context awareness
- **BT:** Econophysics
- **BT:** Expert systems
- **RT:** Knowledge based systems
- **RT:** Self-organizing feature

### Knowledge based systems
- **UF:** Knowledge systems
- **UF:** Knowledge-based systems
- **UF:** Rule based systems
- **BT:** Artificial intelligence
- **RT:** Decision support systems
- **RT:** Deductive databases
- **RT:** Intelligent systems
- **RT:** Knowledge acquisition
- **RT:** Knowledge representation
- **NT:** Linked data
- **NT:** Software agents

### Knowledge discovery
- **BT:** Knowledge engineering
- **RT:** Data mining
- **RT:** Data science
- **RT:** Information retrieval
- **NT:** Knowledge management

### Knowledge engineering
- **BT:** Artificial intelligence
- **RT:** Knowledge management
- **NT:** Inference mechanisms
- **NT:** Knowledge acquisition
- **NT:** Knowledge discovery
- **NT:** Knowledge representation

### Knowledge management
- **UF:** Intellectual capital
- **BT:** Computer applications
- **BT:** Management
- **RT:** Competitive intelligence
- **RT:** Information management
- **RT:** Knowledge discovery
- **RT:** Knowledge engineering
- **NT:** Management information systems
- **NT:** Semantic Web
- **NT:** Knowledge transfer

### Knowledge representation
- **BT:** Knowledge engineering
- **RT:** Expert systems
- **RT:** Formal concept analysis
- **RT:** Knowledge based systems
- **RT:** Linked data
- **RT:** OWL
- **NT:** Description logic
- **NT:** Fuzzy cognitive maps
- **NT:** Ontologies
- **NT:** Thesauri
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# 2021 IEEE Thesaurus

## Lakes

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<th>BT:</th>
<th>Geoscience</th>
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## Laminates

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## Lamination

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## Lamps

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## LAN

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## LAN emulation

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## LAN interconnection

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## Land mine detection

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## Land mobile radio

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## Land mobile radio equipment

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## Land mobile radio networks

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## Land pollution

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<th>BT:</th>
<th>Pollution</th>
<th>RT:</th>
<th>Industrial pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT:</td>
<td>Land use planning</td>
<td>NT:</td>
<td>Radioactive pollution</td>
</tr>
<tr>
<td></td>
<td>Oil pollution</td>
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<tr>
<td></td>
<td>Radio pollution</td>
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<tr>
<td>NT:</td>
<td>Soil pollution</td>
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</tr>
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</table>

## Land surface

<table>
<thead>
<tr>
<th>BT:</th>
<th>Geoscience</th>
<th>RT:</th>
<th>Land surface temperature</th>
</tr>
</thead>
</table>

## Land surface temperature

<table>
<thead>
<tr>
<th>UF:</th>
<th>Ground temperature</th>
<th>USE:</th>
<th></th>
</tr>
</thead>
</table>
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>BT</th>
<th>RT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land temperature</strong></td>
<td></td>
<td>Geoscience and remote sensing</td>
<td>Global warming</td>
</tr>
<tr>
<td><strong>Ocean temperature</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Remote sensing</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Land surface</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>RT: Global warming</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>USE: Land surface temperature</strong></td>
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</tr>
<tr>
<td><strong>Remote sensing</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>RT: Global positioning system</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Land transportation</strong></td>
<td></td>
<td>Ground transportation</td>
<td>Planetary landers</td>
</tr>
<tr>
<td><strong>Rail transportation</strong></td>
<td></td>
<td>Rail vehicles</td>
<td>Land vehicles</td>
</tr>
<tr>
<td><strong>Road transportation</strong></td>
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</tr>
<tr>
<td><strong>Land use planning</strong></td>
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<td>Environmental management</td>
<td>Floods</td>
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<td><strong>Reservoirs</strong></td>
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<td><strong>Water storage</strong></td>
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<td><strong>Land vehicles</strong></td>
<td></td>
<td>Flexible fuel vehicles</td>
<td>Ground vehicles</td>
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<td><strong>Road vehicles</strong></td>
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</tr>
<tr>
<td><strong>BT: Transportation</strong></td>
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<td></td>
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</tr>
<tr>
<td><strong>RT: Global positioning system</strong></td>
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<tr>
<td><strong>Lane detection</strong></td>
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<tr>
<td><strong>Lane departure warning systems</strong></td>
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<tr>
<td><strong>Lane keeping assist systems</strong></td>
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<tr>
<td><strong>Lanthanum</strong></td>
<td></td>
<td>Metals</td>
<td>Lanthanum compounds</td>
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<td><strong>Landmine detection</strong></td>
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<tr>
<td><strong>Landslides</strong></td>
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<td>Geology</td>
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<tr>
<td><strong>Lane departure warning systems</strong></td>
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<tr>
<td><strong>Lane keeping assist systems</strong></td>
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<tr>
<td><strong>Landline</strong></td>
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<td>Home phone</td>
<td>Landline telephone</td>
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<tr>
<td><strong>Main line</strong></td>
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<tr>
<td><strong>POTS</strong></td>
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</tr>
<tr>
<td><strong>BT: Telephone equipment</strong></td>
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</table>

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### Laparoscopes

*BT:* Surgical instruments  
*RT:* Minimally invasive surgery  

*Large-screen displays*  
*USE:* Large screen displays  

Laparoscopic surgery  
*USE:* Minimally invasive surgery  

### Laplace equations

*UF:* Inverse transforms  
*Laplace operator*  
*Laplace transform*  
*Laplacian*  
*BT:* Mathematics  

*Laser ablation*  
*BT:* Laser applications  

### Laser applications

*BT:* Lasers  
*Laser theory*  
*Magnetooptic recording*  

### Large Hadron Collider

*UF:* LHC  
*BT:* Test facilities  
*RT:* Particle accelerators  

### Large scale integration

*UF:* LSI  
*BT:* Circuits  
*Integrated circuits*  
*NT:* Ultra large scale integration  
*Very large scale integration*  
*Wafer scale integration*  

### Laser beam cutting

*BT:* Laser applications  
*Laser beam machining*  
*BT:* Laser applications  
*Machining*  
*RT:* Laser beam cutting  

### Laser beams

*UF:* Laser guide stars  
*BT:* Beams  
*RT:* Bragg gratings  
*Electrooptic modulators*  
*Laser theory*  
*Lasers*  
*Optical beams*  
*Optical vortices*  
*Refractive index*  
*Supercontinuum generation*  
*Thermal lensing*
Laser cavity resonators
BT: Cavity resonators
RT: Optical resonators
Surface emitting lasers

Laser diodes
USE: Diode lasers AND
Semiconductor lasers

Laser excitation
UF: Electron beam pumping
Excitation of lasers
Pumping of lasers
BT: Lasers
NT: Optical pumping

Laser feedback
BT: Laser noise

Laser fusion
BT: Laser applications

Laser guide stars
USE: Laser beams

Laser materials processing
BT: Materials processing

Laser mode locking
BT: Laser modes

Laser modes
BT: Lasers
NT: Laser mode locking

Laser noise
BT: Noise
Optical signal processing
RT: Lasers and electrooptics
NT: Laser feedback

Laser physics
USE: Laser theory

Laser printers
BT: Printers

Laser radar
UF: Lidar
Optical radar
BT: Radar
RT: Geophysical measurement

Laser science
USE: Laser theory

Laser sintering
UF: Selective laser sintering
BT: Materials preparation
RT: Design automation
Prototypes
Stereolithography

Laser stability
BT: Lasers
RT: Stability analysis

Laser surgery
BT: Surgery

Laser theory
UF: Laser physics
Laser science
BT: Laser applications
RT: Laser beams
Lasers
Optical beams
Optical design
Optics
Particle beams
Quantum mechanics

Laser transitions
BT: Lasers

Laser tuning
BT: Semiconductor lasers
Tuning
RT: Optical tuning

Laser velocimetry
BT: Measurement by laser beam

Lasers
UF: Infrared lasers
BT: Lasers and electrooptics
Laser theory
Light sources
Nanobiophotonics
Optical distortion
Oscillators
Stereochemistry
Stimulated emission
Superluminescent diodes
Threshold current
2021 IEEE Thesaurus

Ultraviolet sources
Waveguide lasers
NT: Atom lasers
Chemical lasers
Diode lasers
Free electron lasers
Gas lasers
Laser applications
Laser excitation
Laser modes
Laser stability
Laser transitions
Power lasers
Pump lasers
Quantum well lasers
Ring lasers
Semiconductor lasers
Solid lasers
Surface emitting lasers
X-ray lasers

Lasers and electrooptics
RT: Erbium
   Laser noise
NT: Electro-optical devices
   Electrooptic effects
   Lasers
   Optics
   Optoelectronic devices
   Photonics

Latches
BT: Bistable circuits

Lattice Boltzmann
USE: Lattice Boltzmann methods

Layered division multiplexing
UF: LDM
   Layered-division-multiplexing
   LBDM
   Layered-division-multiplexing
   Layered-division-multiplexing
   Layered-division-multiplexing
   Layered-division-multiplexing
   Layered-division-multiplexing

Layered manufacturing
BT: Manufacturing systems
   Computational geometry
   Stereolithography

Layered media
USE: Nonhomogeneous media

Layout
BT: Graphics
   Art
   Geometry
   Integrated circuit layout
   Wiring

Law enforcement
UF: Police
   Law
   Censorship
   Digital forensics
   Image forensics
   Legal factors
   Threat assessment

Launching (electromagnetic)
USE: Electromagnetic launching
   LCD
   USE: Liquid crystal displays

Launching (electrothermal)
USE: Electrothermal launching
   LCDs
   USE: Liquid crystal displays
<table>
<thead>
<tr>
<th>Term</th>
<th>USE:</th>
<th>BT:</th>
<th>RT:</th>
<th>NT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lcos</td>
<td>Liquid crystal on silicon</td>
<td>Sensor systems and applications</td>
<td>Packaging</td>
<td>Testing</td>
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<td></td>
<td>Layered division</td>
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<td>Vacuum systems</td>
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<td>LDM</td>
<td>USE: Layered division</td>
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<td>LDPA</td>
<td>Log-periodic dipole</td>
<td>Antennas</td>
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<td>LDPC</td>
<td>Parity check codes</td>
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<td>Ldpc codes</td>
<td>USE: Parity check codes</td>
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<td>Pb</td>
<td>Metals</td>
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<td>Lead compounds</td>
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<td>Metals</td>
<td>Graphite</td>
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<td>Lead isotopes</td>
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<td>Lead acid batteries</td>
<td>Lead-acid batteries</td>
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<td></td>
<td>Batteries</td>
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<td>Compounds</td>
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<td>Lead isotopes</td>
<td>Lead</td>
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<td>Lead time reduction</td>
<td>Production management</td>
<td>Production planning</td>
<td>Project management</td>
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<td>Lead-acid batteries</td>
<td>USE: Lead-acid batteries</td>
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<td>Leadership</td>
<td>Human resource</td>
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<td>Business</td>
<td>Government</td>
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<td></td>
<td>Management</td>
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<tr>
<td>Leak detection</td>
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</tbody>
</table>

Leakage currents
- Gate leakage current
- Current
- Electron traps
- Fault currents
- Gate leakage

Leaky wave antennas
- USE: Leaky wave antennas
- BT: Antennas

Lean production
- Manufacturing systems
- Production systems
- Production management

Learning (artificial intelligence)
- Artificial intelligence
- AI accelerators
- Fuzzy cognitive maps
- Gaussian processes
- Image annotation
- Manifold learning
- Distance learning
- Electronic learning
- Naive Bayes methods
- Nearest neighbor methods

Learning automata
- USE: Learning automata
- Learning systems

Learning management systems
- Computer aided instruction
- Learning systems
- Computer applications
- Electronic learning
- Management
- Training

Learning mechanisms
- USE: Learning systems
2021 IEEE Thesaurus

Learning methods
USE: Learning systems
UF: Learning mechanisms
BT: Artificial intelligence
RT: Adaptive systems
NT: Backpropagation
Learning methods
Learning-based method
Learning systems
Learning mechanisms
Learning-based method
UF: Learning mechanisms
BT: Artificial intelligence
RT: Adaptive systems
NT: Backpropagation
Inference mechanisms
Iterative learning control
Mobile agents
Pattern recognition
Software agents
White matter
Backpropagation
Cognitive systems
Hybrid learning
Learning automata
Learning management
LEDS
USE: Learning systems
UC: Learning mechanisms
BT: Least squares approximations
Mean square error methods
BT: Approximation methods
Mean square error methods
Optimization
Recursive estimation
NT: Least mean squares method
Learning systems
LEDS
USE: Learning systems
UC: Learning mechanisms
BT: Least squares approximations
Mean square error methods
BT: Approximation methods
Mean square error methods
Optimization
Recursive estimation
NT: Least mean squares
Least mean squares methods
BT: Least squares approximations
Mean square error methods
BT: Approximation methods
Mean square error methods
Optimization
Recursive estimation
NT: Least mean squares
Least squares approximations
BT: Approximation methods
Mean square error methods
Optimization
Recursive estimation
NT: Least mean squares
Least squares approximations
LED
USE: Light emitting diodes
LED lamps
USE: AC light emitting diode lamps
AC-LED lamps
Light emitting diode lamps
Lamps
Light emitting diodes
Light sources
Left handed materials
USE: Metamaterials
Left-handed materials
USE: Metamaterials
Leg
BT: Extremities
Legal aspects
USE: Law
Legal factors
BT: Engineering management
Censorship
Ethical aspects
Governmental factors
IEEE Corporate activities
Law enforcement
Patents
Product liability
Software protection
Trademarks
Legged locomotion
BT: Mobile robots
Biased locomotion
Gait assessment
Gait control
Gait disorders
Walking
Control systems
Motion control
Stairs
Legislation
BT: Government
NT: General Data Protection
Length measurement
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2021 IEEE Thesaurus

**Lens**
- **BT:** Measurement
- **RT:** Micrometers
  - Size measurement

**Lenses**
- **USE:** Lenses

**LEO**
- **USE:** Low earth orbit satellites

**Lesions**
- **BT:** Tumors
- **NT:** Tissue damage

**Levee**
- **UF:** Dike
  - Levee system
- **BT:** Geoscience

**Levee system**
- **USE:** Levee

**Level control**
- **UF:** Liquid level control
- **BT:** Mechanical variables
  - Control
- **NT:** Gyroscopes

**Level measurement**
- **UF:** Liquid level measurement
- **BT:** Geodesy

**Level set**
- **BT:** Calculus
  - Gradient methods

**Levels, energy**
- **USE:** Energy states

**Levitation**
- **BT:** Physics
- **NT:** Electrostatic levitation
  - Magnetic levitation

**LF noise**
- **USE:** Low-frequency noise

**LHC**
- **USE:** Large Hadron Collider

**Li**
- **USE:** Lithium

**Li-fi**
- **USE:** Light fidelity

**Li-ion batteries**
- **USE:** Lithium-ion batteries

**Li-S batteries**
- **USE:** Lithium-sulfur batteries

**Libraries**
- **BT:** Information services
- **NT:** Software libraries

**Licence**
- **USE:** Licenses

**License plate recognition**
- **USE:** Optical character recognition software

**Licenses**
- **UF:** Licence
  - Licensing
- **BT:** Contracts
  - Must-carry

**Licensing**
- **USE:** Licenses

**Licensing (nuclear facilities)**
- **USE:** Nuclear facility regulation

**Lidar**
- **USE:** Laser radar

**Life estimation**
- **UF:** Accelerated testing
  - BT: Estimation
  - RT: Aging
  - Failure analysis
  - Fatigue
  - Insulation life

**Life long learning**
- **USE:** Continuing professional development

**Life sciences**
- **UF:** Computational life sciences
  - **BT:** Science - general
  - **RT:** Animals

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Biology
Plants (biology)

Life sciences computing
USE: Computational modeling

Life testing
BT: Testing
RT: Reliability

Lifetime estimation
UF: Lifetime measurement
BT: Measurement

Lifetime measurement
USE: Lifetime estimation

Lifetime tests
USE: Lifetime estimation

lifi
USE: Light fidelity

Lifting equipment
UF: Hoists
Jacks
BT: Materials handling equipment
RT: Freight handling
Materials handling
Pulleys
Winches
NT: Cranes

Ligaments
BT: Musculoskeletal system

Light attenuation
USE: Attenuation

Light deflectors
BT: Optical devices
RT: Bragg gratings

Light emitters
USE: Light emitting diodes

Light emitting diode lamps
USE: LED lamps

Light emitting diodes
UF: LED
LEDs
Light emitters

Light fidelity
UF: li-fi
lifi
BT: Wireless LAN
RT: High-speed optical techniques

IEEE 802.15 Standard
Optical fiber networks
Radio frequency
Visible light communication
Wireless communication
Wireless fidelity

Light fields
BT: Optics

Light interferometry
USE: Optical interferometry

Light polarization
USE: Optical polarization

Light rail systems
UF: Light railways
Streetcars
BT: Rail transportation
RT: Public transportation

Light railways
USE: Light rail systems

Light scattering
BT: Scattering
RT: Optical scattering
Resonance light scattering

Light sources
BT: Optics
<table>
<thead>
<tr>
<th>RT: Arc discharges</th>
<th>RT: High intensity discharge lamps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glow discharge devices</td>
<td>Lamps</td>
</tr>
<tr>
<td>High intensity discharge</td>
<td>Light sources</td>
</tr>
<tr>
<td>LED lamps</td>
<td>Lighting</td>
</tr>
<tr>
<td>Lamps</td>
<td>BT: Meteorology</td>
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<tr>
<td>Lasers</td>
<td>RT: Dielectric breakdown</td>
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<tr>
<td>Lighting</td>
<td>Electrostatic processes</td>
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<tr>
<td>Lighting control</td>
<td>Storms</td>
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<tr>
<td>Photometry</td>
<td>NT: Lightning protection</td>
</tr>
<tr>
<td>Supercontinuum generation</td>
<td>Lightning</td>
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<tr>
<td>Synchrotron radiation</td>
<td></td>
</tr>
<tr>
<td>NT: Electroluminescent devices</td>
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<tr>
<td>Fast light</td>
<td>Lightning protection</td>
</tr>
<tr>
<td>Luminescent devices</td>
<td>BT: Lightning</td>
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<tr>
<td>Phosphors</td>
<td>Protection</td>
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<tr>
<td>Slow light</td>
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<td>Stray light</td>
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<tr>
<td>Superluminescent diodes</td>
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<td>Ultraviolet sources</td>
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<tr>
<td>Light trapping</td>
<td></td>
</tr>
<tr>
<td>UF: Plasmonic solar cells</td>
<td></td>
</tr>
<tr>
<td>BT: Photovoltaic cells</td>
<td></td>
</tr>
<tr>
<td>RT: Reflectivity</td>
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<tr>
<td>Light-emitting diodes</td>
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<tr>
<td>USE: Light emitting diodes</td>
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<tr>
<td>Limit cycle</td>
<td>Limbic system</td>
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<tr>
<td>BT: Brain</td>
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<tr>
<td>Lighting</td>
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</tr>
<tr>
<td>UF: Arc lamps</td>
<td></td>
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<tr>
<td>Illumination</td>
<td>Limit cycle</td>
</tr>
<tr>
<td>Optical devices</td>
<td>USE: Limit-cycles</td>
</tr>
<tr>
<td>BT: Building services</td>
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<tr>
<td>Buildings</td>
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<td>Filament lamps</td>
<td>Limit-cycles</td>
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<td>Fluorescent lamps</td>
<td>USE: Limit-cycles</td>
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<td>Gas discharge devices</td>
<td>Limit-cycles</td>
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<td>High intensity discharge</td>
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<td>Light sources</td>
<td>Limiting</td>
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<td>Lighting control</td>
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<tr>
<td>Photometry</td>
<td>BT: Signal processing</td>
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<tr>
<td>Quantum radar</td>
<td>RT: Nonlinear distortion</td>
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<tr>
<td>Visible light communication</td>
<td>Voltage control</td>
</tr>
<tr>
<td>NT: Daylighting</td>
<td></td>
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<tr>
<td>Electrical ballasts</td>
<td></td>
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<tr>
<td>Emergency lighting</td>
<td>Linac</td>
</tr>
<tr>
<td>Lamps</td>
<td>USE: Linear particle accelerator</td>
</tr>
<tr>
<td>Solid state lighting</td>
<td>LINACS</td>
</tr>
<tr>
<td>USE: Linear accelerators</td>
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<tr>
<td>Lighting control</td>
<td>Line enhancers</td>
</tr>
<tr>
<td>UF: Illumination control</td>
<td></td>
</tr>
<tr>
<td>BT: Optical control</td>
<td>BT: Adaptive systems</td>
</tr>
<tr>
<td>RT: Digital filters</td>
<td></td>
</tr>
</tbody>
</table>
Filtering theory

Line output transformer
USE: Flyback transformers

Line-of-sight propagation
BT: Electromagnetic radiation

Linear accelerators
UF: LINACS
BT: Particle accelerators
RT: Collimators

Linear algebra
UF: Linear systems (algebraic)
BT: Algebra
RT: Eigenvalues and eigenfunctions
NT: Linear programming
Matrices
Vectors

Linear antenna arrays
BT: Antenna arrays

Linear approximation
BT: Approximation methods
RT: Nonlinear equations
Nonlinear systems

Linear circuits
BT: Circuits
RT: Ohmic contacts

Linear codes
BT: Block codes
RT: Error correction
NT: Polar codes

Linear discriminant analysis
UF: Linear discriminant classification
BT: Statistics
RT: Machine learning

Linear discriminant classification
USE: Linear discriminant analysis

Linear feedback control systems
BT: Control systems
Cybernetics
RT: Linear systems
Frequency locked loops
Phase locked loops
State feedback

Linear feedback shift registers
BT: Shift registers

Linear filtering
USE: Maximum likelihood detection

Linear frequency modulation
USE: Chirp modulation

Linear integrated circuits
USE: Analog integrated circuits

Linear matrix inequalities
BT: Mathematics
RT: Linear systems
Uncertain systems

Linear parameter varying systems
USE: Linear systems

Linear particle accelerator
UF: Linac
BT: Particle accelerator
instrumentation computing
High energy physics

Linear predictive coding
BT: Prediction methods

Linear programming
UF: Linear-programming
BT: Linear algebra
RT: Algorithms
Microeconomics
Operations research
Optimization methods
NT: Data envelopment analysis
Integer programming

Linear regression
BT: Regression analysis
NT: Maximum likelihood linear regression

Linear systems
UF: Linear parameter varying systems
BT: Mathematics
RT: Control systems
Linear feedback control systems
NT: Linear matrix inequalities
Principal component analysis
Transfer functions

Linear systems (algebraic)
USE: Linear algebra

Linear-programming
USE: Linear programming

Linearisation techniques
USE: Linearization techniques

Linearity
BT: Electromagnetic measurements

Linearization techniques
UF: Linearisation techniques
BT: Mathematics
RT: Control system synthesis
Control systems
MOSFET circuits
Modulation
Operational amplifiers
Transmitters

Linguistic indexing
USE: Image annotation

Linguistics
BT: Natural languages
RT: Semiotics
NT: Phonetics
Pragmatics

Link aggregation
BT: Telecommunication network topology

Linkages
USE: Couplings

Linked data
BT: Internet
RT: Big Data
Database systems
Knowledge based systems
Knowledge representation
Metadata
NoSQL databases
Ontologies
Open data
Query processing
Semantic Web

Linkedin
USE: Social networking (online)

Linking
USE: Joining processes

Linux
BT: High level languages

Lipid bilayers
USE: Lipidomics

Lipidomics
UF: Lipid bilayers
Lipids
BT: Molecular biomarkers
RT: Fats

Lips
BT: Head
RT: Stomatognathic system

Liquefied natural gas
UF: LNG
BT: Natural gas

Liquid cooling
BT: Cooling
NT: Indirect liquid cooling

Liquid crystal devices
UF: Liquid-crystal devices
BT: Displays
RT: Electro-optical devices
Liquid crystals
Microdisplays
Thin film transistors
NT: Liquid crystal displays
Liquid crystal on silicon

Liquid crystal displays
UF: LCD
LCDs
BT: Liquid crystal devices
NT: Active matrix liquid crystal displays

Liquid crystal on silicon
UF: Lcos
BT: Liquid crystal devices
2021 IEEE Thesaurus

RT: Integrated optoelectronics
Microdisplays

Batteries

NT: Lithium compounds

Lithium batteries

BT: Batteries

Liquid crystal polymers

UF: Liquid-crystal polymers

Lithium compounds

BT: Lithium

Lithium compounds

RT: Alloying

Batteries

NT: Lithium batteries

Lithium niobate

Lithium-ion batteries

USE: Lithium-ion batteries

Lithium niobate

BT: Lithium compounds

Lithium-ion batteries

USE: Li-ion batteries

Lithium-ion batteries

BT: Batteries

Lithium-sulfur batteries

USE: Li-S batteries

Lithium-sulfur batteries

BT: Batteries

Lithography

UF: Photolithography

Lithography

BT: Manufacturing

Lithography

RT: Nanotechnology

Lithography

Printing

Lithography

Proximity effects

Lithography

Colloidal lithography

Lithography

Extreme ultraviolet

Lithography

Interferometric lithography

Lithography

Nanolithography

Soft lithography

Lithography

Stereolithography

Lithography

X-ray lithography

Lithotripsy

BT: Medical treatment

Lithotripsy

RT: Kidney stones

Lithotripsy

Lithotriptors

BT: Biomedical equipment

Lithotripsy

RT: Lithotripsy

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver

BT: Digestive system

Liver
Load modeling
BT: Modeling
Power system modeling
RT: Power demand

Load shedding
BT: Load management
RT: Power distribution

Load tap changers
USE: On load tap changers

Load variations
USE: Load management

Loaded antennas
BT: Antennas

Loaded waveguides
BT: Electromagnetic waveguides
RT: Dielectric materials
Waveguide discontinuities

Loading
BT: Freight handling
RT: Containers
Filling
Grippers
Pulleys

Loans and mortgages
UF: Mortgages
BT: Financial management

Local area network emulation
USE: LAN emulation

Local area networks
UF: LAN
BT: Communication systems
Digital systems
RT: Distributed computing
Ethernet
FDDI
Field buses
File servers
IEEE 802.3 Standard
IPTV
Internetworking
LAN interconnection
Media Access Protocol
Multiprocessor

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Office automation
Open systems
Protocols
Regional area networks
Storage area networks
Token networks
Virtual private networks
NT: Wireless LAN

Local authorities
USE: Local government

Local government
UF: Local authorities
BT: Government

Local oscillators
BT: Oscillators

Localization
USE: Location awareness

Location awareness
UF: Geo tagging
Location
Location based services
Location metadata
Mobile location
management
Mobile radio mobility
management
BT: Mobile communication
RT: Cellular radio
Intercell interference
Land mobile radio
Mobile computing
Navigation
Personal communication
networks
Position measurement
Wireless communication
NT: Network location
awareness

Location based services
USE: Location awareness

Location metadata
USE: Location awareness

Log normal distribution
USE: Log-normal distribution
NT: Combinational circuits

Log-periodic dipole antennas
UF: LDPA
BT: Antennas

Logic
UF: Formal logic
BT: Computational and artificial intelligence
RT: Boolean algebra
Cognitive science
Computer science
Logic circuits
Logic functions
NT: Fuzzy logic
Multivalued logic
Probabilistic logic
Sufficient conditions

Logic arrays
BT: Circuits
NT: Logic circuits
Programmable logic arrays

Logic CAD
USE: Logic design

Logic circuit testing
USE: Logic testing

Logic circuits
BT: Circuits
RT: Adders
Computers and information processing
Counting circuits
Digital circuits
Digital integrated circuits
Flip-flops
Logic
Logic design
Logic devices
Logic functions
Multiplying circuits
Pulse inverters
Shift registers

Logic arrays
Programmable logic arrays
2021 IEEE Thesaurus

Superconducting logic

Logic design
UF: Circuit design (logic)
Logic CAD
Design automation
CU: Circuit synthesis
Design for testability
Design methodology
Engineering education
Logic circuits
Timing
NT: Reconfigurable logic

Logic devices
BT: Circuits and systems
CU: Logic circuits
NT: Logic gates
Programmable logic

Logic functions
BT: Boolean functions
CU: Logic
Logic circuits
Multivalued logic

Logic gates
BT: Logic devices
CU: Boolean algebra

Logic inverters
USE: Pulse inverters

Logic programming
BT: Programming
NT: Constraint handling

Logic test
USE: Logic testing

Logic testing
UF: Logic circuit testing
CU: Logic test
Integrated circuit testing
CU: Design for testability
Logical decomposition
USE: System analysis and design

Logistics
UF: Physical distribution
management
BT: Production management

Long short term memory
UF: LSTM
BT: Artificial neural networks
RT: Machine learning

Long Term Evolution
UF: LTE
BT: LTE advanced
RT: 3GPP Standards
Communication standards
4G mobile communication
High-speed networks
Mobile communication
Mobile handsets
Wireless communication

Look-up table
USE: Table lookup

Look-up table
USE: Table lookup

Loop-filtering algorithm
USE: Filtering algorithms

LOPT
USE: Flyback transformers

Loran
USE: Radio navigation

Lorentz covariance
UF: Lorentz force
BT: Physics

Lorentz force
USE: Lorentz covariance

Lorentz invariance
USE: Lorentz covariance

Loss measurement
BT: Measurement
RT: Attenuation measurement
Magnetic losses
Optical losses
NT: Packet loss

Lot sizing
BT: Production control
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Low-earth-orbit</td>
<td>USE: Low earth orbit satellites</td>
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<tr>
<td>Low-frequency noise</td>
<td>UF: LF noise, BT: Noise</td>
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<tr>
<td>Low-latency communication</td>
<td>USE: Low latency communication</td>
</tr>
<tr>
<td>Low-noise amplifiers</td>
<td>UF: Low noise amplifiers, BT: Amplifiers</td>
</tr>
<tr>
<td>Low-pass filters</td>
<td>UF: Low pass filters, BT: Filters</td>
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<td>Low-power electronics</td>
<td>UF: Low power electronics, BT: Consumer electronics</td>
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<tr>
<td>Low-temperature plasmas</td>
<td>USE: Low temperature plasmas</td>
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<tr>
<td>Low-voltage</td>
<td>USE: Low voltage</td>
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<tr>
<td>LSI</td>
<td>USE: Large scale integration</td>
</tr>
<tr>
<td>LSTM</td>
<td>USE: Long short term memory</td>
</tr>
<tr>
<td>LTE</td>
<td>USE: Long Term Evolution</td>
</tr>
<tr>
<td>LTE advanced</td>
<td>USE: Long Term Evolution</td>
</tr>
<tr>
<td>Lubricants</td>
<td>UF: Cutting fluids, BT: Production materials, RT: Lubrication</td>
</tr>
<tr>
<td>Materials requirements planning</td>
<td></td>
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<tr>
<td>RT:</td>
<td>Materials requirements planning</td>
</tr>
<tr>
<td>BT: Audio systems</td>
<td></td>
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<tr>
<td>RT: Acoustic distortion</td>
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<td>Low density parity check codes</td>
<td>USE: Parity check codes</td>
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<td>Low earth orbit satellites</td>
<td>USE: Low-earth-orbit, BT: Artificial satellites</td>
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<td>Low fossile fuel economy</td>
<td>USE: Low-carbon economy</td>
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<td>Low latency communication</td>
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<td>Low noise amplifiers</td>
<td>USE: Low-noise amplifiers</td>
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<td>Greenhouse effect</td>
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<td>Renewable energy sources</td>
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<table>
<thead>
<tr>
<th>Term</th>
<th>UF:</th>
<th>BT:</th>
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<tbody>
<tr>
<td>Lubricating oils</td>
<td>Oil filters</td>
<td>Chemical elements</td>
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<td>Oiling (lubrication)</td>
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<td>Lyapunov function</td>
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<td>Mechanical factors</td>
<td>Lyapunov methods</td>
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<td>Mechanical bearings</td>
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<td>Optics</td>
<td>Lyapunov stability</td>
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<td>Muon colliders</td>
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<td>Scintillators</td>
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<td>Bioluminescence</td>
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<td>Electroluminescence</td>
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<td>Fluorescence</td>
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<td>Phosphorescence</td>
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<td>Light sources</td>
<td>M2M</td>
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<td>Muon colliders</td>
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<td>Electroluminescent devices</td>
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<td>Lunar</td>
<td>Moon</td>
<td>MAC</td>
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<td></td>
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<td>MAC protocol</td>
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<td>Lung</td>
<td>Respiratory system</td>
<td>Machine-to-machine communications</td>
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<td>Pulmonary diseases</td>
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<td></td>
<td>Pulmonology</td>
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<td>Lung cancer</td>
<td>Cancer</td>
<td>Mach-Zehnder modulation</td>
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<td>Mach-Zehnder interferometers</td>
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<td>Lung diseases</td>
<td>Pulmonary diseases</td>
<td>Machine added indexing</td>
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<td>Machine aided indexing</td>
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<td>Lung neoplasms</td>
<td>Neoplasms</td>
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<tr>
<td>LUT</td>
<td>Table lookup</td>
<td>Machine assisted indexing</td>
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<td>Lutecium</td>
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</table>
Machine aided indexing
Machine-assisted indexing

BT: Indexes
RT: Indexing

Machine components

<table>
<thead>
<tr>
<th>BT: Machinery</th>
<th>RT: Machinery components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couplings</td>
<td>Mechanical products</td>
</tr>
<tr>
<td>Engines</td>
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<tr>
<td>Gears</td>
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<tr>
<td>Turbomachinery</td>
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<tr>
<td>Wheels</td>
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</tr>
</tbody>
</table>

NT: Air cleaners
Belts
Cams
Engine cylinders
Exhaust systems
Impellers
Intake systems
Manifolds
Mechanical splines
Pistons
Rotors
Shafts
Valves

Machine control

BT: Industrial electronics
NT: Machine vector control

Machine ethics

UF: Computational ethics
Computational morality
Machine morality
Ethics
Technology
Artificial intelligence
Philosophical considerations

Machine indexin
USE: Machine assisted indexing

Machine intelligence

BT: Computational and artificial intelligence
RT: Machine-to-machine communications

NT: Pattern analysis

Machine tools

BT: Production equipment
RT: Coordinate measuring machines

Cutting tools
Fixtures
Gears
Hand tools
Hobbing machines
Machine shops
Machining

Machine-learning algorithms

BT: Algorithms

Machine morality

USE: Machine ethics

Machine shops

BT: Production facilities
RT: Machine tools

Machinery production industries
Machining

Machine tool spindles

UF: Spindle bearings
BT: Machine tools
RT: Mechanical splines

Shafts

2021 IEEE Thesaurus

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Manufacturing Mechanical guides
Turning NT: Dies
Drilling machines Grinding machines Machine tool spindles Metalworking machines Milling machines Presses NT: Massive machine type
Sawing machines Machine translation
BT: Computational linguistics Natural language processing Machine vector control
BT: Machine control AC-DC power converters DC-DC power converters Machine vision
UF: Vision systems (nonbiological)
BT: Windings Machine-added indexing
USE: Machine assisted indexing Machine-aided indexing
USE: Machine assisted indexing Machine-assisted indexing
USE: Machine assisted indexing Machine-learning
USE: Machine learning Machine-to-machine communications
UF: M2M Machine translation
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BT: Communication systems
RT: IP networks
Industrial Internet of Things Internet of Things Machine intelligence Remote monitoring Tactile Internet Wireless communication Wireless sensor networks NT: Massive machine type communications
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USE: Machine assisted indexing Machine-aided indexing
USE: Machine assisted indexing Machine-assisted indexing
USE: Machine assisted indexing Machine-learning
USE: Machine learning Machine-to-machine communications
UF: M2M
2021 IEEE Thesaurus

Laser beam machining
Milling
Planing
Sawing
Turning
Virtual machining

Macrocell networks
UF: Macrocells
BT: Cellular networks
RT: Rural areas

Macrocells
USE: Macrocell networks

Macroeconomics
BT: Economics
RT: Government
International trade
Public finance
NT: Privatization

Maglev
USE: Magnetic levitation

Maglev trains
USE: Magnetic levitation vehicles

Maglev transportation
USE: Magnetic levitation vehicles

Maglev vehicles
USE: Magnetic levitation vehicles

Magnesium
UF: Mg
BT: Metals
NT: Magnesium compounds

Magnesium compounds
BT: Magnesium
NT: Magnesium oxide

Magnesium oxide
UF: Irtran 5
MgO
BT: Magnesium compounds
RT: Ceramics
Optical materials

Magnetic analysis
BT: Magnetics
RT: Electromagnetic analysis
Magnetic fields
NT: Magnetization

Magnetic anisotropy
BT: Magnetics
NT: Magnetic domain walls
Magnetic domains
Magnetic moments
Perpendicular magnetic anisotropy

Magnetic anomaly detection
BT: Magnetic variables
measurement
RT: Magnetic fields
Object detection

Magnetic anomaly detectors
BT: Magnetometers
RT: Magnetic fields
Military equipment
Object detection

Magnetic bearings
USE: Magnetic levitation

Magnetic circuits
BT: Circuits
RT: Coils
Magnetic devices
Windings

Magnetic communication
BT: Communication systems
RT: Electromagnetic induction
Near field communication

Magnetic confinement
BT: Plasma confinement
RT: Electromagnets
Fusion power generation
Tokamak devices
Tokamaks

Magnetic core losses
USE: Magnetic losses

Magnetic cores
BT: Magnetic devices
RT: Inductors
NT: Transformer cores

Magnetic devices
BT: Magnetics
RT: Magnetic circuits
Magnetic materials
NT: Accelerator magnets
<table>
<thead>
<tr>
<th>Magnetic devices</th>
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<td>Ferrite devices</td>
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<td>Magnetostatics</td>
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<td>Magnetic gears</td>
<td>Toroidal magnetic fields</td>
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</table>

**Magnetic domain walls**

- BT: Magnetic anisotropy

**Magnetic domains**

- BT: Magnetic anisotropy

**Magnetic field induced strain**

- BT: Magnetomechanical effects
- RT: Ferroelectric films
- Ferroelectric materials
- MISFETs
- Semiconductor diodes
- Semiconductor films
- Semiconductor-metal

**Magnetic field measurement**

- BT: Magnetic variables
- RT: Magnetic fields

**Magnetic fields**

- BT: Magnetics
- RT: Biomagnetics
- Compass
- Critical current density

**Magnetic flux**

- BT: Magnetics
- RT: Remanence
- NT: Flux pinning
- Magnetic flux density
- Magnetic flux leakage

**Magnetic flux density**

- BT: Magnetic flux

**Magnetic flux leakage**

- BT: Magnetic flux
- RT: Nondestructive testing
- Magnetic flux leakage

**Magnetic force microscopy**

- BT: Magnetics
- RT: Atomic force microscopy
- Magnetic forces

**Magnetic forces**

- BT: Magnetics
- RT: Electromagnetic forces
- Magnetic force microscopy
- Magnetic levitation
- NT: Coercive force

**Magnetic gears**

- BT: Gears
- Magnetic devices
- Magnetic levitation
- NT: Permanent magnets

**Magnetic memory**

- Magnetic modulators
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<th><strong>Power transmission</strong></th>
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Magnetic permeability  
USE: Permeability

Magnetic properties  
BT: Magnetics

Magnetic reconnection  
BT: Magnetic fields

Magnetic recording  
UF: Perpendicular recording  
BT: Recording  
RT: Magnetic heads  
Memory  
NT: Digital magnetic recording  
Heat-assisted magnetic recording  
Magnetic noise  
Magneto optic recording  
Microwave-assisted magnetic recording  
Perpendicular magnetic recording  
Shingled magnetic recording

Magnetic resonance  
BT: Resonance  
Ferro resonance  
Magnetic resonance imaging  
NT: Antiferromagnetic resonance  
Ferromagnetic resonance  
Nuclear magnetic resonance  
Paramagnetic resonance

Magnetic resonance elastography  
BT: Magnetic resonance imaging

Magnetic resonance fingerprinting  
BT: Magnetic resonance imaging

Magnetic resonance imaging  
UF: Biomedical MRI  
MRI  
NMR imaging  
Nuclear magnetic resonance imaging  
BT: Imaging  
Diagnostic radiography

Magnetic semiconductors  
BT: Magnetic materials  
Semiconductor materials

Magnetic sensors  
BT: Magnetics  
Sensors  
NT: Spin valves

Magnetic separation  
UF: Magnetic filters  
BT: Magnetic fields  
RT: Particle separators

Magnetic shielding  
BT: Electromagnetic shielding

Magnetic stimulation  
BT: Medical treatment

Magnetic storage  
USE: Magnetic memory

Magnetic superlattices  
BT: Magnetic materials  
Superlattices

Magnetic susceptibility  
BT: Magnetics

Magnetic switching  
BT: Magnetics

Magnetic thin films  
USE: Magnetic films

Magnetic tunnel junctions  
USE: Magnetic tunneling

Magnetic tunneling  
UF: Magnetic tunnel junctions  
Magnetic tunnelling  
Spin-dependent tunnelling  
Spin-dependent tunnelling

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Magnetic tunnelling
USE: Magnetic tunneling

Magnetic variables control
BT: Control systems

Magnetic variables measurement
UF: Magnetic measurements
BT: Measurement
NT: Magnetic anomaly
detection
measurement
Magnetic field
Magnetometers
Permeability measurement

Magnetics
NT: Biomagnetics
Demagnetization
Gyromagnetism
Magnetic analysis
Magnetic anisotropy
Magnetic devices
Magnetic fields
Magnetic flux
Magnetic force microscopy
Magnetic forces
Magnetic hysteresis
Magnetic levitation
Magnetic losses
Magnetic materials
Magnetic multilayers
Magnetic particles
Magnetic properties
Magnetic sensors
Magnetic susceptibility
Magnetic switching
Magnetization processes
Magnetoacoustic effects
Magnetoelastic effects
Magneto mechanical effects
Magneto optic effects
Magnets
Magnonics
Microwave magnetics
Nonlinear magnetics
Remanence

Magnetisation processes
USE: Magnetization processes

Magnetisation reversal
USE: Magnetization reversal

Magnetization
UF: Magnetisation
BT: Magnetic analysis

Magnetization processes
UF: Magnetisation processes
BT: Magnetics
RT: Hysteresis
NT: Magnetization reversal
Saturation magnetization

Magnetization reversal
UF: Magnetisation reversal
BT: Magnetization processes

Magneto electrical resistivity imaging
technique
UF: MERIT
BT: Imaging
RT: Geophysical measurement

Magnetoacoustic effects
UF: Acoustomagnetic effects
BT: Magnetics
RT: Acoustics
Magneto mechanical effects

Magnetoelasticity
BT: Magnetomechanical effects
RT: Magnetic materials
NT: Magnetostriction

Magneto electric effects
BT: Magnetics
NT: Hall effect

Magneto electronic devices
USE: Magnetoelectronics

Magnetoelectronics
UF: Magneto electronic devices
BT: Magneto electric effects
RT: Magnetic tunneling
Magneto resistive devices
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NT:

Spin polarized transport

Magnetoencephalography
BT:
Biomagnetics
RT:
Biomedical image
processing
Brain
Magnetofluid dynamics
USE:
Magnetohydrodynamics
Magnetofluiddynamics
USE:
Magnetohydrodynamics
Magnetohydrodynamic power generation
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Power generation
RT:
Magnetohydrodynamics
Magnetohydrodynamics
UF:
Hydromagnetics
MHD
Magnetofluid dynamics
Magnetofluiddynamics
BT:
Dynamics
Hydrodynamics
Mechanical factors
RT:
Electrohydraulics
Fluid flow
Magnetohydrodynamic
power generation
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Piezomagnetic effects
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Mechanical factors
Stress
NT:
Magnetic field induced
strain
Magnetoelasticity
Magnetostriction
Magnetometers
UF:
BT:
measurement
NT:
detectors

Magnetometry
Magnetic variables
Magnetic anomaly

BT:
RT:

Magnetic devices
Magnetooptic effects

Magnetooptic effects
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Magnetic recording
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Magnetooptic effects
Magnetoresistance
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Magnetoresistivity
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Magnetoelectric effects
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Magnetoresistive devices
Nanocontacts
Spin polarized transport
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Anisotropic
magnetoresistance
Ballistic magnetoresistance
Colossal
magnetoresistance
Enhanced
magnetoresistance
Extraordinary
magnetoresistance
Giant magnetoresistance
Ordinary
magnetoresistance
Tunneling
magnetoresistance
Magnetoresistive devices
UF:
Magnetoresistors
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Giant magnetoresistance
Magnetic heads
Magnetoelectronics
Magnetoresistance
Tunneling
magnetoresistance

SQUID magnetometers
Magnetometry
USE:

Magnetoresistivity
USE:

Magnetoresistance

Magnetoresistors
USE:

Magnetoresistive devices

Magnetometers

Magnetooptic devices
UF:
Photomagnetic devices

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<td>RT:</td>
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<td>Terrestrial atmosphere</td>
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<tr>
<td>MAI</td>
<td></td>
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<tr>
<td>USE: Machine assisted indexing</td>
<td></td>
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<td>Mail</td>
<td></td>
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<td>USE: Postal services</td>
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<td>Mail (electronic)</td>
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<td>USE: Electronic mail</td>
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### Maintenance
<table>
<thead>
<tr>
<th>BT: Reliability</th>
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</table>

### Maintenance engineering
| UF: Repair |
| BT: Engineering - general |
| RT: Automatic testing |
| Availability |
| Fault diagnosis |
| Configuration management |
| Inspection |
| Monitoring |
| Remaining life assessment |
| Testing |
| NT: Maintenance management |
| Predictive maintenance |
| Preventive maintenance |
| Systems support |

### Maintenance management
| BT: Maintenance engineering |
| Technical management |

### Major depressive disorder
| USE: Depression |

### Maldistribution
| BT: Reliability |

### Malicious software
| USE: Malware |

### Malignancy
| USE: Cancer |

### Malignant
| USE: Cancer |

### Malignant tumors
| BT: Tumors |

### Malware
| UF: Malicious software |
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<th>BT: Software</th>
<th>Management training</th>
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<td>RT: Anti-virus software</td>
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<td>Personnel</td>
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<td>Phishing</td>
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<td>Asset management</td>
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<td>Security</td>
<td>Best practices</td>
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<tr>
<td>NT: Computer viruses</td>
<td>Building management</td>
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<td>Computer worms</td>
<td>Business continuity</td>
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<td>Ransomware</td>
<td>Business process</td>
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<td>Rootkit</td>
<td>Trojan horses management</td>
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<td>NT: Computer viruses systems</td>
<td>Business process re-engineering</td>
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**Mammary glands**

<table>
<thead>
<tr>
<th>BT: Glands</th>
<th>Communication system operations and management</th>
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**Mammary neoplasms**

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<td>Contingency management</td>
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**Mammography**

<table>
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<th>Contract management</th>
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<tbody>
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<td>Contracts</td>
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**Man-machine systems**

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<tr>
<td>USE: User interfaces</td>
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<td>USE: User interfaces planning</td>
<td>Distributed management</td>
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**Man-machine interfaces**

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<th>Enterprise resource</th>
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**Man-machine systems**

<table>
<thead>
<tr>
<th>UF: Cyborgs</th>
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<td>UF: Human computer</td>
<td>Interface management</td>
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<td>BT: Man machine systems management</td>
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<td>BT: Systems, man, and cybernetics</td>
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<td>RT: Androids</td>
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<td>RT: Ergonomics</td>
<td>Outsourcing</td>
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<td>RT: Human computer interaction</td>
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<td>NT: Digital intelligence</td>
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<td>NT: Tactile Internet</td>
<td>Program management</td>
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<td>NT: Extended reality</td>
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**Management**

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Management accounting
- BT: Financial management
- RT: Company reports
- NT: Cost accounting

Management information base
- UF: MIB
- BT: Computer network management
- RT: Information systems
- NT: Portals

Management information systems
- BT: Information systems management
- RT: Customer relationship management
- KM: Knowledge management
- NM: Supply chain management

Management training
- BT: Training
- RT: Continuing education

MANET
- USE: Mobile ad hoc networks

Manganese
- UF: Mn
- BT: Metals
- NT: Manganese alloys

Manganese alloys
- BT: Manganese

Manifold learning
- BT: Dimensionality reduction
- RT: Learning (artificial intelligence)

Manipulator dynamics
- BT: Manipulators

Manipulator sensing systems
- USE: Robot sensing systems

Manipulator vision systems
- USE: Robot vision systems

Manipulators
- UF: Arms (robotic)
- BT: Robots
- RT: Assembly

Manipulators (nonrobotic)
- USE: Remote handling

Manpower planning
- USE: Labor resources

Manuals
- UF: Technical manuals
- BT: Professional communication
- RT: Documentation

Manufactured products
- UF: Counterfeit goods
- BT: Manufacturing
- RT: Product customization
- NT: Ceramic products

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### Manufacturing

<table>
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### Manufacturing economics

- USE: Industrial economics

### Manufacturing facilities

- USE: Production facilities

### Manufacturing industries

- BT: Industries
- NT: Aerospace industry
- Cement industry
- Ceramics industry
- Clothing industry
- Electrical products industry
- Electronics industry
- Food industry
- Footwear industry
- Fuel processing industries
- Glass industry
- Machinery production
- Metal product industries
- Plastics industry
- Pulp and paper industry
- Rubber industry
- Shipbuilding industry
- Textile industry
- Toy manufacturing industry

### Manufacturing management

- USE: Production management

### Manufacturing process

- USE: Manufacturing processes

### Manufacturing processes

- UF: Compliant mechanisms
- Froth flotation
- Manufacturing process
- Manufacturing systems
- Rapid prototyping

### Manufacturing systems

- BT: Manufacturing
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<td>Underwater structures</td>
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</table>

**Markov decision processes**
- USE: Markov processes

**Markov network**
- USE: Markov random fields

### Marine transportation
- BT: Marine technology
- RT: Global Positioning System
- Seaports
- NT: Marine vehicles

### Marine vegetation
- UF: Ocean vegetation
- Sea vegetation
- BT: Vegetation

### Marine vehicles
- UF: Ships
- BT: Marine transportation
- RT: Marine accidents
- Marine safety
- Propellers
- Seaports
- NT: Boats
- Marine robots
- Underwater vehicles

### Market opportunities
- BT: Marketing management
- Consumer behavior
- Customer profiles
- Disruptive innovation
- Disruptive technologies
- Emissions trading

### Market research
- BT: Customer relationship management
- Engineering management
- Brand management
- Competitive intelligence
- Consumer products
- Customer satisfaction

### Marketing management
- BT: Management
- Electronic commerce
- Public relations
- NT: Advertising

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# 2021 IEEE Thesaurus

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## Materials handling equipment

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## Materials handling systems

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<tr>
<td>Swaging</td>
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</tr>
</tbody>
</table>

**Materials reliability**

- **BT**: Materials science and technology
- **Reliability**
- **RT**: Green's function methods

**Materials requirements planning**

- **UF**: MRP
- **BT**: Production planning
- **RT**: Lot sizing
- **Scheduling**
- **Supply chain management**
- **Supply chains**
- **NT**: Bills of materials

**Materials science and technology**

- **USE**: Materials science and technology

**Materials, elements, and compounds**

- **NT**: Chemical elements
- **Compounds**
- **Material storage**
- **Materials**
- **Materials science and technology**
- **Metals**

**Maternity benefits**

- **USE**: Employee welfare

**Mathematical analysis**

- **BT**: Mathematical model
- **NT**: Formal concept analysis
- **Fractional calculus**
- **Modal analysis**

**Mathematical model**

- **BT**: Mathematics
- **RT**: Artificial neural networks
- **NT**: Mathematical analysis

**Mathematical programming**

- **BT**: Mathematics
- **Optimization methods**

**Mathematics**

- **RT**: Bio-inspired computing
- **Econometrics**
<table>
<thead>
<tr>
<th>Mathematics computing</th>
<th>BT: Computer applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT: Matlab</td>
<td></td>
</tr>
<tr>
<td>Matlab</td>
<td></td>
</tr>
<tr>
<td>UF: Matrix laboratory</td>
<td></td>
</tr>
<tr>
<td>BT: Mathematics computing</td>
<td></td>
</tr>
<tr>
<td>RT: Computer aided instruction</td>
<td></td>
</tr>
<tr>
<td>Numerical analysis</td>
<td></td>
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<tr>
<td>Simulation</td>
<td></td>
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<tr>
<td>Software libraries</td>
<td></td>
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<td>Matrices</td>
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<td>USE: Matrices</td>
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<tr>
<td>Matrix algebra</td>
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<td>Matrix converters</td>
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<td>USE: Matrix converters</td>
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<tr>
<td>Matrix decomposition</td>
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<tr>
<td>Matrix convertors</td>
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<tr>
<td>USE: Matrix converters</td>
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<td>Matrix decomposition</td>
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<td>Matrix convertors</td>
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<tr>
<td>USE: Matrix converters</td>
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<tr>
<td>Matrix decomposition</td>
<td></td>
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<tr>
<td>Matrix convertors</td>
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<tr>
<td>USE: Matrix converters</td>
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</table>

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### Statistics

**Matrix laboratory**
- **USE:** Matlab

**Matter waves**
- **UF:** De Broglie methods
- **BT:** Waves

**Maximum a posteriori estimation**
- **UF:** Maximum a posteriori
- **BT:** Waves

**Maximum a posteriori estimator**
- **USE:** Maximum a posteriori

**Maximum a posteriori framework**
- **USE:** Maximum a posteriori

**Maximum a posteriori method**
- **USE:** Maximum a posteriori

**Maximum a posteriori probability**
- **USE:** Maximum a posteriori

**Maximum a-posteriori**
- **USE:** Maximum a posteriori

**Maximum a posteriori**
- **USE:** Maximum a posteriori

**Maximum likelihood decoding**
- **BT:** Decoding
- **RT:** Algorithms

**Maximum likelihood detection**
- **UF:** Additive metric
- **Complexity constrained**

---

**Linear filtering**
- **BT:** Algorithms
- **RT:** Filtering theory

**Maximum likelihood estimation**
- **UF:** MLE
- **BT:** Estimation
- **RT:** Set theory

**Maximum likelihood linear regression**
- **BT:** Linear regression

**Maximum power point trackers**
- **UF:** MPPT
- **BT:** Solar power generation
- **RT:** Inverters

**Maximum power point tracking**
- **USE:** Maximum power point trackers

**Maxwell equations**
- **BT:** Equations
- **RT:** Electric fields

**Maxwell-Boltzmann distribution**
- **UF:** Maxwell-Boltzmann statistics
- **BT:** Probability distribution

**Maxwell-Boltzmann statistics**
- **USE:** Maxwell-Boltzmann distribution

**MC-CDMA**
- **USE:** Multicarrier code division

**MCCDMA**
- **USE:** Multicarrier code division

**MDDI**
### 2021 IEEE Thesaurus

**USE:** Musical instrument digital interfaces

**Mean square error methods**
- **BT:** Approximation methods
- **RT:** Error analysis
- Estimation theory
- Least squares
- **approximations**
- **NT:** Least mean squares

**Measurement**
- **UF:** Metrics
  - Performance measurement
  - Performance metrics
- **BT:** Instrumentation and measurement
- **RT:** Containers
  - Data acquisition
  - Instruments
  - Measurement standards
  - Phase frequency detectors
  - Telemetry
  - Testing
  - Transducers
- **NT:** Accelerometers
  - Acoustic measurements
  - Antenna measurements
  - Anthropometry
  - Area measurement
  - Atmospheric measurements
  - Atomic measurements
  - Bathymetry
  - Biomedical measurement
  - Calorimetry
  - Coordinate measuring machines
- **measurement**
  - Density measurement
  - Distance measurement
  - Distortion measurement
  - Doppler measurement
  - Dosimetry
  - Dynamic range
  - Electric variables
- **measurement**
  - Electromagnetic measurements
  - Extraterrestrial measurements
  - Fluid flow measurement
  - Frequency measurement
  - Gain measurement
  - Gas chromatography

**NT:** Least mean squares methods
- **measurement**
- **beam**

**Measurement by laser**
- Measurement errors
- Measurement techniques
- Measurement uncertainty
- Measurement units
- Mechanical variables
- Micrometers
- Moisture measurement
- Nuclear measurements
- Optical variables
- Particle beam
- Particle measurements
- Performance evaluation
- Plasma measurements
- Pollution measurement
- Pressure measurement
- Pulse measurements
- Reflectometry
- Reproducibility of results
- Scintillation counters
- Sea state
- Semiconductor device

**Sensitivity**
- Shape measurement
- Size measurement
- Software measurement
- Soil measurements
- Spectral efficiency
- Spectroscopy
- Thermal variables

**Time measurement**
- UHF measurements
- Ultrasonic variables

**Viscosity**
- Wavelength measurement
- Wide area measurements
- pH measurement

---

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### Measurement by laser beam
- **BT:** Measurement
- **RT:** Laser applications
- **NT:** Laser velocimetry

### Measurement errors
- **BT:** Measurement
- **RT:** Error analysis
- **NT:** Statistical analysis

### Measurement standards
- **BT:** Standards categories
- **RT:** ISO
  - Measurement
  - Measurement units

### Measurement uncertainty
- **BT:** Measurement
- **RT:** Estimation
  - Measurement techniques

### Measurement units
- **UF:** Units (measurement)
- **BT:** Measurement
- **RT:** Measurement standards
- **NT:** International System of Units
  - Nanometers

### Mechanical bearings
- **BT:** Friction
- **RT:** Ball bearings
  - Lubrication
  - Mechanical factors
  - Rolling bearings

### Mechanical cables
- **UF:** Cables (mechanical)
- **BT:** Cables

### Mechanical energy
- **BT:** Mechanical systems
- **RT:** Kinetic energy
  - Potential energy

### Mechanical engineering
- **BT:** Engineering - general
- **RT:** Mechanical products

### Mechanical factors
- **UF:** Mechanical properties
- **BT:** Physics
- **RT:** Acoustic noise
  - Electrostriction
  - Magnetomechanical effects
  - Mechanical bearings
  - Mechanical variables

### Mechanical guides
- **UF:** Guideways (mechanical)
- **BT:** Mechanical products
- **RT:** Machine tools
  - Position control

### Mechanical power transmission
- **UF:** Continuously variable transmission
  - Powertrain

### Mechanical systems
- **BT:** Measurement
- **RT:** Laser applications

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# 2021 IEEE Thesaurus

## Mechanical systems
- BT: Mechanical engineering
- RT: Mechatronics
- NT: Microelectromechanical devices
- Pneumatic systems
- Turbomachinery
- Micromechanical devices
- Suspensions (mechanical systems)

## Mechanical variables control
- BT: Control systems
- RT: Frequency control
- NT: Mechanical factors
- Mobile robots
- Motor drives
- Robots
- Displacement control
- Force control
- Level control
- Motion control
- Pitch control (position)
- Position control
- Shape control
- Size control
- Strain control
- Stress control
- Torque control
- Velocity control
- Vibration control
- Weight control

## Mechanical properties
- USE: Mechanical factors
- BT: Measurement
- RT: Frequency measurement
- NT: Angular velocity
- Force measurement
- Motion measurement
- Position measurement
- Rotation measurement
- Strain measurement
- Stress measurement
- Torque measurement
- Velocity measurement
- Vibration measurement

## Mechanical sensors
- BT: Sensors
- NT: Capacitive sensors
- USE: Mechanical factors
- Force measurement
- Motion measurement
- Position measurement
- Rotation measurement
- Strain measurement
- Stress measurement
- Torque measurement
- Velocity measurement
- Vibration measurement
Volume measurement
Weight measurement

**Mechanical vibrations**
USE: Vibrations

**Mechanobiology**
BT: Biology
RT: Biological system modeling
Biomechanics
Cell signaling
Nanomedicine

**Mechatronics**
BT: Electron devices
RT: Autonomous vehicles
Control equipment
Intelligent control
Intelligent sensors
Mechanical systems
Microelectromechanical devices

**Media**
BT: Materials
RT: Closed captioning
Design tools
Nonhomogeneous media
Photorealism
Random media

**Media access control**
USE: Media Access Protocol

**Media Access Protocol**
UF: MAC
MAC protocol
Media access control
Medium access control
Access protocols
Local area networks
Metropolitan area networks

**Media sharing Web sites**
USE: Multimedia Web sites

**Media streaming**
USE: Streaming media

**Medical computing**
USE: Biomedical computing

**Medical conditions**
UF: Medical disorders
BT: Medical services
NT: Aneurysm
Atrophy
Autism
Blindness
Cataracts
Congestive heart failure
Cybersickness
Deafness
Depression
Diabetes
Diseases
Hemorrhaging
Hypertension
Hyperthermia
Injuries
Kidney stones
Obesity
Paralysis
Pregnancy
Sleep apnea
Stroke (medical condition)
Thrombosis
Tumors

**Medical control systems**
BT: Control systems
RT: Assistive technology
Biomedical equipment
Orthotics
Prosthetics

**Medical devices**
BT: Biomedical equipment
RT: Biomedical communication

**Medical diagnosis**
UF: Diagnosis (medical)
BT: Medical services
RT: Biomedical imaging
Diagnostic radiography
Diseases
Electroencephalography
Medical expert systems
Occupational medicine
Radiography
Translational research
<table>
<thead>
<tr>
<th>NT: Autopsy</th>
<th>Wearable robots</th>
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<tbody>
<tr>
<td>Bronchoscopy</td>
<td>Rehabilitation robotics</td>
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<td>Colonography</td>
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<td>Computer aided diagnosis</td>
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<td>Medical signal detection</td>
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<tr>
<td>Plethysmography</td>
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<tr>
<td>Sensitivity and specificity</td>
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</table>

**Medical diagnostic imaging**

<table>
<thead>
<tr>
<th>BT: Biomedical imaging</th>
<th>Medical robots</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Cancer</td>
<td>Medical diagnosis</td>
</tr>
<tr>
<td>Positron emission</td>
<td>Medical diagnosis</td>
</tr>
<tr>
<td>tomography</td>
<td>Medical diagnosis</td>
</tr>
</tbody>
</table>

| NT: Anatomical structure | Medical diagnosis |

**Medical disorders**

<table>
<thead>
<tr>
<th>USE: Medical conditions</th>
<th>Medical services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Physician</td>
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<td>Emergency services</td>
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<td>Translational research</td>
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<td>Assisted living</td>
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<td>Catheterization</td>
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<td>Clinical diagnosis</td>
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<td>Cybercare</td>
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<td>Electronic healthcare</td>
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<td>Health information</td>
</tr>
</tbody>
</table>

**Medical equipment**

| USE: Biomedical equipment AND Medical instruments | Biomedical imaging |

**Medical expert systems**

<table>
<thead>
<tr>
<th>BT: Biomedical computing</th>
<th>Biomedical image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert systems</td>
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</tr>
<tr>
<td>RT: Medical diagnosis</td>
<td>Biomedical image</td>
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<tr>
<td>Medical treatment</td>
<td>Biomedical image</td>
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<td>Biomedical image</td>
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</table>

**Medical image processing**

| USE: Biomedical image | Biomedical image |

**Medical imaging**

| USE: Biomedical imaging | Biomedical image |

**Medical information systems**

<table>
<thead>
<tr>
<th>BT: Biomedical computing</th>
<th>Biomedical image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer applications</td>
<td>Biomedical image</td>
</tr>
<tr>
<td>Information systems</td>
<td>Biomedical image</td>
</tr>
<tr>
<td>NT: Electronic medical records</td>
<td>Biomedical image</td>
</tr>
</tbody>
</table>

**Medical signal detection**

| BT: Medical diagnosis | Medical diagnosis |

**Medical simulation**

| BT: Simulation | Medical diagnosis |

**Medical specialties**

<table>
<thead>
<tr>
<th>BT: Engineering in medicine</th>
<th>Biomedical image</th>
</tr>
</thead>
<tbody>
<tr>
<td>and biology</td>
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</tr>
<tr>
<td>NT: Anesthesiology</td>
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</tr>
<tr>
<td>Cardiology</td>
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<tr>
<td>Dermatology</td>
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<table>
<thead>
<tr>
<th>Medical tests</th>
<th>Medium access control</th>
</tr>
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<tbody>
<tr>
<td>BT: Medical services</td>
<td>USE: Media Access Protocol</td>
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<td>RT: Mammography</td>
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<tr>
<td>NT: Amniocentesis</td>
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<tr>
<td>Biopsy</td>
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<tr>
<td>Cancer detection</td>
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<td>Colonoscopy</td>
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<tr>
<td>Pregnancy test</td>
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<tr>
<td>Medical treatment</td>
<td></td>
</tr>
<tr>
<td>UF: Patient identification</td>
<td></td>
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<tr>
<td>Patient treatment</td>
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<tr>
<td>Therapy</td>
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<td>BT: Medical services</td>
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<td>RT: Biohazards</td>
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<tr>
<td>Biomedical applications of radiation</td>
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<td>NT: Anesthesia</td>
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<td>Angioplasty</td>
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<td>Brain stimulation</td>
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<td>Hospitals</td>
<td></td>
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<td>Intubation</td>
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<tr>
<td>Lithotripsy</td>
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<tr>
<td>Magnetic stimulation</td>
<td></td>
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<tr>
<td>Neuromuscular stimulation</td>
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</tbody>
</table>

| Medium resolution imaging spectrometer |                                                                                           |
| USE: MERIS                                           |
|                                                                                           |
| Medium voltage                                   |                                                                                           |
| USE: Medium voltage                              |                                                                                           |
| BT: Voltage measurement                          |                                                                                           |
|                                                                                           |
| Meeting planning                                 |                                                                                           |
| USE: Technical meetings                         |                                                                                           |
| BT: Professional communication                  |                                                                                           |
| RT: Public speaking                             |                                                                                           |
| NT: Conferences                                  |                                                                                           |
|                                                                                           |
| Meetings                                          |                                                                                           |
| USE: Conferences                                  |                                                                                           |

| Mel frequency cepstral coefficient               |                                                                                           |
| USE: Mel frequency cepstral coefficient          |                                                                                           |
| BT: Cepstral analysis                            |                                                                                           |
|                                                                                           |
| Melanoma                                         |                                                                                           |
| BT: Skin cancer                                  |                                                                                           |

| Melt processing                                 |                                                                                           |
| USE: Manufacturing systems                       |                                                                                           |
| BT: Materials processing                         |                                                                                           |
| RT: Die casting                                  |                                                                                           |
## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>NT: Vacuum arc remelting</th>
<th>Memory management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membrane potentials</td>
<td>UF: Garbage collection</td>
</tr>
<tr>
<td>BT: Cells (biology)</td>
<td>BT: Computer architecture</td>
</tr>
<tr>
<td>RT: Action potentials</td>
<td>RT: Memory architecture</td>
</tr>
<tr>
<td>UF: Membrane voltage</td>
<td>Memory modules</td>
</tr>
<tr>
<td>Membranes</td>
<td>BT: Printed circuits</td>
</tr>
<tr>
<td>USE: Membrane potentials</td>
<td>RT: Integrated circuits</td>
</tr>
<tr>
<td>Memetics</td>
<td>Memory management</td>
</tr>
<tr>
<td>BT: Evolution (biology)</td>
<td>BT: Memory architecture</td>
</tr>
<tr>
<td>Memetics</td>
<td>Memory modules</td>
</tr>
<tr>
<td>USE: Membrane potentials</td>
<td>RT: Integrated circuits</td>
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<td>Membrane voltage</td>
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<td>USE: Membrane potentials</td>
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<td>Membranes</td>
<td>USE: Memristors</td>
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<tr>
<td>Memetics</td>
<td>Memoryless systems</td>
</tr>
<tr>
<td>BT: Evolution (biology)</td>
<td>Memoryless channel</td>
</tr>
<tr>
<td>Memetic circuits</td>
<td>USE: Memristors</td>
</tr>
<tr>
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<td>Memory management</td>
<td>RT: Neuromorphic engineering</td>
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<td>Memory resistors</td>
<td>Resistive RAM</td>
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<td>Memristors</td>
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<td>Memoryless systems</td>
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<td>USE: Microelectromechanical systems</td>
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<td>MEMS</td>
</tr>
<tr>
<td>Memory resistors</td>
<td>USE: Microswitches</td>
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<td>Mental disorders</td>
</tr>
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<tr>
<td>Memory management</td>
<td>Mental health</td>
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<td>BT: Human factors</td>
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<tr>
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<td>Psychology</td>
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<td>RT: Behavioral sciences</td>
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</tr>
<tr>
<td>Memory management</td>
<td>Psychology</td>
</tr>
<tr>
<td>Memory resistors</td>
<td>RT: Behavioral sciences</td>
</tr>
</tbody>
</table>

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### Mentoring
- BT: Career development
- RT: Training

### Mercury (metals)
- UF: Hg
- BT: Chemical elements
- Metals

### Mercury (planets)
- BT: Planets

### Mergers
- USE: Corporate acquisitions

### Merging
- BT: Data handling
- RT: Sorting

### MERIS
- UF: Medium resolution imaging spectrometer
- BT: Spectroscopy

### MERIT
- USE: Magneto electrical resistivity imaging technique

### Merit pay
- USE: Incentive schemes

### Mesencephalon
- USE: Midbrain

### MESFET circuits
- BT: FET circuits
- RT: MESFETs
- NT: MESFET integrated circuits

### MESFET integrated circuits
- BT: FET integrated circuits
- Integrated circuits
- MESFET circuits
- RT: MESFETs
- NT: Microwave FET integrated circuits

### MESFETs
- UF: Schottky FETs
- BT: Field effect transistors
- RT: MESFET circuits
- MESFET integrated circuits
- Schottky barriers
- NT: Microwave FETs

### Mesh generation
- BT: Computer displays
- RT: Computer graphics

### Mesh networks
- BT: Ad hoc networks

### Mesomycetozoea
- BT: Organisms

### Mesons
- UF: Kaons
- Muons
- Pions
- BT: Elementary particles
- RT: Cosmic rays

### Mesoporous
- USE: Mesoporous materials

### Mesoporous materials
- UF: Mesoporous
- BT: Materials
- RT: Electrocatalysts

### Message authentication
- BT: Data security
- RT: Cryptography
- Digital signatures
- Message systems
- NT: Steganography

### Message passing
- BT: Distributed processing
- RT: Belief propagation

### Message service
- UF: Messaging service
- WeChat
- BT: Web services

### Message systems
- BT: Communications technology
- RT: Cluster computing
- Digital signatures
- Message authentication
- Electronic mail
- Electronic messaging
- Postal services
- Publish subscribe systems
- Voice mail

### Message-oriented middleware
<table>
<thead>
<tr>
<th>BT: Middleware</th>
<th>RT: Metal products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Messaging service</strong></td>
<td><strong>Metal products</strong></td>
</tr>
<tr>
<td>USE: Message service</td>
<td>BT: Manufactured products</td>
</tr>
<tr>
<td>RT: Ball bearings</td>
<td></td>
</tr>
<tr>
<td><strong>Meta data</strong></td>
<td>Metal product industries</td>
</tr>
<tr>
<td>USE: Metadata</td>
<td>Metals industry</td>
</tr>
<tr>
<td><strong>Meta search</strong></td>
<td>Swaging</td>
</tr>
<tr>
<td>USE: Metasearch</td>
<td>NT: Metal enclosures</td>
</tr>
<tr>
<td><strong>Meta-modeling</strong></td>
<td><strong>Metal vapor lasers</strong></td>
</tr>
<tr>
<td>USE: Metamodelling</td>
<td>USE: Gas lasers</td>
</tr>
<tr>
<td><strong>Meta-search</strong></td>
<td><strong>Metal-insulator structures</strong></td>
</tr>
<tr>
<td>USE: Metasearch</td>
<td>BT: Insulators</td>
</tr>
<tr>
<td><strong>Metabolic networks</strong></td>
<td>RT: Electrodes</td>
</tr>
<tr>
<td>USE: Biochemistry</td>
<td>MIS devices</td>
</tr>
<tr>
<td><strong>Metabolism</strong></td>
<td>MOS integrated circuits</td>
</tr>
<tr>
<td>USE: Biochemistry</td>
<td>NT: MIM capacitors</td>
</tr>
<tr>
<td><strong>Metabolomics</strong></td>
<td>MIM devices</td>
</tr>
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<td>BT: Molecular biomarkers</td>
<td><strong>Metal-insulator-metal capacitors</strong></td>
</tr>
<tr>
<td>USE: Meta data</td>
<td>USE: MIM capacitors</td>
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<td><strong>Metaccomputing</strong></td>
<td><strong>Metal-insulator-metal devices</strong></td>
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<td>BT: Distributed computing</td>
<td>USE: MIM devices</td>
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<td>NT: Grid computing</td>
<td><strong>Metal-insulator-semiconductor devices</strong></td>
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<td>USE: Biochemistry</td>
<td>USE: MIS devices</td>
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<tr>
<td><strong>Metadata</strong></td>
<td><strong>Metal-oxide semiconductor field effect transistor</strong></td>
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<tr>
<td>USE: Meta data</td>
<td>USE: MOSFET circuits</td>
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<td>BT: Data models</td>
<td><strong>Metal-oxide semiconductors</strong></td>
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<tr>
<td>RT: Image annotation</td>
<td>USE: MOS devices</td>
</tr>
<tr>
<td>Linked data</td>
<td><strong>Metal-oxide-nitride-oxide-semiconductors</strong></td>
</tr>
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<td>NT: Annotations</td>
<td>USE: MONOS devices</td>
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<td><strong>Metal cutting tools</strong></td>
<td><strong>Metal-oxide-nitride-oxide-silicon</strong></td>
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<td>BT: Cutting tools</td>
<td>USE: MONOS devices</td>
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<td>RT: Plasma jets</td>
<td><strong>Metal-oxide-semiconductor devices</strong></td>
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<tr>
<td><strong>Metal enclosures</strong></td>
<td>USE: MOS devices</td>
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<td>BT: Metal products</td>
<td><strong>Metal-oxide-semiconductor interfaces</strong></td>
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<td><strong>Metal foam</strong></td>
<td><strong>Metal-semiconductor interfaces</strong></td>
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<td>BT: Materials</td>
<td>USE: Semiconductor-metal</td>
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<tr>
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<td>Metals foams</td>
<td><strong>Metallic materials</strong></td>
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<td><strong>Metal oxide semiconductor heterojunction FETs</strong></td>
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<td>USE: MOSFETs</td>
<td>RT: Cermet</td>
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<td><strong>Metal product industries</strong></td>
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<td>BT: Manufacturing industries</td>
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<tr>
<td>BT:</td>
<td>Superlattices</td>
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</tr>
<tr>
<td>Metallisation</td>
<td>USE: Metallization</td>
</tr>
<tr>
<td>Metallization</td>
<td>UF: Metallisation</td>
</tr>
<tr>
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<td>BT: Metals</td>
</tr>
<tr>
<td></td>
<td>RT: Wiring</td>
</tr>
<tr>
<td></td>
<td>NT: Integrated circuit</td>
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<td>Metallurgy</td>
<td>BT: Materials science and technology</td>
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<tr>
<td></td>
<td>RT: Iron alloys</td>
</tr>
<tr>
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<td>Metals</td>
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<tr>
<td>Metalorganic vapor deposition</td>
<td>USE: MOCVD</td>
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<tr>
<td>Metals</td>
<td>UF: Alloys</td>
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<td>BT: Materials, elements, and compounds</td>
</tr>
<tr>
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<td>RT: Blanking</td>
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<tr>
<td></td>
<td>Die casting</td>
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<td>Filler metals</td>
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<td>Inorganic compounds</td>
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<td>Metallurgy</td>
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<td></td>
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<td>Bismuth</td>
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<td>Boron</td>
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<td>Gallium</td>
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<td>Manganese</td>
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<tr>
<td>Metamaterial cloaking</td>
<td>USE: Optical cloaking</td>
</tr>
<tr>
<td>Metamaterials</td>
<td>UF: Acoustic metamaterials</td>
</tr>
<tr>
<td></td>
<td>Left handed materials</td>
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<td>Left-handed materials</td>
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<td>Microwave metamaterials</td>
</tr>
<tr>
<td></td>
<td>BT: Materials</td>
</tr>
<tr>
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<td>RT: Metasurfaces</td>
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<tr>
<td></td>
<td>Nanocomposites</td>
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<td>Optical materials</td>
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<td>Optical materials</td>
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</tr>
<tr>
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<td>Optical materials</td>
</tr>
<tr>
<td>Metamodeling</td>
<td>UF: Meta-modeling</td>
</tr>
<tr>
<td></td>
<td>BT: Modeling</td>
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</table>

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2021 IEEE Thesaurus

Metamorphic HEMTs
USE: mHEMTs

Metasearch
UF: Federated search
Federated searching
Meta search
Meta-search
BT: Search methods
RT: Triples (Data structure)
Web search

Meter reading
BT: Power system
measurements
NT: Automatic meter reading
Smart meters

Meters
BT: Instruments
NT: Automatic meter reading

Metastasis
UF: Metastatic disease
BT: Cancer
RT: Diseases

Metastatic disease
USE: Metastasis

Metasurfaces
BT: Surfaces
RT: Metamaterials
Thin films

Meteorological factors
BT: Geoscience
RT: Fading channels
Multipath channels

Meteorological radar
UF: Radar meteorology
BT: Radar
RT: Backscatter
Radar imaging

Meteorology
UF: Climate
Weather
BT: Geophysics
RT: Air pollution
Atmosphere
Atmospheric measurements
Data assimilation
Environmental factors
Ice
Ionosphere
Pressure effects
Remote sensing
Terrestrial atmosphere
NT: Humidity
Lightning
Monsoons
Rain

Method of moments
USE: Method of moments

Methane
BT: Natural gas
RT: Carbon emissions

Methanol
UF: Carbinol
Methyl alcohol
Wood alcohol
Wood naphtha
Wood spirits
BT: Chemical compounds
RT: Anti-freeze
Fuels
Solvents

Method of moments
USE: Method of moments

Methyl alcohol
USE: Methanol
<table>
<thead>
<tr>
<th>Metrics</th>
<th>USE: Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro area networks</td>
<td>USE: Metropolitan area networks</td>
</tr>
<tr>
<td>Metrology</td>
<td>BT: Science - general</td>
</tr>
<tr>
<td></td>
<td>NT: Optical metrology</td>
</tr>
<tr>
<td>Metropolitan area networks</td>
<td>UF: Metro area networks</td>
</tr>
<tr>
<td></td>
<td>BT: Communication systems</td>
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<td></td>
<td>Computer networks</td>
</tr>
<tr>
<td></td>
<td>Digital systems</td>
</tr>
<tr>
<td></td>
<td>RT: Distributed computing</td>
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<td></td>
<td>IEEE 802.16 Standard</td>
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<td></td>
<td>Internetworking</td>
</tr>
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<td>LAN interconnection</td>
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<td>Media Access Protocol</td>
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<td>Multiprocessor</td>
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<td>interconnection</td>
<td>Open systems</td>
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<td>Protocols</td>
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<td>Regional area networks</td>
</tr>
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<td>Token networks</td>
</tr>
<tr>
<td>Metropolitan areas</td>
<td>USE: Urban areas</td>
</tr>
<tr>
<td>MFCC</td>
<td>USE: Mel frequency cepstral coefficient</td>
</tr>
<tr>
<td>Mg</td>
<td>USE: Magnesium</td>
</tr>
<tr>
<td>MgO</td>
<td>USE: Magnesium oxide</td>
</tr>
<tr>
<td>MHD</td>
<td>USE: Magnetohydrodynamics</td>
</tr>
<tr>
<td>mHEMTs</td>
<td>UF: Metamorphic HEMTs</td>
</tr>
<tr>
<td></td>
<td>BT: HEMTs</td>
</tr>
<tr>
<td>MIB</td>
<td>USE: Management information</td>
</tr>
<tr>
<td>MIC</td>
<td>USE: Microwave integrated circuits</td>
</tr>
<tr>
<td>Mice</td>
<td>UF: Mouse</td>
</tr>
<tr>
<td></td>
<td>BT: Animals</td>
</tr>
<tr>
<td>Mice flows</td>
<td>USE: Communication system</td>
</tr>
<tr>
<td></td>
<td>traffic AND</td>
</tr>
<tr>
<td></td>
<td>Computer networks</td>
</tr>
<tr>
<td>Micro air vehicles</td>
<td>USE: Unmanned aerial vehicles</td>
</tr>
<tr>
<td>Micro computers</td>
<td>USE: Microcomputers</td>
</tr>
<tr>
<td>Micro-computers</td>
<td>USE: Microcomputers</td>
</tr>
<tr>
<td>Micro-electro-mechanical devices</td>
<td>USE: Microelectromechanical devices</td>
</tr>
<tr>
<td>Micro-electro-mechanical systems</td>
<td>USE: Microelectromechanical systems</td>
</tr>
<tr>
<td>Micro-electromechanical devices</td>
<td>USE: Microelectromechanical devices</td>
</tr>
<tr>
<td>Micro-electromechanical systems</td>
<td>USE: Microelectromechanical systems</td>
</tr>
<tr>
<td>Micro-hydro</td>
<td>USE: Microhydro power</td>
</tr>
<tr>
<td>Micro-optical components</td>
<td>USE: Microoptics</td>
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<tr>
<td>MHD</td>
<td>USE: Micro-optical components</td>
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<td>Microactuators</td>
<td>BT: Actuators</td>
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<td>Microelectromechanical devices</td>
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<tr>
<td></td>
<td>RT: Microrelays</td>
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<tr>
<td>Microarchitecture</td>
<td>BT: Software architecture</td>
</tr>
<tr>
<td>Microassembly</td>
<td>UF: Die attach</td>
</tr>
</tbody>
</table>
Die bonding
BT: Assembly
RT: Flip-chip devices
Integrated circuit manufacture
Micromachining
Semiconductor device manufacture

Microbial electrolysis cells
USE: Fuel cells

Microbial fuel cells
USE: Fuel cells

Microbiology
BT: Biology
NT: Electroporation
Virology

Microcavities
BT: Optical resonators
RT: Cavity resonators
Light emitting diodes
Microoptics
Photoluminescence
Spontaneous emission
Whispering gallery modes

Microcell networks
UF: Microcells
Small cell networks
BT: Cellular networks
Ultra-dense networks

Microcells
USE: Microcell networks

Microchannels
BT: Hydraulic diameter

Microchip lasers
BT: Solid lasers

Microchips
USE: Integrated circuits

Microcomputers
UF: Laptops
Micro computers
Micro-computers
Minicomputers
Personal computers
BT: Computers
RT: Consumer electronics

Microcontact printing
USE: Soft lithography

Microcontrollers
BT: Control equipment
Microprocessors
RT: CMOS technology
Control systems
High-speed integrated circuits

Microdispalyes
BT: Displays
RT: Liquid crystal devices
Liquid crystal on silicon
Microoptics

Microeconomics
BT: Economics
RT: Linear programming
Monopoly
Oligopoly
Supply and demand
NT: Economies of scale
Industrial economics

Microelectrodes
BT: Electrodes
RT: Neurophysiology
Neurostimulation

Microelectromechanical devices
UF: Micro-electro-mechanical devices
BT: Micro-electromechanical systems
RT: Magnetic particles
Mechanical systems
Mechatronics
Micro-machining
Microsensors

Microprocessors
BT: Microprocessors

Microsensors
NT: Microactuators
Micromotors
Micropumps
<table>
<thead>
<tr>
<th>Microvalves</th>
<th>Power system reliability</th>
<th>Smart grids</th>
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<tbody>
<tr>
<td><strong>Microelectromechanical systems</strong></td>
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<tr>
<td><strong>UF:</strong> MEMS</td>
<td><strong>Microgrippers</strong></td>
<td>USE:</td>
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<td><strong>Micro-electro-mechanical systems</strong></td>
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<td>Grippers</td>
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<td><strong>BT:</strong>                      Electron devices</td>
<td><strong>Microhydro power</strong></td>
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</tr>
<tr>
<td><strong>RT:</strong>                      Mechatronics</td>
<td><strong>UF:</strong> Micro-hydro</td>
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<td><strong>Nano-electromechanical systems</strong></td>
<td><strong>BT:</strong> Hydroelectric power</td>
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<tr>
<td><strong>NT:</strong>                      Microelectromechanical devices</td>
<td><strong>RT:</strong> Approachable technology</td>
<td></td>
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<tr>
<td><strong>devices</strong></td>
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<td><strong>Radiofrequency</strong></td>
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<td><strong>microelectromechanical systems</strong></td>
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<td><strong>Microelectronic implants</strong></td>
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<td><strong>BT:</strong>                      Implants</td>
<td><strong>Micromachining</strong></td>
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<tr>
<td><strong>Microelectronic stimulation</strong></td>
<td><strong>BT:</strong> Electronic equipment</td>
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<td><strong>USE:</strong>                      Electrical stimulation</td>
<td><strong>manufacture</strong></td>
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<tr>
<td><strong>Microelectronics</strong></td>
<td><strong>RT:</strong> Electrochemical machining</td>
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<td><strong>BT:</strong>                      Electronic equipment</td>
<td><strong>Embossing</strong></td>
<td></td>
</tr>
<tr>
<td><strong>RT:</strong>                      Integrated circuits</td>
<td><strong>Etching</strong></td>
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<td><strong>Microfabrication</strong></td>
<td><strong>manufacture</strong></td>
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<td><strong>BT:</strong>                      Fabrication</td>
<td><strong>Microassembly</strong></td>
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<td><strong>Microelectromechanical devices</strong></td>
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<td><strong>RT:</strong>                      Micromechanical devices</td>
<td><strong>Microinjection</strong></td>
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<td><strong>Fiducial markers</strong></td>
<td><strong>BT:</strong> Implants</td>
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<td><strong>BT:</strong> Fluidics</td>
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<td><strong>RT:</strong> Biocommunication</td>
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<td><strong>Sterility</strong></td>
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<td><strong>UF:</strong> Micromechanical systems</td>
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<td><strong>RT:</strong>                      Micromachining</td>
<td><strong>Microsystems</strong></td>
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<td><strong>BF:</strong> Micromechanical systems</td>
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<td><strong>BT:</strong>                      Magnets</td>
<td><strong>Microsystems</strong></td>
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<td><strong>BF:</strong> Microsystems</td>
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<td><strong>BF:</strong> Fluidics</td>
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<td><strong>UF:</strong>                      Micromechanical systems</td>
<td><strong>RT:</strong> Mechanical systems</td>
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<tr>
<td><strong>Electron devices</strong></td>
<td><strong>BT:</strong> Microsystems</td>
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<tr>
<td><strong>Microfluidics</strong></td>
<td><strong>RT:</strong> Nanogenerator</td>
<td></td>
</tr>
<tr>
<td><strong>BT:</strong>                      Fluidics</td>
<td><strong>NT:</strong> Biomedical</td>
<td></td>
</tr>
<tr>
<td><strong>Microinjection</strong></td>
<td><strong>UF:</strong> Micromachining</td>
<td></td>
</tr>
<tr>
<td><strong>BT:</strong>                      Biology</td>
<td><strong>RT:</strong> Microshaping</td>
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<tr>
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<td><strong>BT:</strong> Biochip engineering</td>
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<tr>
<td><strong>BT:</strong>                      Fluidics</td>
<td><strong>RT:</strong> Fluidic systems</td>
<td></td>
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<tr>
<td><strong>RT:</strong>                      Biomedical engineering</td>
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<tr>
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<td><strong>UF:</strong> Fluidic systems</td>
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<tr>
<td><strong>HF:</strong>                      Hydrodynamics</td>
<td><strong>BT:</strong> Micromachining</td>
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<td><strong>RT:</strong> Microfluidics</td>
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</tr>
<tr>
<td><strong>USE:</strong>                      Photomicrography</td>
<td><strong>BF:</strong> Micromachining</td>
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<td><strong>Microgrids</strong></td>
<td><strong>RT:</strong> Micromachining</td>
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<td><strong>BT:</strong>                      Power grids</td>
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<tr>
<td><strong>RT:</strong>                      Distributed power generation</td>
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<tr>
<td><strong>Power distribution networks</strong></td>
<td><strong>BF:</strong> Micromachining</td>
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<tr>
<td><strong>Power generation</strong></td>
<td><strong>BF:</strong> Micromachining</td>
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<td><strong>Power system management</strong></td>
<td><strong>BF:</strong> Micromachining</td>
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<td><strong>Micrometers</strong></td>
<td><strong>BF:</strong> Micromachining</td>
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<tr>
<td><strong>UF:</strong>                      Micrometers</td>
<td><strong>BF:</strong> Micromachining</td>
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<tr>
<td><strong>Micromotors</strong></td>
<td><strong>BF:</strong> Micromachining</td>
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<tr>
<td><strong>UF:</strong>                      Micrometer</td>
<td><strong>BF:</strong> Micromachining</td>
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<tr>
<td><strong>BT:</strong>                      Measurement</td>
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</tbody>
</table>
2021 IEEE Thesaurus

RT: Distance measurement
Interferometry
Length measurement
Strain measurement
Thickness measurement

Micrometres
USE: Micrometers

Micrometry
USE: Micrometers

Micromirrors
UF: Digital micromirror devices
BT: Microoptics
Mirrors
RT: Optical arrays
Optical projectors

Micromotors
BT: Microelectromechanical devices
Motors
Rotating machines

Microns
USE: Micrometers

Microoptical components
USE: Microoptics

Microoptics
UF: Micro-optical components
Micro-opticalmechanical devices
BT: Microoptical components
Optics
Integrated optics
Integrated optoelectronics
Microcavities
Microdisplays
Micromechanical devices
Microwaves
NT: Micromirrors

Microorganisms
UF: Bacteria
Bacterial content
Viruses (microorganisms)
BT: Organisms
Biological cells
Immune system
Molecular biophysics
NT: Adenoviruses
Viruses (medical)

Microphone arrays
BT: Microphones

Microphones
BT: Audio systems
NT: Microphone arrays

Microphotographs
USE: Photomicrography

Microphotography
USE: Photomicrography

Microprocessor chips
BT: Microprocessors
RT: Flip-chip devices
Substrates
Yield estimation
NT: AI accelerators

Microprocessors
BT: Circuits
Integrated circuits
CMOS technology
Embedded systems
Flip-chip devices
Microcomputers
Processor scheduling
System-on-chip
NT: Automatic logic units
Biomimetics
Coprocessors
Microcontrollers
Microprocessor chips
Vector processors

Microprogramming
UF: Firmware
BT: Programming
RT: Computer architecture
Software

Micropumps
BT: Microelectromechanical devices
Pumps

Microrelays
BT: Relays
RT: Microactuators

Microsatellites
USE: Small satellites
### Microscopy

**BT:** Imaging
  - Instruments
  - Optical imaging
  - Atomic force microscopy
  - Electron microscopy
  - Endomicroscopy
  - Scanning microwave

**RT:** Microscopy
  - Scanning probe microscopy

**NT:** Microsensors
  - Electromechanical sensors
  - Control systems
  - Microelectromechanical devices

**USE:** Wireless sensor networks

**Microsoft Excel**
  - USE: Spreadsheet programs

**Microsoft Windows**
  - USE: Operating systems

**Microstrip**
  - UF: Microstrip lines
  - BT: Planar transmission lines
  - RT: Broadband antennas
  - NT: Microstrip components

**Microstrip antenna arrays**
  - UF: Microstrip arrays
  - BT: Antenna arrays
  - RT: Antennas
  - Aperture coupled antennas
  - Microstrip antennas

**Microstrip antennas**
  - BT: Antennas
  - Aperture coupled antennas
  - Microstrip antenna arrays
  - Patch antennas

**Microstrip arrays**
  - USE: Microstrip antenna arrays

**Microstrip components**
  - BT: Microstrip
  - RT: Power combiners
  - Power dividers
  - Thick film inductors
  - NT: Microstrip resonators

**Microstrip filters**
  - BT: Filters

**RT:** Microwave communication

**Microstrip lines**
  - USE: Microstrip

**Microstrip resonators**
  - BT: Microstrip components
  - RT: Resonance

**Microstructure**
  - BT: Materials science and technology
  - RT: Crystal microstructure

**Microstructured fibers**
  - USE: Photonic crystal fibers

**Microstructured fibres**
  - USE: Photonic crystal fibers

**Microsurgery**
  - BT: Surgery

**Microswitches**
  - UF: MEMS switches
  - BT: Switches
  - RT: Microoptics

**Microsystems**
  - USE: Micromechanical devices

**Microvalves**
  - BT: Microelectromechanical devices
  - Valves

**Microwave amplifiers**
  - BT: Microwave devices

**Microwave antenna arrays**
  - BT: Antenna arrays

**Microwave antennas**
  - BT: Antennas

**Microwave bands**
  - BT: Microwave technology
  - NT: C-band
  - K-band
  - L-band

**Microwave circuits**
  - BT: Circuits
  - Microwave technology
  - RT: Analog circuits
2021 IEEE Thesaurus

circuits
Distributed parameter
Microwave devices
Microwave integrated circuits

Microwave communication
BT: Communication systems
Microwave technology
RT: Microstrip filters
Microwave photonics
NT: Rectennas

Microwave devices
BT: Microwave technology
RT: Electromagnetic waveguides
Microwave circuits
Microwave photonics
Photonic crystals
Superconducting

microwave devices
NT: Masers
Microwave amplifiers
Microwave filters
Microwave transistors

Microwave FET integrated circuits
BT: MESFET integrated circuits
RT: Microwave FETs

Microwave FETs
BT: MESFETs
Microwave transistors
RT: Microwave FET integrated circuits

circuits

Microwave filters
BT: Microwave devices

Microwave frequencies
BT: Microwave measurement

Microwave generation
BT: Microwave technology
NT: High power microwave generation

Microwave heating
USE: Electromagnetic heating

Microwave imaging
BT: Imaging
RT: Remote sensing

Microwave integrated circuits
UF: MIC
BT: Integrated circuits
RT: Analog integrated circuits
Microwave circuits
NT: MMICs

Microwave lasers
USE: Masers

Microwave magnetics
BT: Magnetics

Microwave measurement
BT: Electromagnetic measurements
RT: Microwave technology
NT: Microwave frequencies

Microwave metamaterials
USE: Metamaterials

Microwave oscillators
BT: Oscillators

Microwave ovens
BT: Consumer electronics
Consumer products
Home appliances
Ovens

Microwave photonics
BT: Microwave technology
Photonics
RT: Electrooptic modulators
Elementary particles
Integrated optoelectronics
Microwave circuits
Microwave communication
Microwave devices
Optical modulation

Microwave propagation
BT: Electromagnetic propagation
RT: Broadband antennas
Electromagnetic waveguides

Microwave radiometry
USE: Radar

BT: Radiometry
### Microwave sensors
- **BT:** Microwave technology

### Microwave technology
- **BT:** Microwave theory and techniques
- **RT:** Microwave measurement Radar
- **NT:** Baluns Beam steering Circulators Masers Microwave bands Microwave circuits Microwave communication Microwave devices Microwave generation Microwave photonics Microwave sensors

### Microwave theory and techniques
- **NT:** Microwave technology
- **Submillimeter wave technology**

### Microwave transistors
- **BT:** Microwave devices
- **NT:** Microwave FETs

### Microwave-assisted magnetic recording
- **BT:** Magnetic recording

### Midbrain
- **UF:** Mesencephalon
- **BT:** Brain Central nervous system
- **RT:** Forebrain Hindbrain

### Middleboxes
- **BT:** Computer network management
- **Internet**

### Middleware
- **BT:** Client-server systems Software
- **RT:** Computer applications Computer networks Internet of Things Publish subscribe systems
- **NT:** Mediation
- **Message-oriented middleware**
- **Web services**

### Microwave photonics

### Mie scattering
- **BT:** Electromagnetic scattering
- **RT:** Electromagnetic analysis Electromagnetic fields Electromagnetic forces Electromagnetic measurements propagation
- **Mil standards**
- **USE:** Military standards

### Military aircraft
- **BT:** Military equipment
- **RT:** Aircraft Hyperspectral sensors
- **NT:** Payloads

### Military command and control
- **USE:** Command and control systems

### Military computing
- **BT:** Computer applications
- **RT:** Mobile computing

### Military equipment
- **BT:** Aerospace and electronic systems
- **RT:** Defense industry Explosion protection Ground support Landmine detection Magnetic anomaly detectors
- **Night vision**
- **Open area test sites**
- **Wearable robots**

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# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>NT: Military aircraft</th>
<th>Millimeter wave integrated circuits</th>
<th>Millimeter wave integrated circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT: Military satellites</td>
<td>NT: Millimeter wave transistors</td>
<td>UB: Millimeter-wave integrated circuits</td>
</tr>
<tr>
<td>NT: Military vehicles</td>
<td>RT: Globa Positioning System</td>
<td>UB: Circuits</td>
</tr>
<tr>
<td>Weapons</td>
<td>RT: Hyperspectral sensors</td>
<td>Integrated circuits</td>
</tr>
<tr>
<td></td>
<td>RT: Military communication</td>
<td>Millimeter wave circuits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Millimeter wave technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RT: Analog integrated circuits</td>
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<tr>
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<td></td>
<td>Millimeter wave devices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NT: MIMICs</td>
</tr>
<tr>
<td>Military standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UF: Mil standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT: Standards categories</td>
<td></td>
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<tr>
<td>Military vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT: Military equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT: Marine robots</td>
<td></td>
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<tr>
<td>Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USE: Dairy products</td>
<td></td>
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<tr>
<td>Millennial generation</td>
<td></td>
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<tr>
<td>USE: Millennials</td>
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<tr>
<td>Millennials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UF: Generation Y</td>
<td></td>
<td></td>
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<tr>
<td>BT: Social groups</td>
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<tr>
<td>Millimeter wave circuits</td>
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<tr>
<td>UF: Millimeter-wave circuits</td>
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<tr>
<td>BT: Circuits</td>
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<tr>
<td>RT: Millimeter wave technology</td>
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<tr>
<td>circuits</td>
<td></td>
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<tr>
<td>RT: Analog circuits</td>
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<tr>
<td>Distributed parameter</td>
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<tr>
<td>circuits</td>
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<tr>
<td>NT: Millimeter wave devices</td>
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<tr>
<td>Millimeter wave communication</td>
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<tr>
<td>UF: Millimeter-wave communication</td>
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<tr>
<td>BT: mmwave communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT: Radio communication</td>
<td></td>
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<tr>
<td>propagation</td>
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<tr>
<td>Millimeter wave devices</td>
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<tr>
<td>UF: Millimeter-wave devices</td>
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<tr>
<td>BT: Millimeter wave technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT: Millimeter wave circuits</td>
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</tbody>
</table>

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Millimeter-wave circuits
USE: Millimeter wave circuits

Millimeter-wave communication
USE: Millimeter wave communication

Millimeter-wave devices
USE: Millimeter wave devices

Millimeter-wave integrated circuits
USE: Millimeter wave integrated circuits

Millimeter-wave measurements
USE: Millimeter wave measurements

Millimeter-wave monolithic integrated circuits
USE: MIMICs

Millimeter-wave propagation
USE: Millimeter wave propagation

Millimeter-wave radar
USE: Millimeter wave radar

Millimeter-wave technology
USE: Millimeter wave technology

Millimeter-wave transistors
USE: Millimeter wave transistors

Millimicron
USE: Nanometers

Milling
BT: Machining
RT: Boring
Milling machines
BT: Machine tools
RT: Ball milling
Cutting tools
Milling

MIM capacitors
UF: Metal-insulator-metal
BT: Metal-insulator structures
MIMO radar
BT: Multistatic radar

MIM devices
MIMO systems
USE: MIMO communication
2021 IEEE Thesaurus

Mind-machine interfaces
USE: Brain-computer interfaces

Mineral processing
USE: Materials processing

Mineral resources
BT: Minerals

Mineralization
BT: Minerals

Minerals
BT: Geology
NT: Mineral resources
Mineralization
Ores

Miniaturized satellites
USE: Small satellites

Minicomputers
USE: Microcomputers

Minimally invasive surgery
UF: Laparoscopic surgery
BT: Surgery
RT: Laparoscopes

Minimax techniques
UF: Minimax techniques
BT: Statistics
RT: Artificial intelligence
Game theory
Minimization methods

Minimisation
USE: Minimization

Minimisation methods
USE: Minimization methods

Minimization
UF: Minimisation
BT: Mathematics
RT: Optimization
NT: Minimization methods

Minimization methods
UF: Minimisation methods
BT: Minimization
RT: Approximation methods
Minimax techniques

Minimum analog-digital integrated circuits
USE: Analog-digital integrated circuits

Mining equipment
BT: Production equipment
RT: Mining industry

Mining industry
BT: Industries
RT: Excavation
Fracking
Fuel processing industries
Geoeengineering
Hyperspectral sensors
Mining equipment
Raw materials
NT: Coal mining

Minmax techniques
USE: Minimax techniques

Mirrors
BT: Optical devices
RT: Optical materials
Optical reflection
Reflection
NT: Distributed Bragg reflectors
Micromirrors

MIS devices
UF: Metal-insulator-semiconductor devices
BT: Semiconductor devices
RT: Metal-insulator structures
Semiconductor-insulator interfaces
NT: Charge coupled devices
MOS devices

MISFETs
BT: Field effect transistors
RT: CMOSFET logic devices
Magnetic field induced strain

MISO communication
UF: multiple input single-output
multiple-input single-output
Communication systems
MIMO communication
SIMO communication
SISO communication

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Missile guidance
  BT: Missiles
  RT: Target recognition

Missiles
  UF: Torpedoes
  BT: Weapons
  RT: Aerospace control
       Ground support
  NT: Missile guidance

Mission critical systems
  UF: Mission-critical systems
  BT: Contingency management

Mission-critical systems
  USE: Mission critical systems

Mixed analog-digital integrated circuits
  USE: Mixed analog-digital circuits

Mixed analog-digital integrated circuits
  UF: Mixed analog digital
     circuits
  BT: Analog-digital integrated
     circuits
  RT: Analog processing circuits
       System-on-chip

Mixed convection
  USE: Convection

Mixed convection
  USE: Convection

Mixed integer linear programming
  UF: Mixed-integer linear
     programming
  BT: Integer linear programming

Mixed reality
  BT: Simulation
  RT: Augmented reality
       Multimedia systems
       Virtual reality

Mixed integer linear programming
  USE: Mixed integer linear
     programming

Mixers
  BT: Frequency conversion
  RT: Demodulation
      Modulation
      Nonlinear circuits

Mixture models

BT: Statistics
RT: Feature extraction
Image segmentation
Probabilistic logic

MLE
USE: Maximum likelihood estimation

MLFMA
UF: Multilevel fast multipole algorithm
     BT: Algorithms

MMICs
UF: Monolithic microwave integrated circuits
     BT: Microwave integrated circuits
     Monolithic integrated circuits
     RT: Analog integrated circuits
     MIMICs
     Radiofrequency integrated circuits

MMTC
USE: Massive machine type communications

mmtc
USE: Massive machine type communications

mmwave communication
USE: Millimeter wave communication

Mn
USE: Manganese

MNN
USE: Multi-layer neural network

Mobile ad hoc networks
  UF: MANET
      Wireless ad hoc network
  BT: Ad hoc networks

Mobile agents
  BT: Knowledge based systems
  RT: Computer applications
      Distributed computing
      Intelligent systems
      Learning systems
2021 IEEE Thesaurus

Mobile computing
Software agents

Mobile antennas
BT: Antennas
Land mobile radio
equipment
RT: Land mobile radio

Mobile application development
USE: Application programming
interfaces

Mobile applications
UF: Mobile apps
BT: Computer applications
RT: Mobile communication
Mobile handsets
Wireless communication

Mobile apps
USE: Mobile applications

Mobile communication
BT: Communication systems
Near field communication
RT: Acoustic communication
(telecommunication)
Block codes
Film bulk acoustic
resonators

Mobile devices
USE: Mobile handsets

Mobile handsets
UF: Mobile devices
Mobile phones
BT: Telephone sets
RT: Dual band
Land mobile radio
Long Term Evolution
Mobile applications
Mobile communication
Personal communication
networks
Tablet computers
Transceivers
UHF communication
Smart phones

Mobile learning
BT: Electronic learning
Mobile communication
RT: Distance learning
Mobile computing

Mobile location management
USE: Location awareness

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| Mobile nodes | Mobile communication | Telecommunication | Mobile telecommunication | USE: TV |
| Mobile office | Teleworking |
| Mobile payment | Online banking |
| Mobile phones | Mobile handsets |
| Mobile radio | Land mobile radio |
| Mobile radio mobility management | Location awareness |
| Mobile robot sensing systems | Robot sensing systems |
| Mobile robot vision systems | Robot vision systems |
| Mobile robots | Robots |
| Control | Motion control |
| Services | Service robots |
| Stairs | Stairs |
| Unmanned aerial vehicles | Unmanned aerial vehicles |
| Vehicles | Vehicles |
| Vehicular automation | Vehicular automation |
| Wearable robots | Wearable robots |
| Autonomous automobiles | Autonomous automobiles |
| Climbing robots | Climbing robots |
| Legged locomotion | Legged locomotion |
| Mobile security | Mobile device security |
| BT: Robots |
| RT: Agricultural robots |
| Assembly systems |
| Control systems |
| Humanoid robots |
| Industrial control |
| Manufacturing automation |
| Marine robots |
| Materials handling |
| Mechanical variables |
| Mode checking | System testing |
| RT: Algorithms |
| Concurrent computing |
| Formal verification |
| Static analysis |
| Model driven engineering | Model-driven engineering |
| BT: Software design |
| Model predictive control | Predictive control |
| Model reduction | Reduced order systems |
| Model-based reasoning | Inference mechanisms |
| Model-driven development | Software development management |
## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE: Model driven engineering</th>
<th>System identification</th>
<th>Systems modeling</th>
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<td><strong>Model-predictive control</strong></td>
<td><strong>Modelling</strong></td>
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<tr>
<td>USE: Predictive control</td>
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<td><strong>Modelling</strong></td>
<td>USE: Modeling</td>
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<td><strong>Modems</strong></td>
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</tr>
<tr>
<td>UF: Modulator-demodulators</td>
<td>BT: Communication equipment</td>
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</tr>
<tr>
<td>BT: Communication equipment</td>
<td></td>
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</tr>
<tr>
<td>RT: Data communication</td>
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<td>MODFET circuits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT: FET circuits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT: Rail to rail amplifiers</td>
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<td>MODFET integrated circuits</td>
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<td>RT: MODFETs</td>
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<tr>
<td>MODIS</td>
<td></td>
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</tr>
<tr>
<td>UF: Moderate resolution imaging spectroradiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT: Payloads</td>
<td></td>
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<td>MODIS</td>
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<td>Imaging Spectroradiometer</td>
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<td>BT: Payloads</td>
<td></td>
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<tr>
<td>MODIS</td>
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<tr>
<td>UF: Moderate resolution imaging spectroradiometer</td>
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<td>BT: Mounting</td>
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<td>Imaging Spectroradiometer</td>
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<td></td>
</tr>
<tr>
<td>BT: Payloads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UF: Moderate resolution imaging spectroradiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT: Mounting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## Prefabricated construction

**Modular multi-level converters**  
*USE*: Multi-level converters AND Voltage-source converters

**Modular multilevel converters**  
*USE*: Multi-level converters

### Modulation

**UF**: Modulation format  
- Modulation index  
- Modulation-coding  
- Modulators  

**BT**: Communications  
**RT**: Signal processing  
**spectrum communication**  
- Direct sequence spread  
- Encoding  
- IEEE 802.11 Standard  
- IEEE 802.11g Standard  
- IEEE 802.11n Standard  
- Linearization techniques  
- Mixers  
- Modems  
- OFDM  
- Phase locked loops  
- Tracking loops  
- Transmitters  

**NT**: Amplitude modulation  
- Chirp modulation  
- Demodulation  
- Digital modulation  
- Frequency modulation  
- Magnetic modulators  
- Modulation coding  
- Optical modulation  
- Phase modulation  
- Pulse modulation  
- Pulse width modulation  

### Modulation coding

**BT**: Modulation  
**RT**: Encoding  
**NT**: Information theory  
**Interleaved codes**

### Modulation format

*USE*: Modulation

### Modulation index

*USE*: Modulation

### Modulation-coding

**Modulator-demodulators**  
*USE*: Modems

**Modulators**  
*USE*: Modulation

**Modules (abstract algebra)**  
**BT**: Abstract algebra

### Moisture

**BT**: Geophysics  
**RT**: Moisture control  
- Moisture measurement  
- Trees - insulation

### Moisture control

**BT**: Control systems  
**RT**: Moisture  
**NT**: Humidity control

### Moisture measurement

**BT**: Measurement  
**RT**: Moisture  
**NT**: Humidity measurement

### Molded case circuit breakers

**UF**: Molded-case circuit  
**breakers**  
**BT**: Circuit breakers  
**RT**: Short-circuit currents

**Molded-case circuit breakers**  
*USE*: Molded case circuit

### Molding equipment

**UF**: Moulding equipment  
**BT**: Production equipment

### Molecular beam applications

**BT**: Molecular beams  
**RT**: Light emitting diodes  
- Semiconductor devices  
- Semiconductor lasers

### Molecular beam epitaxial growth

**BT**: Epitaxial growth  
**RT**: Crystals  
- Gallium  
- Thin films

### Molecular beams
<table>
<thead>
<tr>
<th><strong>MONOS devices</strong></th>
<th><strong>Morphology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Metal-oxide-nitride-oxide-silicon</td>
<td>BT: Natural language</td>
</tr>
<tr>
<td>BT: Semiconductor devices</td>
<td>processing</td>
</tr>
<tr>
<td><strong>Monsoons</strong></td>
<td><strong>RT: Entomology</strong></td>
</tr>
<tr>
<td>BT: Meteorology</td>
<td><strong>Mortar</strong></td>
</tr>
<tr>
<td>RT: Rain Storms</td>
<td>BT: Building materials</td>
</tr>
<tr>
<td><strong>Monte Carlo methods</strong></td>
<td>Chemical products</td>
</tr>
<tr>
<td>UF: Importance sampling</td>
<td>RT: Construction industry</td>
</tr>
<tr>
<td>Monte Carlo simulations</td>
<td><strong>Mortgages</strong></td>
</tr>
<tr>
<td>Monte-Carlo methods</td>
<td>USE: Loans and mortgages</td>
</tr>
<tr>
<td>RT: Computational electromagnetics</td>
<td><strong>MOS capacitors</strong></td>
</tr>
<tr>
<td>Modeling</td>
<td>BT: MOS devices</td>
</tr>
<tr>
<td>Probability</td>
<td>RT: Capacitors</td>
</tr>
<tr>
<td>Simulated annealing</td>
<td><strong>MOS devices</strong></td>
</tr>
<tr>
<td>Simulation</td>
<td>UF: Metal-oxide semiconductors</td>
</tr>
<tr>
<td><strong>Monte Carlo simulations</strong></td>
<td>Metal-oxide-semiconductor devices</td>
</tr>
<tr>
<td>USE: Monte Carlo methods</td>
<td>BT: MIS devices</td>
</tr>
<tr>
<td><strong>Monte-Carlo methods</strong></td>
<td>RT: Semiconductor-insulator interfaces</td>
</tr>
<tr>
<td>USE: Monte Carlo methods</td>
<td>NT: MOS capacitors</td>
</tr>
<tr>
<td><strong>Monte-Carlo simulations</strong></td>
<td>MOSFET</td>
</tr>
<tr>
<td>USE: Monte Carlo methods</td>
<td>Negative bias temperature instability</td>
</tr>
<tr>
<td><strong>Mood</strong></td>
<td><strong>MOS integrated circuits</strong></td>
</tr>
<tr>
<td>BT: Psychology</td>
<td>BT: MOSFET circuits</td>
</tr>
<tr>
<td><strong>Moon</strong></td>
<td>RT: Metal-insulator structures</td>
</tr>
<tr>
<td>UF: Lunar</td>
<td><strong>MOS transistors</strong></td>
</tr>
<tr>
<td>BT: Satellites</td>
<td>USE: MOSFET</td>
</tr>
<tr>
<td><strong>Moore's Law</strong></td>
<td><strong>MOSFET</strong></td>
</tr>
<tr>
<td>BT: Integrated circuit technology</td>
<td>UF: MOS transistors</td>
</tr>
<tr>
<td>nMOSFETs</td>
<td><strong>Mopeds</strong></td>
</tr>
<tr>
<td>pMOSFETs</td>
<td>USE: Motorcycles</td>
</tr>
<tr>
<td><strong>Mopeds</strong></td>
<td><strong>Morals</strong></td>
</tr>
<tr>
<td>USE: Motorcycles</td>
<td>USE: Ethics</td>
</tr>
<tr>
<td><strong>Morphological operations</strong></td>
<td>transistors</td>
</tr>
<tr>
<td>BT: Image processing</td>
<td><strong>MOSFET circuits</strong></td>
</tr>
<tr>
<td>RT: Topology</td>
<td><strong>Mortgage</strong></td>
</tr>
<tr>
<td>USE: Loans and mortgages</td>
<td><strong>Mortgages</strong></td>
</tr>
<tr>
<td>UF: Metal-oxide semiconductor field effect transistor</td>
<td>Motion detection</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BT: Circuits</td>
<td>BT: Signal detection</td>
</tr>
<tr>
<td>FET circuits</td>
<td>RT: Alarm systems</td>
</tr>
<tr>
<td>RT: Active inductors</td>
<td>Corner detection</td>
</tr>
<tr>
<td>Linearization techniques</td>
<td>Image motion analysis</td>
</tr>
<tr>
<td>Operational amplifiers</td>
<td>Image sensors</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>Infrared detectors</td>
</tr>
<tr>
<td>Rail to rail amplifiers</td>
<td>Mobile robots</td>
</tr>
<tr>
<td>Rail to rail operation</td>
<td>Motion control</td>
</tr>
<tr>
<td>Threshold voltage</td>
<td>Surveillance</td>
</tr>
<tr>
<td>NT: CMOSFET circuits</td>
<td>Video signal processing</td>
</tr>
<tr>
<td>MOS integrated circuits</td>
<td>Video surveillance</td>
</tr>
<tr>
<td>Power MOSFET</td>
<td></td>
</tr>
</tbody>
</table>

**MOSHFETs**

| UF: Metal oxide semiconductor heterojunction FETs | Motion estimation |
|---|---|---|
| BT: Field effect transistors | BT: Parameter estimation |

**Motion analysis**

| BT: Robot kinematics | Motion measurement |
|---|---|---|
| NT: Active contours | BT: Mechanical variables |
| Motion segmentation | RT: Doppler measurement |
| Robot localization | Gaze tracking |

**Motion artifacts**

| BT: Biomedical image processing | Video signal processing |

**Motion compensation**

| BT: Control systems | Motion planning |
|---|---|---|
| RT: Image communication | BT: Motion control |

**Motion control**

| BT: Mechanical variables | Motion segmentation |
|---|---|---|
| control | BT: Motion analysis |
| RT: Aerospace control | **Motion sensors** |
| Legged locomotion | USE: Motion detection |
| Manipulators | |
| Mobile robots | |
| Motion detection | **Motor control** |
| Motor coordination | USE: Motor drives |
| Servosystems | |
| Structure from motion | |
| Trajectory | **Motor coordination** |
| Trajectory tracking | BT: Kinematics |
| Velocity control | |
| NT: Collision avoidance | |
| Collision mitigation | |
| Kinetic theory | |
| Motion planning | |
| Path planning | |
| Visual servoing | |
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>RT: Motion control</th>
<th>NT: Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralysis</td>
<td></td>
</tr>
</tbody>
</table>

**Motor drives**

- **UF:** Motor control
- **BT:** Drives
- **RT:** Industrial control
- **Mechanical variables**
- **control**
  - Motors
  - Sensorless control
  - Servosystems
  - Torque control
  - Variable speed drives
  - Velocity control
  - Voltage control

**Motorbikes**

- **USE:** Motorcycles

**Motorcycles**

- **UF:** Mopeds
- **Motorbikes**
- **Scooters**
- **BT:** Road vehicles

**Motors**

- **BT:** Energy conversion
- **Machinery**
- **RT:** Coils
- **Motor drives**
- **Sensorless control**
- **NT:** AC motors
- **Brushless motors**
- **Commutation**
- **DC motors**
- **Electric motors**
- **Hysteresis motors**
- **Induction motors**
- **Micromotors**
- **Permanent magnet motors**
- **Servomotors**
- **Traction motors**
- **Universal motors**

**Moulding equipment**

- **USE:** Molding equipment

**Mouse**

- **USE:** Mice

**Mouth**

- **BT:** Digestive system
- **Head**
- **RT:** Stomatognathic system

**Movies**

- **USE:** Motion pictures

**Moving object databases**

- **USE:** Visual databases

**Moving picture experts group**

- **USE:** MPEG standards

**Moving Pictures Experts Group**

- **BT:** IEC
- **ISO**

**MP3**

- **USE:** Digital audio players AND Portable media players

**MPEG**

- **USE:** Transform coding

**MPEG 1 Standard**

- **BT:** MPEG standards

**MPEG 2 Standard**

- **BT:** MPEG standards

**MPEG 4 Standard**

- **UF:** MPEG4
- **BT:** MPEG standards
- **RT:** Digital multimedia broadcasting
  - High efficiency video coding
  - Streaming media
  - Vector quantization
  - Video codecs
  - Video coding
  - Video signal processing

**MPEG 7 Standard**

- **UF:** MPEG7
- **BT:** MPEG standards
- **RT:** Audio coding
  - Content management
  - Digital multimedia broadcasting
  - Multimedia communication
  - Multimedia systems

**MPEG standards**

- **USE:** Moving picture experts group
- **BT:** IEC Standards
- **ISO Standards**

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<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital multimedia broadcasting</td>
<td>Image coding, Streaming media, Transform coding, Video codecs, Video coding, Video signal processing</td>
</tr>
<tr>
<td>MPEG 1 Standard</td>
<td>MPEG 2 Standard, MPEG 4 Standard, MPEG 7 Standard</td>
</tr>
<tr>
<td>MPEG 4</td>
<td>MPEG 4 Standard</td>
</tr>
<tr>
<td>MPEG 7</td>
<td>MPEG 7 Standard</td>
</tr>
<tr>
<td>Multiprotocol label</td>
<td>Maximum power point</td>
</tr>
<tr>
<td>Magnetic resonance imaging</td>
<td>Materials requirements planning</td>
</tr>
<tr>
<td>Sediments</td>
<td>Exhaust systems</td>
</tr>
<tr>
<td>Multisensory integration</td>
<td>Multi-stage noise shaping, Multi-agent systems</td>
</tr>
<tr>
<td>Multi-agent models</td>
<td>Multi-agent systems</td>
</tr>
</tbody>
</table>

**Multi-agent models**

**Multiagent systems**

**Multi-attribute optimization**

**Multi-carrier code division multiple access**

**Multi-casting**

**Multi-core processing**

**Multi-core processors**

**Multi-factor authentication**

**Multi-hop**

**Multi-layer neural network**

**Multi-level converters**

**Multi-level inverters**

**Multi-objective programming**

**Multi-resolution**
Multi-robot systems
UF: Multirobot systems
BT: Robotics and automation
NT: Swarm robotics
Multi-stage noise shaping
UF: MASH
Multi stage noise shaping
Multistage noise shaping
BT: Noise shaping
Multi-threaded comput*
USE: Multithreading
Multi-threaded systems
USE: Program processors
Multi-threading systems
USE: Program processors
Multi-user channels
USE: Multiuser channels
Multi-user detection
USE: Multiuser detection
Multi-vibrators
USE: Multivibrators
Multiaccess communication
UF: CDMA
CSMA
Carrier sense multiaccess
Code division multiaccess
Code division multiple
access
access
access
communication
BT: Cellular technology
Communication systems
RT: 3G mobile communication
Delay estimation
Multiplexing
OFDM
Telecommunications
Viterbi algorithm
NT: Access charges
Direct-sequence code-
division multiple access
Multiaccess systems
USE: Multiaccess communication
Multiagent models
USE: Multi-agent systems
Multiagent systems
USE: Multi-agent systems
Multicarrier code division multiple access
UF: MC-CDMA
MCCDMA
Multi-carrier code division
multiple access
BT: Multiaccess communication
RT: Code division multiplexing
Communication channels
OFDM
Protocols
Spread spectrum
communication
Telecommunications
Time division synchronous
code division multiple access
Multicast algorithms
BT: Algorithms
Multicast communication
UF: Multi-casting
Multicasting
BT: Communication systems
RT: Ad hoc networks
Multicast protocols
Optical wavelength
conversion
Routing
Telecommunications
Wavelength division
multiplexing
NT: Multicast VPN
Multicast protocols
BT: Protocols
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>RT: Multicast communication, Multicast protocols</th>
<th>BT: Internet, Internet communication, Internet protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multicast VPN</strong></td>
<td>BT: Multicast communication</td>
</tr>
<tr>
<td><strong>Multicasting</strong></td>
<td>USE: Multicast communication</td>
</tr>
<tr>
<td><strong>Multichip modules</strong></td>
<td>BT: Integrated circuit packaging, Packaging</td>
</tr>
<tr>
<td><strong>Multiconductor transmission lines</strong></td>
<td>BT: Transmission lines, RT: Coupled mode analysis</td>
</tr>
<tr>
<td><strong>Multicore</strong></td>
<td>USE: Multicore processing</td>
</tr>
<tr>
<td><strong>Multicore processing</strong></td>
<td>UF: Many core processing, Many core systems, Many-core processing, Multi-core processors, Multicore</td>
</tr>
<tr>
<td>BT: Parallel architectures, NT: Embedded multicore processing</td>
<td></td>
</tr>
<tr>
<td><strong>Multidimensional signal processing</strong></td>
<td>BT: Signal processing, RT: Image processing, NT: Video signal processing</td>
</tr>
<tr>
<td><strong>Multidimensional systems</strong></td>
<td>BT: Systems engineering and theory</td>
</tr>
<tr>
<td><strong>Multifilamentary superconductors</strong></td>
<td>BT: Superconducting materials</td>
</tr>
<tr>
<td><strong>Multifrequency antennas</strong></td>
<td>BT: Antennas</td>
</tr>
<tr>
<td><strong>Multigrid methods</strong></td>
<td>BT: Numerical analysis</td>
</tr>
<tr>
<td><strong>Multihop</strong></td>
<td>USE: Spread spectrum communication</td>
</tr>
<tr>
<td><strong>Multilayer perceptrons</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Multilevel converters</strong></td>
<td>USE: Nonhomogeneous media, USE: Collimators</td>
</tr>
<tr>
<td><strong>Multileaf collimators</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Multilevel fast multipole algorithm</strong></td>
<td>USE: MLFMA</td>
</tr>
<tr>
<td><strong>Multilevel inverters</strong></td>
<td>UF: Modular multi-level converters, Modular multilevel converters, BT: Converters</td>
</tr>
<tr>
<td><strong>Multilevel invertors</strong></td>
<td>USE: Multilevel inverters</td>
</tr>
<tr>
<td><strong>Multilevel systems</strong></td>
<td>BT: Hierarchical systems</td>
</tr>
<tr>
<td><strong>Multilinear systems</strong></td>
<td>USE: Nonlinear systems</td>
</tr>
<tr>
<td><strong>Multimedia communication</strong></td>
<td>BT: Communication systems, Multimedia systems, RT: B-ISDN, Broadband communication, Diffserv networks, Digital multimedia</td>
</tr>
<tr>
<td><strong>Multimedia computing</strong></td>
<td>broadcasting: Huffman coding, IEEE 802.16 Standard, ISDN, Intserv networks, Journalism, MPEG 7 Standard, Multimedia computing, Streaming media, Transcoding, NT: Hypermedia</td>
</tr>
</tbody>
</table>
### Multimedia systems

**BT:** Multimedia systems  
**RT:** Audio user interfaces  
Collaborative work  
Computer graphics  
Computers and information processing  
Content management  
Information systems  
Multimedia communication  
Multimedia databases  
Video sequences  

**NT:** Multimedia Web sites

### Multimedia databases

**BT:** Database systems  
Databases  
Multimedia systems  
**RT:** Audio databases  
Huffman coding  
Multimedia computing

### Multimedia products

**USE:** Videos

### Multimedia systems

**BT:** Consumer electronics  
Authoring systems  
Electronic publishing  
Huffman coding  
MPEG 7 Standard  
Mixed reality  
**NT:** Multimedia communication  
Multimedia computing  
Multimedia databases

### Multimedia Web sites

**UF:** Dailymotion  
Flickr  
Image sharing Web sites  
Instagram  
Media sharing Web sites  
Photo sharing Web sites  
Pinterest  
Snapchat  
Video sharing Web sites  
Vimeo  
Youtube  
**BT:** Multimedia computing  
Web sites  
**RT:** Social networking (online)  
Streaming media  
Video on demand  
Video sharing

### Multimedia computing

**USE:** Multisensory integration

### Multimodal sensors

**UF:** Multi-modal sensors  
Multimodal sensing  
**BT:** Sensors  
**RT:** Sensor fusion

### Multiobjective programming

**USE:** Pareto optimization

### Multipath channels

**BT:** Communication channels  
**RT:** Channel estimation  
Diversity methods  
Fading channels  
MIMO communication  
Meteorological factors  
Multiuser detection  
Radio propagation  
Terrain factors  
Ultra wideband

### Multiple access interference

**BT:** OFDM

### Multiple antenna systems

**USE:** MIMO communication

### Multiple input multiple output

**USE:** MIMO communication

### Multiple sclerosis

**BT:** Diseases

### Multiple signal classification

**UF:** MUSIC  
**BT:** Noise measurement

### Multimodal integration
Multiple-input single output
USE: MISO communication

Multiple-input single-output
USE: MISO communication

Multiple-input-multiple-output
USE: MIMO communication

Multiplexed
USE: Multiplexing

Multiplexing
UF: Multiplexed
BT: Communications
technology
RT: Arrayed waveguide gratings
Multiaccess communication
NT: Code division multiplexing
Demultiplexing
Frequency division

Multiplexing
Layered division

Multiplexing equipment
OFDM
Space division multiplexing
Time division multiplexing
Wavelength division

Multiplexing equipment
BT: Multiplexing
RT: Communication equipment
NT: Add-drop multiplexers

Multiplying circuits
BT: Circuits
RT: Digital integrated circuits
Logic circuits

Multiprocessing systems
BT: Parallel processing
RT: AI accelerators
Computer networks
Computers and information
processing
Concurrency control
Distributed computing
Parallel languages
Parallel programming
Pipeline processing
NT: Data flow computing
Processor scheduling
Systolic arrays

Multiprocessor interconnection
UF: Interconnection networks
Parallel processor
interconnection
BT: Computer architecture
RT: Computer networks
Data communication
Local area networks
Metropolitan area networks
Wide area networks
NT: Hypercubes

Multiprocessor interconnection networks
BT: Computer networks

Multiprocessor scheduling
USE: Processor scheduling

Multiprotocol label switching
UF: Label swapping
MPLS
BT: Communication switching
Packet switching
Protocols
RT: Asynchronous transfer

Multiresolution analysis
UF: Multi-resolution
BT: Wavelet analysis

Multirobot systems
USE: Multi-robot systems

Multisensor systems
BT: Sensor fusion
RT: Robot sensing systems

Multisensory integration
UF: Multi modal integration
Multi sensory integration
Multimodal integration
BT: Sense organs

Multiskilling
UF: Job rotation
BT: Human resource
management
RT: Industrial training
Job specification
Vocational training
Multispectral imaging  
BT: Imaging

Multistage noise shaping  
USE: Multi-stage noise shaping

Multistatic radar  
BT: Radar
NT: MIMO radar

Multitasking  
BT: Computers and information processing
NT: Parametric study

Multithreaded systems  
USE: Program processors

Multithreading  
UF: Multi-threaded comput*
Multithreading comput*  
BT: Parallel processing

Multithreading comput*  
USE: Multithreading

Multithreading systems  
USE: Program processors

Multiuser channels  
UF: Multi-user channels
BT: Communication channels

Multiuser detection  
UF: Multi-user detection
BT: Signal detection
RT: Cellular radio
Land mobile radio
Mobile communication
Multipath channels
Spread spectrum
communication

Multivalued logic  
UF: Many valued logic
Ternary logic  
BT: Logic
RT: Logic functions

Multivariable systems  
USE: MIMO communication

Multivariate regression  
BT: Regression analysis

Multivibrators  
UF: Multi-vibrators
BT: Electronic circuits

Multiwave mixing  
BT: Optical mixing

Munitions  
USE: Weapons

Muon colliders  
UF: Muon sources
BT: Colliding beam devices
RT: Luminescence
Luminescent devices
Storage rings

Muon sources  
USE: Muon colliders

Muons  
USE: Mesons

Muscles  
BT: Musculoskeletal system
NT: Myocardium
Neuromuscular

Musculoskeletal system  
BT: Anatomy
NT: Cartilage
Fascia
Ligaments
Muscles
Skeleton
Tendons

MUSIC  
USE: Multiple signal classification

Music  
UF: Computer music
Musical
BT: Acoustics
RT: Audio systems
White noise
NT: Computer generated music
Electronic music
Musical instrument digital
interfaces
Rhythm
Timbre

Music information retrieval  
BT: Information retrieval
## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>RT</th>
<th>BT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Cepstral analysis</td>
<td>BT: Social networking (online)</td>
</tr>
<tr>
<td>Music recommendation</td>
<td>Video sharing</td>
</tr>
<tr>
<td>USE: Recommender systems</td>
<td>Web sites</td>
</tr>
<tr>
<td>Musical</td>
<td></td>
</tr>
<tr>
<td>USE:</td>
<td>Music</td>
</tr>
<tr>
<td>Musical instrument digital interfaces</td>
<td></td>
</tr>
<tr>
<td>UF: MDDI</td>
<td></td>
</tr>
<tr>
<td>BT: Computer interfaces</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>RT: Digital communication</td>
<td></td>
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<tr>
<td>Must carry</td>
<td></td>
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<tr>
<td>USE: Must-carry</td>
<td></td>
</tr>
<tr>
<td>Must-carry</td>
<td></td>
</tr>
<tr>
<td>UF: Must carry</td>
<td></td>
</tr>
<tr>
<td>BT: Cable TV</td>
<td></td>
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<tr>
<td>Government policies</td>
<td></td>
</tr>
<tr>
<td>RT: Licenses</td>
<td></td>
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<tr>
<td>TV</td>
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<tr>
<td>Mutual conductance</td>
<td></td>
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<tr>
<td>USE: Transconductance</td>
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<tr>
<td>Mutual coupling</td>
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<tr>
<td>BT: Electromagnetic coupling</td>
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<tr>
<td>Mutual funds</td>
<td></td>
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<tr>
<td>BT: Financial management</td>
<td></td>
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<td>Mutual information</td>
<td></td>
</tr>
<tr>
<td>UF: Transinformation</td>
<td></td>
</tr>
<tr>
<td>BT: Information theory</td>
<td></td>
</tr>
<tr>
<td>Myelin</td>
<td></td>
</tr>
<tr>
<td>BT: Nerve fibers</td>
<td></td>
</tr>
<tr>
<td>RT: Axons</td>
<td></td>
</tr>
<tr>
<td>Myocardial</td>
<td></td>
</tr>
<tr>
<td>USE: Myocardium</td>
<td></td>
</tr>
<tr>
<td>Myocardium</td>
<td></td>
</tr>
<tr>
<td>UF: Myocardial</td>
<td></td>
</tr>
<tr>
<td>BT: Muscles</td>
<td></td>
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<tr>
<td>Myopia</td>
<td></td>
</tr>
<tr>
<td>USE: Vision defects</td>
<td></td>
</tr>
<tr>
<td>Myspace</td>
<td></td>
</tr>
<tr>
<td>USE: Social networking (online)</td>
<td></td>
</tr>
<tr>
<td>MySpace</td>
<td></td>
</tr>
</tbody>
</table>

**NACE International**

UF: National Association of Corrosion Engineers

BT: Standards organizations

**NACE Standards**

BT: Standards publications

**Nails**

BT: Integumentary system

**Naive Bayes algorithms**

USE: Naive Bayes methods

**Naive Bayes classification**

USE: Naive Bayes methods

**Naive Bayes classifiers**

USE: Naive Bayes methods

**Naive Bayes methods**

UF: Naive Bayes algorithms

Naive Bayes classification

Bayes methods

Learning (artificial intelligence)

Pattern classification

RT: Data mining

Machine learning

Probability

Supervised learning

Support vector machines

Text analysis

**Nakagami distribution**

BT: Probability distribution

**NAND flash**

USE: Flash memories

**Nano biophotonics**

USE: Nanobiophotonics

**Nano communication**

USE: Nanocommunication (telecommunication)

**Nano devices**

USE: Nanoscale devices

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### 2021 IEEE Thesaurus

**Nano generators**
- **USE:** Nanogenerators
- **BT:** Nanoscale devices
- **RT:** Enhanced magnetoresistance

**Nano packaging**
- **USE:** Nanopackaging

**Nano ribbons**
- **USE:** Nanoribbons

**Nanoactuators**
- **USE:** Actuators AND Nanoelectronics

**Nanobiophotonics**
- **UF:** Nano biophotonics
- **BT:** Nanobiotechnology Photons
- **RT:** Biomedical imaging Biosensors Lasers Nanoparticles Nanoscale devices

**Nanobiotechnology**
- **BT:** Biology Nanotechnology
- **RT:** Colloidal lithography Nanofluidics DNA computing Nanobiotechnology

**Nanocarriers**
- **BT:** Nanomaterials
- **RT:** Drug delivery

**Nanocommunication (telecommunication)**
- **UF:** Nano communication
- **BT:** Communication systems Nanotechnology
- **RT:** Biomedical communication Molecular communication Wireless networks Wireless sensor networks

**Nanocomposites**
- **BT:** Nanostructured materials
- **RT:** Metamaterials

**Nanocontacts**
- **BT:** Nanoscale devices
- **RT:** Enhanced magnetoresistance

**Nano crystals**
- **USE:** Nanocrystals

**Nanoelectromechanical systems**
- **UF:** NEMS
- **BT:** Nanotechnology
- **RT:** Microelectromechanical systems

**Nanomedicine**
- **NT:** Junctionless nanowire transistors

**Nanofiltration**
- **USE:** Filtration

**Nanofluidics**
- **UF:** Nanofluids
- **BT:** Fluidics
- **RT:** Nanotechnology Nanobiotechnology

**Nanogenerators**
- **UF:** Nano generators
- **BT:** Energy harvesting
- **RT:** Electric generators Low-power electronics

---

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### Micromechanical devices
- Nanowires
- Piezoelectric devices
- Triboelectricity
- Vibrations

### Nanomaterials
- BT: Nanotechnology
- RT: Nanopatterning
- Soft lithography

### Nanomotors
- BT: Nanotechnology
- RT: Nanopackaging
- Nanocarriers

### Nanometers
- UF: Millimicron
- BT: Measurement units
- Nanometres

### Nanomachines
- BT: Nanotechnology
- RT: Nanobiophotonics

### Nanoparticles
- UF: Nanopowders
- BT: Nanostructures
- Nanocrystals
- Nanocrystals

### Nanopatterns
- BT: Nanotechnology
- RT: Nanolithography

### Nanophasics
- BT: Nanotechnology
- Photonics

### Nanoporous materials
- BT: Nanostructured materials

### Nanopositioning
- BT: Nanotechnology
- Position control

### Nanopowders
- USE: Nanoparticles

### Nanoribbons
- UF: Nano ribbons
- BT: Nanostructures

### Nanosatellites
- USE: Small satellites

### Nanoscale devices
- UF: Nano devices
- BT: Nanotechnology
- RT: Nanobiophotonics
- Nanocontacts
- Nanotube devices

### Nanosensors
- BT: Nanotechnology
- Sensors
- Nanoparticles
- Nanostructures

### Nanostructured materials
- UF: Core-shelf nanostructures
- BT: Materials
- Nanotechnology
- Nanocomposites
- Nanoporous materials

### Nanostructures
- BT: Nanotechnology
- Nanoribbons
- Nanotubes
- Nanowires

---

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<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Nanowires</td>
<td>Nanostructures</td>
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<td>Nanocontacts</td>
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<td>Nanogenerators</td>
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<tr>
<td></td>
<td>Wires</td>
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<td>Narrowband</td>
<td>Bandwidth</td>
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<td>Communication systems</td>
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<tr>
<td>NASA</td>
<td>National Aeronautics &amp; Space Administration</td>
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<td></td>
<td>National Aeronautics and Space Administration</td>
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<tr>
<td>Nash equilibrium</td>
<td>Game theory</td>
</tr>
<tr>
<td>National Electric Code</td>
<td>National electric safety code</td>
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<tr>
<td></td>
<td>ANSI Standards</td>
</tr>
<tr>
<td>National Fire Protection Agency</td>
<td>NFPA</td>
</tr>
<tr>
<td>National Institute of Standards &amp; Technology</td>
<td>NIST</td>
</tr>
</tbody>
</table>
### National Institute of Standards and Technology

| USE  | NIST |

### National Institutes of Health

| UF   | NIH |
| BT   | US Department of Health and Human Services |

### National security

| BT   | Terrorism |
| RT   | Control system security |
|      | Cyber warfare |

### National Society Agreement awards

| BT   | IEEE Awards activities |

### National Telecommunications and Information Administration

| USE  | NTIA |

### National vocational qualification

| USE  | Vocational training |

### Natural fibers

| UF   | Natural fibres |
| BT   | Textile fibers |
| RT   | Cotton |
|      | Wool |
| NT   | Bamboo |

### Natural gas

| BT   | Fossil fuels |
| RT   | Energy resources |
|      | Fracking |
|      | Gases |
| NT   | Natural gas industry |
|      | Liquefied natural gas |
|      | Methane |

### Natural gas industry

| BT   | Industries |
|      | Natural gas |
|      | Petroleum industry |
|      | Pipelines |

### Natural language processing

| UF   | NLP |
| BT   | Natural languages |
| RT   | Phonetics |
|      | Pragmatics |
|      | Semantic search |
|      | Semantic technology |

### Natural languages

| UF   | Natural speech |
| BT   | Systems, man, and cybernetics |
| RT   | Artificial intelligence |
| NT   | Linguistics |
|      | Natural language processing |

### Natural response

| USE  | Transient response |

### Natural speech

| USE  | Natural languages |

### Navier-Stokes equations

| BT   | Differential equations |
|      | Fluid dynamics |
| RT   | Finite volume methods |
|      | Viscosity |

### Navigation

| UF   | Direction-finding |
| BT   | Geomagnetic navigation |
|      | Intelligent transportation systems |
|      | Vehicular and wireless technologies |
| RT   | Compass |
|      | Ground support |
|      | Location awareness |
|      | Motion planning |
|      | Position measurement |
|      | Sensor systems |
| NT   | Aircraft navigation |
|      | Course correction |
|      | Dead reckoning |
|      | Indoor navigation |
|      | Inertial navigation |
|      | Marine navigation |
|      | Radio navigation |
|      | Satellite navigation systems |
|      | Sonar navigation |

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2021 IEEE Thesaurus

Niobium

USE: Niobium

Nb3Sn
USE: Niobium-tin

NBS
USE: NIST

NBTI
USE: Negative bias temperature instability

NC machines
USE: Computer numerical control

Nd
USE: Neodymium

Near field communication
UF: NFC
Nearfield communication
BT: Communication standards
Radio communication
RT: Magnetic communication
NT: Mobile communication

Near field radiation pattern
USE: Near-field radiation pattern

Nearest neighbor methods
UF: K-NN methods
Nearest neighbor searches
Nearest neighbour methods
k neighbor methods
k neighbour methods
BT: Learning (artificial intelligence)
Nonparametric statistics
Pattern recognition
RT: Data mining
Pattern classification
Pattern clustering
Regression analysis
Search methods
Statistical analysis

Nearest neighbor searches
USE: Nearest neighbor methods

Nearest neighbour methods
USE: Nearest neighbor methods

Nearfield communication
USE: Near field communication

Neck
BT: Body regions

Needles
BT: Mechanical products
RT: Biomedical equipment
Textile machinery

Negative bias temperature instability
UF: NBTI
BT: MOS devices

Negative feedback
BT: Feedback

Negative feedback amplifier
USE: Feedback amplifiers

Negative feedback loops
BT: Feedback loop

NEMA
BT: Standards organizations

NEMS
USE: Nanoelectromechanical systems

Neodymium
UF: Nd
BT: Metals
NT: Neodymium alloys
Neodymium compounds

Neodymium alloys
BT: Neodymium
RT: Alloying

Neodymium compounds
BT: Neodymium

Neon
BT: Chemical elements

Neonatology
BT: Medical specialties
RT: Pediatrics

Neoplasia
USE: Neoplasms
<table>
<thead>
<tr>
<th>Neoplasms</th>
<th>Spine</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Neoplasia</td>
<td>Synapses</td>
</tr>
<tr>
<td>BT: Biological tissues</td>
<td></td>
</tr>
<tr>
<td>NT: Breast neoplasms</td>
<td></td>
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<tr>
<td>Liver neoplasms</td>
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<tr>
<td>Lung neoplasms</td>
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<tr>
<td>Skin neoplasms</td>
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</table>

Neoplasms

**Net neutrality**

USE: Network neutrality

**Network address translation**

BT: Computer network management

**Network analyzers**

BT: Instruments

**Network architecture**

BT: Network topology

Telecommunication network management

NT: Active networking

Information-centric networking

Network function virtualization

BT: Network function virtualization

NT: Network slicing

**Network coding**

BT: Information theory

RT: Network security

**Network control systems**

USE: Networked control systems

**Network interfaces**

BT: Interface phenomena

RT: Interface management

**Network intrusion**

BT: Data breach

RT: Data security

Network security

Privacy

NT: Network intrusion detection

**Neptunium**

BT: Chemical elements

**Nerve cells**

USE: Neurons

**Nerve endings**

BT: Nervous system

**Nerve fibers**

BT: Neurons

NT: Axons

Myelin

**Nerve tissues**

BT: Nervous system

**Nervous system**

BT: Anatomy

RT: Bioelectric phenomena

Computational neuroscience

Neural networks

Neurological diseases

Neurology

Neuromuscular stimulation

Neuropathology

NT: Autonomic nervous system

Brain

Brain mapping

Central nervous system

Cranial

Ganglia

Glial cells

Nerve endings

Nerve tissues

Neural pathways

Neuroanatomy

Neurons

Neuroradiology

Neuroscience

Peripheral nervous system

Pituitary gland

Spinal cord

Synapses

Network neutrality

Network address translation

Network analyzers

Network architecture

Network coding

Network control systems

Network function virtualization

Network interfaces

Network intrusion

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<thead>
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<th>BT:</th>
<th>RT:</th>
<th>NT:</th>
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<tr>
<td>Network intrusion detection</td>
<td>Intrusion detection</td>
<td>Systems engineering and theory</td>
<td>DC distribution systems</td>
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<td>Location awareness</td>
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<td>Net neutrality</td>
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<td></td>
<td>Telecommunication</td>
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<tr>
<td></td>
<td>network management</td>
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<tr>
<td>Network operating systems</td>
<td>Operating systems</td>
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<td></td>
<td>Resource management</td>
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<td></td>
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<tr>
<td></td>
<td>Autonomic systems</td>
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<tr>
<td>Network reconnaissance</td>
<td>Footprinting</td>
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<td></td>
<td>Network security</td>
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<td>Network resource management</td>
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<td></td>
<td>Cellular radio</td>
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<td>Mobile communication</td>
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<td>Intercell interference</td>
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<td>Network reconnaissance</td>
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<tr>
<td>Network servers</td>
<td>Computer networks</td>
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<tr>
<td>Network slicing</td>
<td>Network architecture</td>
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<td>Augmented reality</td>
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<td>Network synthesis</td>
<td>Computer network</td>
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<td>Network systems</td>
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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>RT: Brain-computer interfaces</th>
<th>Neural oscillation</th>
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<tr>
<td>Intracranial pressure</td>
<td>Neural pathways</td>
</tr>
<tr>
<td></td>
<td>Neural prostheses</td>
</tr>
<tr>
<td>NT: Neural circuits</td>
<td>Neural prosthesis</td>
</tr>
<tr>
<td>Neural microtechnology</td>
<td>Neural pathways</td>
</tr>
<tr>
<td>Neural nanotechnology</td>
<td>Neural prostheses</td>
</tr>
<tr>
<td>Neural implants</td>
<td>Neural pathways</td>
</tr>
<tr>
<td>UF: Brain implants</td>
<td>Neural prostheses</td>
</tr>
<tr>
<td>BT: Brain implants</td>
<td>Neural pathways</td>
</tr>
<tr>
<td>RT: Deep brain stimulation</td>
<td>Neural prostheses</td>
</tr>
</tbody>
</table>

### Neural network hardware

<table>
<thead>
<tr>
<th>UF: Neural chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Neural networks</td>
</tr>
<tr>
<td>RT: AI accelerators</td>
</tr>
<tr>
<td>Analog integrated circuits</td>
</tr>
<tr>
<td>Integrated circuits</td>
</tr>
<tr>
<td>Neurocontrollers</td>
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</tbody>
</table>

### Neural networks

<table>
<thead>
<tr>
<th>UF: Neural nets</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Computational and artificial intelligence</td>
</tr>
<tr>
<td>RT: AI accelerators</td>
</tr>
<tr>
<td>Adaptive systems</td>
</tr>
<tr>
<td>Artificial intelligence</td>
</tr>
<tr>
<td>Associative memory</td>
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<tr>
<td>Backpropagation</td>
</tr>
<tr>
<td>Bio-inspired computing</td>
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<tr>
<td>Cybernetics</td>
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<tr>
<td>Deep architecture</td>
</tr>
<tr>
<td>Dynamic programming</td>
</tr>
<tr>
<td>Fuzzy cognitive maps</td>
</tr>
<tr>
<td>Generative adversarial</td>
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<td>Neuroimaging</td>
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<td>Neuroanatomy</td>
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### Neurocontrollers
- **BT:** Intelligent control
- **RT:** Artificial intelligence
- **Microcontrollers**

### Neurodynamics
- **BT:** Brain
- **RT:** Neurophysiology

### Neuroengineering
- **USE:** Neural engineering

### Neurofeedback
- **UF:** Neuro-feedback
- **BT:** Feedback

### Neuroglia
- **USE:** Glial cells

### Neuroimaging
- **UF:** Neuro imaging
- **BT:** Biomedical image processing
- **RT:** Brain mapping
- **NT:** Functional neuroimaging

### Neuroinformatics
- **BT:** Bioinformatics
- **RT:** Analytical models
- **Informatics**
- **Neuroscience**

### Neurological diseases
- **UF:** Neurological disorders
- **BT:** Diseases
- **RT:** Nervous system

### Neurology
- **BT:** Medical specialties
- **RT:** Nervous system

### Neuromodulation
- **BT:** Neurons
- **RT:** Physiology

### Neuromorphic computing
- **USE:** Neuromorphic engineering

### Neuromorphic engineering
- **UF:** Neuromorphic computing
- **BT:** Neuromorphics
- **RT:** AI accelerators
- **Artificial neural networks**
- **CMOS integrated circuits**
- **Memristors**
- **Neurophysiology**
- **Synapses**

### Neuromuscular
- **BT:** Very large scale integration
- **RT:** Analog circuits
- **NT:** Neuromorphic engineering

### Neuromuscular stimulation
- **UF:** Functional electrical stimulation
- **BT:** Medical treatment
- **RT:** Nervous system

### Neuronal networks
- **USE:** Biological neural networks

### Neuronal process
- **USE:** Neurites

### Neurone
- **USE:** Neurons

### Neuron
- **UF:** Nerve cells
- **BT:** Nervous system
- **RT:** Action potentials
- **Membrane potentials**
- **Neural circuits**
- **Synapses**
- **NT:** Dendrites (neurons)
- **Nerve fibers**
- **Neurites**
- **Neuromodulation**
- **Photoreceptors**
- **Soma**

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Neuropathology
BT: Pathology
RT: Nervous system
Neurophysiology
BT: Brain
RT: Biomedical signal processing
Microelectrodes
Neural networks
Neuromorphic engineering
Science - general
NT: Biological neural networks
Neuroplasticity
UF: Brain plasticity
Cortical plasticity
BT: Neurophysiology
Neuropsychology
BT: Brain
Psychology
Neuroradiology
BT: Nervous system
Radiology
RT: Electromagnetics
Neuroimaging
Neuroscience
BT: Nervous system
Science - general
NT: Clinical neuroscience
Cognitive neuroscience
Computational neuroscience
Neuroinformatics
Systems neuroscience
Transcranial direct current stimulation
Transcranial magnetic stimulation
Neurostimulation
BT: Neuromodulation
RT: Deep brain stimulation
Microelectrodes
NT: Transcranial direct current stimulation
Transcranial magnetic stimulation
Neurotransmission
USE: Neurotransmitters
Neurotransmitters
UF: Neuro transmitters
Neurotransmission
NT: Transcranial direct current stimulation
Transcranial magnetic stimulation
Neurosurgery
BT: Surgery
NT: Deep brain stimulation
Neurotechnology
BT: Brain
Technology
Neurotransmission
USE: Neurotransmitters
Neurotransmitter sources
UF: Neurino
Neutrons
BT: Elementary particles
RT: Radioactive materials
Neutrino
USE: Neutrino sources
Neutrinos
USE: Neutrino sources
Neutron beams
USE: Particle beams
Neutron capture therapy
UF: BNCT
Boron neutron capture therapy
BT: Medical treatment
RT: Biological effects of radiation
Dosimetry
Neutron radiation effects
BT: Radiation effects
Neutron scattering
USE: Neutron spin echo
Neutron spin echo
UF: Neutron scattering
BT: Spectroscopy
Neutrons
2021 IEEE Thesaurus

**BT:** Elementary particles
**RT:** Cosmic rays

**New media age**
**USE:** Information age

**New Radio**
**BT:** 5G mobile communication
**RT:** Radio access technologies
**3GPP**

**Newborns**
**USE:** Pediatrics

**Newton Fourier method**
**USE:** Newton method

**Newton method**
**UF:** Newton Fourier method
Newton Raphson method
Newton's method
Newton-Fourier method
Newton-Raphson method
Newton’s method
Newton-Raphson method
Newton's method

**UF:** Numerical analysis
**RT:** Optimization methods
Poles and zeros

**Newton Raphson method**
**USE:** Newton method

**Newton's method**
**USE:** Newton method

**Newton-Fourier method**
**USE:** Newton method

**Newton-Raphson method**
**USE:** Newton method

**Newtons method**
**USE:** Newton method

**Next generation networks**
**USE:** Next generation networking

**Next-generation networks**
**USE:** Next generation networking

**NFB**
**USE:** Feedback amplifiers

**NFC**
**USE:** Near field communication

**NFPA**
**UF:** National Fire Protection Agency
Association
**BT:** Standards organizations

**NFV**
**USE:** Network function virtualization

**NGN**
**USE:** Next generation networking

**NGNA**
**USE:** Next generation networking

**Ni**
**USE:** Nickel

**Nickel**
**UF:** Ni
**BT:** Metals
**NT:** Nickel alloys
Nickel compounds

**Nickel alloys**
**BT:** Nickel
**RT:** Alloying

**Nickel cadmium batteries**
**BT:** Batteries
<table>
<thead>
<tr>
<th>Nickel compounds</th>
<th>Nickel compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Nickel</td>
<td><strong>BT:</strong> Nickel</td>
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<table>
<thead>
<tr>
<th>Night vision</th>
<th>Nitrogen compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Infrared imaging</td>
<td><strong>BT:</strong> Nitrogen</td>
</tr>
<tr>
<td><strong>RT:</strong> Image sensors</td>
<td><strong>NT:</strong> Ammonia</td>
</tr>
<tr>
<td>Military equipment</td>
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<table>
<thead>
<tr>
<th>NIH</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USE:</strong> National Institutes of Health</td>
<td><strong>BT:</strong> Signal processing</td>
</tr>
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<table>
<thead>
<tr>
<th>Niobium</th>
<th>Noise</th>
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<tbody>
<tr>
<td><strong>UF:</strong> Nb</td>
<td><strong>BT:</strong> Signal processing</td>
</tr>
<tr>
<td><strong>BT:</strong> Metals</td>
<td><strong>RT:</strong> Autoregressive processes</td>
</tr>
<tr>
<td><strong>RT:</strong> Type II superconductors</td>
<td><strong>Cyclic redundancy check</strong></td>
</tr>
<tr>
<td><strong>NT:</strong> Niobium alloys</td>
<td><strong>Distortion</strong></td>
</tr>
<tr>
<td>Niobium compounds</td>
<td><strong>Electromagnetic interference</strong></td>
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<tr>
<th>Niobium alloys</th>
<th>Noise</th>
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<tr>
<td><strong>BT:</strong> Niobium</td>
<td><strong>BT:</strong> Signal processing</td>
</tr>
<tr>
<td><strong>RT:</strong> Alloying</td>
<td><strong>RT:</strong> Autoregressive processes</td>
</tr>
<tr>
<td><strong>NT:</strong> Niobium-tin</td>
<td><strong>Cyclic redundancy check</strong></td>
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<table>
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<tr>
<th>Niobium compounds</th>
<th>Noise</th>
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<tr>
<td><strong>BT:</strong> Niobium</td>
<td><strong>BT:</strong> Signal processing</td>
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<table>
<thead>
<tr>
<th>Niobium-tin</th>
<th>Noise</th>
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<tbody>
<tr>
<td><strong>UF:</strong> Nb3Sn</td>
<td><strong>NT:</strong> 1/f noise</td>
</tr>
<tr>
<td><strong>BT:</strong> Niobium alloys</td>
<td><strong>Additive noise</strong></td>
</tr>
<tr>
<td><strong>RT:</strong> Superconducting materials</td>
<td><strong>Colored noise</strong></td>
</tr>
<tr>
<td><strong>NT:</strong> Tin alloys</td>
<td><strong>Gaussian noise</strong></td>
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<table>
<thead>
<tr>
<th>NISO Standards</th>
<th>Noise</th>
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<tbody>
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<td><strong>BT:</strong> Standards publications</td>
<td><strong>BT:</strong> Signal processing</td>
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<table>
<thead>
<tr>
<th>NIST</th>
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<tr>
<td><strong>UF:</strong> NBS</td>
<td><strong>BT:</strong> Signal processing</td>
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<tr>
<td>National Bureau of Standards</td>
<td><strong>RT:</strong> Autoregressive processes</td>
</tr>
<tr>
<td>National Institute of Standards &amp; Technology</td>
<td><strong>Cyclic redundancy check</strong></td>
</tr>
<tr>
<td>National Institute of Standards and Technology</td>
<td><strong>Distortion</strong></td>
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</table>

<table>
<thead>
<tr>
<th>NIST Standards</th>
<th>Noise</th>
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</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Standards organizations</td>
<td><strong>BT:</strong> Signal processing</td>
</tr>
<tr>
<td>US Department of Commerce</td>
<td><strong>RT:</strong> Autoregressive processes</td>
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</tbody>
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<thead>
<tr>
<th>Nitrogen</th>
<th>Noise</th>
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<tbody>
<tr>
<td><strong>BT:</strong> Chemical elements</td>
<td><strong>BT:</strong> Signal processing</td>
</tr>
<tr>
<td>Gases</td>
<td><strong>RT:</strong> Autoregressive processes</td>
</tr>
<tr>
<td><strong>NT:</strong> Nitrogen compounds</td>
<td><strong>Noise reduction</strong></td>
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<tr>
<th>Silicon nitride</th>
<th>Noise</th>
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<tbody>
<tr>
<td><strong>BT:</strong> Silicon</td>
<td><strong>BT:</strong> Signal processing</td>
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2021 IEEE Thesaurus

USE: Noise cancellation
USE: Noise measurement

Noise figure
BT: Noise measurement
RT: Signal to noise ratio

NOMA
UF: non-orthogonal multiple access
BT: Communication systems
RT: MIMO communication

Noise generators
BT: Signal generators
RT: Noise

Noise level
BT: Acoustic noise

Non relational databases
USE: NoSQL databases

Noise measurement
UF: Noisy
BT: Measurement
RT: Distortion measurement
Electric variables
measurement
Noise
Packet loss
NT: Multiple signal classification
Noise figure
Noise shaping

Non-gyroscopes
USE: Gyrosopes

Noise reduction
UF: Audio enhancement
De-noising
Denoising
Noise abatement
Noise suppression
BT: Acoustic noise
NT: Active noise reduction
Noise robustness
Wiener filters

Non-volatile memory
USE: Nonvolatile memory

Noise robust
USE: Noise robustness

Non-volatile single electron memory
USE: Nonvolatile single electron memory

Noise robustness
UF: Noise robust
BT: Noise reduction

Non-volatile single-electron memory
USE: Nonvolatile single electron memory

Noise shaping
UF: Noise-shaping
BT: Noise measurement
NT: Multi-stage noise shaping

Nonconductive adhesives
BT: Adhesives

Noise suppression
USE: Noise reduction

Nondestructive testing
BT: Materials testing
RT: Acoustic emission
Ultrasonic transducers
NT: Magnetic flux leakage

Noisy
USE: Noise reduction

Nondeterministic polynomial-time hard
USE: NP-hard problem

Non-gyroscopes
USE: Gyroscopes

Nonhomogeneous media
UF: Composite media
Inhomogeneous media
Layered media
2021 IEEE Thesaurus

Multilayers
Periodic media
Stratified media
BT: Media
RT: Random media

Noninvasive diagnosis
USE: Noninvasive treatment

Noninvasive measurement
USE: Noninvasive treatment

Noninvasive surgery
USE: Noninvasive treatment

Noninvasive technique
USE: Noninvasive treatment

Noninvasive treatment
UF: Noninvasive diagnosis
Noninvasive measurement
Noninvasive surgery
Noninvasive technique
BT: Medical treatment
RT: Pulse oximeter
NT: Embolization
Pulse oximetry

Nonlinear acoustics
BT: Acoustics
RT: Acoustic distortion
Nonlinear wave
propagation

Nonlinear circuits
BT: Circuits
RT: Chaos
Mixers
Power conversion
Rail to rail inputs
Rail to rail outputs
NT: Nonlinear network analysis

Nonlinear control systems
BT: Control systems
RT: Control nonlinearities
Piecewise linear techniques

Nonlinear distortion
BT: Distortion
RT: Limiting
Predistortion
NT: Harmonic distortion
Intermodulation distortion

Nonlinear dynamical systems
UF: Nonlinear dynamics
BT: Dynamical systems
Nonlinear systems
RT: Chaos
Econophysics
Fuzzy sets
Kalman filters
Neural networks
Pattern formation
Possibility theory
Predator prey systems
Spatiotemporal phenomena
Uncertainty

Nonlinear dynamics
USE: Nonlinear dynamical systems

Nonlinear equations
BT: Equations
RT: Mathematics
Algebra
Linear approximation
Nonlinear systems
Numerical analysis
NT: Bifurcation

Nonlinear filters
BT: Filters
RT: Detectors
Phase locked loops

Nonlinear magnetics
BT: Magnetics
RT: Ferroresonance

Nonlinear network analysis
BT: Circuit analysis
Nonlinear circuits

Nonlinear optical devices
BT: Nonlinear optics
RT: Optical detectors

Nonlinear optics
BT: Optics
RT: Electrooptic effects
Pattern formation
Photonic crystals
Thermal lensing
NT: Fiber nonlinear optics
Nonlinear optical devices
Optical mixing
Optical saturation
### 2021 IEEE Thesaurus

**Photorefractive effect**
- Nonvolatile single-electron memory

**Raman scattering**

**Supercontinuum generation**

**Nonlinear systems**
- **UF:** Bilinear systems
- **Multilinear systems**
- **BT:** Mathematics
- **Control systems**
- **Linear approximation**
- **Manipulators**
- **Mobile robots**
- **Nonlinear equations**
- **Robots**
- **Chaos**
- **Nonlinear dynamical systems**

**Nonlinear wave propagation**
- **BT:** Propagation
- **RT:** Nonlinear acoustics

**Nonparametric statistics**
- **UF:** Non-parametric statistics
- **BT:** Statistics
- **NT:** Nearest neighbor methods

**Nonrelational databases**
- **USE:** NoSQL databases

**Nonuniform electric fields**
- **BT:** Electric fields

**Nonuniform sampling**
- **BT:** Sampling methods

**Nonuniform transmission lines**
- **USE:** Distributed parameter circuits

**Nonvolatile memories**
- **USE:** Nonvolatile memory

**Nonvolatile memory**
- **UF:** Non-volatile memory
- **Nonvolatile memories**
- **BT:** Memory
- **Nonvolatile single electron memory**

**Nonvolatile single-electron memory**
- **UF:** Non-volatile single electron memory

**Normal distribution**
- **USE:** Gaussian distribution

**North America**
- **BT:** Continents

**North Pole**
- **BT:** Arctic

**Nose**
- **BT:** Head
- **NT:** Olfactory

**NoSQL databases**
- **UF:** Non relational databases
- **BT:** Database systems
- **RT:** Big Data

**Notch filters**
- **UF:** Band-stop filters
- **BT:** Filters

**Notice of Violation**
- **BT:** IEEE publications
- **RT:** Intellectual property

**NP hard problem**
- **USE:** NP-hard problem

**NP-C**
- **USE:** NP-complete problem

**NP-complete problem**
- **UF:** NP-C
- **BT:** Complexity theory

**NP-hard problem**
- **UF:** NP hard problem
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition/Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nondeterministic polynomial-time hard</td>
<td>Complexity theory</td>
</tr>
<tr>
<td>BT: Complexity theory</td>
<td>Traveling salesman</td>
</tr>
<tr>
<td>NT: Traveling salesman</td>
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<tr>
<td><strong>NTIA</strong></td>
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<tr>
<td>UF: National</td>
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<td>Telecommunications and Information</td>
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<tr>
<td>Administration</td>
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<tr>
<td>BT: US Department of Commerce</td>
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<tr>
<td><strong>Nuclear and plasma sciences</strong></td>
<td>Biomedical applications of radiation</td>
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<tr>
<td>Colliding beam devices</td>
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<tr>
<td>Electron emission</td>
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<tr>
<td>Elementary particles</td>
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<tr>
<td>Fusion power generation</td>
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<tr>
<td>Fusion reactors</td>
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<tr>
<td>Gamma-rays</td>
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<tr>
<td>Gas discharge devices</td>
<td></td>
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<tr>
<td>High energy physics</td>
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<tr>
<td>instrumentation computing</td>
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<tr>
<td>Ion beam applications</td>
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<tr>
<td>Nuclear electronics</td>
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<td>Nuclear imaging</td>
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<td>Nuclear medicine</td>
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<td>Nuclear physics</td>
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<tr>
<td>Particle accelerators</td>
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<td>Particle beam handling</td>
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<td>Particle beam injection</td>
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<td>Plasmas</td>
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<td>Radiation effects</td>
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<td>Radiation hardening</td>
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<td>Radiation monitoring</td>
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<td>Radiation safety</td>
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<tr>
<td>Reactor instrumentation</td>
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<tr>
<td>Scintillation counters</td>
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<tr>
<td>Thermonic emission</td>
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<tr>
<td>Nuclear energy</td>
<td></td>
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<tr>
<td>USE: Nuclear power generation</td>
<td></td>
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<tr>
<td>Nuclear facility licensing</td>
<td></td>
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<tr>
<td>USE: Nuclear facility regulation</td>
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<tr>
<td>Nuclear facility regulation</td>
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<tr>
<td>UF: Licensing (nuclear facilities)</td>
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<tr>
<td>BT: Power industry</td>
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<tr>
<td>RT: Radioactive waste</td>
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<tr>
<td>Nuclear imaging</td>
<td></td>
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<tr>
<td>USE: Fission reactors</td>
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<tr>
<td>Nuclear fuels</td>
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<tr>
<td>BT: Energy resources</td>
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<tr>
<td>Fuels</td>
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<tr>
<td>Radioactive materials</td>
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<tr>
<td>RT: Nuclear power generation</td>
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<tr>
<td>Radioactive waste</td>
<td></td>
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<tr>
<td>Nuclear magnetic resonance</td>
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<tr>
<td>UF: Gamma-ray imaging</td>
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<tr>
<td>BT: Imaging</td>
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<tr>
<td>Nuclear and plasma sciences</td>
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</tr>
<tr>
<td>sciences</td>
<td></td>
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<tr>
<td>Nuclear magnetic resonance imaging</td>
<td></td>
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<tr>
<td>USE: Magnetic resonance imaging</td>
<td></td>
</tr>
<tr>
<td>Nuclear measurements</td>
<td></td>
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<tr>
<td>BT: Measurement</td>
<td></td>
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<tr>
<td>RT: Atomic measurements</td>
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<td>CAMAC</td>
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<tr>
<td>Fastbus</td>
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<td>Position sensitive particle detectors</td>
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<td>Radiation detectors</td>
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<tr>
<td>Spectroscopy</td>
<td></td>
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<tr>
<td>NT: Particle tracking</td>
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<tr>
<td>Nuclear batteries</td>
<td>Atomic batteries</td>
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<tr>
<td>USE: Atomic batteries</td>
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<tr>
<td><strong>Nuclear bombs</strong></td>
<td>Nuclear weapons</td>
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<tr>
<td>USE: Nuclear weapons</td>
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<tr>
<td>Nuclear electronics</td>
<td></td>
</tr>
<tr>
<td>BT: Nuclear and plasma sciences</td>
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</tr>
<tr>
<td>RT: FET circuits</td>
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<tr>
<td>High energy physics</td>
<td></td>
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<tr>
<td>instrumentation computing</td>
<td></td>
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<tr>
<td>Nuclear medicine</td>
<td>Engineering in medicine</td>
</tr>
<tr>
<td>BT: Engineering in medicine</td>
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</tbody>
</table>
Nuclear and plasma sciences

RT: Energy resolution
Gamma-rays
Nuclear imaging
Positron emission
tomography

Nuclear phase transformations
UF: Nuclear phase transitions
Phase transformations,
nuclear
BT: Phase transitions, nuclear
RT: Nuclear thermodynamics

Nuclear phase transitions
USE: Nuclear phase
transformations

Nuclear physics
BT: Nuclear and plasma
sciences
RT: Hafnium
NT: Alpha particles
Beta rays
Ignition
Ion sources
Isotopes
Nuclear phase
transformations
Nuclear thermodynamics
Relativistic effects

Nuclear Power Generating Stations
USE: Nuclear power generation

Nuclear power generation
UF: Atomic energy
Nuclear Power Generating Stations

Nuclear reactors (fission)
USE: Fission reactors

Nuclear reactors (fusion)
USE: Fusion reactors

Nuclear thermodynamics
approximations

NUCLEAR WASTES
USE: Radioactive pollution

NUCLEAR WEAPONS
UF: Nuclear bombs
BT: Weapons

NULL SPACE
BT: Kernel

NULL VALUE
USE: Null value

NUMBER PORTABILITY
BT: Telecommunication services

NUMERICAL ANALYSIS
BT: Mathematics
RT: Convolution
Deconvolution
Difference equations
Differential equations
Error analysis
Integral equations
Inverse problems
Matlab
Nonlinear equations
Numerical models
Transforms

Nuclear energy
BT: Power generation
RT: Nuclear fuels
NT: Atomic batteries
Fission reactors
Fusion power generation

Fusion reactors

Analysis
Iterative methods
Least squares

Fusion power generation

Finite difference methods
Finite element analysis
Finite volume methods
Gradient methods
Independent component
2021 IEEE Thesaurus

Method of moments
Mode matching methods
Multigrid methods
Newton method
Numerical simulation
Numerical stability
Relaxation methods
Sparse matrices
Splines (mathematics)
Surface fitting
Symmetric matrices
Transmission line matrix

Numerical models
BT: Modeling
RT: Numerical analysis

Numerical simulation
BT: Numerical analysis
RT: Modeling
Plasma simulation
Simulation

Numerical stability
BT: Numerical analysis
RT: Algorithms

Nursing
USE: Medical services

Nuts (fasteners)
USE: Fasteners

NVQ
USE: Vocational training

Nylon fiber
USE: Synthetic fibers

O-rings
USE: Structural rings

OATS
USE: Open area test sites

Obesity
BT: Medical conditions

Obituaries
BT: IEEE indexing

Object detection
UF: Image object detection
Target detection

Object oriented databases
BT: Database systems
Databases
RT: Object oriented methods

Object oriented methods
BT: Programming
RT: Object oriented databases
Object oriented programming

Object oriented modeling
BT: Modeling

Object oriented programming
UF: Object-oriented programming
BT: Programming
RT: C languages
C# languages
Object oriented methods
Python
Software libraries
Software reusability
NT: Dispatching

Object recognition
UF: Image object recognition
BT: Machine vision
RT: Image matching
Image recognition
Object tracking
Robot vision systems
NT: Affordances
Target recognition

Object segmentation
BT: Machine vision
NT: Subspace constraints

Object tracking
BT: Tracking
RT: Cinematography
Image motion analysis
Object-oriented programming

**USE:** Object oriented programming

**Observability**

**BT:** Control theory

**Observatories**

**BT:** Astronomy

**RT:** Telescopes

**Observers**

**BT:** State estimation

**RT:** Machine vision

**NT:** Disturbance observers

**Earth Observing System**

**Obstacle avoidance**

**USE:** Collision avoidance

**Occupational Lobe**

**BT:** Brain

**Occupational health**

**UF:** Health (occupational)

**BT:** Health and safety

**RT:** Accidents

**Biological effects of radiation**

**Domestic safety**

**Electric shock**

**Employee welfare**

**Environmental factors**

**Ergonomics**

**Eye protection**

**Occupational medicine**

**Occupational safety**

**Pollution**

**Protective clothing**

**Radioactive materials**

**Risk analysis**

**Safety**

**Toxicology**

**Working environment noise**

**NT:** Occupational stress

**Occupational pensions**

**USE:** Pensions

**Occupational safety**

**UF:** OSHA

**BT:** Health and safety

**RT:** Accidents

**Domestic safety**

**Electric shock**

**Employee welfare**

**Eye protection**

**Industrial accidents**

**Occupational health**

**Protection**

**Protective clothing**

**Radioactive materials**

**Risk analysis**

**Working environment noise**

**Occupational stress**

**BT:** Occupational health

**RT:** Employee welfare

**Hazards**

**OCDM**

**USE:** Code division multiplexing

**Ocean animals**

**USE:** Marine animals

**Ocean circulation**

**BT:** Oceanography

**RT:** Ocean waves

**Sea level**

**Tides**

**Ocean composition**

**USE:** Oceans

**Ocean salinity**

**BT:** Oceans

**RT:** Salinity (geophysical)

**NT:** SMOS mission

**Ocean technology**

**USE:** Marine technology

**Ocean temperature**

**UF:** Sea surface temperature

**BT:** Oceanic engineering and marine technology

**Oceans**
<table>
<thead>
<tr>
<th>RT: Global warming</th>
<th>OCR USE: Optical character recognition software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land surface temperature</td>
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**Ocean vegetation**
- USE: Marine vegetation

**Ocean waves**
- BT: Hydrology
- RT: Ocean circulation
- NT: Sea state
- Wave power

**Oceanic engineering and marine technology**
- NT: Marine navigation
- Marine technology
- Ocean temperature
- Oceanographic techniques
- Water pollution

**Oceanographic techniques**
- BT: Oceanic engineering and marine technology
- RT: Acoustic imaging
- Hydrologic measurements
- Radar applications
- Remote sensing

**Oceanography**
- UF: Marine science
- Oceanology
- BT: Geoscience
- Marine robots
- Oceans
- Ocean circulation

**Oceanology**
- USE: Oceanography

**Oceans**
- UF: Ocean composition
- Planetary oceans
- BT: Geoscience
- Geophysics
- Marine technology
- Oceanography
- Sea ice
- Sea measurements
- Water
- NT: Ocean salinity
- Ocean temperature
- Sea coast
- Sea floor
- Sea level
- Sea surface
- Tides

<table>
<thead>
<tr>
<th>Octrees</th>
<th>BT: Data structures</th>
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</thead>
</table>

**OFDM**
- UF: Orthogonal frequency division multiple access
- Orthogonal frequency division multiplexing
  - BT: Multiple access
  - RT: 3G mobile communication
  - Acoustic communication (telecommunication)
    - Communication channels
    - Digital signal processing
    - MIMO communication
    - Modulation
    - Multiaccess communication
    - Multicarrier code division
    - NOMA
    - Multiple access interference
    - OFDM modulation
    - Partial transmit sequences
    - Peak to average power
    - Multiple access ratio

**OFDM modulation**
- BT: OFDM

**OFETs**
- UF: Organic FETS
- Organic field-effect transistors
- Organic field-effect transistors
- Transistors
- BT: Field effect transistors

**Office automation**
- BT: Automation
- RT: Bring your own device
- Communication systems
- Data communication
- Desktop publishing
- Document handling
- Electronic mail
- Information systems
- Local area networks
- Microcomputers
- Teleconferencing
- Text processing
Unsolicited e-mail
Voice mail
Workflow management software

Offshore distribution systems
USE: Offshore installations

Offshore installations
UF: Gas platforms
Offshore distribution systems
Offshore power plants
Oil platforms
BT: Structural engineering
RT: Oil drilling
Petroleum industry
Power industry

Oil platforms
USE: Offshore installations

Oil pollution
BT: Accidents
RT: Pollution
Land pollution
Marine pollution
Oils
Petroleum
Petroleum industry

Oil refineries
BT: Petroleum industry

Oil sands
USE: Hydrocarbons

Oil shale
USE: Hydrocarbons

Oil tanks
USE: Fuel storage

Oiling (lubrication)
USE: Lubricating oils

Oils
BT: Materials
RT: Engines
Fats
Fluids
Fractionation
Fuel processing industries
Insulation
Marine pollution
Mechanical factors
Mechanical power

transmission

Oil filled cables
BT: Oil insulation
RT: Cable insulation

Oil filters
USE: Lubricating oils

Oil industry
USE: Petroleum industry

OLED
USE: Organic light emitting

Oil insulation
UF: Transformer oil
diodes

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2021 IEEE Thesaurus

Olfactory
BT: Nose

Olfactory bulb
BT: Forebrain
RT: Sense organs

Oligopoly
BT: Economics
RT: Game theory
Microeconomics

Omnidirectional antennas
BT: Antennas

On board unit
BT: Communication equipment
RT: Dedicated short range
communication
Vehicle-to-everything

On demand software
USE: Software as a service

On load tap changers
UF: Load tap changers
On-load tap changers
Onload tap changers
BT: Power transformers
Tap changers
RT: Voltage control

On the job training
UF: On-the-job training
BT: Training
RT: Industrial training

On-chip
USE: System-on-chip

On-demand software
USE: Software AND
Software as a service

Online banking
UF: Digital currency
BT: E-banking
E-currency
Electronic banking
Electronic currency
Internet banking
Mobile payment
Virtual currency

Online indexing
USE: Indexing

Online services
UF: Inverted classroom
BT: On-line services
Reverse teaching
Information retrieval
BT: Cloud gaming
Electronic learning
Internet
RT: Distributed ledger
NT: Online banking

Onload tap changers
USE: On load tap changers

On-the-job training
USE: On the job training

Oncological surgery
UF: Otologic surgery
Surgery oncology
BT: Surgery
RT: Cancer
Oncology

Oncology
BT: Medical specialties
RT: Cancer
Chemotherapy
Oncological surgery
Tumors

Ontologies
UF: Ontology
BT: Knowledge representation
RT: Linked data
2021 IEEE Thesaurus

Open data
Ranking (statistics)
Semantic Web
Semantic search
Thesauri
NT: Description logic

Ontology
USE: Ontologies

ONU
USE: Optical network units

OOO
USE: Out of order

Op amp
USE: Operational amplifiers

Open Access
BT: Open systems
Publishing
NT: Public domain software

Open area test sites
UF: OATS
BT: Test facilities
RT: Electromagnetic compatibility and interference
compatibility and interference
RT: Electromagnetic
interference
Immunity testing
Military equipment

Open data
BT: Data handling
RT: Electronic publishing
Government policies
Internet
Linked data
Ontologies
Open systems
Public domain software
Semantic Web

Open Educational Resources
BT: Educational courses
Open systems

Open Geospatial Consortium
UF: OGC
BT: Standards organizations

Open loop control
USE: Open loop systems

Open loop systems
UF: Open loop control
BT: Control systems
RT: Feedforward systems
Operational amplifiers

Open source hardware
UF: Opensource hardware
BT: Hardware

Open source software
UF: Open-source
BT: Software
RT: Public domain software

Open systems
UF: OSI
BT: Computers and information processing
System analysis and design
RT: Common Information Model
(electricity)
Computer networks
Internet
Interoperability
Local area networks
Metropolitan area networks
Open data
Standards
Wide area networks
NT: Open Access
Open Educational Resources
Physical layer

Open wireless architecture
UF: OWA
BT: Wireless communication

Open-source
USE: Open source software

Opensource hardware
USE: Open source hardware

Operating cost reduction
USE: Costing

Operating systems
UF: Android (operating system)
Computer operating systems
Executive programs
Microsoft Windows

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2021 IEEE Thesaurus

Robot operating systems
Supervisory programs
BT: System software
RT: Computer security
Cyber-physical systems
Program processors
Software defined

networking
System recovery
NT: Booting
Embedded systems
Input-output programs
Kernel
Network operating systems
System kernels

Operational amplifiers
UF: Op amp
BT: Active circuits
Amplifiers
RT: FET circuits
Linearization techniques
MOSFET circuits
Open loop systems
NT: Feedback amplifiers

Operations research
BT: Business
RT: Linear programming
Management
Optimization methods
Principal component
analysis
Resource management
Statistics
TOPSIS
NT: Inventory control
Virtual enterprises

Ophthalmology
BT: Medical specialties
RT: Cornea
Eyes
Iris
Pupils
Retina

Opinion mining
USE: Sentiment analysis

Opportunistic software systems
development
BT: Programming

Optic flow

Optical add-drop multiplexers
UF: ROADMS
BT: Add-drop multiplexers

Optical amplification
USE: Stimulated emission

Optical amplifiers
BT: Optics
RT: Erbium
NT: Doped fiber amplifiers
Erbium-doped fiber
amplifiers
Semiconductor optical
amplifiers

Optical arrays
BT: Optical devices
RT: Micromirrors
Phased arrays

Optical attenuators
UF: Variable optical attenuators
BT: Attenuators
Optical devices
RT: Optical communication
equipment
Optical losses

Optical beam splitting
BT: Optical beams

Optical beams
BT: Beams
RT: Bragg gratings
Laser beams
Laser theory
NT: Optical beam splitting

Optical bistability
UF: Bistability (optical)
BT: Electrooptic effects
RT: Electro-optical devices
Optical switches

Optical buffering
BT: Optical fiber communication

Optical burst switching
BT: Burst switching

Optical character recognition software
UF: License plate recognition
2021 IEEE Thesaurus

Optical cloaking
UF: Metamaterial cloaking
BT: Metamaterials
Optical materials

Optical code division multiplexing
USE: Code division multiplexing

Optical coherence tomography
BT: Tomography
RT: Eyes

Optical collimators
BT: Optical devices

Optical communication
USE: Optical fiber communication

Optical communication equipment
BT: Communication equipment
RT: Biomedical optical imaging
Optical attenuators
Optical switches
NT: Optical transmitters

Optical components
USE: Optical devices

Optical computing
BT: Computers and information processing

Optical control
BT: Control systems
RT: Optical switches
NT: Lighting control
Optical variables control

Optical coupling
BT: Electromagnetic coupling
RT: Optical fiber couplers

Optical crosstalk
BT: Optics
RT: Optical fiber communication

Optical design
BT: Optics
RT: Laser theory
NT: Optical design techniques

Optical design techniques

Optical detectors
BT: Optical sensors
RT: Nonlinear optical devices
NT: Bar codes

Optical device fabrication
UF: Optical device manufacture
BT: Fabrication
Optical devices
RT: Electronic equipment manufacture

Optical device manufacture
USE: Optical device fabrication

Optical devices
UF: Optical components
BT: Optics
RT: Biomedical optical imaging
Endoscopy
Gratings
Optical materials
NT: Bragg gratings
Collimators
Displays
Holographic optical components

Optical diffraction
BT: Electromagnetic diffraction
RT: Photonic band gap
NT: Diffraction gratings

Optical distortion
BT: Optics
RT: Lasers
Optical noise
### 2021 IEEE Thesaurus

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<thead>
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<th>Term</th>
<th>Notes</th>
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<td><strong>Thermal lensing</strong></td>
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<td><strong>Optical distortion measurement</strong></td>
<td>USE: Distortion measurement</td>
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<td><strong>Optical engineering</strong></td>
<td>BT: Engineering - general</td>
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<td></td>
<td>RT: Optics</td>
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<td><strong>Optical feedback</strong></td>
<td>BT: Image processing</td>
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<td>RT: Distributed feedback</td>
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<td><strong>Optical fiber amplifiers</strong></td>
<td>UF: Optical fibre amplifiers</td>
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<td>BT: Optical fibers</td>
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<td>RT: Amplifiers</td>
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<td><strong>Optical fiber applications</strong></td>
<td>UF: Optical fibre applications</td>
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<td>BT: Optics</td>
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<td>RT: Channel spacing</td>
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<td>Code division multiplexing</td>
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<td>Optical fiber cables</td>
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<td>Optical fiber communication</td>
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<td>Optical fibers</td>
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<td>NT: Optical fiber devices</td>
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<td><strong>Optical fiber cables</strong></td>
<td>UF: Communication cables</td>
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<td>(optical)</td>
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<td>BT: Optical fibre cables</td>
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<td>RT: Optical fiber applications</td>
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<td>Splicing</td>
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<td><strong>Optical fiber communication</strong></td>
<td>UF: Infrared communication</td>
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<td>Optical fibre communication</td>
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<td>Optical links</td>
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<td>BT: Communication systems</td>
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<td>RT: Avalanche photodiodes</td>
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<td>Broadband communication</td>
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<td>Indoor communication</td>
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<td>Optical fiber applications</td>
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<td>Optical transmitters</td>
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<td>Quantum communication</td>
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<td>Silicon photonics</td>
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<td>Synchronous digital</td>
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<td><strong>hierarchy</strong></td>
<td>NT: FDDI</td>
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<td><strong>Optical fiber communication</strong></td>
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<td><strong>Free-space optical communication</strong></td>
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<td><strong>Optical buffering</strong></td>
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<td><strong>Optical fiber LAN</strong></td>
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<td><strong>Optical fiber local area network</strong></td>
<td>USE: Optical fiber LAN</td>
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<td><strong>Optical fiber loss</strong></td>
<td>USE: Optical fiber losses</td>
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<td><strong>Optical fiber networks</strong></td>
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<td><strong>Optical-fiber networks</strong></td>
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# Optical Fiber Technology

<table>
<thead>
<tr>
<th>Topic</th>
<th>BT: Optical fiber communication</th>
<th>RT: Light fidelity</th>
<th>NT: All-optical networks</th>
<th>LAN emulation</th>
<th>Optical fiber LAN</th>
<th>Optical network units</th>
<th>Passive optical networks</th>
<th>Protection switching</th>
<th>Wavelength assignment</th>
<th>Optical fiber polarization</th>
<th>Optical fiber sensors</th>
<th>Optical fiber theory</th>
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<td>UF: Optical fibre polarisation</td>
<td>Polariation-maintaining</td>
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<td>RT: Optical fiber polarization</td>
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<td>NT: Polarization mode</td>
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<td>RT: Photorefractive materials</td>
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<td>Microwave photonics</td>
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<td>NT: Electrooptic modulators</td>
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<td>BT: Optical fiber networks</td>
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<td>RT: Optical distortion</td>
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<td>NT: Speckle</td>
<td>USE: Laser radar</td>
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<td>BT: Optical fiber communication</td>
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<td>UF: Light polarisation</td>
<td>BT: Laser applications</td>
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<td>Light polarization</td>
<td>NT: CD recording</td>
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# 2021 IEEE Thesaurus

## Optical reflection

| BT: Electromagnetic reflection | RT: Antireflection coatings |
| Mirrors | Optical scattering |
| Reflectivity | Reflectometry |
| Thermooptic effects |

## Optical refraction

| BT: Physical optics | RT: Photorefractive effect |
| Photorefractive materials | Refractive index |
| Thermooptic effects |

## Optical regenerators

| USE: Repeaters |

## Optical resonators

| BT: Optical devices | RT: Digital filters |
| Laser cavity resonators | Resonance |
| Split ring resonators |
| NT: Microcavities | Optical ring resonators |

## Optical retarders

| UF: Half-wave plates | Quarter-wave plates |
| BT: Optical materials | Optics |
| RT: Polarimetry |

## Optical ring resonators

| UF: Ring resonators | BT: Optical resonators |

## Optical saturation

| BT: Nonlinear optics | Optics |

## Optical scan voting systems

| BT: Electronic voting systems |

## Optical scattering

| BT: Electromagnetic scattering | RT: Laser radar |
| Light scattering | Optical losses |
| Optical reflection | Speckle |

## Optical sensors

| BT: Optical devices | RT: Image sensors |
| NT: Optical detectors | Optical fiber sensors |

## Optical signal detection

| BT: Signal detection | RT: Photodetectors |

## Optical signal processing

| BT: Signal processing | NT: Laser noise |

## Optical solitons

| BT: Optics | RT: Optical vortices |
| Solitons |

## Optical superlattices

| UF: Optical multilayers | BT: Optical materials |
| Superlattices |

## Optical surface waves

| BT: Optical propagation |

## Optical switch

| USE: Optical switches |

## Optical switches

| UF: Optical switch | BT: Switches |
| RT: Optical bistability |
| Optical communication |
| equipment |
| Optical control |
| Photothyristors |
| Smart pixels |
| Thermooptic devices |

## Optical transmitters

| BT: Optical communication equipment |
| Transmitters |
| Diodes |
| Optical fiber communication |
| Optical modulation |
| Photodiodes |
| Semiconductor lasers |
| Semiconductor optical amplifiers |
### 2021 IEEE Thesaurus

#### Optical tuning
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<th>BT: Optics</th>
<th>RT: Laser tuning</th>
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#### Optical variables control
| BT: Optical control | RT: Frequency control  
Phase control |

#### Optical variables measurement
| UF: Optical measurements  
BT: Measurement  
RT: Frequency measurement  
Phase measurement  
Reflectometry  
Wavelength measurement  
NT: Ellipsometry  
Photometry  
Reflection coefficient  
Refractive index  

#### Optical vortex
| USE: Optical vortices  

#### Optical vortices
| UF: Optical vortex  
Vortices, optical  
BT: Physical optics  
RT: Laser beams  
Optical solitons  

#### Optical waveguide components
| BT: Optical waveguides  

#### Optical waveguide theory
| BT: Optical waveguides  
RT: Optical fibers  

#### Optical waveguides
| BT: Optical propagation  
Waveguide components  
RT: Electrooptic modulators  
Integrated optics  
Photonic crystals  
NT: Arrayed waveguide gratings  
Electrooptical waveguides  
Optical fibers  
Optical planar waveguides  
Optical waveguide  
components  

#### Optical wavelength conversion
| BT: Optical fiber communication  

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# 2021 IEEE Thesaurus

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<td>BT: Mathematical programming</td>
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<td>NT: Bang-bang control</td>
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</tbody>
</table>
### Photodetectors
- Superluminescent diodes

### Optothermal effects
- USE: Photothermal effects

### Optothyristors
- USE: Photothyristors

### Oral communication
- UF: Speech communication
- BT: Professional communication
- NT: Public speaking
- Speech

### Orange technology
- USE: Social implications of technology

### Orbital calculations
- BT: Energy states

### Orbital debris
- USE: Space debris

### Orbital robotics
- BT: Robots

### Orbits
- BT: Astrophysics
- RT: Geostationary satellites
- NT: Orbits (stellar)
- Planetary orbits

### Orbits (stellar)
- BT: Orbits
- RT: Stellar motion

### Ordinance
- USE: Weapons

### Ordinary differential equations
- BT: Differential equations

### Ordinary magnetoresistance
- BT: Magnetoresistance

### Ores
- BT: Minerals

### Organic chemicals
- BT: Chemistry
- NT: Hydrocarbons

### Organic compounds
- BT: Compounds
- RT: Carbon
- NT: Carbon compounds
- Organic semiconductors
- Volatile organic compounds

### Organic electronics
- UF: Paper electronics
- BT: Electronic equipment
- RT: Synapses

### Organic FETS
- USE: OFETs

### Organic field effect transistors
- USE: OFETs

### Organic field-effect transistors
- USE: OFETs

### Organic inorganic hybrid materials
- UF: Inorganic organic hybrid materials
- Inorganic-organic hybrid materials
- Organic-inorganic hybrid materials
- Organically modified silicates
- Ormosils
- BT: Materials
- RT: Inorganic compounds
- Optical materials

### Organic light emitting diodes
- UF: OLED
- Organic light-emitting diodes
- Polymer led
- BT: Light emitting diodes
- RT: Electroluminescence
- Molecular electronics
- NT: Active matrix organic light emitting diodes

### Organic light-emitting diodes
- USE: Organic light emitting diodes
- Organic materials
- BT: Materials

### Organic materials
- BT: Materials

### Organic semiconductors
- BT: Organic compounds
2021 IEEE Thesaurus

NT: Pentacene

Organic thin film transistors
UF: OTFT
BT: Thin film transistors

Organic thin-film transistors
USE: Organic thin film transistors

Organic-inorganic hybrid materials
USE: Organic inorganic hybrid materials

Organically modified silicates
USE: Organic inorganic hybrid materials

Organisational aspects
USE: Organizational aspects

Organisational culture
USE: Organizational aspects

Organisational structure
USE: Organizational aspects

Organisms
BT: Biological systems
NT: Algae
Animals
Archaea
Fish
Fungi
Mesomycetozoa
Microorganisms
Plants (biology)

Organizational aspects
UF: Business organisation
Business organization
Organisational aspects
Organisational culture
Organisational structure
Organizational culture
Organizational structure
BT: Management
RT: Business process re-engineering

Organobromine compounds
USE: Bromine compounds

Organs (biological)
USE: Biological systems

Orientation control
USE: Position control

Orientation determination
USE: Position measurement

Orientation measurement
USE: Position measurement

Orifices
BT: Mechanical products

Ormols
USE: Organic inorganic hybrid materials

Orthogonal frequency division multiple access
USE: OFDM

Orthogonal frequency division multiplexing
USE: OFDM

Orthopedic procedures
BT: Medical treatment

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<table>
<thead>
<tr>
<th>Orthopedic surgery</th>
<th>BT:</th>
<th>Surgery</th>
<th>BT:</th>
<th>Bone diseases</th>
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<td>Prosthetics</td>
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<td>Sensory aids</td>
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<td>Wearable robots</td>
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<tr>
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<td>RT:</td>
<td>Damping</td>
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<td>RT:</td>
<td>Klystrons</td>
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<td>Lasers</td>
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<td>RT:</td>
<td>Resonant frequency</td>
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<td>RT:</td>
<td>Vibrations</td>
<td>RT:</td>
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<td>Digital-controlled oscillators</td>
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<tr>
<td></td>
<td>NT:</td>
<td>Injection-locked oscillators</td>
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<td>NT:</td>
<td>Local oscillators</td>
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<td>Local oscillators</td>
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<td>NT:</td>
<td>Microwave oscillators</td>
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<td>Microwave oscillators</td>
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<td></td>
<td>NT:</td>
<td>Phase noise</td>
<td>NT:</td>
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<td>NT:</td>
<td>Ring oscillators</td>
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<tr>
<td></td>
<td>NT:</td>
<td>Voltage-controlled</td>
<td>NT:</td>
<td>Voltage-controlled</td>
</tr>
</tbody>
</table>

| Osmium             | BT: | Chemical elements | BT: | |
| Osmosis            | BT: | Chemical processes | BT: | |
|                    | NT: | Electro-osmosis | NT: | |

| Osteoarthritis     | BT: | |

| Osteoporosis       | BT: | Bone diseases |
| Osteoarthritis     | BT: | Bone diseases |
|                    | RT: | Cancellous bone |

| OTFT               | USE: | Organic thin film transistors |
| Otologic surgery   | USE: | Oncological surgery |
| OTT                | USE: | Over-the-top media services |

| Out of order       | UF: | OOO |
|                   | BT: | Instruction sets |

| Outlier detection  | USE: | Anomaly detection |
| Output feedback    | BT: | Feedback circuits |
| Output power       | USE: | Power generation |

| Outsourcing        | BT: | Management |
|                   | RT: | Crowdsourcing |

| Ovarian cancer     | BT: | Cancer |
| Ovens              | BT: | Home appliances |
|                   | NT: | Microwave ovens |

| Over-the-top media services | UF: | OTT |
|                            | BT: | Streaming media |

| Overflow oscillations   | USE: | Finite wordlength effects |
| Overhead distribution lines | USE: | Power distribution lines |
| Overhead transmission lines | USE: | Power transmission lines |

| Overlay networks       | BT: | Computer networks |

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# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Usage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Network topology</td>
<td>Transport protocols</td>
<td>USE: IEEE 1394 Standard</td>
<td></td>
</tr>
<tr>
<td>OWA</td>
<td>USE: Open wireless architecture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWL</td>
<td>UF: Web ontology language</td>
<td>USE: Peer-to-peer computing</td>
<td></td>
</tr>
<tr>
<td>OWL</td>
<td>BT: Markup languages, Semantic Web</td>
<td>USE: Point-to-multipoint communications</td>
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</tr>
<tr>
<td>OWL</td>
<td>RT: Knowledge representation</td>
<td></td>
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<tr>
<td>Oxidation</td>
<td>BT: Chemical processes</td>
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<td></td>
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<tr>
<td>Oxidation</td>
<td>RT: Materials</td>
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<tr>
<td>Oxidation</td>
<td>NT: Combustion</td>
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<tr>
<td>Oxygen</td>
<td>BT: Chemical elements, Gases</td>
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<tr>
<td>Oxygen</td>
<td>RT: Pulse oximetry</td>
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<tr>
<td>Ozonation</td>
<td>UF: Ozone treatment, Wastewater treatment</td>
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<tr>
<td>Ozonation</td>
<td>BT: Environmental factors, Pollution control</td>
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<tr>
<td>Ozonators</td>
<td>USE: Discharges (electric)</td>
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<tr>
<td>Ozone generators</td>
<td>USE: Discharges (electric)</td>
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<tr>
<td>Ozone treatment</td>
<td>USE: Ozonation</td>
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<tr>
<td>Ozonizers</td>
<td>USE: Discharges (electric)</td>
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<tr>
<td>P-i-N</td>
<td>USE: PIN photodiodes</td>
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<tr>
<td>P-i-n diodes</td>
<td>BT: Semiconductor devices, CMOSFET logic devices</td>
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<tr>
<td>P-i-n diodes</td>
<td>RT: Electrooptic modulators, Vertical cavity surface</td>
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<tr>
<td>P-i-n diodes</td>
<td>emitting lasers</td>
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<tr>
<td>P-n junctions</td>
<td>BT: Junctions, Light emitting diodes, Photodiodes, Semiconductor diodes</td>
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<tr>
<td>Packet loss</td>
<td>BT: Loss measurement, Packet switching</td>
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<tr>
<td>Packet loss</td>
<td>RT: Data communication, Noise measurement</td>
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<tr>
<td>Packet radio</td>
<td>USE: Packet radio networks</td>
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<tr>
<td>P1394</td>
<td>USE: IEEE 802.11 Standard</td>
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<tr>
<td>P2MP</td>
<td>USE: Point-to-multipoint communications</td>
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<tr>
<td>P2P</td>
<td>USE: Peer-to-peer computing</td>
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<tr>
<td>PAAS</td>
<td>USE: Platform as a service</td>
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<tr>
<td>Pacemakers</td>
<td>BT: Biomedical equipment</td>
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<tr>
<td>Pacemakers</td>
<td>RT: Cardiology</td>
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<tr>
<td>Packaging</td>
<td>BT: Industry applications</td>
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<tr>
<td>Packaging</td>
<td>RT: Filling, Leak detection, Packaging machines, Seals</td>
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<tr>
<td>Packaging</td>
<td>NT: Bagging, Bottling, Canning, Encapsulation, Food packaging, Labeling</td>
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<tr>
<td>Packaging</td>
<td>Multichip modules, Nanopackaging, Plastic packaging, Wrapping</td>
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<tr>
<td>Packaging machines</td>
<td>USE: Production equipment, Bagging, Bottling, Labeling, Packaging, Wrapping</td>
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<tr>
<td>Packet radio</td>
<td>USE: Packet radio networks</td>
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</tr>
<tr>
<td>Packet radio</td>
<td>UF: Packet radio</td>
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Packet switching
BT: Radio communication
Packet switching
BT: Communication switching
RT: ARPAENT
Data transfer
IEEE 802.3 Standard
Next generation networking
NT: Burst switching
Frame relay
Multiprotocol label
switching
Packet loss

Pacs
USE: Picture archiving and communication systems

Paediatrics
USE: Pediatrics

Page description languages
UF: Postscript
BT: Markup languages
RT: Desktop publishing
High level languages
Page description languages
USE: Paging systems

Paging systems
UF: Paging strategies
BT: Cellular radio
RT: Wireless communication

Pain
BT: Injuries
NT: Ischemic pain
Neuropathic pain

Painting
BT: Surface finishing
Surface treatment
RT: Coatings
Paints
Photorealism

Paints
BT: Chemical products
Coatings
Materials
RT: Ink
Lacquers
Painting

Pair-wise error probability
USE: Pairwise error probability
Pairwise correlations
USE: Pairwise error probability
Pairwise error probability
UF: Pair-wise error probability
Pairwise correlations
BT: Probability

Palladium
BT: Metals

Palletising
USE: Pallets

Palletizing
USE: Pallets

Pallets
UF: Palletising
Palletizing
BT: Materials handling
RT: Containers
Load management

Palm print recognition
USE: Palmprint recognition

Palmprint identification
USE: Palmprint recognition

Palmprint recognition
UF: Palm print recognition
Palmprint identification
BT: Biometrics (access control)
RT: Identification of persons

Palmtop computers
USE: Personal digital assistants

Pancreas
BT: Digestive system

Pandemics
BT: Epidemics
RT: COVID-19
Coronaviruses
Diseases
Influenza

Pansharpened
USE: Pansharpening
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**Pansharpening**
- **UF:** Pansharpened
- **BT:** Image processing
- **RT:** Image quality

**Paper electronics**
- **USE:** Organic electronics

**Paper industry**
- **USE:** Pulp and paper industry

**Paper making**
- **BT:** Pulp and paper industry
- **RT:** Bleaching
  - Paper making machines
  - Paper products
  - Paper pulp
  - Paper technology
  - Pulp manufacturing
  - Spinning machines

**Paper making machines**
- **BT:** Production equipment
- **RT:** Paper making
  - Paper products
  - Paper pulp
  - Paper technology
  - Pulp manufacturing
  - Spinning machines

**Paper mills**
- **BT:** Production facilities
- **RT:** Industrial plants
  - Paper products
  - Paper pulp
  - Pulp manufacturing
  - Spinning machines

**Paper products**
- **BT:** Manufactured products
- **RT:** Paper making
  - Paper making machines
  - Paper mills
  - Paper pulp
  - Paper technology
  - Pulp and paper industry

**Paper pulp**
- **BT:** Manufactured products
- **RT:** Paper making
  - Paper making machines
  - Paper mills

**Paper technology**
- **BT:** Industry applications
- **RT:** Paper making
  - Paper making machines
  - Paper products
  - Pulp and paper industry
  - Pulp manufacturing

**Paper technology**
- **RT:** Pulp and paper industry

**PAPR**
- **USE:** Peak to average power ratio

**Paraelectric materials**
- **USE:** Dielectric materials

**Parallel algorithms**
- **BT:** Algorithms
  - Parallel processing

**Parallel architectures**
- **BT:** Computer architecture
  - Parallel machines
  - Parallel processing
  - Parallel programming

**Parallel computing**
- **USE:** Parallel processing

**Parallel languages**
- **BT:** High level languages
  - Multiprocessing systems
  - Parallel processing
  - Parallel programming

**Parallel machines**
- **BT:** Computers
  - Parallel architectures
  - Parallel processing

**Parallel processing**
- **UF:** Array processing
  - Parallel computing
  - Parallelism
  - Parallel language processing
  - Parallel architecture

**Parallel programming**
- **BT:** Cluster computing
  - Concurrency control
  - Digital computers
  - Parallel architectures
  - Parallel languages
  - Parallel machines
  - Parallel programming
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parallel processor interconnection</strong></td>
<td>USE: Multiprocessor</td>
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<td><strong>Parallel programming</strong></td>
<td>BT: Programming</td>
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<td><strong>Parallel robots</strong></td>
<td>BT: Robots</td>
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<tr>
<td><strong>Parallelism</strong></td>
<td>USE: Parallel processing</td>
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<tr>
<td><strong>Paralysis</strong></td>
<td>BT: Medical conditions</td>
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<td>BT: Magnetic materials</td>
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<td><strong>Parameter estimation</strong></td>
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<td>BT: Electromagnetic measurements</td>
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<td>USE: Parameter estimation</td>
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<td><strong>Parameter uncertainty</strong></td>
<td>USE: Uncertain systems</td>
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<td><strong>Parametric model</strong></td>
<td>USE: Parametric statistics</td>
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<td><strong>Parametric statistics</strong></td>
<td>UF: Parametric model</td>
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<td><strong>Parametric study</strong></td>
<td>BT: Multitasking</td>
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<td><strong>Parasitic capacitance</strong></td>
<td>BT: Capacitance</td>
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<td>BT: Diseases</td>
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<td>BT: Autonomic nervous system</td>
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<td>UF: Multi-attribute optimization</td>
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<td>Salivary glands</td>
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2021 IEEE Thesaurus

Ion beams

Particle charging
BT: Electrostatic processes
RT: Semiconductor detectors

Particle collisions
BT: Elementary particles

Particle detectors
USE: Radiation detectors

Particle filters
BT: Filters

Particle measurements
UF: Particulate measurements
BT: Measurement
RT: Current density
High energy physics
instrumentation computing
Position sensitive particle
detectors

Particle physics
USE: High energy physics

Particle production
BT: Electrostatic processes
RT: Aerosols
Spraying

Particle scattering
BT: Scattering
RT: Scanning electron
microscopy

Particle separators
UF: Separators
BT: Separation processes
RT: Magnetic separation

Particle swarm
USE: Particle swarm optimization

Particle swarm optimization
UF: Particle swarm
Particle-swarm optimization
Swarm intelligence
Swarm optimization
BT: Evolutionary computation
RT: Artificial bee colony
algorithm
Fireworks algorithm
Stochastic processes

Particle tracking
BT: Nuclear measurements
RT: High energy physics
instrumentation computing
Tracking

Particle-swarm optimization
USE: Particle swarm optimization

Particles (elementary)
USE: Elementary particles

Particulate measurements
USE: Particle measurements

Partitioning algorithms
BT: Algorithms

Passband
BT: Digital communication
Radio communication
RT: Baseband

Passivation
BT: Surface treatment
RT: Corrosion

Passive circuits
BT: Circuits

Passive filters
BT: Passive networks
RT: Filters

Passive microwave remote sensing
BT: Remote sensing

Passive networks
BT: Telecommunication
network topology
NT: Passive filters

Passive optical networks
UF: PON
BT: Optical fiber networks
RT: EPON

Passive radar
BT: Radar
RT: Radar detection
Radar imaging

Passive RFID tags
<table>
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<th>USE: Medical diagnosis</th>
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<tr>
<td><strong>Password</strong></td>
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<tr>
<td>BT: Access control</td>
<td>BT: Monitoring</td>
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<td><strong>Patch antennas</strong></td>
<td><strong>Patient rehabilitation</strong></td>
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<tr>
<td>BT: Antennas</td>
<td>BT: Medical treatment</td>
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<tr>
<td>RT: Microstrip antennas</td>
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<td><strong>Patent law</strong></td>
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<tr>
<td>BT: Law</td>
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<td>USE: Medical treatment</td>
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<tr>
<td>BT: Legal factors</td>
<td><strong>Pattern classification</strong></td>
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<tr>
<td>RT: Intellectual property</td>
<td>BT: Machine intelligence</td>
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<td>US Government agencies</td>
<td>RT: Surface reconstruction</td>
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<td><strong>Path planning</strong></td>
<td><strong>Pattern clustering</strong></td>
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<td>UF: piano mover’s problem</td>
<td><strong>Pattern formation</strong></td>
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<tr>
<td>BT: Motion control</td>
<td>BT: Process design</td>
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<tr>
<td>RT: Course correction</td>
<td>RT: Chaos</td>
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<td>Indoor navigation</td>
<td>Nonlinear dynamical systems</td>
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<td>Vehicle routing</td>
<td>Nonlinear optics</td>
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<td>BT: Diseases</td>
<td>NT: Image matching</td>
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<td>USE: Pathology</td>
<td>BT: Pathology</td>
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<td>NT: Cadaver</td>
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<td>NT: Cadaver</td>
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<td>Death</td>
<td>RT: Autopsy</td>
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<td><strong>NT: Histopathology</strong></td>
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</tbody>
</table>
Pattern recognition
- UF: Image pattern recognition
- BT: Computers and information processing
- RT: Automatic optical inspection
  - Computer vision
  - Feature extraction
  - Feedforward neural networks
- NT: Active shape model
  - Activity recognition
  - Character recognition
  - Clustering methods
  - Data mining
  - Face recognition
  - Fingerprint recognition
  - Gesture recognition
  - Handwriting recognition
  - Nearest neighbor methods
  - Pattern matching
  - Speech recognition
  - Text recognition

Payloads
- BT: Military aircraft
  - Space technology
  - MODIS
- NT: MODIS
  - Pb
  - USE: Lead
- PCA
  - USE: Principal component
  - Analysis
- PCG
  - USE: Phonocardiography
- PCM
  - USE: Phase change materials

PCRAM
- USE: Phase change random access memory

PD control
- UF: PID control
- BT: Proportional + derivative control
- Proportional derivative control
- Proportional plus derivative control
- Proportional-derivative control
- Proportional-integral-derivative control

PDA
- USE: Personal digital assistants

PDAs
- USE: Personal digital assistants

PDF
- USE: Portable document format

Peace technology
- BT: Social implications of technology

Peak signal to noise ratio
- USE: PSNR

Peak signal-to-noise ratio
- USE: PSNR

Peak to average power ratio
- UF: PAPR
  - Peak-to-average power ratio
  - Peak-to-average ratio
  - BT: OFDM

Peak-to-average power ratio
- USE: Peak to average power ratio

Peak-to-average ratio
- USE: Peak to average power ratio

Pediatrics
- UF: Babies
  - Baby
2021 IEEE Thesaurus

Child
Children
Infant
Infants
Newborns
Paediatrics
Toddler

BT: Medical specialties
RT: Neonatology

Peer to peer communications
USE: Peer-to-peer computing

Peer to peer computing
USE: Peer-to-peer computing

Peer to peer exchange
USE: Peer-to-peer computing

Peer to peer network
USE: Peer-to-peer computing

Peer-to-peer communications
USE: Peer-to-peer computing

Peer-to-peer communications
USE: Peer-to-peer computing

Peer-to-peer communications
USE: Peer-to-peer computing

Pelvis
BT: Body regions

Pen test
USE: Penetration testing

Penetration testing
UF: Pen test
BT: Computer security

Pensions
UF: Occupational pensions
Personal pensions
Stakeholder pensions
State pensions
BT: Remuneration
RT: Employee welfare
Termination of employment

Pentacene
BT: Organic semiconductors

Peptides
BT: Biochemistry

Perfectly matched layers
BT: Propagation
RT: Finite difference methods
Finite element analysis
Maxwell equations

Performance analysis
UF: Dynamic program analysis
Performance index
BT: Programming
Optimization
NT: Performance gain

Performance evaluation
BT: Measurement
Benchmark testing
Key performance indicator

Performance gain
BT: Performance analysis

Performance index
USE: Performance analysis

Performance loss
BT: Computer performance

Performance measurement
USE: Measurement

Peltier effect
BT: Thermoelectricity

Pelvic bones
BT: Bones
Performance metrics
USE: Measurement

Performance optimisation
USE: Optimization

Performance optimization
USE: Optimization

Performance related pay
USE: Incentive schemes

Perineum
BT: Body regions

Periodic media
USE: Nonhomogeneous media

Periodic structures
BT: Materials science and technology
NT: Gratings
Photonic crystals

Peripheral equipment
USE: Computer peripherals

Peripheral nervous system
BT: Nervous system

Permanent magnet generators
BT: Permanent magnet machines

Permanent magnet machines
USE: Permanent magnet synchronous machines
BT: Electric machines
Rotating machines
RT: Permanent magnet motors
Permanent magnets
NT: Permanent magnet

Permament magnet synchronous motors
USE: Permanent magnet synchronous motors
Permanent magnet synchronous motors
USE: Permanent magnet synchronous motors

Permanet magnets
BT: Magnets
RT: Magnetic levitation vehicles
Permanent magnet machines
Remanence

Permanent-magnet generators
USE: Permanent magnet motors

Permanent-magnet motors
USE: Permanent magnet motors

Permeability
UF: Magnetic permeability
BT: Electromagnetic analysis
RT: Magnetic materials
Permeability measurement
BT: Magnetic variables
Permeability measurement
RT: Permeability

Permission
UF: Access rights
File system permissions
BT: Computer security

Permittivity
BT: Electric variables
RT: Dielectric constant
Dielectric materials
Permittivity measurement
Permittivity measurement
BT: Dielectric measurement
RT: Permittivity

Perovskites
BT: Crystalline materials

Perpendicular magnetic anisotropy
BT: Magnetic anisotropy

Perpendicular magnetic recording
UF: Vertical recording
BT: Magnetic recording

Permanent magnet synchronous machines
2021 IEEE Thesaurus

RT: Disk drives

Perpendicular recording
USE: Magnetic recording

Persistent currents
BT: Current
RT: High-temperature superconductors
Superconducting magnets

Persistent identifiers
BT: Data structures
RT: Digital systems
Information retrieval

Personal area networks
UF: Piconets
Scatternets
BT: Radio communication
RT: Computer networks
Data communication
Land mobile radio
Personal communication networks
Wireless LAN
Zigbee
NT: Bluetooth
Body area networks
Body sensor networks
Wireless personal area networks

Personal communication networks
UF: Personal communication services
BT: Communication systems
RT: Cellular radio
Digital systems
IEEE 802.15 Standard
Location awareness
Mobile handsets
Personal area networks
Zigbee

Personal communication services
USE: Personal communication networks

Personal computers
USE: Microcomputers

Personal digital assistants
UF: PDA
PDAs

Palmtop computers
Handheld computers

Personal pensions
USE: Pensions

Personal protective equipment
BT: Health and safety
RT: Protective clothing

Personnel
BT: Human resource management
RT: Appraisal
Bring your own device
Education
Employment
Equal opportunities
Management
Productivity
Training
NT: Labor resources

Personnel monitoring
USE: Radiation monitoring

Persuasive systems
BT: Decision making
Social computing
RT: Behavioral sciences
Human factors
Man-machine systems
Psychology

Perturbation methods
UF: Perturbation techniques
BT: Approximation methods
NT: Cavity perturbation methods

Perturbation techniques
USE: Perturbation methods

Pervasive computing
UF: Everyware
Ubicomp
BT: Computers and information processing
Systems, man, and cybernetics
RT: Artificial intelligence
Context awareness
Next generation networking
NT: Ubiquitous computing
Wearable computers
Pest control
UF: Insect control
Vermin control
BT: Environmental management
RT: Agriculture
Hazards

PET USE: Positron emission tomography

Petascale computing
BT: Computers and information processing
RT: Supercomputers

Petri nets
BT: System analysis and design
RT: Discrete-event systems Modeling

Petrochemicals
BT: Chemical products Materials
Chemistry Fuels
Petroleum
Petroleum industry Plastic products Plastics

Petrol USE: Petroleum

Petroleum
UF: Gasoline
Petrol
BT: Chemical products Fuels
Oil processing industries
Oil pollution Oils
Petrochemicals
Hydrocarbons
PT: Oil drilling
Oil refineries
Well logging

PFD USE: Phase frequency detectors

PGA USE: Electronics packaging

pH measurement
BT: Chemical analysis Measurement

Phantoms
BT: Biomedical imaging
RT: Dosimetry Positron emission tomography
computed tomography
Single photon emission
X-ray applications
X-ray detection
X-ray imaging

Pharmaceutical technology
BT: Chemical technology
Chemistry Biochemistry Pharmaceuticals

Pharmaceuticals
BT: Chemical products Medical treatment
Biochemistry Chemistry Pharmaceutical technology
RT: Drugs

Pharynx
BT: Digestive system
Stomatognathic system

Phase change materials
UF: PCM
BT: Materials
RT: Memory
### Phase change memory

- **BT:** Memory
- **RT:** Phase change materials
- **NT:** Phase change random access memory

**Phase change RAM**
- USE: Phase change random access memory

**Phase change random access memory**
- **UF:** PCRAM
- **BT:** Phase change memory
- **RT:** Phase change random

**Phase control**
- **UF:** Phase-control
- **BT:** Power electronics
- **RT:** Electric variables control
- **NT:** Optical variables control

**Phase detection**
- **BT:** Signal detection
- **NT:** Phase frequency detectors

**Phase distortion**
- **BT:** Distortion
- **RT:** Delay effects

**Phase estimation**
- **BT:** Parameter estimation

**Phase frequency detectors**
- **UF:** PFD
- **BT:** Phase detection
- **RT:** Frequency measurement
- **Measurement:** Voltage
- **NT:** Voltage control

**Phase locked loops**
- **UF:** PLL
- **BT:** Phase-locked-loops
- **RT:** Phase-change RAM
- **NT:** Phase-change RAM

**Phase measurement**
- **BT:** Measurement
- **RT:** Acoustic measurements
- **NT:** Electric variables

**Phase modulation**
- **BT:** Modulation
- **RT:** Demodulation
- **NT:** Continuous phase modulation

**Phase noise**
- **BT:** Noise
- **RT:** Oscillators
- **NT:** Time-domain analysis

**Phase shift keying**
- **UF:** PSK
- **BT:** Phase shift keying
- **RT:** QPSK

**Phase shifters**
- **BT:** Circuits
- **RT:** Butler matrices
- **NT:** Phase transformers

**Phase shifting interferometry**
- **BT:** Interferometry

**Phase transformations, nuclear**
- **USE:** Nuclear phase transformations

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2021 IEEE Thesaurus

Photo sharing Web sites
USE: Multimedia Web sites

Photoacoustic effects
UF: Optoacoustic effects
BT: Spectroscopy
RT: Acoustic testing
Laser applications
Photothermal effects
NT: Photoacoustic imaging

Photoacoustic imaging
BT: Biomedical imaging
Photoacoustic effects

Photobleaching
BT: Photochemistry

Photocatalysis
BT: Catalysis
Photochemistry
Photochemistry
RT: Photocatalysts

Photocatalysts
BT: Catalysts
Photochemistry
RT: Photocatalysts

Photocathodes
USE: Cathodes

Photochemistry
BT: Chemistry
Water splitting
RT: Photocatalysis
NT: Photobleaching
Photocatalysis

Photochromism
UF: Photodarkening
BT: Photonics
Color
RT: Photodetectors

Photocomposition
USE: Text processing

Photoconducting devices
BT: Optoelectronic devices
Photoconductivity
Photoconductivity
Photodetectors
Semiconductor devices
NT: Electrophotography

Photoconducting materials
UF: Photoconductors

Photoelectricity
BT: Mechanical factors
Optical polarization
Piezooptic effects
Stress

Photoelectricity
UF: Photoemission
Phototubes
<table>
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<tr>
<th>BT: Electricity</th>
<th>USE: Magnetooptic effects</th>
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<tr>
<td>RT: Electron emission</td>
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**Photoelectron microscopy**

<table>
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<tbody>
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**Photoemission**

<table>
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**Photoemission electron microscopy**

| USE: Photoelectron microscopy |

**Photogalvanic effects**

| USE: Photovoltaic effects |

**Photography**

<table>
<thead>
<tr>
<th>BT: Imaging</th>
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<tbody>
<tr>
<td>Cameras</td>
</tr>
<tr>
<td>Electrophotography</td>
</tr>
<tr>
<td>Image capture</td>
</tr>
<tr>
<td>Image storage</td>
</tr>
<tr>
<td>Optical filters</td>
</tr>
<tr>
<td>NT: Cinematography</td>
</tr>
<tr>
<td>Digital photography</td>
</tr>
<tr>
<td>Image forensics</td>
</tr>
<tr>
<td>Photomicroscopy</td>
</tr>
<tr>
<td>Photorealism</td>
</tr>
</tbody>
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**Photoionisation**

| USE: Ionization |

**Photoionization**

| USE: Ionization |

**Photolithography**

| USE: Lithography |

**Photoluminescence**

<table>
<thead>
<tr>
<th>UF: Electrophotoluminescence</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Luminescence</td>
</tr>
<tr>
<td>Optics</td>
</tr>
<tr>
<td>RT: Judd-Ofelt theory</td>
</tr>
<tr>
<td>Microcavities</td>
</tr>
</tbody>
</table>

**Photomagnetic devices**

| USE: Magnetooptic devices |

**Photomagnetic effects**

| USE: Photonic bandgap fibres |

**Photometry**

<table>
<thead>
<tr>
<th>BT: Geoscience and remote sensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>measurement</td>
</tr>
<tr>
<td>RT: Optical variables</td>
</tr>
<tr>
<td>Light sources</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
<tr>
<td>Radiometry</td>
</tr>
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</table>

**Photomicrographs**

| USE: Photomicrography |

**Photomicrography**

<table>
<thead>
<tr>
<th>USE: Photomicrographs</th>
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</thead>
<tbody>
<tr>
<td>Micrographs</td>
</tr>
<tr>
<td>Microphotographs</td>
</tr>
<tr>
<td>Microphotography</td>
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<tr>
<td>Photomicrographs</td>
</tr>
<tr>
<td>BT: Photography</td>
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**Photomultipliers**

<table>
<thead>
<tr>
<th>BT: Vacuum technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Avalanche photodiodes</td>
</tr>
<tr>
<td>Electron multipliers</td>
</tr>
<tr>
<td>Photoelectricity</td>
</tr>
</tbody>
</table>

**Photon collider**

| BT: Particle accelerators |

**Photon crystal fibers**

| USE: Photonic crystal fibers |

**Photon crystal fibres**

| USE: Photonic crystal fibers |

**Photonic band gap**

<table>
<thead>
<tr>
<th>UF: Band gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band-gap</td>
</tr>
<tr>
<td>Bandgap</td>
</tr>
<tr>
<td>Photonic bandgap</td>
</tr>
<tr>
<td>BT: Electromagnetic wave polarization</td>
</tr>
<tr>
<td>Optical diffraction</td>
</tr>
</tbody>
</table>

**Photonic band gap**

| USE: Photonic bandgap |

**Photonic bandgap fibres**

| USE: Photonic bandgap fibres |

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Photonic crystal fibers
UF: Microstructured fibers
Microstructured fibres
Photon crystal fibers
Photon crystal fibres
Photic-crystal fibers
Photic-crystal fibres
BT: Photonic crystals
NT: Holey fibers
Photonic bandgap fibers

Photonic crystal fibres
USE: Photonic crystal fibers

Photonic crystals
UF: 2-D photonic crystals
2D photonic crystals
Photonic crystal fibers
Two dimensional photonic
crystals
BT: Periodic structures
NT: Photonic band gap
Photonic crystal fibers

Photonic crystall fibers
USE: Photonic crystals

Photonic integrated circuits
BT: Integrated circuits

Photonic metamaterials
USE: Optical metamaterials

Photonic-crystal fibers
USE: Photonic crystal fibers

Photonic-crystal fibres
USE: Photonic crystal fibers

Photonic
BT: Lasers and electrooptics
RT: Electromagnetic
metamaterials
Epitaxial growth
Silicon devices
Synapses

Photoplethysmography
BT: Biomedical measurement
Plethysmography

Photorealism
BT: Media
Photography
RT: Art
Cameras
Human image synthesis
Painting

Photoreceptors
BT: Neurons

Photorefractive effect
BT: Nonlinear optics
RT: Birefringence
Optical refraction
Photorefractive materials
Refractive index

Photorefractive materials
BT: Optical materials
RT: Birefringence
Holography
Optical mixing
Optical refraction
Photorefractive effect

Photoresists
USE: Resists

Photothermal effects
UF: Optothermal effects
Thermal wave imaging
BT: Photonics
RT: Photoacoustic effects

Photothyristors
UF: Optothyristors
BT: Thyristors
RT: Optical switches

Phototransistors
BT: Photodetectors
Transistors
RT: Optoelectronic devices
Radiation detectors

Phototubes
USE: Photoelectricity

Photovoltaic cells
UF: Solar cells
BT: Electron devices
Energy conversion
RT: Photoelectricity
Photovoltaic effects
Photovoltaic systems
NT: Light trapping

Photovoltaic effects
UF: Photogalvanic effects
BT: Photoelectricity
RT: Photovoltaic cells
Photovoltaic systems
NT: Shunts (electrical)

Photovoltaic power systems
USE: Photovoltaic systems

Photovoltaic systems
UF: Photovoltaic power systems
BT: Solar power generation
RT: Hybrid power systems
Phonovoltaic cells
Photovoltaic effects
Water pumps
NT: Building integrated photovoltaics
Fill factor (solar cell)
Solar panels

Phylogenetic tree
USE: Phylogeny

Physicist
USE: Medical services

Physical design
BT: System analysis and design
Systems engineering and theory
RT: Integrated circuit layout

Physical distribution management
USE: Logistics

Physical layer
BT: Open systems
NT: Physical layer security

Physical layer security
BT: Physical layer

Physical optics
BT: Optics
NT: Optical refraction
Optical vortices

Physical theory of diffraction
BT: Electromagnetic diffraction

Physical unclonable function
UF: PUF
Physically unclonable function
BT: Control system security
Semiconductor device manufacture
RT: Cryptography
Security
Semiconductor devices
Smart devices

Physical vapor deposition
UF: Physical vapor transport
Physical vapour deposition
BT: Plasma materials
Processing
RT: Sputtering

Physical vapor transport
USE: Physical vapor deposition

Physical vapour deposition
USE: Physical vapor deposition

Physically unclonable function
USE: Physical unclonable function
2021 IEEE Thesaurus

Physics

BT: Science - general
RT: Buoyancy
NT: Acoustics
Astrophysics
Beams
Biophysics
Dark energy
Entropy
Fluid flow
Geophysics
High energy physics
Kinetic theory
Levitation
Lorentz covariance
Mechanical factors
Network theory (graphs)
Physics education
Quantum mechanics
Rydberg atoms
Solid-state physics
String theory
Thermal factors
Waves

Physics computing

BT: Computer applications

Physics education

BT: Engineering education
Physics

Physiology

BT: Biology
RT: Entomology
NT: Action potentials
External stimuli
Neuromodulation

PhysStimuli

USE: External stimuli

PI control

UF: PI controller
Proportional + integral
control
Proportional-integral control
Proportional-integral controller
Proportional-integral-derivative control
Proportional-integral-derivative controller
BT: Control systems

PI controller

USE: PI control

piano mover’s problem

USE: Path planning

Pickling

BT: Surface treatment
RT: Chemistry

Pico-hydro

USE: Picohydro power

Picohydro power

UF: Pico-hydro
BT: Hydroelectric power generation
RT: Appropriate technology

Piconets

USE: Personal area networks

Picture archiving and communication systems

UF: Pacs
BT: Image communication
RT: Biomedical communication
Biomedical computing
Biomedical imaging

Picture phones

USE: Videophone systems

Picture processing

USE: Image processing

Picturephones

USE: Videophone systems

PID control

USE: PD control

Piecewise linear approximation

BT: Piecewise linear techniques

Piecewise linear techniques

BT: Mathematics
RT: Control system analysis
Control system synthesis
Difference equations
Nonlinear control systems
NT: Piecewise linear approximation

Piezoceramics
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE:</th>
<th>Piezoelectric materials</th>
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<tbody>
<tr>
<td><strong>Piezoelectric actuators</strong></td>
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<td>BT: Actuators</td>
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<tr>
<td>BT: Dielectric devices</td>
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<td>RT: Acoustic devices</td>
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<td><strong>Piezoelectric effects</strong></td>
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<td>USE: Piezoelectricity</td>
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<td><strong>Piezoelectric films</strong></td>
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<tr>
<td>BT: Dielectric films</td>
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<td>Films</td>
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<td>Piezoelectric materials</td>
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<tr>
<td>RT: Piezoelectric devices</td>
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<td>Piezoelectricity</td>
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<tr>
<td><strong>Piezoelectric materials</strong></td>
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<tr>
<td>UF: Piezoceramics</td>
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<tr>
<td>BT: Dielectric materials</td>
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<td>RT: Acoustic materials</td>
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<td>Crystals</td>
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<td>Piezoelectric devices</td>
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<td>Piezoelectricity</td>
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<td>NT: Piezoelectric films</td>
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<td><strong>Piezoelectric polarization</strong></td>
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<tr>
<td>BT: Piezoelectricity</td>
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<tr>
<td><strong>Piezoelectric transducers</strong></td>
<td></td>
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<tr>
<td>BT: Transducers</td>
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<tr>
<td><strong>Piezoelectricity</strong></td>
<td></td>
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<tr>
<td>UF: Piezoelectric effects</td>
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<tr>
<td>BT: Electricity</td>
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<tr>
<td>Ultrasonics, ferroelectrics, and frequency control</td>
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<tr>
<td>RT: Electrostriction</td>
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<td>Piezoelectric devices</td>
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<td>Piezoelectric films</td>
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<td>Piezoelectric materials</td>
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<td>Piezoresistance</td>
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<tr>
<td><strong>Pyroelectricity</strong></td>
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<tr>
<td>Stress</td>
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<tr>
<td>Ultrasonic transducers</td>
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<tr>
<td><strong>Piezomagnetic effects</strong></td>
<td></td>
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<tr>
<td>USE: Magnetomechanical effects</td>
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<tr>
<td><strong>Piezooptic effects</strong></td>
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<tr>
<td>BT: Acoustooptic effects</td>
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<tr>
<td>RT: Photoelasticity</td>
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<tr>
<td>Pressure effects</td>
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<tr>
<td>Stress</td>
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<tr>
<td><strong>Piezoresistance</strong></td>
<td></td>
</tr>
<tr>
<td>UF: Piezoresistive</td>
<td></td>
</tr>
<tr>
<td>BT: Electric variables</td>
<td></td>
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<tr>
<td>Resistance</td>
<td></td>
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<tr>
<td>RT: Piezoelectricity</td>
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<tr>
<td>Piezoresistive devices</td>
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<td>Pressure effects</td>
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<td>Stress</td>
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<tr>
<td><strong>Piezoresistive devices</strong></td>
<td></td>
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<tr>
<td>UF: Piezoresistors</td>
<td></td>
</tr>
<tr>
<td>BT: Semiconductor devices</td>
<td></td>
</tr>
<tr>
<td>RT: Piezoelectric devices</td>
<td></td>
</tr>
<tr>
<td>Piezoresistance</td>
<td></td>
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<tr>
<td>Pressure measurement</td>
<td></td>
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<tr>
<td><strong>Pigmentation</strong></td>
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</tr>
<tr>
<td>BT: Color</td>
<td></td>
</tr>
<tr>
<td>Materials science and technology</td>
<td></td>
</tr>
<tr>
<td>NT: Pigments</td>
<td></td>
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<tr>
<td><strong>Pigments</strong></td>
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<tr>
<td>BT: Pigmentation</td>
<td></td>
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<tr>
<td><strong>PIN diodes</strong></td>
<td></td>
</tr>
<tr>
<td>USE: PIN photodiodes</td>
<td></td>
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<tr>
<td><strong>Pin grid arrays</strong></td>
<td></td>
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<tr>
<td>USE: Electronics packaging</td>
<td></td>
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<tr>
<td><strong>PIN photodiodes</strong></td>
<td></td>
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<tr>
<td>UF: P-I-N</td>
<td></td>
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<tr>
<td>PIN diodes</td>
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</tbody>
</table>
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT: Photodiodes</th>
<th>Pituitary gland BT: Glands Nervous system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink noise USE: 1/f noise</td>
<td>Pixel BT: Digital images</td>
</tr>
<tr>
<td>Pins BT: Plugs</td>
<td>PLA USE: Programmable logic arrays</td>
</tr>
<tr>
<td>Pinterest USE: Multimedia Web sites</td>
<td>Plagiarism BT: Professional communication RT: Copyright protection Notice of Violation Publishing</td>
</tr>
<tr>
<td>Pions USE: Mesons</td>
<td>Planar antennas USE: Planar arrays</td>
</tr>
<tr>
<td>Pipeline processing UF: Computer pipeline processing Pipelining BT: Parallel processing RT: Multiprocessing systems Systolic arrays</td>
<td>Planar array USE: Planar arrays</td>
</tr>
<tr>
<td>Pipelines BT: Fluid flow RT: Chemical industry Magnetic flux leakage Materials handling Natural gas industry Oils Petroleum industry</td>
<td>Planar arrays UF: Planar antennas BT: Antenna arrays</td>
</tr>
<tr>
<td>Pipelining USE: Pipeline processing</td>
<td>Planar motors BT: Electric motors</td>
</tr>
<tr>
<td>Piracy (software) USE: Computer crime</td>
<td>Planar transmission lines BT: Transmission lines RT: Spurline NT: Coplanar transmission lines Finline Microstrip Slot lines Stripline</td>
</tr>
<tr>
<td>Pistons BT: Machine components Mechanical products RT: Bellows Engine cylinders Engines Gaskets Shafts Structural rings</td>
<td>Planar waveguides BT: Electromagnetic waveguides RT: Rectangular waveguides</td>
</tr>
<tr>
<td>Pitch control (audio) BT: Audio systems Variable speed drives</td>
<td>Planarisation USE: Planarization</td>
</tr>
<tr>
<td>Pitch control (position) BT: Mechanical variables control</td>
<td>Planarisation UF: Chemical mechanical planarisation BT: Surface treatment</td>
</tr>
</tbody>
</table>
RT: Dielectric films
Integrated circuits

Planetary chemistry
USE: Astrochemistry

Planetary composition
USE: Extraterrestrial measurements AND
Planets

Planetary landers
USE: Land transportation AND
Space vehicles

Planetary oceans
USE: Oceans AND
Planets

Planetary orbits
BT: Orbits

Planetary volcanic activity
USE: Planetary volcanoes

Planetary volcano
USE: Planetary volcanoes

Planetary volcanoes
UF: Planetary volcanic activity
Planetary volcano
BT: Volcanoes

Plants (biology)
BT: Organisms
RT: Life sciences
NT: Bamboo

Plants (industrial)
USE: Industrial plants

Plasma accelerators
BT: Particle accelerators
Plasma devices

Plasma applications
BT: Plasmas
RT: Low-temperature plasmas
Plasma materials
processing
NT: Plasma devices
Plasma immersion ion implantation
Plasma welding
Tokamaks

Plasma chemistry
BT: Plasma properties

Plasma confinement
BT: Plasmas
NT: Inertial confinement
Magnetic confinement

Plasma density
BT: Plasma properties

Plasma devices
BT: Plasma applications
RT: Gas discharge devices
Plasmas
NT: Plasma accelerators
Plasma jets
Tokamaks

Plasma diagnostics
BT: Plasmas
RT: Plasma measurements

Plasma display panel

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2021 IEEE Thesaurus

**USE:** Flat panel displays

**Plasma immersion ion implantation**
**BT:** Ion implantation
**Plasma applications**
**RT:** Semiconductor impurities

**Plasma jets**
**BT:** Plasma devices
**Metal cutting tools**
**Propulsion**

**Plasma materials processing**
**BT:** Materials processing
**Plasma applications**
**NT:** Chemical vapor deposition
**Ignition**
**Physical vapor deposition**

**Plasma measurements**
**BT:** Measurement
**Plasma diagnostics**
**Plasmas**

**Plasma properties**
**BT:** Plasmas
**Electron mobility**
**Stability analysis**
**Dusty plasmas**
**Plasma chemistry**
**Plasma density**
**Plasma sheaths**
**Plasma stability**
**Plasma temperature**
**Plasmons**

**Plasma sheaths**
**BT:** Plasma properties

**Plasma simulation**
**BT:** Plasmas
**Modeling**
**Numerical simulation**
**Tokamaks**

**Plasma sources**
**BT:** Plasmas
**Ion implantation**
**Ion sources**

**Plasma transport processes**
**BT:** Plasmas

**Plasma waves**
**BT:** Waves
**Plasmas**

**Plasma welding**
**BT:** Plasma applications
**Joining processes**
**Materials processing**
**Plasmas**

**Plasma x-ray sources**
**BT:** X-ray imaging
**X-ray lasers**

**Plasma-assisted combustion**
**BT:** Combustion
**Plasmas**

**Plasmas**
**BT:** Nuclear and plasma sciences
**Arc discharges**
**Discharges (electric)**
**Ionization**
**Ionosphere**
**Plasma devices**
**Plasma measurements**
**Plasma waves**
**Plasma welding**
**Relativistic effects**
**Atmospheric-pressure plasmas**

**Plasma sources**
**BT:** Plasmas
**Ion implantation**
**Plasmons**

**Plasmonics**
**USE:** Plasmons

**Plasmonic solar cells**
**USE:** Light trapping

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### 2021 IEEE Thesaurus

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<td>Plasmon</td>
<td>Manufactured products</td>
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<td>Surface plasmons</td>
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<td>Resins</td>
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<td>Epoxy resins</td>
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<td>Plastic integrated circuit packaging</td>
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<td>Integrated circuit packaging</td>
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<td>Integrated circuit packaging</td>
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<td>Plastic insulators</td>
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<td></td>
<td></td>
<td>Plastic</td>
<td>RT:</td>
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<td>Plastics</td>
<td>Alloying</td>
</tr>
<tr>
<td>Plastic products</td>
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<td>Plastic bottles</td>
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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Related Terms</th>
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</thead>
<tbody>
<tr>
<td><strong>Photoplethysmography</strong></td>
<td>NT:</td>
<td><strong>Plug-in electric vehicles</strong></td>
</tr>
<tr>
<td><strong>Phase locked loops</strong></td>
<td>USE:</td>
<td><strong>Plug-in hybrid electric vehicles</strong></td>
</tr>
<tr>
<td><strong>Electric vehicles</strong></td>
<td>BT:</td>
<td><strong>Plugboard</strong></td>
</tr>
<tr>
<td><strong>Hybrid electric vehicles</strong></td>
<td>BT:</td>
<td><strong>Plugs</strong></td>
</tr>
<tr>
<td><strong>Charging stations</strong></td>
<td>RT:</td>
<td><strong>Plumbago</strong></td>
</tr>
<tr>
<td><strong>Breadboard</strong></td>
<td>USE:</td>
<td><strong>Pluto</strong></td>
</tr>
<tr>
<td><strong>Connectors</strong></td>
<td>BT:</td>
<td><strong>Plutonium</strong></td>
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<td><strong>Keyways</strong></td>
<td>NT:</td>
<td><strong>pMOSFETs</strong></td>
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<td><strong>Pins</strong></td>
<td>Pins</td>
<td><strong>PMU</strong></td>
</tr>
<tr>
<td><strong>MOSFET</strong></td>
<td>USE:</td>
<td><strong>PMUs</strong></td>
</tr>
<tr>
<td><strong>Phasor measurement units</strong></td>
<td>USE:</td>
<td><strong>PNAs</strong></td>
</tr>
<tr>
<td><strong>Presence network agents</strong></td>
<td>USE:</td>
<td><strong>Pneumatic actuators</strong></td>
</tr>
<tr>
<td><strong>Actuators</strong></td>
<td>BT:</td>
<td><strong>Pneumatic systems</strong></td>
</tr>
<tr>
<td><strong>Control systems</strong></td>
<td>BT:</td>
<td><strong>Pneumology</strong></td>
</tr>
<tr>
<td><strong>Bellows</strong></td>
<td>RT:</td>
<td><strong>Pneumology</strong></td>
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<tr>
<td><strong>Fluidics</strong></td>
<td>RT:</td>
<td><strong>Pneumology</strong></td>
</tr>
<tr>
<td><strong>Mechanical systems</strong></td>
<td>RT:</td>
<td><strong>Pneumology</strong></td>
</tr>
<tr>
<td><strong>Pulmonology</strong></td>
<td>USE:</td>
<td><strong>Pneumology</strong></td>
</tr>
<tr>
<td><strong>Superconducting materials</strong></td>
<td>USE:</td>
<td><strong>Pnictide superconductors</strong></td>
</tr>
</tbody>
</table>

### Additional Terms
- **Pockels readout optical modulator**
  - USE: Electrooptic modulators
- **Podcast**
  - USE: Digital audio broadcasting
- **Poincare group**
  - USE: Poincare invariance
- **Poincare invariance**
  - UF: Poincare group
  - BT: Transforms
- **Point of care**
  - BT: Documentation
  - Medical services
  - RT: Biomedical communication
  - Clinical diagnosis
  - Patient monitoring
  - Smart healthcare
- **Point-to-multipoint communications**
  - UF: P2MP
  - PTMP
  - BT: Wireless communication
  - Internet
  - Internet telephony
- **Poisons**
  - USE: Toxicology
- **Poisson equation**
  - USE: Poisson equations
- **Poisson equations**
  - UF: Poisson equation
  - BT: Partial differential equations
  - RT: Electrostatics
- **Polar codes**
  - BT: Block codes
  - Linear codes
  - RT: Channel coding
  - Error correction codes
  - Reed-Muller codes
- **Polar cyclones**
  - USE: Cyclones
- **Polarimetric synthetic aperture radar**
  - BT: Synthetic aperture radar
- **Polarimetry**
  - UF: Solar polarimetry

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2021 IEEE Thesaurus

**Police**
- USE: Law enforcement

**Polishing machines**
- BT: Production equipment
- RT: Deburring
  - Rough surfaces
  - Surface finishing
  - Surface roughness

**Polishing machines**
- BT: Production equipment
- RT: Deburring
  - Rough surfaces
  - Surface finishing
  - Surface roughness

**Pollution**
- BT: Environmental factors
- RT: Contamination
  - Design for disassembly
  - Environmental economics
  - Green products
  - Occupational health
  - Pollution control
  - Pollution measurement
  - Sewage treatment
  - Toxicology
  - Waste disposal
- NT: Air pollution
  - Emissions trading
  - Industrial pollution
  - Land pollution
  - Oil pollution
  - Radioactive pollution
  - Thermal pollution
  - Urban pollution
  - Water pollution

**Pollution control**
- BT: Environmental management
- RT: Carbon emissions
  - Decontamination
  - Electrostatic precipitators
  - Environmental monitoring
  - Greenhouse effect
  - Ozonation
  - Pollution
  - Pollution measurement
  - Sewage treatment
  - Sludge treatment

**Poles & zeros**
- USE: Poles and zeros

**Poles and towers**
- UF: Pylons
  - Towers
  - Wood poles
- BT: Transmission lines
- RT: Power distribution lines
  - Power transmission lines
- NT: Telephone poles

**Poles and zeros**
- UF: Poles & zeros
  - Roots
  - Zeros
- BT: Transfer functions
- RT: Circuits
  - Control systems
  - Newton method
  - Polynomials

**Pollution measurement**
- BT: Measurement
- RT: Environmental monitoring
  - Pollution
  - Pollution control

**Polonium**
- BT: Chemical elements
<table>
<thead>
<tr>
<th><strong>2021 IEEE Thesaurus</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Polycaprolactone</strong></td>
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<tr>
<td>BT: Polymers</td>
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<tr>
<td>RT: Smart materials</td>
</tr>
<tr>
<td><strong>Polyethylene</strong></td>
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<tr>
<td>BT: Polymers</td>
</tr>
<tr>
<td>NT: Thermoplastic polyethylene</td>
</tr>
<tr>
<td><strong>Polyimides</strong></td>
</tr>
<tr>
<td>BT: Polymers</td>
</tr>
<tr>
<td><strong>Polymer coatings</strong></td>
</tr>
<tr>
<td>USE: Polymer films</td>
</tr>
<tr>
<td><strong>Polymer films</strong></td>
</tr>
<tr>
<td>UF: Polymer coatings</td>
</tr>
<tr>
<td>BT: Films</td>
</tr>
<tr>
<td>RT: Dielectric thin films</td>
</tr>
<tr>
<td><strong>Polymer foams</strong></td>
</tr>
<tr>
<td>BT: Materials</td>
</tr>
<tr>
<td>RT: Insulation</td>
</tr>
<tr>
<td>Insulators</td>
</tr>
<tr>
<td>Metal foam</td>
</tr>
<tr>
<td>Resins</td>
</tr>
<tr>
<td><strong>Polymer gels</strong></td>
</tr>
<tr>
<td>BT: Materials</td>
</tr>
<tr>
<td><strong>Polymer led</strong></td>
</tr>
<tr>
<td>USE: Organic light emitting diodes</td>
</tr>
<tr>
<td><strong>Polymers</strong></td>
</tr>
<tr>
<td>UF: Electroactive polymers</td>
</tr>
<tr>
<td>BT: Materials</td>
</tr>
<tr>
<td>RT: Colloidal lithography</td>
</tr>
<tr>
<td>Plastics</td>
</tr>
<tr>
<td>NT: Azobenzene</td>
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<tr>
<td>Biopolymers</td>
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<tr>
<td>Liquid crystal polymers</td>
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<tr>
<td>Optical polymers</td>
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<tr>
<td>Polycaprolactone</td>
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<tr>
<td>Polyethylene</td>
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<tr>
<td>Polyimides</td>
</tr>
<tr>
<td><strong>Polynomials</strong></td>
</tr>
<tr>
<td>BT: Equations</td>
</tr>
<tr>
<td>RT: Poles and zeros</td>
</tr>
<tr>
<td><strong>PON</strong></td>
</tr>
<tr>
<td>USE: Passive optical networks</td>
</tr>
<tr>
<td><strong>Porcelain</strong></td>
</tr>
<tr>
<td>BT: Ceramics</td>
</tr>
<tr>
<td><strong>Position control</strong></td>
</tr>
<tr>
<td>UF: Orientation control</td>
</tr>
<tr>
<td><strong>Porous silicon</strong></td>
</tr>
<tr>
<td>BT: Silicon</td>
</tr>
<tr>
<td><strong>Portable computers</strong></td>
</tr>
<tr>
<td>UF: Laptops</td>
</tr>
<tr>
<td>Portable PCs</td>
</tr>
<tr>
<td>NT: Handheld computers</td>
</tr>
<tr>
<td><strong>Portable document format</strong></td>
</tr>
<tr>
<td>UF: PDF</td>
</tr>
<tr>
<td>BT: Document handling</td>
</tr>
<tr>
<td>RT: Document image</td>
</tr>
<tr>
<td><strong>Portable media players</strong></td>
</tr>
<tr>
<td>UF: MP3</td>
</tr>
<tr>
<td>Portable Multimedia players</td>
</tr>
<tr>
<td>Portable video players</td>
</tr>
<tr>
<td>iPod</td>
</tr>
<tr>
<td>BT: Audio systems</td>
</tr>
<tr>
<td>Digital communication</td>
</tr>
<tr>
<td>Home automation</td>
</tr>
<tr>
<td>RT: Digital audio broadcasting</td>
</tr>
<tr>
<td>Tablet computers</td>
</tr>
<tr>
<td><strong>Portals</strong></td>
</tr>
<tr>
<td>BT: Management information systems</td>
</tr>
<tr>
<td>RT: Information retrieval</td>
</tr>
<tr>
<td>Web sites</td>
</tr>
<tr>
<td><strong>Portfolios</strong></td>
</tr>
<tr>
<td>UF: Electronic portfolios</td>
</tr>
<tr>
<td>BT: Professional</td>
</tr>
<tr>
<td>communication</td>
</tr>
<tr>
<td><strong>Pose estimation</strong></td>
</tr>
<tr>
<td>BT: Estimation</td>
</tr>
<tr>
<td>RT: Computer vision</td>
</tr>
<tr>
<td>BT: Mechanical variables</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Capacitive transducers</td>
</tr>
<tr>
<td>Mechanical guides</td>
</tr>
<tr>
<td>NT: Nanopositioning</td>
</tr>
</tbody>
</table>

**Position measurement**

<table>
<thead>
<tr>
<th>UF: Attitude determination</th>
<th>BT: Mechanical variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation determination</td>
<td>RT: Direction-of-arrival</td>
</tr>
<tr>
<td>Orientation measurement</td>
<td>Distance measurement</td>
</tr>
<tr>
<td>Source location</td>
<td>Gaze tracking</td>
</tr>
<tr>
<td></td>
<td>Geodesy</td>
</tr>
<tr>
<td></td>
<td>Location awareness</td>
</tr>
<tr>
<td></td>
<td>Navigation</td>
</tr>
<tr>
<td></td>
<td>Tracking</td>
</tr>
</tbody>
</table>

**Position sensitive particle detectors**

<table>
<thead>
<tr>
<th>BT: Ionizing radiation sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: High energy physics</td>
</tr>
</tbody>
</table>

**Positive train control**

<table>
<thead>
<tr>
<th>BT: Control systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail transportation</td>
</tr>
</tbody>
</table>

**Positron emission tomography**

<table>
<thead>
<tr>
<th>UF: PET</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Tomography</td>
</tr>
<tr>
<td>RT: Biomedical applications of radiation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BT: Elementary particles</th>
</tr>
</thead>
</table>

**Possibility theory**
### 2021 IEEE Thesaurus

| RT: Resistors | BT: Electric variables control converters |
| Voltage measurement | Power factor correction converters |

### POTS

**USE:** Landline

### Powders

**BT:** Coatings

**RT:** Ceramics

### Power amplifiers

**UF:** Radio frequency power amplifiers

**Radiofrequency power amplifiers**

**BT:** Amplifiers

**NT:** High power amplifiers

**Predistortion**

### Power and energy standards

**BT:** Standards categories

### Power cable insulation

**BT:** Cable insulation

**RT:** Power cables

### Power cables

**BT:** Cables

**Power transmission lines**

**RT:** Conductors

**Power cable insulation**

**Power distribution lines**

**NT:** Underground power cables

### Power capacitors

**BT:** Capacitors

**NT:** Supercapacitors

### Power combiners

**BT:** Waveguide components

**RT:** Microstrip components

**Power dividers**

**Stripline components**

### Power conditioning

**BT:** Power electronics

**RT:** Power conversion

**Pulse width modulation converters**

**NT:** Demand response

### Power demand

**UF:** Power consumption

**BT:** Power supplies

**RT:** Electricity supply industry

**Energy conservation**

**Energy resources**

**Load management**

**Load modeling**

**Power distribution**

**NT:** Demand response

**Load forecasting**

### Power dissipation

**BT:** Circuits

**RT:** CMOS logic circuits

**MOSFET circuits**

**Nanotechnology**

**Power transmission**

**System-on-chip**

### Power control

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### Power distribution

<table>
<thead>
<tr>
<th>UF: Distribution of electric power</th>
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<tbody>
<tr>
<td>BT:</td>
</tr>
<tr>
<td>RT:</td>
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</tbody>
</table>

### Power distribution control

| BT:  | Power distribution           |
| RT:  | Voltage control              |

### Power distribution faults

| BT:  | Power distribution |

### Power distribution lines

<table>
<thead>
<tr>
<th>UF: Overhead distribution lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT:</td>
</tr>
<tr>
<td>RT:</td>
</tr>
<tr>
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<td></td>
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</tbody>
</table>

### Power distribution networks

| BT:  | Power distribution |
| RT:  | Microgrids         |
|      | Power grids        |
|      | Smart grids        |
| NT:  | Active distribution networks |

### Power distribution planning

| BT:  | Power distribution |
|      | Power system planning |

### Power distribution reliability

| BT:  | Power distribution |
|      | Power system reliability |

### Power distribution transformers

| USE: Power transformers |

### Power dividers

| BT:  | Waveguide components |
| RT:  | Microstrip components |
|      | Power combiners       |
|      | Stripline components  |

### Power electronics

<table>
<thead>
<tr>
<th>UF: Electric power</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: High-voltage techniques</td>
</tr>
<tr>
<td>Matrix converters</td>
</tr>
<tr>
<td>Power conversion</td>
</tr>
<tr>
<td>Power filters</td>
</tr>
<tr>
<td>Pulse width modulation converters</td>
</tr>
<tr>
<td>Resonant inverters</td>
</tr>
<tr>
<td>Switching converters</td>
</tr>
<tr>
<td>Voltage-source converters</td>
</tr>
<tr>
<td>Adiabatic</td>
</tr>
<tr>
<td>Gate drivers</td>
</tr>
<tr>
<td>Inverters</td>
</tr>
<tr>
<td>Phase control</td>
</tr>
<tr>
<td>Power conditioning</td>
</tr>
<tr>
<td>Power semiconductor devices</td>
</tr>
</tbody>
</table>

### Power engineering

| BT: Power engineering and energy |
| RT: Power engineering education |
| NT: Ferroresonance              |
| High-voltage techniques        |
| Power engineering              |
| Power system simulation        |
| Power engineering and energy   |
| RT: Electrochemical devices    |
| NT: Electric variables control |
| Energy                         |
| Power engineering              |
| Power generation               |
| Power systems                  |

### Power engineering computing

| BT: Computer applications |
| RT: Power system analysis  |

### Power engineering education

| BT: Engineering education |
| RT: Power engineering    |
2021 IEEE Thesaurus

Power exchange
  USE: Power markets

Power factor
  USE: Reactive power

Power factor correction
  BT: Electric current control
  Load flow control
  RT: Power control
  Power transmission
  Voltage control

Power filters
  UF: Power line filters
  BT: Filters
  RT: Power electronics
  NT: Spurline

Power flow
  USE: Load flow

Power flow analysis
  USE: Load flow analysis

Power flow control
  USE: Load flow control

Power generation
  UF: Generation of electric power
  Output power
  Power plants
  Power stations
  BT: Power engineering and energy
  Batteries
  Fuel cells
  Generators
  Microgrids
  Power generation economics
  Power supplies
  Pulsed power systems
  Space power stations
  NT: Automatic generation
  Cogeneration
  Distributed power
  Geothermal power
  Hydroelectric power

Power generation control
  BT: Automatic control

Power generation dispatch
  BT: Power generation

Power generation economics
  BT: Economics
  RT: Power generation
deregulation
  NT: Electricity supply industry
deregulation

Power generation planning
  BT: Power generation

Power generation reliability
  BT: Power generation

Power grids
  UF: Electricity grids
  BT: Power systems
  RT: Power distribution networks
  Wind energy integration
  NT: Microgrids
  Smart grids

Power harmonic filters
  BT: Power system harmonics

Power harvesting
  USE: Energy harvesting

Power industry
  UF: Electric utilities
  BT: Industries
  RT: Offshore installations
  Power system faults
  NT: Electrical equipment
  Telecontrol equipment
  industry
  Electricity supply industry
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear facility regulation</td>
<td>Power system</td>
<td>USE: Power system reliability</td>
</tr>
<tr>
<td>Power interconnection</td>
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<td></td>
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<tr>
<td>Power injection molding</td>
<td>USE: Injection molding</td>
<td></td>
</tr>
<tr>
<td>Power injection moulding</td>
<td>USE: Injection molding</td>
<td></td>
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<tr>
<td>Power integrated circuits</td>
<td>BT: Circuits</td>
<td>RT: Power semiconductor devices</td>
</tr>
<tr>
<td></td>
<td>Integrated circuits</td>
<td></td>
</tr>
<tr>
<td>Power lasers</td>
<td>BT: Lasers</td>
<td>RT: Power semiconductor devices</td>
</tr>
<tr>
<td>Power line communications</td>
<td>BT: Transmission lines</td>
<td></td>
</tr>
<tr>
<td>Power line filters</td>
<td>USE: Power filters</td>
<td></td>
</tr>
<tr>
<td>Power management</td>
<td>USE: Power system management</td>
<td></td>
</tr>
<tr>
<td>Power markets</td>
<td>UF: Electricity markets</td>
<td>BT: Power transmission lines</td>
</tr>
<tr>
<td></td>
<td>Electricity trading</td>
<td>RT: Railway electrification</td>
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<td>Power exchange</td>
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<td>Power pools</td>
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<td>Power trading</td>
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<td>Emissions trading</td>
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<td></td>
<td>Power transmission</td>
<td></td>
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<td></td>
<td>Transactive energy</td>
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<tr>
<td>Power measurement</td>
<td>BT: Electric variables</td>
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<tr>
<td></td>
<td>measurement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RT: Wattmeters</td>
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</tr>
<tr>
<td></td>
<td>NT: Dynamometers</td>
<td></td>
</tr>
<tr>
<td>Power MOSFET</td>
<td>BT: MOSFET circuits</td>
<td>RT: Power semiconductor devices</td>
</tr>
<tr>
<td>Power outages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power overhead lines</td>
<td>BT: Power transmission lines</td>
<td></td>
</tr>
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RT: Power conversion
Power generation
Pulsed power systems
Uninterruptible power

Power system faults
BT: Power systems
RT: Electricity supply industry
Error correction
Fuzzy set theory
Power industry
Power system protection
Signal analysis

Power system harmonics
BT: Power systems
RT: Power quality
NT: Power harmonic filters

Power system interconnection
BT: Power industry
RT: Power systems
Power transmission

Power system management
UF: Power management
Telecommunication power management
BT: Power systems
RT: Microgrids
NT: Load flow
Preventive maintenance

Power system measurements
BT: Power systems
NT: Meter reading

Power system modeling
BT: Modeling
RT: Power systems
NT: Load modeling

Power system planning
BT: Power systems
RT: Demand side management
Electricity supply industry
NT: Power demand
Power distribution planning

Power system protection
BT: Power systems
Product safety engineering
AR: Power system faults
RT: Arresters
Circuit breakers
Fuses
Grounding
Power system transients

NT: Low-carbon economy

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2021 IEEE Thesaurus

Protective relaying

NT: Electrical safety
Substation protection
Surge protection

Power system relaying
BT: Relays
RT: Power systems
Protective relaying

Power system reliability
UF: Power outages
BT: Power systems
RT: Microgrids
Power system stability
Reliability
NT: Power distribution reliability

Power system restoration
BT: Power supplies
RT: Electricity supply industry
Power systems

Power system security
BT: Security
RT: Load flow analysis
Power systems
Reactive power control

Power system simulation
BT: Power engineering
RT: Power systems

Power system stability
BT: Power systems
RT: Power system reliability

Power system transients
BT: Electromagnetic transients
Arresters
Power quality
Power system protection
NT: Transient analysis

Power systems
UF: Electric power
BT: Power engineering and transmission
energy
RT: Civil engineering
Mechanical power
Interconnection

Power transformer insulation
Power Systems Computer Aided Design
USE: PSCAD

Power trading
USE: Power markets

Power transformers
UF: Power distribution transformers
BT: Transformers
RT: Transformer cores
Windings
NT: On load tap changers
### 2021 IEEE Thesaurus

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## 2021 IEEE Thesaurus

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### Predator-prey models
- **USE:** Predator prey systems

### Predator-prey systems
- **USE:** Predator prey systems

### Prediction algorithms
- **BT:** Algorithms

### Prediction methods
- **BT:** Artificial intelligence
- **RT:** Estimation
- **Forecasting**
- **Gaussian processes**
- **Kalman filters**
- **Prediction theory**
- **Signal processing**
- **Spectral analysis**
- **Speech processing**
- **NT:** Linear predictive coding
- **Predictive coding**
- **Predictive encoding**
- **Predictive models**

### Prediction theory
- **BT:** Statistics
- **RT:** Artificial intelligence
- **Estimation**
- **Prediction methods**

### Predictive analysis
- **USE:** Predictive analytics

### Predictive analytics
- **UF:** Predictive analysis
- **BT:** Statistical analysis
- **RT:** Data mining
- **Machine learning**
- **Predictive models**

### Predictive coding
- **BT:** Prediction methods

### Predictive control
- **UF:** Model predictive control
- **Model-predictive control**
- **BT:** Process control
- **RT:** Control engineering

### Predictive encoding
- **BT:** Prediction methods

### Predictive maintenance

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**Privacy preserving data mining**

| USE: | Data privacy | |
| Privacity | USE: | Privatization | |

**Privacy-invasive software**

| UF: | Invasive software | |
| BT: | Software | |
| RT: | Computer crime | |
|     | Computer security | |
|     | Unsolicited e-mail | |
| NT: | Spyware | |

**Probabilistic computing**

| BT: | Computers and information processing | |

**Probability density function**

| BT: | Integral equations | |
| RT: | Distribution functions | |

**Probability distribution**

| BT: | Probability | |
| NT: | Exponential distribution | |
|     | Log-normal distribution | |
|     | Maxwell-Boltzmann | |
|     | Nakagami distribution | |

**Probes**

| BT: | Instruments | |

**Problem-solving**

| BT: | Cognitive science | |
| RT: | Human factors | |

**Process control**

| BT: | Industrial control | |
| RT: | Bleaching | |
|     | Chemical reactors | |
|     | Continuous production | |
|     | Manufacturing automation | |
Process design
  BT: Design methodology
  RT: Chemical engineering
  NT: Design for disassembly
  Process control
  Process planning
  Product design
  Service computing
  NT: Pattern formation
  Process modeling

Process modeling
  BT: Modeling
  Process design
  Process control

Process monitoring
  BT: Monitoring

Process planning
  BT: Management
  Production
  Production management
  Production planning
  Process control
  Process design
  Business process integration
  Business process management
  Cause effect analysis
  Root cause analysis

Processor scheduling
  UF: Multiprocessor scheduling
  BT: Concurrency control
  Multiprocessing systems
  RT: Microprocessors
  Optimization methods
  NT: Scheduling algorithms

Processes (program)
  USE: Program processors

Procurement
  BT: Supply chain management

Product codes
  BT: Codes
  RT: Decoding
  Error correction
  Radiofrequency
  NT: Bar codes

Product customisation
  USE: Product customization

Product customisation
  UF: Product customisation
  BT: Product development
  RT: Customer satisfaction
  Manufactured products
  Product design

Product design
  BT: Design methodology
  RT: Concurrent engineering
  Design for disassembly
  Design for quality
  Design tools
  Group technology
  Manufactured products
  Process design
  Product customization
  Product development
  Prototypes
  Requirements engineering

Product development
  BT: Crowdsourcing
  Engineering management
  Brand management
  Manufactured products
  Product design
  Quality function deployment
  Rapid prototyping
  Reverse engineering
  Virtual prototyping
  NT: Graphical user interfaces
  Product customization
  Product lifecycle

Product liability
  BT: Supply chain management
  USE: Program processors

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**Product lifecycle management**

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**Product safety**

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**Product safety engineering**

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</tr>
<tr>
<td></td>
<td>Power system protection</td>
</tr>
<tr>
<td></td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Vehicle crash testing</td>
</tr>
</tbody>
</table>

**Product warranties**

| USE: | Warranties |

**Product warranty**

| USE: | Warranties |

**Production**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Industry applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT:</td>
<td>Containers</td>
</tr>
<tr>
<td></td>
<td>Wheels</td>
</tr>
<tr>
<td></td>
<td>Wire drawing</td>
</tr>
<tr>
<td>NT:</td>
<td>Ball milling</td>
</tr>
<tr>
<td></td>
<td>Compression molding</td>
</tr>
<tr>
<td></td>
<td>Embossing</td>
</tr>
<tr>
<td></td>
<td>Food products</td>
</tr>
<tr>
<td></td>
<td>Group technology</td>
</tr>
<tr>
<td></td>
<td>Injection molding</td>
</tr>
<tr>
<td></td>
<td>Materials processing</td>
</tr>
<tr>
<td></td>
<td>Mechanical products</td>
</tr>
<tr>
<td></td>
<td>Process planning</td>
</tr>
<tr>
<td></td>
<td>Production control</td>
</tr>
</tbody>
</table>

**Production control**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Industrial control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production</td>
</tr>
<tr>
<td></td>
<td>Adaptive scheduling</td>
</tr>
<tr>
<td></td>
<td>Cellular manufacturing</td>
</tr>
<tr>
<td></td>
<td>Group technology</td>
</tr>
<tr>
<td></td>
<td>Inventory control</td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Process control</td>
</tr>
<tr>
<td>NT:</td>
<td>Production systems</td>
</tr>
<tr>
<td></td>
<td>Supply chain management</td>
</tr>
<tr>
<td></td>
<td>Continuous production</td>
</tr>
<tr>
<td></td>
<td>Lot sizing</td>
</tr>
<tr>
<td></td>
<td>Optimized production technology</td>
</tr>
<tr>
<td></td>
<td>Scheduling</td>
</tr>
</tbody>
</table>

**Production economics**

| USE: | Industrial economics |

**Production engineering**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Engineering - general</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production</td>
</tr>
<tr>
<td></td>
<td>Industrial engineering</td>
</tr>
<tr>
<td></td>
<td>Inventory management</td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Manufacturing systems</td>
</tr>
<tr>
<td></td>
<td>Production equipment</td>
</tr>
<tr>
<td></td>
<td>Production management</td>
</tr>
<tr>
<td>NT:</td>
<td>Production materials</td>
</tr>
<tr>
<td></td>
<td>Production planning</td>
</tr>
</tbody>
</table>

**Production equipment**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gears</td>
</tr>
<tr>
<td></td>
<td>Machinery</td>
</tr>
<tr>
<td></td>
<td>Materials handling</td>
</tr>
<tr>
<td></td>
<td>Production engineering</td>
</tr>
<tr>
<td>NT:</td>
<td>Applicators</td>
</tr>
<tr>
<td></td>
<td>Clamps</td>
</tr>
<tr>
<td></td>
<td>Cutting tools</td>
</tr>
<tr>
<td></td>
<td>Fixtures</td>
</tr>
<tr>
<td></td>
<td>Machine tools</td>
</tr>
<tr>
<td><strong>Production facilities</strong></td>
<td><strong>Production planning</strong></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Mining equipment</td>
<td>Inhibitors</td>
</tr>
<tr>
<td>Molding equipment</td>
<td>Ink</td>
</tr>
<tr>
<td>Packaging machines</td>
<td>Joining materials</td>
</tr>
<tr>
<td>Paper making machines</td>
<td>Lubricants</td>
</tr>
<tr>
<td>Polishing machines</td>
<td>Retardants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Production systems</strong></th>
<th><strong>Production materials</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Production</td>
<td>BT: Materials</td>
</tr>
<tr>
<td>RT: Manufacturing</td>
<td>RT: Production</td>
</tr>
<tr>
<td>NT: Warehousing</td>
<td>NT: Assembly systems</td>
</tr>
<tr>
<td></td>
<td>Lead time reduction</td>
</tr>
<tr>
<td></td>
<td>Optimized production</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
</tr>
<tr>
<td></td>
<td>Trade</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Production management</strong></th>
<th><strong>Production management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Manufacturing</td>
<td>Management</td>
</tr>
<tr>
<td>BT: Management</td>
<td>Production</td>
</tr>
<tr>
<td>RT: Continuous improvement</td>
<td>Continuous production</td>
</tr>
<tr>
<td>NT: Foundries</td>
<td>Industrial engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Production materials</strong></th>
<th><strong>Professional aspects</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Materials</td>
<td>Engineering profession</td>
</tr>
<tr>
<td>BT: Production</td>
<td></td>
</tr>
<tr>
<td>RT: Additives</td>
<td></td>
</tr>
<tr>
<td>NT: Abrasives</td>
<td></td>
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<td></td>
<td></td>
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<tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Professional communication</strong></th>
<th><strong>Productivity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Technical communication</td>
<td>Labor productivity</td>
</tr>
<tr>
<td>RT: Collaborative work</td>
<td>Labour productivity</td>
</tr>
</tbody>
</table>

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2021 IEEE Thesaurus

Pragmatics
Semantics
Semiotics
Syntactics

NT: Collaboration
Communication aids
Communication

effectiveness
Communication symbols
Context
Databases
Global communication
Grammar
Information analysis
Information integrity
Information resources
Information retrieval
Information science
Information services
Information systems
Information technology
Manuals
Meetings
Oral communication
Plagiarism
Portfolios
Professional societies
Public speaking
Rhetoric
Writing

Professional societies
BT: Professional
communication

Profit sharing schemes
USE: Incentive schemes

Profitability
BT: Economics
RT: Cost accounting
Econometrics
Financial management
Productivity

Progenitor cells
BT: Cells (biology)
RT: Stem cells

Prognostics and health management
UF: PHM
BT: Product lifecycle
management

Program management
UF: Programme management
BT: Management
RT: Project management
Technical management

Program processors
UF: Assemblers (program)
Compilers (program)
Interpreters (program)
Multi-threaded systems
Multi-threading systems
Multithreaded systems
Multi threading systems
Processors (program)
BT: System software
RT: Input-output programs
Manycore processors
Operating systems
NT: Application specific
processors
Graphics processing units
Instruction sets
Optimizing compilers

Program profiling
USE: Programming

Programmable circuits
BT: Circuits
NT: Field programmable analog arrays
Programmable logic arrays
Programmable logic devices

Programmable control
BT: Digital control
RT: Industrial control
Manufacturing automation
NT: Flow graphs

Programmable logic arrays
UF: PLA
BT: Circuits
Logic arrays
Logic circuits
Programmable circuits
Programmable logic devices

Programmable logic controllers

Program generators

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Programmable logic devices

**USE:** Programmable logic devices
**UF:** Programmable logic controllers
**BT:** Circuits
**Logic devices**
**Programmable circuits**
**RT:** High level synthesis
**Programmable logic arrays**

Programmable read only memory

**USE:** Programmable read only memory
**UF:** Programmable logic read only memory
**BT:** Circuits
**Logic devices**
**Programmable logic circuits**
**RT:** High level synthesis
**Programmable logic arrays**

Programme management

**USE:** Programme management
**UF:** Program management
**BT:** Circuits
**Logic devices**
**Programmable circuits**
**RT:** High level synthesis
**Programmable logic arrays**

Programmed instruction

**USE:** Programmed instruction
**UF:** Programmed instruction
**BT:** Circuits
**Logic devices**
**Programmable circuits**
**RT:** High level synthesis
**Programmable logic arrays**

Programming

**USE:** Programming
**UF:** Program profiling
**BT:** Computer science
**Aerospace and electronic systems**
**Digital computers**
**Flowcharts**
**Null value**
**Programming environments**
**Runtime**
**Self-assembly**
**Software**
**Software debugging**
**Software tools**
**Structured Query Language**
**Syntactics**
**NT:** Augmented reality
**Automatic programming**
**Concatenated codes**
**Functional programming**
**Granular computing**
**Integer linear programming**
**Logic programming**
**Microprogramming**
**Object oriented methods**
**Object oriented systems development**
**Opportunistic software**
**Parallel programming**
**Performance analysis**
**Programming profession**
**Robot programming**

Programming environments

**USE:** Programming environments
**BT:** Software engineering
**RT:** Computer aided software engineering
**Programming**
**Software debugging**
**Software tools**

Programming languages

**USE:** Programming languages
**UF:** Computer programming languages
**BT:** Computer science
**Aerospace and electronic systems**
**Digital computers**
**Flowcharts**
**Null value**
**Programming environments**
**Runtime**
**Self-assembly**
**Software**
**Software debugging**
**Software tools**
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**Logic programming**
**Microprogramming**
**Object oriented methods**
**Object oriented systems development**
**Opportunistic software**
**Parallel programming**
**Performance analysis**
**Programming profession**
**Robot programming**

Programming profession

**USE:** Programming profession
**UF:** Computer programming profession
**BT:** Programming
**RT:** Employment
**Engineering profession**

Project engineering

**USE:** Project engineering
**BT:** Engineering management
**NT:** Scheduling
**Turnkey project**

Project management

**USE:** Project management
**BT:** Management
**RT:** Building information management
**Concurrency management**
**Lead time reduction**
**Program management**
**Requirements engineering**
**Requirements management**
**Research and development management**
**Scrum (Software development)**
**System integration**
**Technology management**
**NT:** Proposals
**Turnkey project**

Projectiles

**USE:** Projectiles
**BT:** Weapons

Projection algorithms

**USE:** Projection algorithms
**BT:** Algorithms

Projective geometry

**USE:** Projective geometry
**BT:** Geometry

Projective shadowing

**USE:** Projective shadowing
**USE:** Shadow mapping

Projectors (optical)

**USE:** Projectors (optical)
**USE:** Optical projectors
<table>
<thead>
<tr>
<th>PROM</th>
<th>UF: Programmable read only memory</th>
<th>BT: Read only memory</th>
<th>NT: EPROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promethium</td>
<td>BT: Chemical elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promotion - marketing</td>
<td>UF: Sales promotion</td>
<td>BT: Marketing management</td>
<td>RT: Public relations</td>
</tr>
<tr>
<td>Proof of Work</td>
<td>BT: Computer security Protocols</td>
<td>RT: Blockchain Denial-of-service attack</td>
<td></td>
</tr>
<tr>
<td>Propagation</td>
<td>UF: Wave equations</td>
<td>BT: Waves</td>
<td>RT: Damping Electromagnetic waveguides</td>
</tr>
<tr>
<td></td>
<td>NT: Attenuation Electromagnetic propagation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insertion loss Nonlinear wave propagation</td>
<td>Perfectly matched layers Reflection Scattering Transient response</td>
<td></td>
</tr>
<tr>
<td>Propagation constant</td>
<td>BT: Electromagnetic propagation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation delay</td>
<td>BT: Delay effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation loss</td>
<td>USE: Propagation losses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propagation losses</td>
<td>UF: Propagation loss</td>
<td>BT: Electromagnetic propagation</td>
<td></td>
</tr>
<tr>
<td>Propellants</td>
<td>BT: Vehicular and wireless technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propellers</td>
<td>BT: Aircraft propulsion</td>
<td>RT: Aircraft Blades Engines Impellers Marine vehicles Shafts</td>
<td></td>
</tr>
<tr>
<td>Proportional + derivative control</td>
<td>USE: PD control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional + integral control</td>
<td>USE: PI control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional control</td>
<td>BT: Control systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional derivative control</td>
<td>USE: PD control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional plus derivative control</td>
<td>USE: PD control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional-derivative control</td>
<td>USE: PD control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional-integral control</td>
<td>USE: PI control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional-integral controller</td>
<td>USE: PI control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional-integral-derivative control</td>
<td>USE: PI control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposals</td>
<td>UF: Technical proposals</td>
<td>BT: Project management</td>
<td>RT: Contracts Procurement Technical requirements Writing</td>
</tr>
<tr>
<td>Propulsion</td>
<td>BT: Vehicular and wireless technologies</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th><strong>IEEE 802.11 Standard</strong></th>
<th><strong>IEEE 802.11e Standard</strong></th>
<th><strong>IEEE 802.11g Standard</strong></th>
<th><strong>IEEE 802.11n Standard</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPTV</strong></td>
<td><strong>Internet of Things</strong></td>
<td><strong>Local area networks</strong></td>
<td><strong>Metropolitan area networks</strong></td>
</tr>
<tr>
<td><strong>multiple access</strong></td>
<td><strong>Software defined</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>networking</strong></td>
<td><strong>TCP/IP</strong></td>
<td><strong>Wide area networks</strong></td>
<td></td>
</tr>
<tr>
<td><strong>mode</strong></td>
<td></td>
<td><strong>Access protocols</strong></td>
<td><strong>Asynchronous transfer</strong></td>
</tr>
<tr>
<td><strong>switching</strong></td>
<td><strong>Consensus protocol</strong></td>
<td><strong>Cryptographic protocols</strong></td>
<td><strong>Master-slave</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Multicast protocols</strong></td>
<td><strong>Multiprotocol label</strong></td>
</tr>
<tr>
<td><strong>protocol</strong></td>
<td><strong>Proof of Work</strong></td>
<td><strong>Routing protocols</strong></td>
<td><strong>Smart contracts</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Transport protocols</strong></td>
<td><strong>Wireless application</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Zero knowledge proof</strong></td>
</tr>
</tbody>
</table>

### Proton radiation effects

<table>
<thead>
<tr>
<th><strong>BT:</strong> Proton effects</th>
<th><strong>RT:</strong> Ion transistors</th>
<th><strong>Protons</strong></th>
<th><strong>Radiation effects</strong></th>
<th><strong>Semiconductor devices</strong></th>
<th><strong>Silicon-on-insulator</strong></th>
</tr>
</thead>
</table>

### Proton therapy

<table>
<thead>
<tr>
<th><strong>BT:</strong> Medical treatment</th>
<th><strong>RT:</strong> Biological effects of radiation</th>
</tr>
</thead>
</table>

### Protons

<table>
<thead>
<tr>
<th><strong>BT:</strong> Elementary particles</th>
<th><strong>RT:</strong> Cosmic rays</th>
<th><strong>Ions</strong></th>
<th><strong>Proton accelerators</strong></th>
<th><strong>Proton effects</strong></th>
<th><strong>Proton radiation effects</strong></th>
</tr>
</thead>
</table>

### Prototypes

<table>
<thead>
<tr>
<th><strong>BT:</strong> Design methodology</th>
<th><strong>RT:</strong> Laser sintering</th>
<th><strong>Product design</strong></th>
<th><strong>Stereolitography</strong></th>
<th><strong>Virtual prototyping</strong></th>
<th><strong>NT:</strong> Breadboard</th>
<th><strong>Rapid prototyping</strong></th>
</tr>
</thead>
</table>

### Proximity effects

<table>
<thead>
<tr>
<th><strong>UF:</strong> Current crowding</th>
<th><strong>BT:</strong> Electromagnetics</th>
<th><strong>RT:</strong> Conductors</th>
<th><strong>Lithography</strong></th>
</tr>
</thead>
</table>

### Pry and Bean model

<table>
<thead>
<tr>
<th><strong>USE:</strong> Bean model</th>
</tr>
</thead>
</table>

### PSCAD

<table>
<thead>
<tr>
<th><strong>Aided Design</strong></th>
<th><strong>UF:</strong> Power Systems Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Design automation</td>
<td><strong>RT:</strong> EMTDC</td>
</tr>
</tbody>
</table>

### Pseudobinary semiconductors

<table>
<thead>
<tr>
<th><strong>USE:</strong> Semiconductor materials</th>
</tr>
</thead>
</table>

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Pseudomorphic HEMTs
USE: PHEMTs

Pseudonoise coded communication
USE: Spread spectrum

Pseudonoise coded radar
USE: Spread spectrum radar

Pseudorandom sequences
USE: Random sequences

PSK
USE: Phase shift keying

PSNR
UF: Peak signal to noise ratio
Peak signal-to-noise ratio
BT: Signal to noise ratio

pSPICE
USE: SPICE

PSTN
USE: Communication networks

Psychiatry
BT: Behavioral sciences
RT: Medical treatment
NT: Mental disorders

Psychoacoustic models
BT: Auditory system
NT: Masking threshold

Psychoacoustics
BT: Acoustics
RT: Auditory system

Psychology
BT: Behavioral sciences
Social sciences
RT: Affective computing
Cognition
Cognitive science
Digital intelligence
Emotion recognition
Employee welfare
Persuasive systems
Social engineering
(security)
NT: Active perception
Emotional responses
Industrial psychology

Psychometric testing
BT: Psychology
RT: Industrial psychology

PTMP
USE: Point-to-multipoint communications

Public domain software
BT: Open Access Software
RT: Copyright protection
Open data
Open source software
NT: Python
R language

Public finance
UF: Government borrowing
Government expenditure
BT: Governmental factors
Financial management
Government
Macroeconomics

Public health
USE: Public healthcare

Public healthcare
UF: Public health
BT: Medical services
RT: Epidemiology

Public infrastructure
BT: Asset management
Environmental management
Government policies
Public policy
Rural areas
Urban areas
Urban planning
NT: Critical infrastructure

Public key
BT: Cryptography
NT: Public key cryptography

Public key cryptography
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>UF: Public key cryptosystems</th>
<th>Publish/subscribe systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Public key</td>
<td>Publish subscribe systems</td>
</tr>
<tr>
<td>NT: Elliptic curve cryptography</td>
<td>USE: Publish subscribe systems</td>
</tr>
<tr>
<td>Identity-based encryption</td>
<td></td>
</tr>
</tbody>
</table>

### Public key cryptosystems

**USE:** Public key cryptography

### Public policy

**BT:** Government policies
**RT:** Public infrastructure

### Public relations

**BT:** Management
**RT:** Customer relationship management

**RT:** Marketing management
**RT:** Promotion - marketing

### Public speaking

**UF:** Speechmaking
**BT:** Oral communication
**RT:** Professional communication

**RT:** Meetings

### Public switched telephone network

**USE:** Communication networks

### Public transportation

**UF:** Subways
**BT:** Taxi
**BT:** Trolley cars
**BT:** Uber
**RT:** Transportation
**RT:** Light rail systems
**RT:** Rail transportation
**RT:** Urban areas

### Publish subscribe systems

**UF:** Publish-subcribe systems
**BT:** Publish/subscribe systems
**BT:** Message systems
**RT:** Content management
**RT:** Middleware
**RT:** Pattern recognition
**RT:** Queueing analysis

### Publishing

**BT:** Computer applications
**RT:** Bibliographies
**NT:** Copyright protection
**NT:** Digital printing
**NT:** Document handling
**NT:** Guidelines
**NT:** Plagiarism
**NT:** Printing
**NT:** Text processing

**NT:** Bibliometrics
**RT:** Company reports
**RT:** Desktop publishing
**RT:** Electronic publishing
**RT:** Journalism
**RT:** Open Access
**RT:** Scientific publishing

### Pulmonary diseases

**UF:** Lung diseases
**BT:** Respiratory diseases
**BT:** Diseases
**RT:** Lung
**RT:** Respiratory system

### Pulmonology

**UF:** Chest medicine
**UF:** Pneumology
**UF:** Respiratory medicine
**UF:** Respirology
**BT:** Medical specialties
**RT:** Lung
**RT:** Respiratory system

### Pulp and paper industry

**UF:** Paper industry
**BT:** Manufacturing industries
**RT:** Forestry
**RT:** Paper products
**RT:** Paper pulp
**RT:** Paper technology
## 2021 IEEE Thesaurus

### Pulp manufacturing
- **BT**: Manufacturing systems
- **RT**: Paper making
- **NT**: Paper making machines
- **NT**: Paper mills
- **NT**: Pulp and paper industry
- **WT**: Wood industry

### Pulse oximetry
- **BT**: Instrumentation and measurement
- **RT**: Biomedical measurement
- **NT**: Oxygen
- **NT**: Pulse oximeter
- **NT**: Remote sensing

### Pulse shaping
- **USE**: Pulse shaping methods

### Pulse shaping methods
- **UF**: Pulse shaping
- **BT**: Signal processing
- **NT**: Optical pulse shaping

### Pulse transformers
- **BT**: Transformers

### Pulse width modulated power converters
- **USE**: Pulse width modulation converters

### Pulse width modulation
- **UF**: PWM
- **BT**: Modulation
- **RT**: AC generators
- **NT**: AC machines
- **NT**: AC motors
- **NT**: Converters
- **NT**: DC generators
- **NT**: DC machines
- **NT**: DC motors
- **NT**: Pulse width modulation converters
- **NT**: Pulse width modulation inverters
- **NT**: Space vector pulse width modulation

### Pulse oximeter
- **BT**: Biomedical equipment
Pulsewidth modulation converters
BT: Converters
RT: Power conditioning
Power control
Power conversion
Power electronics
Pulse width modulation
Voltage-source converters

Pulse width modulation inverters
USE: Pulse width modulation converters

Pulse width modulation invertors
USE: Pulse width modulation converters

Pulse width modulation
USE: Pulse width modulation converters

Pump lasers
BT: Lasers

Pumping of lasers
USE: Laser excitation

Pumps
BT: Machinery
RT: Bellows
Compressors
Impellers
Turbo machinery
NT: Fuel pumps
Heat pumps
Insulin pumps
Micropumps
Water pumps

Punching
BT: Materials processing
RT: Sheet metal processing

Pulsed electroacoustic methods
BT: Acoustoelectric effects
RT: Acoustoelectric devices
Charge measurement
Insulation testing
Space charge

Pulsed laser deposition
BT: Chemical vapor deposition

Pulsed power supplies
BT: Pulsed power systems

Pulsed power systems
BT: Power systems
RT: Energy storage
High-voltage techniques
Power generation
Power supplies
NT: Pulsed power supplies

Pulsewidth modulation
USE: Pulse width modulation converters

Pursuit algorithms
BT: Algorithms

PWM
USE: Pulse width modulation converters

PWM converters
USE: Pulse width modulation converters
<table>
<thead>
<tr>
<th>Term</th>
<th>USE:</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWM converters</td>
<td>Pulse width modulation</td>
<td>qbit QCD vacuum QFD QFP QoE QoS Qox QPSK QR codes Quad flat packs Quadratic programming Quadrature amplitude modulation Quadrature phase shift keying Qualifications Quality assessment Quality assurance</td>
</tr>
<tr>
<td>PWM inverters</td>
<td>Pulse width modulation</td>
<td></td>
</tr>
<tr>
<td>PWM invertors</td>
<td>Pulse width modulation</td>
<td></td>
</tr>
<tr>
<td>Pylons</td>
<td>Poles and towers</td>
<td></td>
</tr>
<tr>
<td>Pyroelectric devices</td>
<td>Dielectric devices Pyroelectricity</td>
<td></td>
</tr>
<tr>
<td>Pyroelectricity</td>
<td>Electricity Ultrasonics, ferroelectrics, and frequency control</td>
<td></td>
</tr>
<tr>
<td>Python</td>
<td>Computer languages Public domain software Functional programming Object oriented Software libraries</td>
<td></td>
</tr>
<tr>
<td>Q factor</td>
<td>Q-factor</td>
<td></td>
</tr>
<tr>
<td>Q measurement</td>
<td>Electric variables Q-factor</td>
<td></td>
</tr>
<tr>
<td>Q-factor</td>
<td>Q factor Quality factor Dielectric devices Capacitors Q measurement</td>
<td></td>
</tr>
<tr>
<td>QAM</td>
<td>Quadrature amplitude modulation</td>
<td></td>
</tr>
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Design for quality
IEEE 802.11e Standard
Product liability
Quality awards
Quality control
Quality function deployment
Six sigma
Total quality management
NT: Best practices

Quality awards
BT: Quality management
RT: Continuous improvement
Quality assurance
Quality function deployment
Total quality management

Quality control
BT: Quality management
RT: Contamination
Coordinate measuring
Data integrity
Design for quality
Failure analysis
IEEE 802.11e Standard
Quality assurance
Quality function deployment
Reliability
Six sigma
Total quality management

Quality factor
USE: Q-factor

Quality function deployment
UF: QFD
BT: Quality management
RT: Concurrent engineering
Product development
Quality assurance
Quality function deployment
Reliability
Six sigma
Total quality management

Quality of experience
UF: QoE
Qox
BT: Communication systems
Customer satisfaction
RT: Quality of service
User experience

Quality of service
UF: QoS
BT: Communication systems
Customer satisfaction
RT: Conformance testing
IEEE 802.11e Standard
IP networks
Next generation networking
Quality of experience
Service level agreements
Spatial diversity
Telecommunication
computing
NT: Admission control

Quantity of service
USE: Quality of service

Quantisation
USE: Quantization (signal)

Quantization (signal)
UF: Quantisation
Quantization effects
Signal quantisation
Signal quantization
Signal processing
RT: Analog-digital conversion
Data compression
Digital representation
Encoding
Finite wordlength effects
Signal sampling
NT: Vector quantization

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Quantization effects
USE: Quantization (signal)

Quantization errors
USE: Quantization (signal)

Quantum algorithm
BT: Quantum computing

Quantum capacitance
BT: Capacitance
Quantum mechanics
RT: CNTFETs

Quantum cascade lasers
UF: Cascade lasers
BT: Quantum well lasers
RT: Quantum mechanics

Quantum cellular automata
BT: Quantum computing

Quantum channel
BT: Communication channels
Quantum information science
RT: Qubit

Quantum chemistry
BT: Chemistry
Quantum computing
RT: Molecular computing

Quantum circuit
BT: Circuits
Quantum communication
Quantum computing
Quantum information science

Quantum communication
BT: Communication systems
RT: Channel capacity
Information theory
Optical fiber communication
Teleportation
NT: Quantum circuit
Quantum networks

Quantum computing
BT: Computers and information processing
Electron devices
RT: Coherence time
Quantum algorithm
NT: Quantum algorithm

Quantum confinement
USE: Potential well

Quantum cryptography
BT: Cryptography
Quantum mechanics

Quantum dash
USE: Quantum dots

Quantum decoherence
BT: Quantum mechanics
RT: Coherence

Quantum dot lasers
UF: Quantum-dash lasers
BT: Semiconductor lasers
RT: Quantum dots
Quantum mechanics
Quantum well lasers

Quantum dots
UF: Quantum dash
Quantum-dot lasers
Quantum-dots
BT: Semiconductor devices
RT: Nanocrystals
Quantum dot lasers
Quantum mechanics

Quantum entanglement
UF: Entangled states
BT: Quantum mechanics
RT: Quantum radar
Quantum state
Teleportation

Quantum information science
BT: Information science
Quantum mechanics
NT: Quantum channel
Quantum circuit

Quantum key distribution
BT: Communication system
security
RT: Cryptography
### Quantum mechanics

<table>
<thead>
<tr>
<th>TF: Quantum theory</th>
<th>BT: Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Laser theory</td>
<td>Nanotechnology</td>
</tr>
<tr>
<td></td>
<td>Philosophical</td>
</tr>
</tbody>
</table>

### Quantum state

| BT: Quantum mechanics | RT: Quantum entanglement |

### Quantum system

| BT: Quantum mechanics |

### Quantum well devices

<table>
<thead>
<tr>
<th>UF: Quantum-well devices</th>
<th>BT: Electron devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantumwell devices</td>
<td>Electooptic modulators</td>
</tr>
</tbody>
</table>

### Quantum wells

<table>
<thead>
<tr>
<th>UF: Semiconductor quantum wells</th>
<th>BT: Electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantum well devices</td>
<td>Quantum well lasers</td>
</tr>
<tr>
<td>Surface emitting lasers</td>
<td>Quantum cascade lasers</td>
</tr>
<tr>
<td>Two dimensional hole gas</td>
<td></td>
</tr>
</tbody>
</table>

### Quantum networks

<table>
<thead>
<tr>
<th>BT: Quantum communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantum computing</td>
</tr>
</tbody>
</table>

### Quantum optics

| BT: Quantum mechanics |

### Quantum radar

<table>
<thead>
<tr>
<th>BT: Radar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote sensing</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
</tbody>
</table>

### Quantum simulation

<table>
<thead>
<tr>
<th>BT: Quantum computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantum mechanics</td>
</tr>
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</table>

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QUANTUM DOTS

Quantum-dot lasers
USE: Quantum dot lasers

Quantum-dots
USE: Quantum dots

Quantum-well devices
USE: Quantum well devices

Quantum-well lasers
USE: Quantum well lasers

Quantumwell devices
USE: Quantum well devices

Quarter-wave plates
USE: Optical retarders

QUARTZ CRYSTALS

BT: Crystals

QUASI-DOPING

BT: Semiconductor device manufacture
RT: Semiconductor device doping

QUASI-RESONANT INVERTERS
USE: Resonant inverters

R & D MANAGEMENT
USE: Research and development management

R LANGUAGE
BT: Computer languages

QUBIT
UF: qbit
BT: Quantum computing
RT: Coherence time

QUERY EVALUATION
USE: Query processing

QUERY LANGUAGES
USE: Database languages

QUERY OPTIMISATION
USE: Query processing

QUERY OPTIMIZATION
USE: Query processing

QUERY PIPELINE
USE: Query processing

QUERY PROCESS
USE: Query processing

QUERY PROCESSING
UF: Query evaluation

RT: Publish subscribe systems

SCHEDULING

QUEUEING ANALYSIS
UF: Queueing theory

RT: Publish subscribe systems

RAD HARDENED
USE: Radiation hardening (electronics)

RABBIT
BT: Animals

RADIO

2021 IEEE Thesaurus

UF: Microwave radar
BT: Aerospace and electronic systems
sensing
RT: Microwave technology
Radar detection
Radar scattering
NT: Airborne radar
Bistatic radar
Cognitive radar
Doppler radar
Ground penetrating radar
High frequency radar
Laser radar
Meteorological radar
Millimeter wave radar
Multistatic radar
Passive radar
Quantum radar
Radar applications
Radar clutter
Radar cross-sections
Radar equipment
Radar theory
Spaceborne radar
Spread spectrum radar
Synthetic aperture radar
Ultra wideband radar

Radar antennas
BT: Antennas

Radar applications
BT: Radar
RT: Oceanographic techniques
NT: Radar countermeasures
Radar detection
Radar imaging
Radar measurements
Radar polarimetry
Radar remote sensing
Radar tracking

Radar clutter
BT: Radar
RT: Jamming

Radar countermeasures
BT: Electronic warfare
Radar applications
RT: Adaptive arrays
Electronic countermeasures
Jamming
Spread spectrum radar

Radar detection
BT: Radar applications
Signal detection
RT: Ground penetrating radar
Passive radar
Radar
Ultra wideband radar

Radar equipment
BT: Radar

Radar imaging
BT: Radar applications
RT: Ground penetrating radar
Landmine detection
Meteorological radar
Passive radar
Remote sensing
Synthetic aperture radar
Ultra wideband radar

Radar interferometry
BT: Interferometry
NT: Synthetic aperture radar
interferometry

Radar measurements
BT: Radar applications
RT: Remote sensing
NT: Radar cross-sections

Radar meteorology
USE: Meteorological radar

Radar polarimetry
UF: SAR imaging

2021 IEEE Thesaurus

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Synthetic aperture radar

BT: Radar applications

Radar remote sensing

BT: Radar applications

RT: Spaceborne radar

Radar scattering

BT: Electromagnetic scattering

RT: Radar

detectors

Silicon radiation detectors

Radar signal processing

BT: Signal processing

Radar theory

BT: Radar

Radar tracking

BT: Radar applications

RT: Target tracking

Radial basis function networks

UF: RBF networks

Radial basis function neural networks

BT: Neural networks

RT: Artificial intelligence

Computer networks

Cybernetics

Interpolation

Radiation counters

USE: Radiation detectors

Radiation detection

USE: Radiation detectors

Radiation detector circuits

BT: Circuits

RT: Counting circuits

Radiation detectors

UF: Counters

Particle detectors

Radiation counters

Radiation detection

Rate

Radiation detectors

BT: Ionizing radiation sensors

RT: Atomic measurements

Radiation dosage

BT: Radiation monitoring

Radiation dosimetry

USE: Dosimetry

Radiation effects

UF: Irradiation

BT: Nuclear and plasma sciences

RT: Biomedical applications of radiation

Brachytherapy

Proton effects

Proton radiation effects

Radiation monitoring

Radiation protection

Safety

NT: Biological effects of radiation

Gamma-ray effects

Ion radiation effects

Neutron radiation effects

Scintillators

Single event latchup

Space radiation

Terahertz radiation

Total ionizing dose

Radiation hardening (electronics)

UF: Rad hardened

BT: Electronic equipment manufacture

Nuclear and plasma sciences

RT: Ionizing radiation

Satellite communication

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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Radiation imaging</th>
<th>USE: Automotive components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Imaging</td>
<td></td>
</tr>
<tr>
<td><strong>RT:</strong> Biomedical imaging</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiation monitoring</th>
<th><strong>UF:</strong> Health physics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Monitoring</td>
<td>Radiation effects</td>
</tr>
<tr>
<td><strong>RT:</strong> Nuclear and plasma</td>
<td>Radiation protection</td>
</tr>
<tr>
<td><strong>NT:</strong> Dosimetry</td>
<td>Radiation detectors</td>
</tr>
<tr>
<td></td>
<td>Radiation effects</td>
</tr>
<tr>
<td></td>
<td>Radioactive pollution</td>
</tr>
<tr>
<td></td>
<td>Reactor instrumentation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiation pattern</th>
<th><strong>USE:</strong> Antenna radiation patterns</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Radiation protection</th>
<th><strong>UF:</strong> Radiation shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Protection</td>
<td>Radiological protection</td>
</tr>
<tr>
<td><strong>RT:</strong> Radiation safety</td>
<td>Biological effects of radiation</td>
</tr>
<tr>
<td></td>
<td>Contamination</td>
</tr>
<tr>
<td></td>
<td>Dosimetry</td>
</tr>
<tr>
<td></td>
<td>Fission reactors</td>
</tr>
<tr>
<td></td>
<td>Radiation effects</td>
</tr>
<tr>
<td></td>
<td>Radioactive pollution</td>
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<td></td>
<td>Radiation monitoring</td>
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</table>

<table>
<thead>
<tr>
<th>Radiation safety</th>
<th><strong>BT:</strong> Nuclear and plasma</th>
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<tbody>
<tr>
<td><strong>NT:</strong> Safety</td>
<td>Radiation protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiation shielding</th>
<th><strong>USE:</strong> Radiation protection</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Radiation therapy</th>
<th><strong>USE:</strong> Biomedical applications of radiation</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Radiative recombination</th>
<th><strong>BT:</strong> Spontaneous emission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RT:</strong> Semiconductor materials</td>
<td></td>
</tr>
<tr>
<td><strong>equipment:</strong> Radio propagation</td>
<td></td>
</tr>
<tr>
<td><strong>SIMO communication</strong></td>
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</tbody>
</table>

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SISO communication
Wireless LAN
NT: Baseband
Bluetooth
Cellular technology
Indoor radio communication
Land mobile radio
Millimeter wave

communication
Near field communication
Packet radio networks
Passband
Personal area networks
Radio broadcasting
Radio communication
countermeasures
Radio frequency
Radio links
Radio spectrum
management
Satellite communication
Satellite ground stations
Software radio
Zigbee

Radio communication countermeasures
BT: Communication system
security
Radio communication
RT: Adaptive arrays
Electronic countermeasures
Electronic warfare
Jamming
Spread spectrum

Radio communication equipment
BT: Communication equipment
RT: Antennas
Radio communication
Telephone equipment
NT: Base stations
Ham radios
Land mobile radio
equipment
Radio transceivers
Transponders

Radio control
BT: Control systems

Radio frequency
UF: RF
Radio-frequency
Radiofrequency

Radio frequency identification
USE: Radiofrequency identification

Radio frequency integrated circuits
USE: Radiofrequency integrated circuits

Radio frequency interference
USE: Radiofrequency interference

Radio frequency power amplifiers
USE: Power amplifiers

Radio interference
USE: Electromagnetic interference

Radio interferometry
UF: Radiowave interferometry
BT: Interferometry

Radio LAN
USE: Wireless LAN

Radio links
BT: Radio communication
RT: Transport protocols

Radio navigation
UF: Loran
BT: Navigation
RT: Air traffic control
Indoor navigation
Satellite navigation systems
Transponders

Radio networks
BT: Radio broadcasting

Radio propagation
BT: Electromagnetic propagation
RT: Fading channels
Multipath channels
Radio communication
Radiowave propagation
Rayleigh channels
Radio receivers
USE: Receivers
Radio resource management
USE: Resource management
Radio spectrum management
UF: Frequency allocation
Spectrum management
BT: Radio communication
RT: Communication standards
NT: Direct sequence spread
spectrum communication
White spaces
Radio telescopes
USE: Radio astronomy
Radio transceivers
BT: Radio communication equipment
Transceivers
Dynamic spectrum access
Radio transmitters
BT: Transmitters
Radio-frequency
USE: Radio frequency
Radio-frequency identification
USE: Radiofrequency identification
Radio-frequency interference
USE: Radiofrequency interference
Radioactive decay
BT: Radioactive materials
Radioactive label
USE: Radiotracer
Radioactive materials
UF: Alphavoltaic power sources
Betavoltaic power sources
Radioisotopes
BT: Materials
RT: Isotopes
Neutrino sources
Occupational health
Occupational safety
Radioactive pollution
Safety
Radioactive tracer
USE: Radiotracer
Radioactive waste
BT: Radioactive materials
Waste materials
Radioactive pollution
Industrial pollution
Land pollution
Radioactive materials
Radioactive waste
Radioactive pollution
Safety
Radioactive waste disposal
Waste materials
Radioactive waste disposal
Incineration
Materials handling
Nuclear facility regulation
Nuclear fuels
Radioactive pollution
Waste disposal
Waste management
Radioactive waste disposal
Institutional pollution
Materials handling
Radioactive pollution
Vitrification
Waste handling
Radiofrequency
USE: Radio frequency
Radiofrequency amplifiers
USE: Radiofrequency power amplifiers
Amplifiers
Radiofrequency identification
UF: RFID
Radio frequency identification

Radio-frequency identification

BT: Sensor systems and
applications
RT: Internet of Things
Product codes
Radiofrequency integrated circuits

NT: RFID tags

Radiofrequency integrated circuits

UF: RFIC
Radio frequency integrated circuits

BT: Integrated circuits
RT: MIMICs
MMICs
Radiofrequency

Radiation

Radiofrequency interference

UF: Radio frequency
interference
Radio-frequency interference
BT: Electromagnetic
interference
RT: Superconducting filters
NT: Intercell interference

Radiofrequency micro-electro-mechanical systems

USE: Radiofrequency microelectromechanical systems

Radiative power amplifiers

USE: Power amplifiers AND
Radiofrequency amplifiers

Radiographic image enhancement

BT: Biomedical image
processing

Radiography

BT: Imaging
RT: Biomedical applications of radiation
Medical diagnosis
Nuclear imaging
X-ray detection
X-ray imaging
NT: Diagnostic radiography

Radioisotope thermoelectric generators

BT: Atomic batteries

Radioisotopes

USE: Radioactive materials

Radiological protection

USE: Radiation protection

Radiology

BT: Biomedical image
processing
NT: Neuroradiology

Radiometers

BT: Meters
Radiometry
NT: Spectroradiometers

Radiometry

BT: Electromagnetic
measurements
Geoscience and remote sensing
RT: Imaging
Photometry
Remote sensing
Temperature measurement
Microwave radiometry
Radiometers

Radiomics

BT: Biomedical image
processing
RT: Machine learning

Radiotracer
<table>
<thead>
<tr>
<th>UF: Radioactive label</th>
<th>UF: RRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactive tracer</td>
<td>BT: Chemical compounds</td>
</tr>
<tr>
<td>BT: Chemical compounds</td>
<td>RT: Nonlinear circuits</td>
</tr>
</tbody>
</table>

**Radiowave interferometry**

USE: Radio interferometry

**Radiowave propagation**

BT: Electromagnetic

propagation

RT: Radio propagation

**Radium**

BT: Chemical elements

**Radomes**

BT: Antenna accessories

**Radon**

BT: Chemical elements

**Rail guns**

USE: Railguns

**Rail line**

USE: Rail transportation

**Rail lines**

USE: Rail transportation

**Rail to rail amplifiers**

BT: Rail to rail operation

RT: Amplifiers

MODFET circuits

MOSFET circuits

Rail to rail inputs

Rail to rail outputs

**Rail to rail inputs**

UF: RRI

BT: Rail to rail operation

RT: Nonlinear circuits

Rail to rail amplifiers

**Rail to rail operation**

BT: Circuits

RT: Amplifiers

CMOSFET circuits

MODFET circuits

MOSFET circuits

NT: Rail to rail amplifiers

Rail to rail inputs

Rail to rail outputs

**Rail to rail outputs**

UF: RRO

BT: Rail to rail operation

RT: Nonlinear circuits

Rail to rail amplifiers

**Rail traffic**

USE: Rail transportation

**Rail transportation**

UF: Rail line

Rail lines

Rail traffic

Rail ways

Railways

BT: Land transportation

RT: Block signalling

Land vehicles

Magnetic levitation

Public transportation

NT: High-speed rail transportation

Light rail systems

Magnetic levitation vehicles

Positive train control

Railway communication

Railway electrification

**Railways**

USE: Rail transportation

**Railguns**

UF: Rail guns

BT: Electromagnetic launching

RT: Rails

**Rails**

BT: Structural shapes

RT: Flanges

Railguns

**Railway accidents**

UF: Derailments

BT: Accidents

RT: Positive train control

Railway engineering

Railway safety

**Railway bridges**

USE: Structural panels

**Railway communication**

BT: Rail transportation

Telecommunications

NT: Block signalling

GSM-R
2021 IEEE Thesaurus

Railway electrification
BT: Rail transportation
RT: Power overhead lines

Railway engineering
BT: Civil engineering
RT: Railway accidents
NT: Railway safety

Railway safety
BT: Railway engineering
RT: Positive train control
Railway accidents
Safety devices

Rain
BT: Meteorology
RT: Floods
Monsoons

Rain fades
USE: Rain fading

Rain fading
UF: Rain fades
BT: Interference

RAKE receivers
BT: Receivers
RT: Signal to noise ratio

Raleigh fading
USE: Rayleigh channels

Raleigh fading channels
USE: Rayleigh channels

RAM
USE: Random access memory

Raman effect
USE: Raman scattering

Raman scattering
UF: Raman effect
Raman spectroscopy
NT: Brownian motion
Nonlinear optics

Raman spectroscopy
USE: Raman scattering

Random access communication
USE: Multiaccess communication

Random access memory
UF: RAM
BT: Memory
NT: DRAM chips
Phase change random access memory
Resistive RAM
SDRAM
SRAM cells
SRAM chips

Random access storage
USE: Random access memory

Random forests
BT: Machine learning
Random processes
RT: Decision trees
Pattern recognition
Regression analysis

Random media
UF: Turbulent media
BT: Media
RT: Chaos
Nonhomogeneous media

Random number generation
BT: Cryptography
Random sequences
Stochastic processes
White noise

Random processes
BT: Mathematics
Algorithms
Probability
Signal processing
Statistical analysis
Time series analysis

Random sequences
UF: Pseudorandom sequences

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT: Sequences</th>
<th>RT: Cryptography</th>
<th>Random number</th>
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</thead>
</table>

**Random variables**

<table>
<thead>
<tr>
<th>BT: Probability</th>
<th>RT: Stochastic processes</th>
<th>Stochastic systems</th>
</tr>
</thead>
</table>

**Ranging**

<table>
<thead>
<tr>
<th>USE: Distance measurement</th>
</tr>
</thead>
</table>

**Ranking (statistics)**

<table>
<thead>
<tr>
<th>BT: Statistics</th>
<th>RT: Information retrieval</th>
<th>Ontologies</th>
<th>Search methods</th>
<th>Semantic Web</th>
<th>Vocabulary</th>
</tr>
</thead>
</table>

**Ransomware**

<table>
<thead>
<tr>
<th>BT: Malware</th>
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</table>

**Rapid eye movement sleep**

<table>
<thead>
<tr>
<th>UF: REM sleep</th>
<th>BT: Sleep</th>
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</thead>
</table>

**Rapid prototyping**

<table>
<thead>
<tr>
<th>BT: Prototypes</th>
<th>RT: CADCAM</th>
<th>Design methodology</th>
<th>Manufacturing processes</th>
<th>Product development</th>
<th>Software engineering</th>
<th>Three-dimensional printing</th>
<th>Virtual prototyping</th>
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</table>

**Rapid thermal annealing**

<table>
<thead>
<tr>
<th>BT: Annealing</th>
<th>RT: Semiconductor devices</th>
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</table>

**Rapid thermal processing**

<table>
<thead>
<tr>
<th>BT: High-temperature techniques</th>
<th>RT: Heating systems</th>
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</table>

**Rare earth metals**

<table>
<thead>
<tr>
<th>BT: Metals</th>
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**Rate distortion**

<table>
<thead>
<tr>
<th>USE: Rate-distortion</th>
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</table>

**Rate distortion theory**

<table>
<thead>
<tr>
<th>BT: Information theory</th>
<th>RT: Audio coding</th>
<th>Channel coding</th>
<th>Channel spacing</th>
<th>Distortion</th>
<th>Image coding</th>
<th>Signal analysis</th>
<th>Signal processing</th>
<th>Source coding</th>
<th>Speech coding</th>
<th>Video coding</th>
</tr>
</thead>
</table>

**Rate-distortion**

<table>
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<tr>
<th>UF: Rate distortion</th>
<th>BT: Information theory</th>
<th>RT: Data compression</th>
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</thead>
</table>

**Ratemeters**

<table>
<thead>
<tr>
<th>USE: Radiation detectors</th>
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</table>

**Rats**

<table>
<thead>
<tr>
<th>BT: Animals</th>
</tr>
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</table>

**Raw materials**

<table>
<thead>
<tr>
<th>BT: Materials</th>
<th>RT: Mining industry</th>
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</thead>
</table>

**Ray tracing**

<table>
<thead>
<tr>
<th>UF: Ray-tracing</th>
<th>BT: Geometrical optics</th>
<th>Optics</th>
<th>RT: Computer graphics</th>
<th>Stray light</th>
</tr>
</thead>
</table>

**Ray-tracing**

<table>
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<tr>
<th>USE: Ray tracing</th>
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**Rayleigh channels**

<table>
<thead>
<tr>
<th>UF: Raleigh fading</th>
<th>BT: Raleigh fading channels</th>
<th>Rayleigh-fading</th>
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**Rayleigh scattering**

<table>
<thead>
<tr>
<th>BT: Electromagnetic scattering</th>
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</table>

**Rayleigh-Benard convection**

<table>
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<tr>
<th>USE: Convection</th>
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</thead>
</table>

**Rayleigh-fading**

<table>
<thead>
<tr>
<th>USE: Rayleigh channels</th>
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</table>

**RBF networks**

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USE: Radial basis function networks

RDF
USE: Resource description framework

Re-configurable devices
USE: Reconfigurable devices

Reachability analysis
BT: Graph theory

Reactive power
UF: Power factor
VAR
BT: Power systems
RT: Reactive power control
Static VAR compensators

Real-time systems
BT: Computers and information processing
RT: Control systems
Endomicroscopy
Hardware-in-the-loop

Readout electronics
BT: Displays
RT: Detectors
SQUIDs

Real-time
USE: Real-time systems

Real-time control
USE: Real-time systems

Real-time monitoring
USE: Real-time systems

Real-time processing
USE: Real-time systems

Reasoning about programs
USE: Cognition AND
Cognitive systems
<table>
<thead>
<tr>
<th>UF: Type interference</th>
<th>BT: Reconfigurable architectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Software engineering</td>
<td>RT: Wireless communication</td>
</tr>
</tbody>
</table>

**Rebreathers**

USE: Rebreathing equipment

**Rebreathing equipment**

UF: Rebreathers
BT: Underwater equipment

**Receive antennas**

USE: Receiving antennas

**Received signal strength indicator**

UF: RSSI
BT: Communication system
signalizing

**Receivers**

UF: Radio receivers
BT: Communication equipment
RT: Demodulation
Signal detection
NT: Optical receivers
RAKE receivers
Receiving antennas

**Receiving antennas**

UF: Receive antennas
BT: Antennas
Receivers
RT: Spatial diversity
Transmitting antennas

**Receptor (biochemistry)**

BT: Biochemistry

**Recommender systems**

UF: Music recommendation
BT: Information filtering
RT: Collaborative filtering

**Reconfigurable architectures**

BT: Computer architecture
NT: Reconfigurable intelligent surfaces

**Reconfigurable devices**

UF: Re-configurable devices
BT: Hardware
RT: Field programmable gate arrays

**Reconfigurable intelligent surfaces**

BT: Logics design

**Reconfigurable logic**

USE: Software radio

**Reconfigurable radio**

BT: Military communication
Security
RT: Remote sensing
Surveillance

**Reconnaissance**

**Reconstruction algorithm**

USE: Reconstruction algorithms

**Recording**

BT: Signal processing
RT: Memory
NT: Audio recording
Digital recording
Disk recording
Magnetic recording
Optical recording
Video recording

**Recruitment**

BT: Human resource management
RT: Equal opportunities
Job specification
Labor resources

**Rectangular waveguides**

BT: Electromagnetic waveguides
RT: Planar waveguides

**Rectennas**

BT: Antennas
Microwave communication
RT: Converters
### Rectifiers

**BT:** Circuits  
**RT:** Bridge circuits  
Power electronics  
Voltage multipliers

### Rectifying circuits

**BT:** AC-DC power converters

### Recurrent neural nets

**USE:** Recurrent neural networks

### Recurrent neural networks

**UF:** RNN  
Recurrent neural nets  
**BT:** Neural networks  
**NT:** Hopfield neural networks

### Recursive estimation

**BT:** Bayes methods  
**RT:** Least squares approximations

### Recycle

**USE:** Recycling

### Recycling

**UF:** Recycle  
**BT:** Environmental management  
**RT:** Food waste

### Red blood cells

**BT:** Blood

### Reddit

**USE:** Social networking (online)  
**AND**  
Web sites

### Reduced instruction set computing

**UF:** RISC  
**BT:** Instruction sets

### Reduced order model

**USE:** Reduced order systems

### Reduced order systems

**UF:** Model reduction  
Reduced order model  
Reduced-order model  
Reduced-order systems  
**BT:** Systems engineering and theory

### Reduced-order model

**USE:** Reduced order systems

### Reduced-order systems

**USE:** Reduced order systems

### Redundancy

**BT:** Fault tolerance  
**RT:** Codes  
Reliability

### Redundancy (employment)

**USE:** Termination of employment

### Reed Solomon codes

**USE:** Reed-Solomon codes

### Reed-Muller codes

**BT:** Error correction codes  
**RT:** Polar codes

### Reed-Solomon codes

**UF:** Reed Solomon codes  
**BT:** Error correction codes

### Refining

**BT:** Materials processing  
**RT:** Chemical technology  
Cleaning  
Purification  
Smelting  
Sugar refining

### Reflectance

**USE:** Reflectivity

### Reflection

**BT:** Propagation  
**RT:** Mirrors  
Scattering  
**NT:** Acoustic reflection  
Backscatter  
Electromagnetic reflection  
Fresnel reflection  
Radar cross-sections

### Reflection coefficient

**BT:** Optical variables  
**RT:** Amplitude estimation
2021 IEEE Thesaurus

Reflective binary codes
UF: Gray codes
Grey codes
BT: Binary codes

Reflectivity
UF: Reflectance
BT: Waves
RT: Geometrical optics
Light trapping
Optical reflection
Sonar detection
Telecommunications

Reflectometry
BT: Measurement
RT: Electromagnetic
measurements
Electromagnetic reflection
Optical reflection
Optical variables
measurement

Reflector antennas
BT: Antennas
RT: Aperture antennas
Radio astronomy

Reflow soldering
BT: Soldering

Refractive index
UF: Refractivity
BT: Optical variables
measurement
RT: Birefringence
Dispersion
Gain measurement
Laser beams
Metamaterials
Optical refraction
Photorefractive effect
Semiconductor device
measurement
Semiconductor lasers

Refraction
USE: Refractive index

Refractoring
USE: Code refractoring

Refrigeraants
BT: Coolants
RT: Heat pumps

Refrigeration
BT: Cooling

Refrigerators
BT: Home appliances
Home automation

Refuse
USE: Waste materials

Refuse incineration
USE: Incineration

Regeneration engineering
BT: Tissue engineering

Regional area networks
UF: RAN
BT: Communication systems
RT: IEEE 802.22 Standard
Local area networks
Metropolitan area networks
Wireless communication
NT: WRAN

Registers
BT: Memory
NT: Shift registers

Regression analysis
BT: Statistical analysis
RT: Correlation coefficient
Econometrics
Nearest neighbor methods
Random forests
NT: Linear regression
Multivariate regression

Regression tree analysis
BT: Decision trees

Regulation
BT: Government policies
NT: Tariffs

Regulators
BT: Control equipment
RT: Current control
Electric variables control
Power conversion
Voltage control
2021 IEEE Thesaurus

Reliability theory
  BT: Reliability

Reluctance generators
  BT: Synchronous generators

Reluctance machines
  BT: Rotating machines
  Synchronous machines
  NT: Reluctance motors

Reluctance motors
  BT: Reluctance machines
  Synchronous motors
  NT: Switched reluctance motors

REM sleep
  USE: Rapid eye movement sleep

Remaining life assessment
  BT: Testing
  RT: Failure analysis
  Maintenance engineering

Remanence
  BT: Magnetics
  RT: Magnetic fields
  Magnetic flux
  Magnetic hysteresis
  Permanent magnets

Remote control
  BT: Control equipment

Remote handling
  UF: Manipulators (nonrobotic)
  BT: Materials handling
  RT: Remote handling
  Telecontrol equipment
  NT: Hyperspectral sensors

Remote handling equipment
  BT: Materials handling
  RT: Remote handling
  Telerobotics
  Waste handling equipment

Remote laboratories
  BT: Laboratories

Remote learning
  USE: Distance learning

Remote monitoring
  BT: Monitoring
  Remote sensing
  RT: Machine-to-machine communications

Remote sensing
  BT: Geoscience and remote sensing
  RT: Atmospheric measurements

Remuneration

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BT: Human resource management
RT: Employee welfare
NT: Incentive schemes
Pensions

Renal calculi
USE: Kidney stones

Rendering (computer graphics)
BT: Computer graphics
RT: Image synthesis

Renewable energy
USE: Renewable energy sources

Renewable energy resources
USE: Renewable energy sources

Renewable energy sources
UF: Renewable energy
Renewable energy resources
BT: Energy conservation
Environmental management
RT: Low-carbon economy
Wave power
NT: Biomass

Renewable-energy
USE: Renewable energy sources
Repair
USE: Maintenance engineering

Repeaters
UF: Optical regenerators
BT: Communication equipment

Replica molding
USE: Soft lithography

Replica moulding
USE: Soft lithography

Report writing
USE: Writing

Representational state transfer
BT: Software architecture

Reproducibility of results
UF: Reproducible research
NT: Translational research

Biomedical measurement
Measurement

Reproducible research
USE: Reproducibility of results

Reproductive cloning
USE: Cloning

Requirements engineering
BT: Systems engineering and theory
RT: Product design
Project management
Requirements management
Software engineering
Stakeholders
NT: Technical requirements

Requirements management
BT: Management
Systems engineering and theory
RT: Project management
Requirements engineering
ReRAM
USE: Resistive RAM

Rescue robots
BT: Robots
RT: Emergency services
Hazards
Marine robots

Research & development
USE: Research and development

Research and development
UF: Research & development
BT: Engineering - general
RT: Electrical engineering
Engineering profession
Industrial engineering
International collaboration
Laboratories
Research and development management
Reverse engineering
Science - general
Technology
Virtual enterprises
Virtual manufacturing
Virtual prototyping

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### Research and development management

**UF:** R & D management  
**BT:** Engineering management  
**RT:** Concurrent engineering  
**NT:** Innovation management  
**BT:** Engineering management  
**RT:** Project management  
**NT:** Innovation management  
**RT:** Research and development  
**NT:** Innovation management  
**BT:** Technology management  
**NT:** Innovation management  
**RT:** Venture capital  
**NT:** Innovation management

### Research initiatives

**BT:** Engineering management

### Reservoirs

**BT:** Water resources  
**RT:** Dams  
**NT:** Innovation management  
**RT:** Lakes  
**NT:** Innovation management  
**RT:** Land use planning  
**NT:** Innovation management  
**RT:** Water  
**NT:** Innovation management

#### Residual networks

**USE:** Residual neural networks

#### Residual neural networks

**UF:** Residual networks  
**BT:** Artificial neural networks

#### Residual stress

**USE:** Residual stresses

#### Residual stresses

**UF:** Residual stress  
**BT:** Stress

### Resilience

**UF:** Resiliency  
**BT:** Material properties  
**BT:** Resilient systems

### Resistivity

**USE:** Conductivity

### Resistivity measurement

**USE:** Conductivity measurement

### Resistive RAM

**USE:** RRAM  
**BT:** Random access memory  
**RT:** Memristors  
**RT:** Electrothermal actuators  
**NT:** Innovation management  
**RT:** Memristors  
**RT:** Phase change memory

### Resistive transducers

**BT:** Transducers

### Resistors

**BT:** Electronic components  
**RT:** Electrical ballasts  
**RT:** Potentiometers  
**NT:** Memristors  
**NT:** Memristors  
**NT:** Switched capacitor  
**NT:** Memristors  
**NT:** Memristors  
**NT:** Memristors

### Resists

**USE:** Photoresists  
**BT:** Materials

### Resins

**BT:** Materials  
**RT:** Plastics  
**NT:** Epoxy resins

### Resistance

**BT:** Electric variables  
**RT:** Electrical resistance  
**RT:** Electrical resistance  
**NT:** Electric resistance  
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### Resistance heating

**UF:** Electric heating  
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**BT:** Materials

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RT: Cavity resonators
Dielectric resonator antennas
Resonators
Microstrip resonators
Optical resonators
Resonant inverters
Resonant tunneling devices
Resonator filters
Resonators
Vibrations
NT: Ferroresonance
Magnetic resonance
Resonance light scattering
Stochastic resonance

Resonance frequency
USE: Resonant frequency

Resonance light scattering
BT: Resonance
Spectroscopy
RT: Light scattering

Resonant circuits
USE: RLC circuits

Resonant converters
BT: Converters

Resonant frequency
UF: Resonance frequency
BT: Frequency
RT: Oscillators
Quantum mechanics
NT: Magnetic resonance

Resonant inverters
UF: Quasi-resonant inverters
Quasi-resonant invertors
Resonant invertors
Resonant inverters
BT: Inverters
RT: Power electronics
Resonance

Resonant invertors
USE: Resonant inverters

Resonant tunneling devices
UF: Resonant tunnelling
management
Resonant-tunnelling devices
Resonant-tunneling devices

Resonant-tunnelling devices
USE: Resonant tunneling devices

Resonator filters
BT: Filters
RT: Resonance

Resonators
BT: Amplifiers
RT: Acoustics
Resonance
Tuners
NT: Cavity resonators
Split ring resonators

Resource allocation
USE: Resource management

Resource description framework
UF: RDF
BT: Semantic Web

Resource distribution
USE: Resource management

Resource management
UF: Allocation
Radio resource management
Resource allocation
Resource distribution
Resource sharing
Resource utilisation
Resource utilization
Resources management
Management
Business process integration
Business process

Cluster computing
Environmental engineering
Forestry
Operations research

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System integration
Network computing
Resource virtualization

Resource sharing
USE: Resource management

Resource utilisation
USE: Resource management

Resource utilization
USE: Resource management

Resource virtualization
BT: Resource management

Resources management
USE: Resource management

Respiratory diseases
USE: Pulmonary diseases

Respiratory medicine
USE: Pulmonology

Respiratory system
UF: Asthma
Bronchi
BT: Anatomy
Intubation
Pulmonary diseases
Pulmonology
Ventilators
NT: Larynx
Lung

Retardants
BT: Production materials
RT: Inhibitors
NT: Flame retardants

Retina
UF: Retinal
BT: Eyes
RT: Ophthalmology
NT: Retinal vessels

Retinal
USE: Retina

Retinal vessels
BT: Retina

Retinopathy
BT: Diseases

Retirement
BT: Human resource management

Reverberation
BT: Acoustics

Reverberation chambers
BT: Electromagnetic compatibility

Reverse engineering
BT: Engineering - general
RT: Product development
Research and development

Reverse logistics
BT: Logistics

Reverse osmosis
BT: Chemical processes
RT: Desalination

Reverse teaching
USE: Education AND Online services

Reversible computing
BT: Computational modeling
Time complexity

Reviews
BT: Writing

Retail price index
USE: Economic indicators
<table>
<thead>
<tr>
<th>Term</th>
<th>USE</th>
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<tbody>
<tr>
<td><strong>RF</strong></td>
<td>Radio frequency</td>
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<tr>
<td><strong>RF interference</strong></td>
<td>Electromagnetic interference</td>
<td></td>
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<tr>
<td><strong>RF micro-electro-mechanical systems</strong></td>
<td>Radiofrequency microelectromechanical systems</td>
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<tr>
<td><strong>RF signals</strong></td>
<td>Signal processing</td>
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<td>Fault trees</td>
<td>Threat assessment</td>
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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE: Risk management</th>
<th>Road safety</th>
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<tbody>
<tr>
<td>Risk handling</td>
<td>BT: Roads</td>
</tr>
<tr>
<td>USE: Risk management</td>
<td>RT: Automated highways</td>
</tr>
<tr>
<td>Risk management</td>
<td>Automotive engineering</td>
</tr>
<tr>
<td>UF: Risk assessment</td>
<td>Lane detection</td>
</tr>
<tr>
<td>Risk handling</td>
<td>Road accidents</td>
</tr>
<tr>
<td>Risk minimization</td>
<td>Vehicle-to-everything</td>
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<tr>
<td>Risk mitigation</td>
<td>Lane departure warning systems</td>
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<tr>
<td>Risk reduction</td>
<td>Road side unit</td>
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<tr>
<td>BT: Risk analysis</td>
<td>BT: Relays</td>
</tr>
<tr>
<td>RT: Contract management</td>
<td>Vehicular ad hoc networks</td>
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<table>
<thead>
<tr>
<th>USE: Risk management</th>
<th>Road traffic control</th>
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<tr>
<td>Risk minimization</td>
<td>BT: Road transportation</td>
</tr>
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<td>Traffic control</td>
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<td>Road transportation</td>
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<td>USE: Risk management</td>
<td>Land transportation</td>
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<tr>
<td>Risk reduction</td>
<td>Civil engineering</td>
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<td>USE: Risk management</td>
<td>Global Positioning System</td>
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<td>Rivers</td>
<td>Road traffic control</td>
</tr>
<tr>
<td>BT: Geoscience</td>
<td>Roads</td>
</tr>
<tr>
<td>RT: Excavation</td>
<td>Traffic congestion</td>
</tr>
<tr>
<td>Floods</td>
<td>Road vehicles</td>
</tr>
<tr>
<td>Lakes</td>
<td>BT: Land vehicles</td>
</tr>
<tr>
<td>Sediments</td>
<td>RT: Road accidents</td>
</tr>
<tr>
<td>Water</td>
<td>Roads</td>
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<td>Water pollution</td>
<td>NT: Automobiles</td>
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<td>Water resources</td>
<td>Motorcycles</td>
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<td>Wetlands</td>
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<table>
<thead>
<tr>
<th>RLC circuits</th>
<th>Roadmaps (technology planning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Resonant circuits</td>
<td>BT: Strategic planning</td>
</tr>
<tr>
<td>BT: Circuits</td>
<td>Technology forecasting</td>
</tr>
<tr>
<td>Tunable circuits and devices</td>
<td></td>
</tr>
<tr>
<td>ROADMS</td>
<td>USE: Optical add-drop multiplexers</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>RNA</th>
<th>Roads</th>
</tr>
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<tbody>
<tr>
<td>UF: Ribonucleic acid</td>
<td>BT: Road transportation</td>
</tr>
<tr>
<td>BT: Biological cells</td>
<td>RT: Civil engineering</td>
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</table>

<table>
<thead>
<tr>
<th>RNN</th>
<th>Roaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Recurrent neural networks</td>
<td>BT: Wireless communication</td>
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</table>

<table>
<thead>
<tr>
<th>Road accidents</th>
<th>Roaming</th>
</tr>
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<tbody>
<tr>
<td>BT: Accidents</td>
<td>BT: Wireless communication</td>
</tr>
<tr>
<td>RT: Road safety</td>
<td>RT: Dual band</td>
</tr>
<tr>
<td>Road vehicles</td>
<td>GSM</td>
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<table>
<thead>
<tr>
<th>Road bridges</th>
<th>Robot automobiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Structural panels</td>
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</tbody>
</table>

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USE: Autonomous automobiles

Robot cars
USE: Autonomous automobiles

Robot control
UF: Robotic control
BT: Control systems
RT: Force control
Motion planning
Trajectory tracking
NT: Robot motion

Robot kinematics
BT: Robots
NT: Motion analysis

Robot learning
BT: Machine learning
RT: Artificial intelligence

Robot localization
BT: Motion analysis
RT: Robot sensing systems

Robot motion
UF: Robotic motion
BT: Robot control

Robot operating systems
USE: Operating systems

Robot programming
UF: Robotic programming
BT: Programming
Robots

Robot sensing systems
UF: Manipulator sensing
Mobile robot sensing
Robot sensor networks
BT: Robots
Sensor systems and applications
RT: Multisensor systems
Robot localization
Robot vision systems
Simultaneous localization
and mapping
Tactile sensors

Robot vision systems
UF: Manipulator vision systems
Mobile robot vision systems
BT: Robot sensing systems
RT: Image sensors
Intelligent robots
Object detection
Object recognition
Pattern recognition
Stereo vision
NT: Visual servoing

Robot-assisted surgery
USE: Surgery

Robotic assembly
UF: Assembly robots
BT: Assembly systems
RT: Robotics and automation

Robotic control
USE: Robot control

Robotic motion
USE: Robot motion

Robotic programming
USE: Robot programming

Robotics and automation
RT: Image motion analysis
Industrial Internet of Things
Robotic assembly
NT: Animatronics
Automation
Autonomous systems
Multi-robot systems
Robots

Robots
BT: Robotics and automation
RT: Assembly systems
Botnet
Control equipment
Control systems
Cybernetics
Industrial control
Manufacturing automation
Materials handling
Mechanical variables
control
2021 IEEE Thesaurus

Mechatronics
Nonlinear systems
Servosystems

NT: Agricultural robots
Androids
Aquatic robots
Automata
Autonomous robots
Bio-inspired robotics
Cognitive robotics
Computer vision
Educational robots
Evolutionary robotics
Humanoid robots
Intelligent robots
Manipulators
Marine robots
Medical robotics
Mobile robots
Orbital robotics
Parallel robots
Rehabilitation robotics
Rescue robots
Robot control
Robot kinematics
Robot learning
Robot programming
Robot sensing systems
Service robots
Snake robots
Soft robotics
Telerobotics
Visual odometry
Wearable robots

Robust control
UF: Active disturbance rejection
BT: System analysis and design
RT: Disturbance observers

Robust stability
BT: Stability

Robustness
BT: Reliability
RT: Control systems
Sensitivity
Stability
Uncertain systems

Rocks
BT: Geology

Rodents
BT: Animals

Roentgenium
BT: Chemical elements

Role transfer
BT: Organizational aspects

Roller bearings
USE: Rolling bearings

Rolling bearings
UF: Roller bearings
Rolling contact bearings
Rolling element bearings
BT: Mechanical bearings
RT: Ball bearings

Rollover
BT: Vehicle dynamics

ROM
USE: Read only memory

Root cause analysis
BT: Process planning
RT: Failure analysis

Root kit
USE: Rootkit

Root mean square
UF: Root mean square error
Root mean square value
BT: Mathematics
Statistics
2021 IEEE Thesaurus

**Root mean square error**
USE: Root mean square

**Root mean square value**
USE: Root mean square

**Rootkit**
UF: Root kit
BT: Malware

**Roots**
USE: Poles and zeros

**Rotating machines**
BT: Electric machines
RC: Brushes
CT: Coils
DC generators
Synchronous motors
Windings

NT: Generators
Hysteresis motors
Induction machines
Induction motors
Micromotors
Permanent magnet

machines
Reluctance machines
Servomotors
Standby generators

**Rotation measurement**
UF: Rotation representation
BT: Mechanical variables

**Rotation representation**
USE: Rotation measurement

**Rotational measurement**
USE: Velocity control

**Rotational speed**
USE: Velocity control

**Rotors**
BT: Electric machines
Machine components

**Rough sets**
BT: Set theory

**Rough surfaces**
BT: Surfaces

RT: Polishing machines
Surface roughness
Terrain factors

NT: Corrugated surfaces

**Round robin**
BT: Scheduling algorithms

**Roundoff errors**
BT: Finite wordlength effects
RT: Error analysis
Noisy

**Routing**
BT: Communication systems
RT: Multicast communication
Routing protocols
Soft switching

NT: Wavelength routing

**Routing protocols**
BT: Protocols
RT: Internet
Land mobile radio
Mobile communication
Multicast protocols
Multiprotocol label
switching
Routing
Wireless access points

**RPI**
USE: Economic indicators

**RRAM**
USE: Resistive RAM

**RRI**
USE: Rail to rail inputs

**RRO**
USE: Rail to rail outputs

**RSSI**
USE: Received signal strength indicator

**Rubber**
BT: Insulators
RT: Rubber industry
Rubber products

**Rubber industry**
BT: Manufacturing industries
RT: Chemical industry

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Rubber products</th>
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<tbody>
<tr>
<td><strong>BT:</strong> Manufactured products</td>
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<tr>
<td><strong>RT:</strong> Hoses</td>
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<tr>
<td><strong>Rubber</strong></td>
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<tr>
<td><strong>Rubber industry</strong></td>
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<tr>
<td><strong>Wastewater treatment</strong></td>
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<tr>
<td><strong>NT:</strong> Tires</td>
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<thead>
<tr>
<th>Safety</th>
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<tbody>
<tr>
<td><strong>BT:</strong> Industry applications</td>
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<tr>
<td><strong>Product safety engineering</strong></td>
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<td><strong>Fires</strong></td>
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<td><strong>Vehicle safety</strong></td>
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<tr>
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<td><strong>USE:</strong> Scattering parameters</td>
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<td><strong>SaaS</strong></td>
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<tr>
<td><strong>USE:</strong> Software as a service</td>
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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th><strong>BT:</strong> Interferometry</th>
<th>Thin wall structures</th>
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</thead>
</table>

**Sales promotion**

**USE:** Promotion - marketing

**Saliency detection**

**BT:** Image processing
**RT:** Feature detection
**Feature extraction**
**Visual systems**

**Salinity (geophysical)**

**BT:** Soil measurements
**RT:** Geochemistry
**Ocean salinity**
**Sea measurements**
**Sea surface salinity**

**Salivary glands**

**UF:** Parotid
**BT:** Glands
**Stomatognathic system**

**Samarium**

**BT:** Metals
**NT:** Samarium alloys

**Samarium alloys**

**BT:** Samarium

**Sampled data circuits**

**BT:** Circuits

**Sampled data systems**

**BT:** Discrete-time systems

**Sampling methods**

**BT:** Statistics
**RT:** Signal sampling
**NT:** Compressed sensing
**Nonuniform sampling**

**SAN**

**USE:** Storage area networks

**Sandblasting**

**BT:** Surface treatment
**RT:** Surface roughness

**Sandwich structures**

**BT:** Structural shapes
**RT:** Honeycomb structures
**Lightweight structures**
**Sheet materials**
**Structural panels**

**Sanitary engineering**

**BT:** Engineering - general
**RT:** Environmental management

**Sewage treatment**
**Waste disposal**
**Waste management**
**Waste materials**
**Wastewater**
**Wastewater treatment**
**Water pollution**

**SAR**

**USE:** Specific absorption rate
**AND**
**Synthetic aperture radar**

**SAR imaging**

**USE:** Radar polarimetry

**SAS**

**USE:** Synthetic aperture sonar

**Satellite antennas**

**BT:** Antennas

**Satellite born radar**

**USE:** Spaceborne radar

**Satellite communication**

**UF:** Communication satellites
**BT:** Communication systems
**Radio communication**
**RT:** Artificial satellites
**Convolutional codes**
**Global Positioning System**
**Handover**
**Radiation hardening**
**electronics**

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**2021 IEEE Thesaurus**

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<tr>
<th>Transponders</th>
<th>BT: Machine tools</th>
<th>Transponders</th>
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<tbody>
<tr>
<td>NT: Downlink</td>
<td>RT: Sawing</td>
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<tr>
<td>Satellite broadcasting</td>
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<td>Satellite broadcasting</td>
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<tr>
<td>Satellite ground stations</td>
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<td>Satellite ground stations</td>
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<tr>
<td>Uplink</td>
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<td>Uplink</td>
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**Satellite constellations**

<table>
<thead>
<tr>
<th>BT: Satellite navigation systems</th>
<th>BT: Satellite constellations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication systems</td>
<td></td>
</tr>
<tr>
<td>Radio communication</td>
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</tr>
<tr>
<td>Satellite communication</td>
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<tr>
<td>Communication equipment</td>
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</table>

**Satellite ground stations**

<table>
<thead>
<tr>
<th>BT: Communication systems</th>
<th>BT: Satellite navigation systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio navigation</td>
<td>Radio navigation</td>
</tr>
<tr>
<td>Time dissemination</td>
<td>Time dissemination</td>
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<tr>
<td>Global Positioning System</td>
<td>Global Positioning System</td>
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<tr>
<td>Global navigation satellite</td>
<td>Global navigation satellite</td>
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**Satellite navigation systems**

<table>
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<tr>
<th>BT: Navigation</th>
<th>BT: Communication systems</th>
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</thead>
<tbody>
<tr>
<td>Radio navigation</td>
<td>Radio navigation</td>
</tr>
<tr>
<td>Time dissemination</td>
<td>Time dissemination</td>
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**Satellites**

<table>
<thead>
<tr>
<th>BT: Solar system</th>
<th>BT: Communication systems</th>
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</thead>
<tbody>
<tr>
<td>Artificial satellites</td>
<td>Artificial satellites</td>
</tr>
<tr>
<td>Geostationary satellites</td>
<td>Geostationary satellites</td>
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<td>Geosynchronous satellites</td>
<td>Geosynchronous satellites</td>
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<tr>
<td>Moon</td>
<td>Moon</td>
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<tr>
<td>Small satellites</td>
<td>Small satellites</td>
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**Saturation detection**

<table>
<thead>
<tr>
<th>USE: Feedback</th>
<th>USE: Feedback</th>
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</table>

**Saturation magnetisation**

<table>
<thead>
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<th>USE: Saturation magnetization</th>
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**Saturation magnetization**

<table>
<thead>
<tr>
<th>UF: Saturation magnetisation</th>
<th>BT: Magnetization processes</th>
</tr>
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<tbody>
<tr>
<td>BT: Magnetic fields</td>
<td>BT: Magnetic fields</td>
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<tr>
<td>Magnets</td>
<td>Magnets</td>
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</tbody>
</table>

**Scanning electron microscopy**

<table>
<thead>
<tr>
<th>UF: SEM</th>
<th>BT: Electron microscopy</th>
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</thead>
<tbody>
<tr>
<td>BT: Electron microscopy</td>
<td>BT: Electron microscopy</td>
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<tr>
<td>RT: Electron beam applications</td>
<td>RT: Electron beam applications</td>
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<tr>
<td>Particle scattering</td>
<td>Particle scattering</td>
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**Scanning microwave microscopy**

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<thead>
<tr>
<th>BT: Microscopy</th>
<th>BT: Microscopy</th>
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<tbody>
<tr>
<td>RT: Atomic force microscopy</td>
<td>RT: Atomic force microscopy</td>
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</table>

**Scanning probe data storage**

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<tr>
<th>BT: Memory</th>
<th>BT: Memory</th>
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**Scanning probe microscopy**

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<tr>
<th>BT: Microscopy</th>
<th>BT: Microscopy</th>
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<tbody>
<tr>
<td>NT: Scanning thermal microscopy</td>
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**Scanning thermal microscopy**

<table>
<thead>
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<th>BT: Scanning probe microscopy</th>
<th>BT: Scanning probe microscopy</th>
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**Scattering**

<table>
<thead>
<tr>
<th>UF: Backscattering</th>
<th>UF: Backscattering</th>
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</thead>
<tbody>
<tr>
<td>Wave scattering</td>
<td>Wave scattering</td>
</tr>
<tr>
<td>BT: Propagation</td>
<td>BT: Propagation</td>
</tr>
<tr>
<td>RT: Reflection</td>
<td>RT: Reflection</td>
</tr>
<tr>
<td>Scattering parameters</td>
<td>Scattering parameters</td>
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<tr>
<td>NT: Acoustic scattering</td>
<td>NT: Acoustic scattering</td>
</tr>
<tr>
<td>Brillouin scattering</td>
<td>Brillouin scattering</td>
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<tr>
<td>Electromagnetic scattering</td>
<td>Electromagnetic scattering</td>
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<tr>
<td>Light scattering</td>
<td>Light scattering</td>
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<td>Particle scattering</td>
<td>Particle scattering</td>
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**Sawing machines**

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<th>BT: Machining</th>
<th>BT: Machining</th>
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<tbody>
<tr>
<td>RT: Sawing machines</td>
<td>RT: Sawing machines</td>
</tr>
</tbody>
</table>
2021 IEEE Thesaurus

Scattering parameters
UF: S parameters
S-parameters
BT: System analysis and design
RT: Circuits
Scattering

Scatternets
USE: Personal area networks

Scene analysis
USE: Image analysis

Scene classification
USE: Image analysis

Schedules
BT: Planning
RT: Scheduling

Scheduling
BT: Organizational aspects
Production control
Project engineering
RT: Materials requirements
planning
Queueing analysis
Schedules
Statistics
Synchronization
NT: Adaptive scheduling
Dynamic scheduling
Job shop scheduling
Single machine scheduling

Scheduling algorithms
BT: Optical fiber communication
Processor scheduling
NT: Round robin

Scholarships
BT: Educational programs

Schools
USE: Educational institutions

Schottky diode
USE: Schottky diodes

Schottky diodes
UF: Schottky diode
BT: Semiconductor devices
Semiconductor diodes
RT: Schottky barriers
Semiconductor-metal

Schottky gate FET
USE: Schottky gate field effect transistors

Schottky gate field effect transistors
UF: Schottky gate FET
BT: Field effect transistors

Schrodinger equation
BT: Quantum mechanics
RT: Electrons

Science - general
RT: Econophysic
Neurophysiology
Research and development
STEM
NT: Astronomy
Biology
Chemistry
Electricity
Epidemiology
Geoscience
History
Life sciences
Meteorology
Neuroscience
Physics
Social sciences
Thermodynamics

Schottky barriers
UF: Schottky contacts
BT: Semiconductor-metal

Schottky diodes
RT: MESFETs
Schottky diodes

Science technology engineering and math
USE: STEM

Science technology engineering mathematics
USE: STEM

science, technology, engineering, and math
USE: STEM
### Scientific computing
- **UF:** Computational science
- **BT:** Computer applications

### Scientific publishing
- **BT:** Publishing

### Scintillation counters
- **BT:** Measurement
  - Nuclear and plasma sciences
- **NT:** Solid scintillation detectors

### Scintillators
- **BT:** Radiation effects
- **RT:** Luminescence

### SCM supply chains
- **USE:** Supply chain management

### Scooters
- **USE:** Motorcycles

### SCR
- **USE:** Thyristors

### Screws
- **USE:** Fasteners

### Scrubbers
- **USE:** Materials handling

### Scrum (Software development)
- **BT:** Agile software development
- **RT:** Feedback
  - Project management
  - Software development management

### SDH
- **USE:** Synchronous digital hierarchy

### SDHTs
- **USE:** MODFETs

### SDN
- **USE:** Software defined networking

### SDRAM
- **UF:** Synchronous DRAM
  - Synchronous dynamic random access memory
- **BT:** Random access memory

### Sea animals
- **USE:** Marine animals

### Sea coast
- **BT:** Oceans

### Sea floor
- **UF:** Seafloor
- **BT:** Oceans
- **RT:** Sediments
- **NT:** Bathymetry
  - Sea floor roughness

### Sea floor roughness
- **BT:** Sea floor

### Sea ice
- **BT:** Ice
- **RT:** Oceans

### Sea level
- **BT:** Oceans
- **RT:** Ocean circulation

### Sea measurements
- **UF:** Current measurement
  - (water)
- **BT:** Geophysical measurements
- **RT:** Oceans
  - Remote sensing
  - Salinity (geophysical)
  - Sonar measurements
- **NT:** Geoacoustic inversion

### Sea ports
- **USE:** Seaports

### Sea state
- **BT:** Measurement
  - Ocean waves
- **RT:** Marine navigation
  - Sea surface roughness

### Sea surface
- **BT:** Oceans
- **RT:** Surface waves
  - Wind
- **NT:** Sea surface roughness
  - Sea surface salinity

### Sea surface roughness
- **BT:** Sea surface
- **RT:** Sea state
<table>
<thead>
<tr>
<th>Term</th>
<th>BT:</th>
<th>RT:</th>
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</thead>
<tbody>
<tr>
<td>Sea surface salinity</td>
<td>Sea surface</td>
<td>Salinity (geophysical)</td>
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<td>Sea surface temperature</td>
<td>Ocean temperature</td>
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<td>Sea vegetation</td>
<td>Marine vegetation</td>
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<td>Seafloor</td>
<td>Sea floor</td>
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<td>Sealants</td>
<td>Sealing materials</td>
<td></td>
</tr>
<tr>
<td>Sealing materials</td>
<td>Sealants</td>
<td>Artificial bee colony algorithm</td>
</tr>
<tr>
<td>Seals</td>
<td>Mechanical products</td>
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<td>Sea ports</td>
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<td>Search engines</td>
<td>Google</td>
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<td>Search methods</td>
<td>Information retrieval</td>
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</tr>
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<td>Secondary electron emission</td>
<td>Electrion emission</td>
<td></td>
</tr>
<tr>
<td>Secondary generated hot-electron injection</td>
<td>Secondary generated hot-electron injection</td>
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</tr>
<tr>
<td>Seprator led ion injection</td>
<td>Ion emission</td>
<td></td>
</tr>
<tr>
<td>Seaports</td>
<td>Sea ports</td>
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<tr>
<td>Search problems</td>
<td>Search methods</td>
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2021 IEEE Thesaurus

- Computer security
- Control system security
- Cryptography
- Data security
- Digital signatures
- Information security
- Network security
- Power system security
- Reconnaissance
- Security management
- Terrorism
- Watermarking

**Security management**
- BT: Management
- USE: Data security

**Sediments**
- UF: Mud
- BT: Geoscience
- RT: Lakes
- Rivers
- Sea floor
- Soil

**Seebeck effect**
- USE: Thermoelectricity

**Seismic measurements**
- UF: Seismic visualization
- BT: Geophysical measurements
- RT: Acoustic measurements
- Seismology

**Seismic retrofitting**
- USE: Seismic measurements

**Seismic visualization**
- USE: Seismic measurements

**Seismic waves**
- BT: Waves
- RT: Acoustic waves
- Earthquakes
- Elastodynamics
- Explosions
- Seismology
- Shock waves

**Seismology**
- BT: Geophysics
- RT: Seismic measurements

**Selective laser sintering**
- USE: Laser sintering

**Selectively doped heterojunction transistors**
- USE: MODFETs

**Selenium**
- BT: Chemical elements

**Self-organizing feature maps**
- USE: Self-organizing feature maps

**Self-testing**
- USE: Automatic testing

**Self-assembly**
- BT: Nanotechnology
- RT: Biological cells
- Programming
- Semiconductor device manufacture
- Thin films
- Electrostatic self-assembly

**Self-aware**
- BT: Cognition

**Self-driving automobiles**
- USE: Autonomous automobiles

**Self-driving car**
- USE: Autonomous automobiles

**Self-dynamic voltage scaling**
- USE: Dynamic voltage scaling
2021 IEEE Thesaurus

Self-organizing feature maps
UF: Kohonen maps
SOM
Self-organising feature maps
maps
Self organizing feature maps
Self organizing maps
BT: Artificial neural networks
RT: Feedforward neural networks
Knowledge acquisition

Self-organizing maps
USE: Self-organizing feature maps
Self-organizing networks
UF: Self organizing networks
BT: Wireless networks
Self-replicating machines
UF: Self replicating machines
BT: Nanotechnology
Self-study courses
BT: Educational programs
Self-testing
USE: Built-in self-test
Self-tuning regulators
USE: Adaptive control
SEM
USE: Scanning electron microscopy
Semantic search
BT: Search methods
Semantics
RT: Context awareness
Natural language
processing
Ontologies
Query processing
Semantic Web

Semantic triple
USE: Triples (Data structure)

Semantic Web
BT: Internet
RT: Artificial intelligence
Content management
Data models
Distributed computing
Document handling
Knowledge management
Linked data
Markup languages
Ontologies
Open data
Ranking (statistics)
Semantic search
Semantic technology
NT: OWL
Resource description framework

Semantics
BT: Semiotics
RT: Natural language processing
Professional communication
Sign language
NT: Semantic search
Semantic technology

Semi-insulating materials
USE: Semiconductor materials

Semi-supervised learning
USE: Semisupervised learning

Semiconductivity
BT: Conductivity
Electron devices
RT: Charge carriers

Semiconductor alloys
USE: Semiconductor materials

Semiconductor charge carriers
USE: Charge carrier processes

Semiconductor controlled rectifiers
USE: Thyristors
Semiconductor counters
UF: Junction detectors
BT: Semiconductor devices
RT: Position sensitive particle detectors

Semiconductor detectors
BT: Detectors
Semiconductor devices
RT: Absorption
Particle charging

Semiconductor device breakdown
BT: Failure analysis
RT: Semiconductor device reliability
testing

Semiconductor device doping
UF: Semiconductor doping
BT: Semiconductor device manufacture
RT: Doping
Quasi-doping
Semiconductor materials

Semiconductor device manufacture
BT: Electronic equipment manufacture
RT: Fiducial markers
Gettering
Ion implantation
Microassembly
Micromachining
Nanotechnology
Self-assembly
Semiconductor devices
Surface cleaning
Surface contamination
NT: Diffusion processes
Flip-chip devices
High-k gate dielectrics
Physical undonable
function
Quasi-doping
Semiconductor device doping
Semiconductor epitaxial layers

Semiconductor device measurement
BT: Measurement
RT: Refractive index
Semiconductor device noise
reliability
Semiconductor device testing

Semiconductor device modeling
UF: Semiconductor device models
BT: Modeling
Semiconductor devices
RT: Semiconductor device noise

Semiconductor device models
USE: Semiconductor device modeling

Semiconductor device noise
BT: Semiconductor devices
RT: Integrated circuit noise
Semiconductor device measurement
modeling

Semiconductor device packaging
BT: Components, packaging, and manufacturing technology
RT: Integrated circuit packaging
Semiconductor devices

Semiconductor device reliability
BT: Reliability
RT: Semiconductor device breakdown
measurement

Semiconductor device testing
BT: Testing
RT: Semiconductor device breakdown
measurement

Semiconductor devices
UF: SIS devices
(semic)
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Semiconductor-Insulator-Semiconductor Devices</th>
<th>Semiconductor Diodes</th>
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<tbody>
<tr>
<td>BT: Electron devices</td>
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<tr>
<td>RT: Contacts</td>
<td>RT: Diodes</td>
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<tr>
<td>Epitaxial growth</td>
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<td>Rapid thermal annealing</td>
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<td>Gunn devices</td>
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<td>Superluminescent diodes</td>
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<td>Thermistors</td>
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<td>Transistors</td>
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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE: Electronics industry</th>
<th>III-V semiconductor materials</th>
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<tbody>
<tr>
<td><strong>Semiconductor laser arrays</strong></td>
<td>Indium gallium arsenide</td>
</tr>
<tr>
<td>BT: Semiconductor lasers</td>
<td>Indium phosphide</td>
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<tr>
<td><strong>Semiconductor lasers</strong></td>
<td>Magnetic semiconductors</td>
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<tr>
<td>UF: Injection lasers</td>
<td>Organic semiconductors</td>
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<td>Junction lasers</td>
<td>Semiconductor</td>
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<tr>
<td>Laser diodes</td>
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<td>BT: Lasers</td>
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<td>Solid lasers</td>
<td>Substrates</td>
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<td>RT: Molecular beam</td>
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<td>Optical transmitters</td>
<td>Semiconductor memory</td>
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<tr>
<td>Refractive index</td>
<td><strong>UF</strong>: Semiconductor storage</td>
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<tr>
<td>NT: Laser tuning</td>
<td><strong>BT</strong>: Memory</td>
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<td>Quantum dot lasers</td>
<td><strong>RT</strong>: Integrated circuits</td>
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<tr>
<td>Quantum well lasers</td>
<td><strong>NT</strong>: Integrated memory circuits</td>
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<td>Semiconductor laser arrays</td>
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<td>BT: Molecular beam</td>
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<td><strong>BT</strong>: Nanotubes</td>
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<td><strong>USE</strong>: Semiconductor quantum wells</td>
</tr>
</tbody>
</table>
| Radiative recombination | **SE**:
| Semiconductor device | **BT**: Radiation detectors |
| doping | Semiconductor storage |
| Semiconductor films | **USE**: Semiconductor memory |
| Semiconductor growth | Semiconductor superlattices |
| Semiconductor impurities | **BT**: Semiconductor materials |
| Semiconductor thin films | **Superlattices** |
| Silicon compounds | Semiconductor thin films |
| Tunneling | **BT**: Thin films |
| NT: Amorphous semiconductors | Semiconductor radiation detectors |
| Deep level transient | **BT**: Radiation detectors |
| spectroscopy | Semiconductor storage |
| Elemental semiconductors | USE: Semiconductor memory |
| Gallium | Semiconductor superlattices |
| Gallium arsenide | **BT**: Semiconductor materials |
| Germanium | **Superlattices** |
| II-VI semiconductor | Semiconductor thin films |
| materials | **BT**: Thin films |
| Gallium | **RT**: Epitaxial growth |
| Germanium | Gallium |
| | Germanium |
Semiconductor materials
Silicon

Semiconductor waveguides
BT: Semiconductor devices

Semiconductor-insulator interfaces
BT: Semiconductor devices
RT: CMOSFETs
MIM devices
MIS devices
MOS devices
Silicon-on-insulator

Semiconductor-insulator-semiconductor devices
USE: Semiconductor devices

Semiconductor-metal interfaces
UF: Metal-semiconductor interfaces
BT: Semiconductor diodes
RT: Magnetic field induced strain
NT: Schottky diodes
Schottky barriers

Semicustom integrated circuits
USE: Application specific integrated circuits

Seminars
BT: Educational programs
NT: Webinars

Semiology
USE: Semiotics

Semiosis
USE: Semiotics

Semiotic studies
USE: Semiotics

Semiotics
UF: Semiology
Semiosis
Semiotic studies
BT: Communication symbols
RT: Communication symbols
Linguistics
Natural language

Sensitivity
BT: Measurement
RT: Circuit analysis
Control systems
Robustness
Tolerance analysis
NT: Sensitivity analysis

Sensitivity analysis
BT: Sensitivity

Sensitivity and specificity
BT: Biomedical measurement
Medical diagnosis

Sensor arrays
BT: Arrays
Sensor systems and applications
NT: Sensor fusion

Sensor fusion
BT: Sensor arrays
RT: Active perception
2021 IEEE Thesaurus

Kalman filters
Multimodal sensors

NT: Multisensor systems

Sensor phenomena and characterization
BT: Sensors

Sensor placement
BT: Sensors

photonic sensors

Sensor systems
BT: Aerospace and electronic systems

Sensor systems and applications
RT: Navigation
NT: Activity recognition

Sensor placement
Sensor phenomena and characterization

Sensor systems and applications
BT: Sensors

Sensors (image)
USE: Image sensors

Sensory aids
BT: Medical services
RT: Assistive technology
Biomedical equipment
Orthotics
Prosthetics

Sentiment analysis
UF: Opinion mining
BT: Computational linguistics
Natural language

Separation processes
BT: Materials science and technology
NT: Fractionation
Particle separators

Separated
USE: Particle separators

Sun sensors
Capacitive transducers
Magnetostrictive devices
Wireless sensor networks
Chemical and biological sensors
Electromechanical sensors
Force sensors
Glucose sensors
Inertial sensors
Infrared sensors
Intelligent sensors

September 11
USE: Terrorism

Sequence analysis
USE: Sequences

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Sequences
UF: Digital sequences
BT: Mathematics
RT: Codes
NT: Binary sequences
Random sequences

Sequencing
USE: Sequential analysis

Sequential analysis
UF: Sequencing
BT: System analysis and design
NT: Zero correlation zone

Sequential circuits
UF: Sequential logic circuits
BT: Circuits

Sequential diagnosis
BT: System analysis and design

Sequential logic circuits
USE: Sequential circuits

Sequential production
USE: Flow production systems

Serious games
BT: Games
Simulation

Servers
BT: Client-server systems
RT: Network function
virtualization
NT: Web servers

Service composability
USE: Interoperability

Service computing
BT: Information technology
RT: Business
Cloud computing
Process design
Service-oriented
architecture
Service-oriented systems
engineering
Web services
NT: Service level agreements

Service function chaining
UF: Service function chains
BT: Software defined networking

Service oriented architecture
USE: Service-oriented architecture

Service robots
BT: Robots
RT: Home automation
Manipulators
Mobile robots
Wearable robots

Service-oriented architecture
UF: SOA
BT: Service-oriented architecture

Service-oriented architectures
USE: Service-oriented architecture

Service-oriented systems engineering
UF: SOSE
BT: Systems engineering and theory
RT: Formal specifications
Service computing
Service-oriented architecture
Software engineering

Servo control
USE: Servosystems

Servo-control
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>USE: Servosystems</th>
<th>UF: Standard Generalized Markup Language</th>
<th>BT: Markup languages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Servomechanisms</strong></td>
<td><strong>Shadow mapping</strong></td>
<td>BT: Computer graphics</td>
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<tr>
<td>BT: Servomotors</td>
<td>UF: Projective shadowing</td>
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<td>RT: Actuators</td>
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<tr>
<td><strong>Servomotors</strong></td>
<td><strong>Shafts</strong></td>
<td>BT: Machine components</td>
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<td>UF: Servos</td>
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<td>BT: Motors</td>
<td>RT: Couplings</td>
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<td>Rotating machines</td>
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<td><strong>Set theory</strong></td>
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<td>BT: Algebra</td>
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<td><strong>SF6</strong></td>
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### 2021 IEEE Thesaurus

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<td>BT: Structural shapes</td>
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<td>RT: Construction industry</td>
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<td><strong>Ships</strong></td>
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<td><strong>Shock</strong></td>
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<td>USE: Electric shock</td>
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<td><strong>UF:</strong> Dampers</td>
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<tr>
<td><strong>BT:</strong> Suspensions (mechanical systems)</td>
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<tr>
<td><strong>RT:</strong> Automotive components</td>
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<td>Damping</td>
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<td>Springs</td>
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<td>BT: Waves</td>
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<td>RT: Aerodynamics</td>
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<td><strong>Shoe manufacture</strong></td>
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<td><strong>Shoes</strong></td>
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<td>USE: Footwear</td>
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<td><strong>Short circuit currents</strong></td>
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<td>USE: Short-circuit currents</td>
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<td><strong>Short-circuit currents</strong></td>
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<td>UF: Short circuit currents</td>
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<td>BT: Current</td>
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<td>RT: Molded case circuit breakers</td>
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<td><strong>Shortest path problem</strong></td>
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<td>USE: Shortest path problem</td>
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<td><strong>Shoulder</strong></td>
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<td>BT: Extremities</td>
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<td>NT: Axilla</td>
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<td><strong>Shunts (electrical)</strong></td>
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<td>BT: Electric current control</td>
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<td>Photovoltaic effects</td>
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<td><strong>Si</strong></td>
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<td>USE: Silicon</td>
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<td><strong>SiC</strong></td>
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<td><strong>Sick pay</strong></td>
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<td>USE: Employee welfare</td>
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<td><strong>Shock absorbers</strong></td>
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<td><strong>Side channel attacks</strong></td>
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</table>
2021 IEEE Thesaurus

**Side-channel attacks**
- USE: Side-channel attacks
- UF: Side channel attacks
- BT: Cryptography

**SiGe**
- USE: Silicon germanium

**Sigma delta**
- USE: Sigma-delta modulation

**Sigma-delta modulation**
- UF: Delta sigma
- Sigma delta
- BT: Delta modulation

**Signal analysis**
- UF: Waveform analysis
- BT: Signal processing
- RT: Autocorrelation
- Blind source separation
- Frequency-domain analysis
- Pattern clustering
- Power system faults
- Rate distortion theory
- Signal resolution
- Speech analysis
- Total harmonic distortion
- Transient analysis
- Wavelet transforms

**Signal classification**
- USE: Pattern classification

**Signal constellation**
- USE: Constellation diagram

**Signal denoising**
- UF: Signal de-noising
- BT: Signal reconstruction
- RT: Signal resolution
- Signal restoration
- Signal to noise ratio

**Signal design**
- BT: Signal processing

**Signal detection**
- UF: Detection (signal)
- BT: Signal processing
- RT: Blind source separation
- Channel estimation
- Correlators
- Decision making
- Demodulation
- Pattern clustering
- Receivers
- Signal resolution
- Source separation
- Time of arrival estimation

**Signal estimation**
- USE: Estimation

**Signal flow graphs**
- USE: Flow graphs

**Signal generators**
- UF: Function generators
- BT: Signal processing
- NT: Noise generators
- Pulse generation

**Signal integrity**
- BT: Signal processing

**Signal mapping**
- BT: Signal analysis

**Signal processing**
- UF: Vibrational signal processing
- RT: Analog processing circuits
- Antennas and propagation
- Band-pass filters
### 2021 IEEE Thesaurus

| Bandwidth | Optical wavelength |
| Biomedical computing conversion | Optical wavelength |
| Bit rate methods | Phase locked loops |
| Correlators methods | Pulse compression |
| Data processing methods | Pulse shaping methods |
| Decoding methods | Quantization (signal) |
| Deconvolution methods | RF signals |
| Digital signal processors methods | Radar signal processing |
| Discrete Fourier transforms methods | Received signal strength |
| Empirical mode methods | Encoding indicator | Recording |
| decomposition indicator | Estimation indicator | Signal analysis |
| analysis indicator | Estimation theory indicator | Signal design |
| Matrix decomposition indicator | Feature extraction indicator | Signal detection |
| Pattern clustering indicator | Fourier series indicator | Signal generators |
| Prediction methods indicator | Gaussian noise indicator | Signal integrity |
| Random processes indicator | Independent component indicator | Signal reconstruction |
| Rate distortion theory indicator | Synapses indicator | Signal resolution |
| Stability analysis indicator | System-on-chip indicator | Signal restoration |
| Structure from motion indicator | Transforms indicator | Signal sampling |
| Synapses indicator | Wavelet transforms indicator | Signal synthesis |
| NT: Acoustic signal processing indicator | Adaptive signal processing indicator | Source separation |
| NT: Wavelet transforms indicator | Amplitude signal processing indicator | Spectrogram |
| NT: Amplitude signal processing indicator | Amplifiers indicator | Tracking loops |
| Array signal processing indicator | Attenuators indicator | BT: Algorithms |
| Attenuators indicator | Chirp indicator | Signal processing |
| Chirp indicator | Convolution indicator | Signal quantization (signal) USE: |
| Convolution indicator | Decorrelation indicator | Signal synthesis |
| Digital signal processing indicator | Distortion indicator | Signal quantization (signal) USE: |
| Displacement indicator | Error correction indicator | Signal sampling |
| Distortion indicator | Fading channels indicator | Signal to noise ratio |
| Digital signal processing indicator | Filters indicator | NT: Signal denoising |
| Dispersion indicator | Frequency locked loops indicator | Signal reconstruction |
| Dispersion indicator | Geophysical signal indicator | Signal resolution |
| Error correction indicator | Limiting indicator | Signal decomposition USE: |
| Error correction indicator | Modulation indicator | Signal processing BT: |
| Fading channels indicator | Multidimensional signal indicator | Signal processing RT: |
| Filters indicator | Signal processing indicator | Array signal processing |
| Signal representation indicator | Signal analysis indicator | Signal denoising |
| Signal resolution indicator | Signal detection indicator | Spectral analysis |
## 2021 IEEE Thesaurus

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<th>Silica</th>
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<td>RT: Quantization (signal)</td>
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<td>RT: Speech synthesis</td>
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<td>UF: S/N</td>
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<td>BT: Noise</td>
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<td>USE: Handwriting recognition</td>
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<tr>
<td>USE: Handwriting recognition</td>
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- **Silicides**: BT: Silicon compounds
- **Silicon**: UF: Si
- **Silicon alloys**: BT: Silicon
- **Silicon carbide**: UF: SiC
- **Silicon compiler**: BT: Computer aided manufacturing
- **Silicon compounds**: UF: Silica
- **Silicon dioxide**: BT: Compounds
- **Silicon germanium**: RT: Critical current density semiconductor materials
- **Silicon germanium**: Si
- **Silicon phosphide**: RT: Alloying
- **Silicon photonics**: NT: Germanium silicon alloys
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
<th>UF</th>
<th>BT</th>
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<tr>
<td>Simple object access protocol</td>
<td>USE: SOAP</td>
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Simulated annealing

**BT:** Mathematics
Optimization methods
Annealing
Monte Carlo methods
Relaxation methods

**RT:** Annealing
Monte Carlo methods
Relaxation methods

**Simulation**

**UF:** Simulation results
**BT:** Application virtualization
Computer aided analysis
Computer graphics
Emulation
Matlab
Monte Carlo methods
Numerical simulation
Reduced order systems

**RT:** Application virtualization
Computer aided analysis
Computer graphics
Emulation
Matlab
Monte Carlo methods
Numerical simulation
Reduced order systems

**NT:** Computer simulation
Digital simulation
Hardware-in-the-loop

**simulation**

Human in the loop
Medical simulation
Mixed reality
Quantum simulation
Serious games
Systems simulation

**Simulation Program with Integrated Circuit Emphasis**

**USE:** SPICE

**Simulation results**

**USE:** Simulation

**Simultaneous localization and mapping**

**UF:** SLAM
**BT:** Robot sensing systems

**Single atom lasers**

**USE:** Atom lasers

**Single electron devices**

**BT:** Circuits and systems
Electron devices
Nanoscale devices
Nanotechnology
Resonant tunneling devices
Single electron memory
Single electron transistors

**RT:** Nanoscale devices
Nanotechnology
Resonant tunneling devices
Single electron memory
Single electron transistors

**NT:** Hetero-nanocrystal memory

**Single electron transistors**

**UF:** Single-electron transistors
**BT:** Single electron devices

**Single event latchup**

**BT:** Proton effects
Radiation effects

**Single event transients**

**BT:** Ionization

**Single event upsets**

**UF:** SEU
**BT:** Ionization

**Single input multiple output systems**

**USE:** SIMO communication

**Single input single output systems**

**USE:** SISO communication

**Single machine scheduling**

**BT:** Scheduling
**RT:** Optimization methods

**single photon avalanche diodes**

**USE:** Single-photon avalanche diodes

**Single photon emission computed tomography**

**UF:** SPECT
**BT:** Computed tomography
**RT:** Cancer
Collimators
Phantoms
Tumors

**Single-electron transistors**

**USE:** Single electron transistors

**Single-photon avalanche diodes**

**USE:** Single photon avalanche diodes

**Single-wall carbon nanotubes**

**USE:** Carbon nanotubes

**Singular value decomposition**

**BT:** Matrices
Siri
USE: Virtual assistants
BT: Cancer
NT: Melanoma

SIS devices (semiconductor)
USE: Semiconductor devices

SIS devices (superconductor)
USE: Superconducting devices

SISO communication
UF: Single input single output systems
BT: Communication systems
Antenna arrays
Diversity reception
MIMO communication
MISO communication
Radio communication
SIMO communication
Transmitters

Skin effect
BT: Current density
RT: Conductors
Power systems
Resistance
System analysis and design

Skin neoplasms
BT: Neoplasms

Skull
BT: Head
RT: Bones

Skyrmions
BT: Solitons

Six sigma
BT: Total quality management
RT: Quality assurance
Quality control

Size control
BT: Mechanical variables
Thickness control

Size measurement
BT: Measurement
Area measurement
Length measurement
Thickness measurement
Volume measurement
NT: Functional point analysis

SLA
USE: Service level agreements

Slabs
BT: Structural shapes

Slag
BT: Industrial waste
Fly ash
Waste disposal
Waste management

SLAM
USE: Simultaneous localization and mapping

SLD
USE: Superluminescent diodes

Sleep
BT: Brain
NT: Rapid eye movement sleep
Sleep apnea

Sleep apnea
UF: Sleep apnoea
Snore activity
Snore signals
Snoring
BT: Medical conditions
Sleep

Skin
BT: Integumentary system
Dermis
Epidermis
Sebaceous glands
Sweat glands

Skin cancer
UF: Basal cell carcinoma
USE: Sleep apnea

Skeleton
BT: Musculoskeletal system
Bones
Joints
Spine
Thorax

Skin
BT: Integumentary system
Dermis
Epidermis
Sebaceous glands
Sweat glands

Sleep apnoea
USE: Sleep apnea
### 2021 IEEE Thesaurus

**Slideways (mechanical)**
- **USE:** Mechanical guides
- **BT:** Satellites
- **NT:** CubeSat

**Sliding mode control**
- **UF:** Sliding-mode control
- **BT:** Control systems

**Sliding-mode control**
- **USE:** Sliding mode control

**Slot antennas**
- **BT:** Antennas

**Slot line components**
- **UF:** Slotline components
- **BT:** Slot lines

**Slot lines**
- **UF:** Slotline
- **BT:** Planar transmission lines
- **NT:** Slot line components

**Slotline**
- **USE:** Slot lines

**Slotline components**
- **USE:** Slot line components

**Slow light**
- **BT:** Light sources
- **RT:** Velocity measurement

**Sludge treatment**
- **UF:** Activated sludge process
- **BT:** Waste handling
- **RT:** Pollution control
- **Sewage treatment**
- **Wastewater**
- **Wastewater treatment**

**Slurries**
- **BT:** Waste materials
- **RT:** Industrial waste

**Small business technology transfer**
- **BT:** Technology transfer

**Small cell networks**
- **USE:** Microcell networks

**Small satellites**
- **UF:** Microsatellites
- **Miniaturized satellites**
- **Nanosatellites**
- **Smallsats**

**Smart actuators**
- **USE:** Intelligent actuators

**Smart buildings**
- **BT:** Buildings

**Smart cameras**
- **BT:** Cameras
- **RT:** Computer vision
- **RT:** Distributed vision networks

**Smart cards**
- **BT:** User interfaces
- **RT:** Access control
- **RT:** Data processing

**Smart cities**
- **BT:** Intelligent structures
- **RT:** Urban areas
- **RT:** Buildings
- **RT:** Construction industry
- **RT:** Cyber-physical systems
- **RT:** Energy informatics

**Smart clothing**
- **USE:** Smart textiles

**Smart contracts**
- **BT:** Contracts
- **Protocols**

**Smart devices**
- **BT:** Electronic equipment
- **RT:** Wireless communication
- **RT:** Physical unclonable function
- **Smart healthcare**
- **Smart manufacturing**
- **Tactile Internet**
- **Virtual assistants**
- **Smart glasses**

**Smart elastomers**
- **USE:** Dielectric elastomers
### Smart fabrics
- **USE:** Smart textiles

### Smart factories
- **USE:** Smart manufacturing

### Smart farming
- **USE:** Digital agriculture

### Smart garments
- **USE:** Smart textiles

### Smart glasses
- **UF:** Smartglasses
- **BT:** Smart devices
- **NT:** Wearable computers

### Smart grids
- **UF:** Smart microgrids
- **BT:** Power grids
- **RT:** Cyber-physical systems
- **NT:** Vehicle-to-grid

### Smart health
- **USE:** Smart healthcare

### Smart homes
- **BT:** Buildings
- **RT:** Home automation

### Smart manufacturing
- **UF:** Smart factories
- **BT:** Manufacturing
- **RT:** Intelligent manufacturing systems

### Smart materials
- **UF:** Shape memory technology
- **BT:** Materials
- **RT:** Austenite
- **Azobenzene**
- **Dielectric elastomers**
- **Martensite**
- **Metamaterials**
- **Polycaprolactone**
- **Smart manufacturing**
- **Smart transportation**

### Smart medical services
- **USE:** Smart healthcare

### Smart meters
- **BT:** Meter reading
- **RT:** Automatic meter reading

### Smart microgrids
- **USE:** Smart grids

### Smart phones
- **UF:** Smartphones
- **BT:** Mobile handsets
- **RT:** Bring your own device

### Smart pixels
- **BT:** Image processing
- **RT:** Integrated optoelectronics
  - Optical switches

### Smart spaces
- **BT:** Ergonomics
- **Sociotechnical systems**

### Smart structures
- **USE:** Intelligent structures

### Smart textiles
- **UF:** Electronic textiles
- **BT:** Smart clothing
- **RT:** Smart fabrics
- **Smart garments**
- **Smart materials**
- **Wearable computers**

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2021 IEEE Thesaurus

Smart transportation
BT: Transportation
RT: Automated highways
Intelligent transportation systems
Intelligent vehicles
Smart materials

Smart TV
BT: TV
RT: Internet

Smartglasses
USE: Smart glasses

Smartphones
USE: Smart phones

Smelting
BT: Materials processing
RT: Blast furnaces
Heat treatment
Melt processing
Metals industry
Refining

SMES
USE: Superconducting magnetic energy storage

Smoke detectors
BT: Alarm systems
RT: Domestic safety
Fires
Ionization chambers
Safety devices
Zigbee

Smoothed particle hydrodynamics
USE: Fluid flow AND Hydrodynamics

Smoothing methods
BT: Mathematics

SMOS mission
UF: Soil moisture and ocean salinity

Salinity mission
BT: Ocean salinity
Soil moisture

SMPS
USE: Switched mode power supplies

SMPTE
UF: Society of Motion Picture and Television Engineers
BT: Standards organizations

SMPTE Standards
BT: Standards publications

Sn
USE: Tin

Snake bots
USE: Snake robots

Snake robots
UF: Snake bots

Snakebots
BT: Robots

Snakebots
USE: Snake robots

Snapchat
USE: Multimedia Web sites

Snore activity
USE: Sleep apnea

Snore signals
USE: Sleep apnea

Snoring
USE: Sleep apnea

Snow
BT: Meteorology
RT: Ice

SNR
USE: Signal to noise ratio

SNS devices
USE: Superconducting devices

Snubbers
BT: Power electronics

SOA
USE: Semiconductor optical amplifiers AND Service-oriented architecture
### Social computing

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### Social engineering (security)

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### Social factors

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### Social implications of technology

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# 2021 IEEE Thesaurus

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### 2021 IEEE Thesaurus

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### Software as a service

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### Software debugging

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<td>Knowledge based systems</td>
</tr>
<tr>
<td></td>
<td>Learning systems</td>
</tr>
<tr>
<td></td>
<td>Mobile agents</td>
</tr>
<tr>
<td>NT:</td>
<td>Agent-based modeling</td>
</tr>
<tr>
<td></td>
<td>Autonomous agents</td>
</tr>
<tr>
<td></td>
<td>Botnet</td>
</tr>
<tr>
<td></td>
<td>Intelligent agents</td>
</tr>
</tbody>
</table>

| NT: | Service function chaining |

### Software algorithms

<table>
<thead>
<tr>
<th>BT:</th>
<th>Algorithms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Software defined networks</td>
</tr>
<tr>
<td></td>
<td>Software defined radio</td>
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</table>

### Software architecture

<table>
<thead>
<tr>
<th>BT:</th>
<th>Software engineering</th>
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<tbody>
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<td></td>
<td>Distributed computing</td>
</tr>
<tr>
<td></td>
<td>Client-server systems</td>
</tr>
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<td></td>
<td>Deep architecture</td>
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<table>
<thead>
<tr>
<th>BT:</th>
<th>Software debugging</th>
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<tbody>
<tr>
<td></td>
<td>Software debuggning</td>
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</table>

<table>
<thead>
<tr>
<th>RT:</th>
<th>Web design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web design</td>
</tr>
</tbody>
</table>

| NT: | Model driven engineering |

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<table>
<thead>
<tr>
<th><strong>2021 IEEE Thesaurus</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usability</strong></td>
</tr>
<tr>
<td><strong>Software development management</strong></td>
</tr>
<tr>
<td>UF: Github</td>
</tr>
<tr>
<td>BT: Engineering management</td>
</tr>
<tr>
<td>RT: Release engineering</td>
</tr>
<tr>
<td>Scrum (Software development)</td>
</tr>
<tr>
<td>NT: Agile software development</td>
</tr>
<tr>
<td>Model-driven development</td>
</tr>
<tr>
<td><strong>Software documentation</strong></td>
</tr>
<tr>
<td>USE: Documentation</td>
</tr>
<tr>
<td><strong>Software engineering</strong></td>
</tr>
<tr>
<td>BT: Computers and information processing</td>
</tr>
<tr>
<td>RT: Code refactoring</td>
</tr>
<tr>
<td>Functional point analysis</td>
</tr>
<tr>
<td>Rapid prototyping</td>
</tr>
<tr>
<td>Requirements engineering</td>
</tr>
<tr>
<td>Service-oriented systems engineering</td>
</tr>
<tr>
<td>Software</td>
</tr>
<tr>
<td>Static analysis</td>
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<tr>
<td>Systems Modeling</td>
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<tr>
<td><strong>Language</strong></td>
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<tr>
<td>Visual BASIC</td>
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<td>NT: Capability maturity model</td>
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<tr>
<td>Computer aided software engineering</td>
</tr>
<tr>
<td>Formal verification</td>
</tr>
<tr>
<td>Programming environments</td>
</tr>
<tr>
<td>Reasoning about programs</td>
</tr>
<tr>
<td>Release engineering</td>
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<tr>
<td>Runtime</td>
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<td>Software architecture</td>
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<td>Software product lines</td>
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<td><strong>Software libraries</strong></td>
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<td>Object oriented programming</td>
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<td>Python</td>
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<td>Software reusability</td>
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<td><strong>Software measurement</strong></td>
</tr>
<tr>
<td>BT: Measurement</td>
</tr>
<tr>
<td><strong>Software packages</strong></td>
</tr>
<tr>
<td>BT: Software</td>
</tr>
<tr>
<td>RT: Computer applications</td>
</tr>
<tr>
<td>Power system analysis computing</td>
</tr>
<tr>
<td>NT: EMTDC</td>
</tr>
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<td>PSCAD</td>
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<tr>
<td>SPICE</td>
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<tr>
<td><strong>Software performance</strong></td>
</tr>
<tr>
<td>BT: Software</td>
</tr>
<tr>
<td>RT: Algorithmic efficiency</td>
</tr>
<tr>
<td>Capability maturity model</td>
</tr>
<tr>
<td><strong>Software piracy</strong></td>
</tr>
<tr>
<td>USE: Computer crime</td>
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<td><strong>Software product lines</strong></td>
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<td>BT: Product development</td>
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<td>Software engineering management</td>
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<td>Software maintenance</td>
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<td><strong>Software protection</strong></td>
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<tr>
<td>BT: Copyright protection</td>
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<tr>
<td>Legal factors</td>
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<tr>
<td>RT: Digital rights management</td>
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<tr>
<td>Intellectual property</td>
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<tr>
<td>Software</td>
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<tr>
<td><strong>Software prototyping</strong></td>
</tr>
<tr>
<td>BT: System analysis and design</td>
</tr>
<tr>
<td><strong>Software quality</strong></td>
</tr>
<tr>
<td>BT: Software</td>
</tr>
<tr>
<td>RT: Algorithmic efficiency</td>
</tr>
<tr>
<td><strong>Software radio</strong></td>
</tr>
<tr>
<td>UF: Reconfigurable radio</td>
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<tr>
<td>Software defined radio</td>
</tr>
<tr>
<td>Software-defined radio computing</td>
</tr>
<tr>
<td>BT: Mobile communication</td>
</tr>
<tr>
<td>Radio communication</td>
</tr>
<tr>
<td>RT: Cellular radio</td>
</tr>
<tr>
<td>Code division multiplexing</td>
</tr>
<tr>
<td>Land mobile radio</td>
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<td>Telecommunication</td>
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<tr>
<td>Transceivers</td>
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<tr>
<td><strong>Software reliability</strong></td>
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</tbody>
</table>
2021 IEEE Thesaurus

Spectroscopy

Solid state batteries
UF: Solid-state batteries
BT: Batteries

Solid state circuit design
UF: Solid-state circuit design
BT: Solid state circuits
RT: Circuit synthesis
NT: Young's modulus

Solid state circuits
UF: Solid-state circuits
RT: Circuits and systems
Solid state drives
NT: Circuit subsystems
Circuit theory
FET circuits
Gate leakage
Solid state circuit design
Transistors

Solid state drives
BT: Digital storage
RT: DRAM chips
Flash memories
Integrated memory circuits
Solid state circuits

Solid state lasers
USE: Solid lasers

Solid state lighting
UF: Solid-state lighting
BT: Lighting

Solid waste
USE: Waste materials

Solid-state batteries
USE: Solid state batteries

Solid-state circuit design
USE: Solid state circuit design

Solid-state circuits
USE: Solid state circuits

Solid-state lasers
USE: Solid lasers

Solid-state lighting
USE: Solid state lighting

Solids
BT: Materials
RT: Crystals
Materials science and technology
NT: Young's modulus

Solitons
BT: Waves
NT: Optical solitons
Skyrmions

Solution design
BT: Systems engineering and theory

Solvents
BT: Chemical processes
RT: Methanol

SOM
USE: Self-organizing feature maps

Soma
UF: Somata
BT: Neurons
RT: Brain

Somata
USE: Soma

Sonar
BT: Aerospace and electronic systems
RT: Acoustic arrays
Chirp modulation
Ultrasonic transducers
NT: Sonar applications
Sonar equipment
Synthetic aperture sonar

Sonar applications
BT: Sonar
RT: Sonar navigation
NT: Sonar detection
Sonar measurements

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Sonar equipment
UF: Hydrophones
BT: Sonar
RT: Sonar applications
Sonar measurements
BT: Sonar applications
RT: Remote sensing
Sonar navigation
BT: Navigation
RT: Sonar applications
SONET
UF: Synchronous optical network
BT: Communication standards
RT: Asynchronous transfer
mode
hierarchy
Sonification
BT: Audio systems
Information processing
Sonogram
BT: Ultrasonography
RT: Spectrogram
SONOS devices
UF: Silicon-oxide-nitride-oxide-silicon
BT: Semiconductor devices
Sorting
BT: Data handling
RT: Merging
SOS (silicon on sapphire)
USE: Silicon-on-insulator
SOSE
USE: Service-oriented systems engineering
Sound systems
BT: Acoustic signal detection
Sonar applications
RT: Reflectivity
Source coding
BT: Data compression
Encoding
Information theory
RT: Rate distortion theory
Release engineering
Source location
USE: Position measurement
Source separation
UF: Signal separation
BT: Signal processing
RT: Adaptive signal detection
Array signal processing
Signal detection
NT: Blind source separation
South America
BT: Continents
South Pole
BT: Antarctica
Space based radar
USE: Spaceborne radar
Space born radar
USE: Spaceborne radar
Space charge
BT: Charge carrier processes
Electrostatic processes
RT: Pulsed electroacoustic methods
Vacuum technology
Space communications
BT: Telecommunications
NT: Deep-space communications
Space cooling
BT: Cooling
RT: Buildings
Coolants
Refrigerants
Space debris
UF: Orbital debris
Space junk
Space waste
BT: Space technology
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th><strong>Space diversity</strong></th>
<th><strong>Space stations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Spatial diversity</td>
<td>BT: Artificial satellites</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Space division multiplexing</strong></th>
<th><strong>Space technology</strong></th>
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<tbody>
<tr>
<td>UF: Space-division multiplexing</td>
<td>USE: Space habitats</td>
</tr>
<tr>
<td>BT: Multiplexing</td>
<td>BT: Aerospace engineering</td>
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<table>
<thead>
<tr>
<th><strong>Space exploration</strong></th>
<th><strong>Space travel</strong></th>
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<tbody>
<tr>
<td>UF: Space travel</td>
<td>USE: Space exploration</td>
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<tr>
<td>BT: Space technology</td>
<td>BT: Interplanetary exploration</td>
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<tr>
<td>RT: NASA</td>
<td>NASA</td>
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<tr>
<td>NT: Interplanetary exploration</td>
<td>Space travel</td>
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<tr>
<td>Space missions</td>
<td>Space vehicles</td>
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<table>
<thead>
<tr>
<th><strong>Space habitats</strong></th>
<th><strong>Space vehicle electronics</strong></th>
</tr>
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<tbody>
<tr>
<td>USE: Buildings AND</td>
<td>USE: Aerospace electronics</td>
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<tr>
<td>Space technology</td>
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<table>
<thead>
<tr>
<th><strong>Space heating</strong></th>
<th><strong>Space vehicle instrumentation</strong></th>
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<tbody>
<tr>
<td>BT: Heating systems</td>
<td>USE: Aerospace electronics</td>
</tr>
<tr>
<td>RT: Building services</td>
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<tr>
<td>Gas appliances</td>
<td></td>
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<tr>
<td>Solar heating</td>
<td></td>
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<tr>
<td>Temperature control</td>
<td></td>
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<td>Vents</td>
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<table>
<thead>
<tr>
<th><strong>Space junk</strong></th>
<th><strong>Space vehicle navigation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Space debris</td>
<td>USE: Space vehicles</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Space measurements</strong></th>
<th><strong>Space vehicles</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Extraterrestrial measurements</td>
<td>USE: Planetary landers</td>
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<table>
<thead>
<tr>
<th><strong>Space missions</strong></th>
<th><strong>Space vehicle navigation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Space exploration</td>
<td>USE: Space vehicles</td>
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<tr>
<td>RT: Interplanetary exploration</td>
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<tr>
<td>NASA</td>
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<table>
<thead>
<tr>
<th><strong>Space phenomena</strong></th>
<th><strong>Space vehicles</strong></th>
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<tbody>
<tr>
<td>USE: Extraterrestrial phenomena</td>
<td>USE: Space vehicle navigation</td>
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<table>
<thead>
<tr>
<th><strong>Space power stations</strong></th>
<th><strong>Space vehicles</strong></th>
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<tr>
<td>UF: Power stations (space)</td>
<td>USE: Planetary landers</td>
</tr>
<tr>
<td>BT: Space stations</td>
<td></td>
</tr>
<tr>
<td>RT: Power generation</td>
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<table>
<thead>
<tr>
<th><strong>Space radiation</strong></th>
<th><strong>Space vehicles</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Radiation effects</td>
<td>USE: Planetary landers</td>
</tr>
<tr>
<td>RT: Ionization</td>
<td></td>
</tr>
<tr>
<td>Solar radiation</td>
<td></td>
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<table>
<thead>
<tr>
<th><strong>Space shuttles</strong></th>
<th><strong>Space waste</strong></th>
</tr>
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<tbody>
<tr>
<td>BT: Space vehicles</td>
<td>USE: Space debris</td>
</tr>
<tr>
<td>RT: Aerospace safety</td>
<td></td>
</tr>
</tbody>
</table>

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2021 IEEE Thesaurus

Space-division multiplexing
USE: Space division multiplexing

Space-time codes
BT: Codes
RT: Channel coding
Decoding

Spaceborne radar
USE: Spaceborne radar

Spaceborne radar
UF: Satellite born radar
Satellite borne radar
Space based radar
Space born radar
Spaceborn radar
BT: Radar
RT: Radar remote sensing
Synthetic aperture radar

Spacecraft materials
USE: Aerospace materials

Spatial indices
USE: Spatial indexes

SPAD
diodes
USE: Single-photon avalanche
diodes

Spam
USE: Unsolicited e-mail

Spamming
USE: Unsolicited e-mail

Spark gaps
BT: Electromagnetic analysis
RT: Air gaps
Electrodes
Insulation
Sparks
Switches

Sparks
BT: Electric breakdown
RT: Spark gaps

Sparse matrices
UF: Sparse matrix
BT: Numerical analysis

Special issues
USE: Special issues and sections

Spatial augmented reality
BT: Augmented reality

Spatial coherence
BT: Image processing

Spatial databases
BT: Databases

Spatial diversity
UF: Antenna diversity
Space diversity
BT: Communication systems
Wireless communication
RT: Antennas
Quality of service
Receiving antennas

Spatial filters
BT: Filters

Spatial indexes
UF: Spacial indices
BT: Indexes

Spatial resolution
BT: Image resolution
RT: Image quality

Spatio-temporal phenomena
USE: Spatiotemporal phenomena

Spatiotemporal phenomena
UF: Spatio-temporal
phenomena
BT: Chaos
RT: Nonlinear dynamical
systems

Speaker recognition
BT: Identification of persons
RT: Biometrics (access control)
Speech
Speech recognition
Viterbi algorithm

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<table>
<thead>
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<th>UF</th>
<th>BT</th>
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<tbody>
<tr>
<td>Special issues</td>
<td>IEEE indexing</td>
<td>Special issues and sections</td>
<td>Bandwidth measurement</td>
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<td>Special sections</td>
<td>Electromagnetic interference</td>
<td>Information processing</td>
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<td>Specific absorption rate</td>
<td>SAR</td>
<td>Spectral shape</td>
<td>Acoustics</td>
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<tr>
<td>Specific sections</td>
<td>Electromagnetic interference</td>
<td>Spectral analysis</td>
<td>Spectrogram</td>
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<tr>
<td>USE: Special issues and sections</td>
<td>BT: Computer languages</td>
<td>Spectral waterfall</td>
<td>Spectrogram</td>
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<td>Specification languages</td>
<td>Domain specific languages</td>
<td>USE: Spectral analysis</td>
<td>Spectrogram</td>
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<tr>
<td>BT: Computer languages</td>
<td>Unified modeling language</td>
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<td>Speckle</td>
<td>Optical noise</td>
<td>BT: Signal processing</td>
<td>Voiceprint</td>
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<tr>
<td>RT: Optical interferometry</td>
<td>Optical scattering</td>
<td>RT: Sonogram</td>
<td>Voiceprint</td>
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<td>Spectral analysis</td>
<td>Power spectra</td>
<td>Spectroradiometers</td>
<td>Radiometers</td>
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<td>BT: Spectral-domain</td>
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<td>Signal analysis</td>
<td>USE: Spectral analysis</td>
<td>MODIS</td>
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<td>Speech analysis</td>
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<td>Judd-Ofelt theory</td>
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<td></td>
<td>Spectroradiometers</td>
<td>Spectroscopy</td>
<td>Spectroscopy</td>
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<td>Spectral domain</td>
<td>MEASUREMENT</td>
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<td>USE: Spectral analysis</td>
<td>Spectroscopy</td>
<td>Spectroscopy</td>
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<td>Spectral efficiency</td>
<td>Bandwidth efficiency</td>
<td>Kirchhoff's Law</td>
<td>Mass spectroscopy</td>
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<td>BT: Channel allocation</td>
<td>Mass spectroscopy</td>
<td>MERIS</td>
<td>Neutron spin echo</td>
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<td>Photoacoustic effects</td>
<td>Photoacoustic effects</td>
<td>Photoacoustic effects</td>
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<td></td>
<td>Resonance light scattering</td>
<td>Resonance light scattering</td>
<td>Resonance light scattering</td>
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</tbody>
</table>
Spectrum analysis
USE: Spectral analysis

Spectrum estimation
USE: Spectral analysis

Spectrum management
USE: Radio spectrum management

Speech
BT: Oral communication
RT: Speaker recognition

Speech activity detection
USE: Voice activity detection

Speech analysis
BT: Speech recognition
RT: Cepstral analysis
Frequency estimation
Signal analysis
Spectral analysis
Speech coding
Speech synthesis

Speech codecs
BT: Codecs
Communication equipment
Decoding
Speech coding
Vocoders

Speech coding
BT: Encoding
Information theory
Audio coding
Rate distortion theory
Speech analysis
Speech codecs
Vector quantization
Vocoders
Voice activity detection

Speech communication
USE: Oral communication

Speech detection
USE: Voice activity detection

Speech enhancement
BT: Speech processing
RT: Hearing aids
Speech recognition

Speech processing
BT: Acoustic signal processing
RT: Delay estimation
Phonetics
Prediction methods
NT: Human voice
Speech enhancement
Speech synthesis
Voice activity detection

Speech recognition
BT: Identification of persons
Pattern recognition
Cepstral analysis
Emotion recognition
Feature extraction
Speaker recognition
Speech enhancement
Voice activity detection

Speech synthesis
UF: Synthetic speech
Voice response systems
BT: Speech processing
RT: Biomedical equipment
Signal synthesis
Speech analysis
Voice activity detection
NT: Automatic speech

Speechmaking
USE: Public speaking

Speed control
USE: Velocity control

Speed measurement
USE: Velocity measurement

SPICE
UF: Simulation Program with Integrated Circuit Emphasis
pSPICE
BT: Software packages
RT: Circuit analysis
Design automation
Integrated circuits

Spin injection
USE: Spin polarized transport
Spin polarised transport
USE: Spin polarized transport

Spin polarized transport
UF: Spin injection
BT: Magnetoelectronics
RT: Magnetic tunneling
Magnetoresistance

Spin valves
BT: Magnetic sensors
RT: Hysteresis

Spin-dependent tunneling
USE: Magnetic tunneling

Spin-dependent tunnelling
USE: Magnetic tunneling

Spinal cord
BT: Nervous system
NT: Cerebrospinal fluid
Spinal cord injury

Spinal cord injuries
USE: Spinal cord injury

Spinal cord injury
UF: Spinal cord injuries
BT: Spinal cord
RT: Neurological diseases

Spinal cord stimulation
USE: Electrical stimulation

Spindle bearings
USE: Machine tool spindles

Spine
BT: Nervous system
Skeleton

Spinelectronics
USE: Spintronics

Spinning
BT: Textile technology
RT: Spinning machines
Textile fibers

Spinning machines
BT: Textile machinery
RT: Paper making
Paper making machines

Spintronics
UF: Fluxtronics
BT: Spinelectronics
Magnetoelectric effects

Spirals
BT: Mathematics

Splicing
UF: Cable splicing
Fusion splicing
BT: Joining processes
RT: Optical fiber cables
Transmission lines

Spline functions
USE: Splines (mathematics)

Splines (mathematics)
UF: B-Spline
Spline functions
BT: Numerical analysis
RT: Curve fitting

Split gate flash memory cells
USE: Split-gate flash memory cells
BT: Flash memory cells

Split ring resonators
BT: Resonators
RT: Electromagnetic metamaterials
Metamaterials
Optical resonators
Terahertz metamaterials

Split-gate flash memory cells
USE: Split gate flash memory cells

SPO
USE: Triples (Data structure)

Spontaneous emission
UF: Superradiance
BT: Photonics
RT: Microcavities
Phononic crystals

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# 2021 IEEE Thesaurus

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<tr>
<th>Sports</th>
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<td>Tennis</td>
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<tr>
<td><strong>BT:</strong> Entertainment industry</td>
<td><strong>RT:</strong> Games</td>
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<tr>
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<td><strong>Spur gears</strong></td>
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<td>Physical vapor deposition</td>
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</table>
2021 IEEE Thesaurus

NT: Sputter etching
Spyware
BT: Privacy-invasive software
SQL
USE: Structured Query Language
SQL injection
BT: Computer crime
Information security
SQUID magnetometers
BT: Magnetometers
RT: Magnetic fields
SQUIDs
UF: Superconducting quantum interference devices
BT: Superconducting devices
RT: Readout electronics
Sr
USE: Strontium
SRAM
USE: SRAM chips
SRAM cells
BT: Random access memory
SRAM chips
UF: SRAM
BT: Random access memory
RT: CMOS memory circuits
Stability
BT: Reliability
RT: Asymptotic stability
Control systems
Damping
Lyapunov methods
Predator prey systems
Robustness
NT: Circuit stability
Robust stability
Stability analysis
Thermal stability
Stability analysis
BT: Stability
RT: Algorithms
Differential equations
Laser stability
Plasma properties
Signal processing
System analysis and design
NT: Stability criteria
Stability criteria
BT: Stability analysis
Stacking
BT: Material storage
RT: Containers
Materials handling
Warehousing
Stairs
BT: Construction
RT: Elevators
Escalators
Legged locomotion
Mobile robots
Stakeholder pensions
USE: Pensions
Stakeholders
BT: Customer relationship management
RT: Decision making
Requirements engineering
Strategic planning
Standard Generalized Markup Language
USE: SGML
Standardization
BT: Engineering - general
RT: IEC
ISO
ISO Standards
NT: Formal specifications
Guidelines
Standards
Standards
BT: Standardization
RT: Conformance testing
IEC
ISO
International collaboration
Open systems
Qualifications
NT: Standards categories
Standards organizations
Standards publications
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## Standards categories

<table>
<thead>
<tr>
<th>BT: Standards</th>
<th>RT: Emergency power supplies</th>
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<tr>
<td>NT: Communication standards</td>
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## Standards publications

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## Standby generators

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<th>UF: Emergency power generators</th>
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<tbody>
<tr>
<td>BT: Generators</td>
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<tr>
<td>Rotating machines</td>
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<th>Pattern recognition</th>
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<table>
<thead>
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<th>Statistics</th>
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<table>
<thead>
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<tbody>
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</tr>
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<td>RT: Reactive power</td>
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<tr>
<td>BT: Quantum mechanics</td>
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<td>USE: Distribution functions</td>
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<table>
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<td>Stellar dynamics</td>
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### Stereo image processing

**USE:** Stereo image processing

**Sternum**
  **BT:** Thorax

**Stethoscope**
  **BT:** Biomedical equipment

**Stimulated emission**
  **UF:** Optical amplification
  **BT:** Particle beam optics
  **RT:** Lasers
  **Masers**

**Stirling engines**
  **BT:** Heat engines

**Stochastic distribution**
  **USE:** Stochastic processes

**Stochastic prediction**
  **USE:** Stochastic processes

**Stochastic processes**
  **UF:** Stochastic distribution
  **BT:** Mathematics
  **RT:** Computational electromagnetics
  **Diffusion processes**
  **Particle swarm optimization**
  **Probability**
  **Random number generation**
  **Random variables**
  **Viterbi algorithm**
  **NT:** Gaussian processes
  **Markov processes**

**Stochastic resonance**
  **BT:** Resonance

**Stochastic systems**
  **BT:** Systems engineering and theory
  **RT:** Control systems
  **Probability**
  **Random variables**

**Stochastic theory**
  **USE:** Stochastic processes

**Stock exchanges**
  **USE:** Stock markets

**Stock markets**
  **UF:** Stock exchanges
  **BT:** Economics

**Stokes parameters**
  **BT:** Optical polarization

**Stomach**
  **BT:** Digestive system

**Stomatognathic system**
  **BT:** Anatomy
  **RT:** Faces
  **Lips**
  **Pharynx**
  **Tongue**
  **NT:** Masticatory muscles
  **Salivary glands**

**Storage area networks**
  **UF:** SAN
  **BT:** Computer networks
  **RT:** Data storage systems
  **Local area networks**

**Storage automation**
  **UF:** Automated storage and retrieval systems
  **BT:** Automation
  **Material storage**
  **RT:** Warehousing

**Storage batteries**
  **USE:** Batteries

**Storage battery**
  **USE:** Batteries

**Storage management**
  **BT:** Capacity planning
  **Management**
  **RT:** Memory management
  **NT:** Digital storage

**Storage rings**
  **BT:** Particle accelerators
  **RT:** Ions
  **Muon colliders**
  **Particle beams**

**Stored energy**
  **USE:** Energy storage
2021 IEEE Thesaurus

Storm systems
USE: Tropical cyclones

Storms
BT: Meteorology
RT: Lightning
Monsoons

Strain
UF: Deformation
BT: Mechanical factors
RT: Elasticity
Elongation
Strain control
Strain measurement
NT: Tensile strain
Uniaxial strain

Strain based sensors
USE: Capacitive sensors

Strain control
UF: Friction stir processing
BT: Mechanical variables
RT: Strain

Strain gauges
USE: Strain measurement

Strain measurement
UF: Strain gauges
BT: Mechanical variables
RT: Micrometers
Strain

Strain sensors
USE: Capacitive sensors

Strategic planning
BT: Planning
RT: Analytic hierarchy process
Business intelligence
Decision making
Information systems
Stakeholders
NT: Roadmaps (technology planning)

Stratified media
USE: Nonhomogeneous media

Stratosphere
USE: Terrestrial atmosphere

Stray light
BT: Light sources
Optics
RT: Ray tracing

Streaming media
UF: Media streaming
Video streaming
BT: Communication system
software
RT: Data compression
IEEE 802.11e Standard
IPTV
Internet
MPEG 4 Standard
MPEG standards
Multimedia Web sites
Multimedia communication
Unicast
Video coding
Video signal processing
Mobile video
Over-the-top media
services
Video on demand

Streetcars
USE: Light rail systems

Stress
UF: Mechanical stress
BT: Mechanical factors
RT: Magnetomechanical effects
Photoelasticity
Piezoelectricity
Piezooptic effects
Piezoresistance
Stress control
Stress measurement
NT: Compressive stress
Internal stresses
Residual stresses
Tensile stress
Wind stress

Stress (psychological)
USE: Human factors

Stress control
BT: Mechanical variables
control
RT: Stress
Surface stress

2021 IEEE Thesaurus

Stress measurement
BT: Mechanical variables
RT: Stress

String theory
BT: Physics
RT: Quantum mechanics

String vacuum
USE: Elementary particle vacuum

Stripboard circuit
UF: Veroboard
BT: Electronic circuits

Stripline
BT: Planar transmission lines
Transmission lines
NT: Stripline components

Stripline components
BT: Stripline
RT: Power combiners
Power dividers

Strips
BT: Structural shapes

Stroke (medical condition)
BT: Medical conditions

Strontium
UF: Sr
BT: Metals
NT: Strontium compounds

Strontium compounds
BT: Strontium
RT: Alloying

Structural beams
UF: Cantilever beams
Girders
BT: Structural shapes
RT: Building materials

Structural discs
UF: Disks (structures)
BT: Structural shapes

Structural engineering
UF: Structural parameter
Structural stability
BT: Civil engineering

Structural parameter
USE: Structural engineering

Structural plates
BT: Structural shapes
RT: Flanges
Structural panels
Wheels

Structural rings
UF: O-rings
BT: Structural shapes
RT: Engine cylinders
Mechanical products
Pistons
Seals

Structural rods
BT: Structural shapes

Structural shapes
BT: Mechanical products
NT: Bars
Bridges
Ducts
Flexible structures
Honeycomb structures
Lightweight structures
Rails
Sandwich structures
Sheet materials
Slabs
2021 IEEE Thesaurus

Strips
Structural beams
Structural discs
Structural panels
Structural plates
Structural rings
Structural rods
Structural shells
Thin wall structures
Wires

**Structural shells**

- **BT:** Structural shapes
- **RT:** Thin wall structures

**Structural stability**

- **USE:** Structural engineering

**Structure from motion**

- **BT:** Image processing
- **RT:** Motion control
- **Signal processing**
- **Three-dimensional displays**
- **Two dimensional displays**

**Structured Query Language**

- **UF:** SQL
- **BT:** Database languages
- **RT:** Programming
  - **Relational databases**

**Student engineers**

- **USE:** Engineering students

**Student experiments**

- **BT:** Engineering education
- **RT:** Laboratories

**Style sheet languages**

- **BT:** Computer languages
- **NT:** Cascading style sheets

**Sub-mm wave filters**

- **USE:** Submillimeter wave filters

**Sub-sea cables**

- **USE:** Underwater cables

**Subcontracting**

- **BT:** Contracts

**Subject predicate object**

- **USE:** Triples (Data structure)

**Submarine technology**

- **USE:** Underwater technology

**Submarines**

- **USE:** Underwater vehicles

**Submersibles**

- **USE:** Underwater vehicles

**Submillimeter wave circuits**

- **BT:** Circuits
  - **Submillimeter wave**
- **technology**
  - **RT:** Analog circuits
    - **Submillimeter wave devices**
  - **NT:** Submillimeter wave integrated circuits

**Submillimeter wave communication**

- **BT:** Communication systems
  - **Submillimeter wave**
- **technology**

**Submillimeter wave devices**

- **UF:** Submillimeter wave systems
- **BT:** Submillimeter wave technology
  - **RT:** Submillimeter wave circuits
  - **Submillimeter wave**
- **integrated circuits**
  - **NT:** Submillimeter wave filters

**Submillimeter wave filters**

- **UF:** Sub-mm wave filters
  - **Submillimetre wave filters**
- **BT:** Submillimeter wave devices
- **RT:** Submillimeter wave circuits

**Submillimeter wave integrated circuits**

- **BT:** Integrated circuits
  - **Submillimeter wave circuits**
  - **Submillimeter wave**
- **technology**
  - **RT:** Analog integrated circuits
  - **Submillimeter wave devices**

**Submillimeter wave measurements**

- **BT:** Electromagnetic
  - **measurements**
  - **RT:** Hyperspectral sensors
## Submillimeter wave technology

- **Submillimeter wave propagation**
  - **BT:** Electromagnetic propagation
- **Submillimeter wave systems**
  - **USE:** Submillimeter wave devices
- **Submillimeter wave technology**
  - **BT:** Microwave theory and techniques
  - **RT:** Submillimeter wave measurements
  - **NT:** Submillimeter wave circuits
  - **Submillimeter wave communication**
    - Submillimeter wave devices
    - Submillimeter wave integrated circuits
- **Submillimeter wave filters**
  - **USE:** Submillimeter wave filters
- **Subroutines**
  - **USE:** Algorithms
- **Subscriber loops**
  - **BT:** Communication systems
  - **Multiaccess communication**
- **Subscriber sets**
  - **USE:** Telephone sets
- **Subsea cables**
  - **USE:** Underwater cables
- **Subspace constraints**
  - **BT:** Object segmentation
- **Substation automation**
  - **BT:** Substations
  - **RT:** Automation
  - **SCADA systems**
  - **Substation protection**
- **Substation protection**
  - **BT:** Power system protection
  - **Substations**
  - **RT:** Substation automation
- **Substations**
  - **USE:** Power stations (substations)

## Substrate hot electron injection

- **UF:** Substrate hot-electron injection
- **BT:** Hot carrier injection

## Substrate integrated waveguides

- **UF:** Post-wall waveguides
- **BT:** Waveguide lasers

## Substrates

- **BT:** Semiconductor materials
  - **RT:** Epitaxial growth
  - **Microprocessor chips**
  - **Printed circuits**
  - **Silicon germanium**
  - **Silicon on sapphire**

## Subthreshold conduction

- **USE:** Subthreshold current

## Subthreshold current

- **UF:** Subthreshold conduction
  - **Subthreshold drain current**
  - **Subthreshold leakage**
  - **BT:** Threshold voltage

## Subthreshold drain current

- **USE:** Subthreshold current

## Subthreshold leakage

- **USE:** Subthreshold current

## Subtraction techniques

- **BT:** Image analysis
- **RT:** Biomedical image processing
  - **Subways**
    - **USE:** Public transportation
  - **Sucrose**
    - **USE:** Sugar
  - **Sufficient conditions**
    - **BT:** Logic

## Sugar
2021 IEEE Thesaurus

UF: Sucrose
BT: Agricultural products
Food products
RT: Sugar industry
Sugar refining
NT: Glucose

Sugar industry
BT: Industries
RT: Food industry
Food products
Sugar
NT: Sugar refining

Sugar refining
BT: Sugar industry
Food industry
Food products
Food technology
Purification
Refining
Sugar

Sulfur
UF: Sulphur
BT: Chemical elements
NT: Sulfur compounds

Sulfur compounds
UF: Sulphur compounds
BT: Sulfur

Sulfur hexafluoride
UF: SF6
BT: Gas insulation

Sulphur
USE: Sulfur

Sulphur compounds
USE: Sulfur compounds

Sum product algorithm
UF: Sum-product algorithm
BT: Iterative algorithms

Sum product message passing
USE: Belief propagation

Sum-product algorithm
USE: Sum product algorithm

Summing circuits
BT: Circuits
RT: Analog computers
Superconductor-insulator-superconductor devices
Superconductor-normal-superconductor devices

**BT:** Superconductivity
**RT:** Cryogenic electronics

**High-temperature superconductors**
Superconducting device noise

**Superconducting films**
Thermal factors

**NT:** Josephson junctions
SQUIDs
Superconducting coils
Superconducting magnets
Superconducting

**microwave devices**
Superconducting

**Superconducting epitaxial layers**
**BT:** Epitaxial layers
**RT:** Superconducting materials

**Superconducting filaments**
**USE:** Superconducting materials

**Superconducting filaments and wires**
**BT:** Superconductivity

**Superconducting films**
**UF:** Superconducting tapes
**BT:** Superconductivity
**RT:** High-temperature superconductors

Superconducting devices
Surface impedance
Surface resistance
Thick films
Thin films

**NT:** Superconducting thin films

**Superconducting filters**
**BT:** Filters
**RT:** Radiofrequency interference

**Superconducting infrared detectors**
**USE:** Superconducting photodetectors

**Superconducting integrated circuits**
**BT:** Integrated circuits
Superconductivity

**Superconducting junction devices**
**USE:** Josephson junctions

**Superconducting logic circuits**
**BT:** Logic circuits

**Superconducting magnet energy storage**
**USE:** Superconducting magnetic energy storage

**Superconducting magnetic energy storage**
**UF:** SMES
Superconducting magnet energy storage
**BT:** Energy storage
Superconductivity

**Superconducting magnets**
**BT:** Electromagnets
Superconducting devices

**RT:** Magnetic levitation vehicles
Persistent currents
Superconducting cables
Superconducting coils

**Superconducting materials**
**UF:** Pnictide superconductors
Superconducting filaments
Superconducting wires
**BT:** Materials
Superconductivity

**RT:** Critical current density
Cryogenic electronics
Superconducting epitaxial layers
Thermal factors

**NT:** Granular superconductors
High-temperature superconductors
Multifilamentary
Niobium-tin
Type II superconductors

**Superconducting microwave devices**
**BT:** Superconducting devices
**RT:** Microwave devices

**Superconducting photodetectors**
**UF:** Superconducting infrared detectors
Superconducting ultraviolet detectors

**BT:** Photodetectors
Superconducting devices

RT: Infrared detectors

Superconducting quantum interference devices
USE: SQUIDs

Superconducting tapes
USE: Superconducting films

Superconducting thin films
BT: Superconducting films
RT: Thin films

Superconducting transition temperature
BT: Superconductivity
RT: High-temperature superconductors

Superconducting transmission lines
BT: Transmission lines
RT: Power transmission lines
NT: Superconducting cables

Superconducting ultraviolet detectors
USE: Superconducting photodetectors

Superconducting wires
USE: Superconducting materials

Superconductive tunneling
UF: Superconductive tunnelling
BT: Superconductivity
RT: Tunneling

Superconductive tunnelling
USE: Superconductive tunneling

Superconductivity
NT: Bean model
Critical current density (superconductivity)
Flux pinning
Superconducting devices
Superconducting filaments
and wires
Superconducting films
Superconducting integrated circuits
Superconducting magnetic energy storage
Superconducting materials
Superconducting transition temperature
Superconductive tunneling

Superconductor-insulator-superconductor devices
USE: Superconducting devices

Superconductor-normal-superconductor devices
USE: Superconducting devices

Superconductors (high temperature)
superconductors

Supercontinuum generation
BT: Nonlinear optics
RT: Laser beams
Light sources
Optical fibers

Superlattices
BT: Crystalline materials
NT: Magnetic superlattices
Metallic superlattices
Optical superlattices
Semiconductor superlattices

Superluminescent diodes
UF: SLD
BT: Light emitting diodes
Light sources
Optoelectronic devices
Semiconductor devices
Semiconductor diodes
RT: Lasers

Superposition calculus
BT: Mathematics

Superradiance
USE: Spontaneous emission

Superresolution
UF: Super-resolution
BT: Image resolution

Superstring vacuum
USE: Elementary particle vacuum

Supervised learning
BT: Learning systems
RT: Naive Bayes methods
Semisupervised learning
NT: Boosting

Supervisory control
2021 IEEE Thesaurus

Control systems
Supervisory control and data acquisition systems
USE: SCADA systems
Supervisory control and data-acquisition systems
USE: SCADA systems
Supervisory programs
USE: Operating systems
Supply and demand
BT: Economics
RT: Microeconomics
Utility theory
Supply chain management
UF: SCM supply chains
BT: Management
RT: Business process integration
management
Capacity planning
Customer relationship
management
Electronic commerce
Management information
systems
Materials requirements
planning
Production control
Supply chains
NT: Procurement
Supply chains
BT: Logistics
RT: Materials requirements
planning
Procurement
Supply chain management
NT: Distribution networks
Support vector machine classification
BT: Support vector machines
Support vector machines
UF: SVM
BT: Computation theory
RT: Artificial intelligence
Support vector regression
NT: Support vector machine classification
Support vector regression
USE: Support vector machines
Surface acoustic wave devices
BT: Acoustic devices
RT: Acoustoelectric devices
Piezoelectric devices
Surface acoustic waves
UF: Acoustic surface waves
BT: Acoustic waves
Surface waves
Waves
Surface charging
BT: Electrostatic processes
RT: Spraying
NT: Triboelectricity
Surface cleaning
BT: Cleaning
Surface treatment
RT: Semiconductor device manufacture
Surface contamination
BT: Contamination
RT: Semiconductor device manufacture
Surface cleaning
Surface treatment
Surface cracks
BT: Mechanical factors
Surface discharges
BT: Dielectric breakdown
RT: Insulator testing
Surface emitting lasers
BT: Lasers
Semiconductor devices
Semiconductor lasers
Solid lasers
RT: Laser cavity resonators
Quantum well lasers
<table>
<thead>
<tr>
<th>Term</th>
<th>BT:</th>
<th>RT:</th>
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<tbody>
<tr>
<td>Quantum wells</td>
<td></td>
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<tr>
<td>Vertical cavity surface</td>
<td></td>
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<tr>
<td>Surface roughness</td>
<td></td>
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<tr>
<td>Superconducting films</td>
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<tr>
<td>Surface soil</td>
<td>BT: Surfaces</td>
<td></td>
</tr>
<tr>
<td>Surface states</td>
<td>BT: Energy states</td>
<td>Surface structures</td>
</tr>
<tr>
<td>Surface stress</td>
<td>BT: Mechanical factors</td>
<td>Surfaces</td>
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<tr>
<td>Surface structures</td>
<td>BT: Surfaces</td>
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<tr>
<td>Surface tension</td>
<td>BT: Surfaces</td>
<td></td>
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<tr>
<td>Surface treatment</td>
<td>BT: Surfaces</td>
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<tr>
<td>Surface morphology</td>
<td>BT: Surfaces</td>
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<tr>
<td>Surface plasmons</td>
<td>BT: Plasmons</td>
<td>Surface plasmon polaritons</td>
</tr>
<tr>
<td>Surface plasmon polaritons</td>
<td>BT: Polaritons</td>
<td>Surface plasmons</td>
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<tr>
<td>Surface resistance</td>
<td>BT: Resistance</td>
<td>Surfaces</td>
</tr>
<tr>
<td>Surface reconstruction</td>
<td>BT: Visualization</td>
<td>Pattern analysis</td>
</tr>
<tr>
<td>Surface soil</td>
<td>BT: Surfaces</td>
<td></td>
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<tr>
<td>Surface states</td>
<td>BT: Energy states</td>
<td>Surface structures</td>
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<tr>
<td>Surface stress</td>
<td>BT: Mechanical factors</td>
<td>Surfaces</td>
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<tr>
<td>Surface structures</td>
<td>BT: Surfaces</td>
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<td>Surface tension</td>
<td>BT: Surfaces</td>
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<td>Surfaces</td>
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<tr>
<td>Surface reconstruction</td>
<td>BT: Visualization</td>
<td>Pattern analysis</td>
</tr>
</tbody>
</table>

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Surface cleaning
Surfactants

**Surface waves**
- BT: Geophysics
- RT: Sea surface
- NT: Surface acoustic waves

**Surface-mount technology**
- BT: Integrated circuit

**Surfaces**
- BT: Materials science and technology
- NT: Corrosion
  - Corrugated surfaces
  - Metasurfaces
  - Rough surfaces
  - Surface impedance
  - Surface morphology
  - Surface resistance
  - Surface roughness
  - Surface soil
  - Surface stress
  - Surface structures
  - Surface tension
  - Surface texture
  - Surface topography
  - Surface treatment

**Surfactants**
- BT: Materials
  - Surface states
  - Surface treatment
- RT: Adsorption
  - Surface tension

**Surge protection**
- BT: Power system protection
- RT: Surges
- NT: Arresters

**Surgery**
- UF: Robot-assisted surgery
- BT: Medical treatment
  - Biomedical equipment
  - Catheters
  - Endoscopes
  - Ambulatory surgery
  - Hepatectomy
  - Laser surgery
  - Microsurgery
  - Minimally invasive surgery
  - Neurosurgery
  - Surgery oncology
  - USE: Oncological surgery

**Surgeries**
- BT: Electromagnetic transients
- RT: Surge protection

**Surgical instruments**
- BT: Biomedical equipment

**Surgical robots**
- USE: Medical robotics

**Surveillance**
- BT: Monitoring
  - Conformance testing
  - Hazardous areas
  - Motion detection
  - Reconnaissance
  - Remote sensing
  - Security
  - Terrorism
- NT: Infrared surveillance
  - Video surveillance

**Suspension bridges**
- USE: Structural panels

**Suspensions (mechanical systems)**
- BT: Mechanical systems
  - Automotive components
  - Springs
- NT: Shock absorbers

**Sustainability**
- USE: Sustainable development

**Sustainable design**
- USE: Green design

**Sustainable development**
- UF: Sustainability
  - Environmental management
  - Social implications of technology
  - Green computing
  - SVC
  - USE: Static VAR compensators
SVM
USE: Support vector machines

SVPWM
USE: Space vector pulse width modulation

Swaging
BT: Materials processing
RT: Metal products

Swarm intelligence
USE: Particle swarm optimization

Swarm optimization
USE: Particle swarm optimization

Swarm robotics
UF: Swarm robots
BT: Multi-robot systems
RT: Consensus control

Swarm robots
USE: Swarm robotics

Sweat glands
BT: Glands
Skin

Swimming
USE: Sports

Swimming robots
USE: Aquatic robots

Switched capacitor circuits
UF: Switched-capacitor circuit
BT: Switched circuits

Switched capacitor networks
UF: Switched-capacitor networks
BT: Resistors
RT: Analog circuits
Capacitors

Switched circuits
BT: Circuits
RT: Telecommunications
NT: Switched capacitor circuits

Switched mode power supplies
USE: Switched mode power

Switched mode power supplies
UF: SMPS
Switched mode power
BT: Power supplies

Switched reluctance motors
BT: Reluctance motors
RT: Brushless motors

Switched systems
BT: Time-varying systems
RT: Control systems
Power conversion

Switched-capacitor circuit
USE: Switched capacitor circuits

Switched-capacitor networks
USE: Switched capacitor networks

Switches
BT: Control equipment
RT: Current control
IEEE 802.3 Standard
Solenoids
Spark gaps
Switchgear
Switching circuits
NT: Contactors
Microswitches
Optical switches

Switchgear
BT: Control equipment
RT: Current control
Fuses
Switches
Interrupters
Relays

Switching circuits
BT: Circuits
RT: Circuit breakers
Digital circuits
Relays
Switches
NT: Choppers (circuits)
Logic circuits
Switching converters
Zero current switching
Zero voltage switching
## 2021 IEEE Thesaurus

### Switching converters
- **BT:** Switching circuits
- **RT:** Power electronics
- **Zero current switching**
- **Zero voltage switching**

### Switching frequency
- **BT:** Switching systems

### Switching loss
- **UF:** Switching losses
- **BT:** Switching systems

### Switching losses
- **USE:** Switching loss

### Switching systems
- **BT:** Communication systems
- **RT:** Communication switching
- **NT:** Electronic switching systems

### Symbiosis
- **UF:** Symbiotic relationships
- **BT:** Biological processes

### Symmetric matrices
- **UF:** Symmetric matrix
- **BT:** Numerical analysis

### Sympathetic nervous system
- **UF:** Sympathetic outflow
- **BT:** Autonomic nervous system

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Optical fiber communication
SONET
Synchronization
Transport protocols

*Synchronous DRAM*
USE: SDRAM

*Synchronous dynamic random access memory*
USE: SDRAM

*Synchronous generators*
BT: AC generators
Synchronous machines
Alternators
RT: Alternators
NT: Reluctance generators

*Synchronous machines*
BT: AC machines
Hysteresis motors
Reluctance machines
Synchronous generators
Synchronous motors

*Synchronous motors*
BT: Synchronous machines
Rotating machines
RT: Rotating machines
Hysteresis motors
Reluctance motors

*Synchronous optical network*
USE: SONET

*Synchrophasors*
USE: Phasor measurement units

*Synchrotron radiation*
BT: Synchrotrons
Biomedical applications of radiation
Light sources
X-rays

*Synchrotrons*
BT: Particle accelerators
Colliding beam accelerators
Electric fields
High energy physics

instrumentation computing
Magnetic fields
Particle beams
NT: Synchrotron radiation
Undulators

*Synthesizers*
USE: Synthesizers

*Synthetic aperture radar*
USE: SAR
BT: Radar
Airborne radar
Ground penetrating radar
Radar imaging
Spaceborne radar
Synthetic aperture sonar
Ultra wideband radar
Inverse synthetic aperture radar
Polarimetric synthetic aperture radar

*Synthetic aperture radar imaging*
USE: Radar polarimetry

*Synthetic aperture radar interferometry*
BT: Radar interferometry

*Synthetic aperture sonar*
USE: SAS
BT: Sonar
RT: Synthetic aperture radar

*Synthetic biology*
USE: Synthetic life research
<table>
<thead>
<tr>
<th>Topic</th>
<th>Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BT:</strong> Biology</td>
<td>Fault tolerant systems</td>
</tr>
<tr>
<td>Engineering in medicine</td>
<td>Interconnected systems</td>
</tr>
<tr>
<td>and biology</td>
<td>Large-scale systems</td>
</tr>
<tr>
<td><strong>RT:</strong> Biological system modeling</td>
<td>Lyapunov methods</td>
</tr>
<tr>
<td>Computational biology</td>
<td>Open systems</td>
</tr>
<tr>
<td><strong>Synthetic fibers</strong></td>
<td>Petri nets</td>
</tr>
<tr>
<td><strong>UF:</strong> Artificial fibers</td>
<td>Physical design</td>
</tr>
<tr>
<td>Artificial fibres</td>
<td>Robust control</td>
</tr>
<tr>
<td>Nylon fiber</td>
<td>Scalability</td>
</tr>
<tr>
<td>Synthetic fibres</td>
<td>Scattering parameters</td>
</tr>
<tr>
<td><strong>BT:</strong> Textile fibers</td>
<td>Sequential analysis</td>
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<tr>
<td><strong>Synthetic fibres</strong></td>
<td>Sequential diagnosis</td>
</tr>
<tr>
<td><strong>USE:</strong> Synthetic fibers</td>
<td>Software prototyping</td>
</tr>
<tr>
<td><strong>Synthetic gas</strong></td>
<td>Static analysis</td>
</tr>
<tr>
<td><strong>USE:</strong> Syngas</td>
<td>System dynamics</td>
</tr>
<tr>
<td><strong>Synthetic life research</strong></td>
<td>System performance</td>
</tr>
<tr>
<td><strong>USE:</strong> Synthetic biology</td>
<td>System-level design</td>
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<tr>
<td><strong>Synthetic speech</strong></td>
<td>Systems Modeling</td>
</tr>
<tr>
<td><strong>USE:</strong> Speech synthesis</td>
<td><strong>System availability</strong></td>
</tr>
<tr>
<td><strong>SYSML</strong></td>
<td><strong>USE:</strong> Availability</td>
</tr>
<tr>
<td><strong>USE:</strong> Systems Modeling</td>
<td><strong>System buses</strong></td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td><strong>BT:</strong> Computer interfaces</td>
</tr>
<tr>
<td><strong>System analysis</strong></td>
<td><strong>System design</strong></td>
</tr>
<tr>
<td><strong>USE:</strong> System analysis and design</td>
<td><strong>USE:</strong> System analysis and design</td>
</tr>
<tr>
<td><strong>System analysis and design</strong></td>
<td><strong>System dynamics</strong></td>
</tr>
<tr>
<td><strong>UF:</strong> Logical decomposition</td>
<td><strong>BT:</strong> System analysis and design</td>
</tr>
<tr>
<td>System analysis</td>
<td><strong>RT:</strong> Behavioral sciences</td>
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<tr>
<td>System design</td>
<td>Complex networks</td>
</tr>
<tr>
<td>System metrics</td>
<td>Feedback</td>
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<tr>
<td><strong>BT:</strong> Systems engineering and</td>
<td>Flow production systems</td>
</tr>
<tr>
<td>theory</td>
<td>Timing</td>
</tr>
<tr>
<td><strong>RT:</strong> Configuration management</td>
<td><strong>System identification</strong></td>
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<td>Systems simulation</td>
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<td><strong>NT:</strong> Asymptotic stability</td>
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<td>System integration</td>
<td>System recovery</td>
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</tr>
<tr>
<td>BT: Systems engineering and theory</td>
<td>UF: Deadlocks (computers)</td>
</tr>
<tr>
<td>RT: Enterprise resource planning</td>
<td>BT: Error recovery (computers)</td>
</tr>
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<td>Integrated manufacturing systems</td>
<td>BT: Computers and information processing</td>
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<td>Project management</td>
<td>RT: Business continuity</td>
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<tr>
<td>Resource management</td>
<td>Operating systems</td>
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<tr>
<td>NT: Checkpointing</td>
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<td>Core dumps</td>
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<td>Debugging</td>
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<tr>
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<tr>
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<tr>
<td>USE: Product lifecycle</td>
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<th>System planning</th>
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<tr>
<td>RT: Complex networks</td>
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<td>Emergent phenomena</td>
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<tr>
<td>Networked control systems</td>
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<tr>
<td>NT: Cyber-physical systems</td>
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<tr>
<td>USE: Planning</td>
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<td>USE: System-on-chip</td>
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<tr>
<td>UF: Cooperative cache</td>
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<tr>
<td>BT: System analysis and design</td>
<td></td>
</tr>
<tr>
<td>NT: Cooperative caching</td>
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</tr>
<tr>
<td>USE: Data security</td>
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<table>
<thead>
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<th>System-level design</th>
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<td>RT: System analysis and design</td>
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<tr>
<td>NT: System testing</td>
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<tr>
<td>USE: System-on-a-chip</td>
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</table>

<table>
<thead>
<tr>
<th>System on-chip</th>
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<tbody>
<tr>
<td>USE: On-chip</td>
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2021 IEEE Thesaurus

SOC
System on chip
System-on-a-chip
BT: Application specific
RT: Al accelerators
Microcontrollers
Microprocessors
Mixed analog-digital
Power dissipation
Signal processing
NT: Lab-on-a-chip
Network-on-chip

Systematics
UF: Biological systematics
BT: Biology

Systems architecture
BT: Systems engineering and theory
NT: Deep architecture

Systems biology
BT: Biology

Systems engineering
USE: Systems engineering and theory

Systems engineering and theory
UF: Systems engineering
RT: Aerospace and electronic systems
Business process
Management
NT: Adaptive systems
Capability engineering
Complex systems
Configuration management
Hierarchical systems
Integrated design
Interface management
Modeling
Multidimensional systems
Network systems
Physical design
Reduced order systems
Requirements engineering
Requirements management
Service-oriented systems
Solution design
Stochastic systems
System analysis and design
System implementation
System improvement
System integration
System of systems
System realization
System validation
System verification
Systems architecture
Systems engineering

Systems engineering education
BT: Engineering education
Systems engineering and theory

Systems modeling
BT: Modeling
System analysis and design

Systems Modeling Language
UF: SYSML
BT: Computer languages
System analysis and design
Modeling
Software engineering

Systems neuroscience
BT: Neuroscience
RT: Neural networks

Systems operation
BT: Systems engineering and theory

Systems simulation
BT: Simulation
System analysis and design
Technical management

Systems support
BT: Maintenance engineering
Systems engineering and theory
Systems thinking

BT: Systems engineering and theory
RT: Systems, man, and cybernetics

Systems, man, and cybernetics

RT: Systems thinking
NT: Behavioral sciences
- Biological control systems
- Computational linguistics
- Cybernetics
- Ergonomics
- Human factors
- Identification of persons
- Man-machine systems
- Natural languages
- Pervasive computing
- Posthuman
- Teleworking
- Transhuman
- User interfaces

Tactile sensors

UF: Tactile feedback
BT: Touch sensors
RT: Robot sensing systems
NT: Pressure measurement
- Tactile Internet
- Touch sensitive screens

Tag clouds

UF: Word cloud
BT: Tagging

Tagging

UF: Hashtag
BT: Information retrieval
RT: Indexing
NT: Internet of Things
- Tag clouds

TAI
USE: International Atomic Time

Tail

BT: Animal structures

Takagi-Sugeno model

BT: Fuzzy logic
RT: Fuzzy control
- Fuzzy systems
NT: Takagi-Sugeno-Kang model

Takagi-Sugeno-Kang model

BT: Takagi-Sugeno model

Talbot effect

BT: Optical imaging
RT: Interferometry
- Optical interferometry

Tactile feedback

USE: Tactile sensors

Tantaleum

BT: Chemical elements

Tactile Internet

BT: Haptic interfaces
- Internet of Things
RT: 5G mobile communication
- Human-robot interaction

Table lookup

UF: LUT
BT: Look-up table
- Lookup table
- Image processing

Tablet computers

UF: Tablet PC
BT: Computers
RT: Mobile handsets
Portable media players

Tablet PC

USE: Tablet computers

Tachometers

BT: Meters

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2021 IEEE Thesaurus

BT: Transformers
NT: On load tap changers

**Tape casting**
BT: Casting
RT: Ceramics

**Target detection**
USE: Object detection

**Target recognition**
BT: Object recognition
RT: Missile guidance

**Target tracking**
BT: Tracking
RT: Control systems
Radar tracking

**Targeted drug delivery**
BT: Drug delivery

**Tariffs**
BT: Regulation
RT: Trade agreements

**Task analysis**
BT: Business process
management
System analysis and design
Systems engineering and theory

**Taste buds**
BT: Sense organs

**Taxes**
USE: Finance

**Taxi**
USE: Public transportation

**Taxonomy**
BT: Information retrieval

**Taylor expansion**
USE: Taylor series

**Taylor series**
UF: Taylor expansion
BT: Mathematics

**TCP/IP**
USE: TCPIP

**TCP/IP protocol suite**
USE: TCPIP

**TCPIP**
UF: TCP/IP
TCP/IP protocol suite
Transmission control
protocol-internet protocol
Transmission control
protocol/internet protocol
BT: IP networks
RT: Computer networks
Data communication
Digital communication
Internet
Protocols
Transport protocols

**TDM**
USE: Time division multiplexing

**TDSCDMA**
USE: Time division synchronous code division multiple access

**Teaching**
USE: Education

**Teaching machines**
USE: Computer aided instruction

**Team working**
BT: Organizational aspects

**Teamwork**
BT: Collaboration

**Technetium**
BT: Chemical elements

**Technical assessment**
USE: Technical management

**Technical communication**
USE: Professional communication

**Technical data management**
USE: Database systems AND Technical management

**Technical drawing**
BT: Design methodology
RT: Engineering drawings
Graphics
## Technical management

**UF:** System life cycle

**BT:** Technical risk management

**RT:** Program management

**NT:** Maintenance management

**Technical assessment**

**Technical data**

**Technical planning**

**Technical proposals**

**Technical reports**

**Technical requirements**

**Technical risk management**

**Technical textiles**

**Technical writing**

**Technician training**

**Technique for order of preference by similarity to ideal solution**

**Technological forecasting**

## Technological innovation

**UF:** Innovation

**BT:** Technology

**RT:** Disruptive innovation

**Technological forecasting**

**NT:** Roadmaps (technology planning)

## Technology

**BT:** Social implications of technology

**RT:** Engineering - general

**Philosophical considerations**

**Research and development**

**STEM**

**Technology forecasting**

**Technology planning**

**Appropriate technology**

**Disruptive technologies**

**Machine ethics**

**Neurotechnology**

**Technological innovation**

**Technology social factors**

**Technology transfer**

**Telexistence**

## Technology acceptance model

**UF:** TAM

**BT:** Human factors

**Information theory**

**RT:** Computer aided instruction

**Consumer behavior**

**Information systems**

**Social implications of technology**

**Statistical analysis**

**Technology transfer**

**User centered design**

**User experience**

## Technology management

**BT:** Management

**RT:** Data processing
<table>
<thead>
<tr>
<th>Innovation management</th>
<th>USE: Telecommunication control</th>
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<tbody>
<tr>
<td>Production management</td>
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<td>Project management</td>
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<td>Research and development</td>
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</table>

**Technology planning**

<table>
<thead>
<tr>
<th>BT: Planning</th>
<th>USE: Telecommunication network management</th>
</tr>
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<tbody>
<tr>
<td>RT: Social factors</td>
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<tr>
<td>Technology</td>
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</table>

**Technology social factors**

| BT: Social factors | USE: Telecommunication network reliability |
| Technology |                                           |
| RT: Philosophical |                                         |
| Risk analysis |                                               |
| Technological innovation |                                         |
| Technology forecasting |                                         |
| NT: Privacy |                                                   |

**Technology transfer**

| BT: Technology | USE: Telecommunication services |
| Technology acceptance |                     |
| NT: Technology management |                      |
| Small business technology |                         |

**Teeth**

| UF: Tooth | USE: Telecommunication signaling |
| BT: Mouth |                                      |

**TEGFETs**

| UF: MODFETs | USE: Communication system signaling |

**Telecom**

| USE: Telecommunications | USE: Communication system signaling |

**Telecom buffers**

| USE: Telecommunication buffers | USE: Communication channels |
| BT: Data communication |                     |
| RT: Buffer storage |                                             |

**Telecommunication channels**

| USE: Communication channels | USE: Telecommunication control |

**Telecommunication computing**

| USE: Telecommunication congestion control | USE: Telecommunication control |
| BT: Computer applications |                     |
| 3G mobile communication |                                             |
| 4G mobile communication |                                           |
| Information-centric networking |                                      |
| Mobile computing |                                               |
| Quality of service |                                             |
| Software radio |                                               |
| TV |                                                   |
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>Term</th>
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<tr>
<td>Telecommunication network management</td>
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<td><strong>Telecommunication congestion control</strong></td>
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<tr>
<td><strong>UF</strong>: Telecom congestion control</td>
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<tr>
<td><strong>BT</strong>: Telecommunication</td>
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<tr>
<td>network topology</td>
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<tr>
<td><strong>NT</strong>: Call admission control</td>
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<tr>
<td><strong>Telecommunication control</strong></td>
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<tr>
<td><strong>UF</strong>: Telecom control</td>
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<tr>
<td><strong>BT</strong>: Communication system</td>
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<tr>
<td>control</td>
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<tr>
<td><strong>RT</strong>: Telecommunication computing</td>
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<td><strong>UF</strong>: Telecom network management</td>
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<td><strong>BT</strong>: Telecommunication</td>
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<tr>
<td>network topology</td>
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<td><strong>RT</strong>: Management information base</td>
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<td><strong>NT</strong>: Mobile nodes</td>
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<td><strong>UF</strong>: Communication network reliability</td>
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<td><strong>BT</strong>: Telecom network reliability</td>
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<td><strong>RT</strong>: Reliability</td>
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<tr>
<td><strong>UF</strong>: Telecom network topology</td>
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<tr>
<td><strong>BT</strong>: Telecommunications</td>
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<tr>
<td><strong>RT</strong>: Dynamic spectrum access</td>
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<td><strong>Network topology</strong></td>
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<tr>
<td><strong>NT</strong>: Intelligent networks</td>
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<tr>
<td><strong>UF</strong>: Telecom services</td>
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<tr>
<td><strong>BT</strong>: Telecommunications</td>
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<tr>
<td><strong>RT</strong>: Radio access networks</td>
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<tr>
<td><strong>NT</strong>: Acoustic communication</td>
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<tr>
<td>(<strong>telecommunication</strong>)</td>
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<td><strong>Number portability</strong></td>
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<tr>
<td><strong>UF</strong>: Telecom switching</td>
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<td><strong>Traffic load</strong></td>
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<td><strong>BT</strong>: Telecommunication</td>
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<td><strong>network topology</strong></td>
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<td><strong>RT</strong>: Communication system traffic</td>
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<td><strong>UF</strong>: Telecom</td>
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<tr>
<td><strong>BT</strong>: Communication systems</td>
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<td><strong>RT</strong>: Convolutional codes</td>
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<tr>
<td><strong>Diversity reception</strong></td>
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<td><strong>Film bulk acoustic resonators</strong></td>
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<td><strong>Global Positioning System</strong></td>
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<td><strong>Helical antennas</strong></td>
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<td><strong>Multiaccess communication</strong></td>
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<td><strong>Multicarrier code division</strong></td>
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<td>Term</td>
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<td>RT: Deep-space communications</td>
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<td>NT: Ambient intelligence</td>
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<tr>
<td><strong>Imaging</strong></td>
<td><strong>Multivalued logic</strong></td>
</tr>
</tbody>
</table>

### Terbium

<table>
<thead>
<tr>
<th>BT:</th>
<th>USE:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical elements</strong></td>
<td><strong>Multivalued logic</strong></td>
</tr>
</tbody>
</table>

### Termination of employment

<table>
<thead>
<tr>
<th>UF:</th>
<th>BT:</th>
<th>RT:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dismissal (employment)</strong></td>
<td><strong>Security</strong></td>
<td><strong>Pensions</strong></td>
</tr>
<tr>
<td><strong>Redundancy (employment)</strong></td>
<td><strong>Biohazards</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td><strong>Surveillance</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Human resource management</strong></td>
<td><strong>Threat assessment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Pensions</strong></td>
<td><strong>US Department of Homeland Security</strong></td>
<td></td>
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</tbody>
</table>

### Termination of employment

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<td><strong>US Department of Homeland Security</strong></td>
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### Terrorism

<table>
<thead>
<tr>
<th>UF:</th>
<th>BT:</th>
<th>RT:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9/11</strong></td>
<td><strong>Security</strong></td>
<td><strong>Weapons</strong></td>
</tr>
<tr>
<td><strong>9/11 attack</strong></td>
<td><strong>Biohazards</strong></td>
<td><strong>Bioterrorism</strong></td>
</tr>
<tr>
<td><strong>911 attack</strong></td>
<td><strong>Surveillance</strong></td>
<td><strong>Cyber terrorism</strong></td>
</tr>
<tr>
<td><strong>September 11</strong></td>
<td><strong>Threat assessment</strong></td>
<td><strong>National security</strong></td>
</tr>
<tr>
<td><strong>Terrorist</strong></td>
<td><strong>US Department of Homeland Security</strong></td>
<td><strong>Weapons</strong></td>
</tr>
</tbody>
</table>

### Ternary logic

<table>
<thead>
<tr>
<th>USE:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terrorism</strong></td>
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</table>

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Test data compression
    BT: Data compression

Test equipment
    BT: Testing
    RT: Oscilloscopes
    NT: Automatic test equipment

Test facilities
    BT: Testing
    NT: Anechoic chambers
    Laboratories
    Large Hadron Collider
    Open area test sites
    TEM cells
    Wind tunnels

Test generation
    USE: Test pattern generators

Test pattern generators
    UF: Test generation
    BT: Automatic test pattern

Text analysis
    USE: Test categorization

Text categorization
    UF: Text classification
    BT: Text analysis
    RT: Data analysis

Text classification
    USE: Text categorization

Text messaging
    USE: Electronic messaging

Text mining
    BT: Data mining
    RT: Triples (Data structure)

Text processing
    UF: Photocomposition
    Word processing
    BT: Data processing
    RT: Desktop publishing
    Document handling
    Office automation
    Publishing
    Text recognition
    NT: Typesetting

Text recognition
    BT: Pattern recognition
    RT: Character recognition
    Text processing

Test equipment testing
    Software testing
    System testing
    Test equipment
    Test facilities

Text analysis
    Data mining
    Naive Bayes methods

Text categorization
    Text classification

Text classification
    USE: Text categorization

Text messaging
    USE: Electronic messaging

Text mining
    BT: Data mining
    RT: Triples (Data structure)

Text processing
    UF: Photocomposition
    Word processing
    BT: Data processing
    RT: Desktop publishing
    Document handling
    Office automation
    Publishing
    Text recognition
    NT: Typesetting

Text recognition
    BT: Pattern recognition
    RT: Character recognition
    Text processing

Textile fibers
    UF: Fibers
    Textile fibres
    BT: Textiles
    RT: Cotton
    Spinning
    Textile products
    Textile technology
    Weaving

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2021 IEEE Thesaurus

Wool
NT: Natural fibers
Synthetic fibers
Yarn

Textile fibres
USE: Textile fibers

Textile industry
BT: Manufacturing industries
RT: Clothing industry
Cotton
Spinning machines
Textile machinery
Textile products
Textile technology
Weaving

Textile machinery
BT: Machinery
RT: Needles
Textile industry
Textile products
Textile technology
Textiles
NT: Spinning machines

Textile products
UF: Technical textiles
BT: Manufactured products
RT: Textile fibers
Textile industry
Textile machinery
Textile technology
Textiles

Textile technology
BT: Industries
RT: Bleaching
Textile fibers
Textile industry
Textile machinery
Textile products
Textiles
NT: Spinning
Weaving

Textiles
BT: Materials
RT: Spinning machines
Textile machinery
Textile products
Textile technology
Weaving
NT: Cotton

Fabrics
Textile fibers
Wool

TFETs
UF: Tunnel field effect
transistors
BT: Field effect transistors
RT: MOSFET

TFT
USE: Thin film transistors

Thalamus
BT: Brain

Thallium
BT: Chemical elements

Theodolites
BT: Instruments
RT: Geodesy
Geologic measurements
Geophysical measurement techniques

Theoretical neuroscience
USE: Computational neuroscience

Therapy
USE: Medical treatment

Thermal analysis
BT: Thermal variables control
NT: Thermomechanical processes

Thermal conductivity
BT: Thermal factors
RT: Grain boundaries
Thermal resistance
NT: Heat transfer

Thermal decomposition
BT: Thermolysis

Thermal degradation
BT: Thermolysis

Thermal energy
BT: Heating systems
RT: Energy
Kinetic energy
Thermal engineering
Thermal engineering
  BT:  Engineering - general
  RT:  Cooling
  Heat recovery
  Heating systems
  Thermal energy
  Thermal factors
  Thermal variables control
  Thermal variables

Thermal expansion
  BT:  Thermal factors
  RT:  Electrothermal actuators
  NT:  Thermal force

Thermal factors
  UF:  High-temperature effects
  BT:  Physics
  RT:  Annealing
  Critical current density
  Heat treatment
  Proton effects
  Pyroelectricity
  Superconducting devices
  Superconducting materials
  Temperature control
  Thermal engineering
  Thermal stability
  Thermal variables control
  Thermal variables

measurement
  NT:  Temperature
  Temperature dependence
  Thermal conductivity
  Thermal expansion
  Thermal management
  Thermal stresses
  Thermoelasticity
  Thermoelectricity
  Thermolysis
  Thermooptic effects
  Thermostresistivity

Thermal force
  BT:  Thermal expansion

Thermal loading
  BT:  Thermal stresses

Thermal management
  BT:  Thermal factors
  RT:  Enthalpy
  Reliability

Thermal management of electronics
  BT:  Components, packaging, and manufacturing technology
  NT:  Electronic packaging
  thermal management
  Electronics cooling

Thermal noise
  UF:  Johnson Nyquist noise
  BT:  Circuit noise
  RT:  Conductors

Thermal plumes
  USE:  Thermal pollution

Thermal pollution
  UF:  Heat islands
  Thermal plumes
  Urban heat islands
  BT:  Pollution
  RT:  Air pollution
  Global warming
  Industrial pollution
  Marine pollution
  Waste heat
  Water pollution

Thermal quenching
  BT:  Cooling

Thermal resistance
  BT:  Resistance
  RT:  Thermal conductivity

Thermal sensors
  BT:  Sensors
  NT:  Electrothermal actuators
  Temperature sensors

Thermal shock
  BT:  Shock (mechanics)
  Thermal stresses

Thermal spraying
  BT:  Spraying

Thermal stability
<table>
<thead>
<tr>
<th>BT: Temperature sensors</th>
<th>Integrated circuits</th>
<th>( \text{RT: Hybrid integrated circuits} )</th>
</tr>
</thead>
</table>

**Thermonuclear fusion**

USE: Fusion reactors

**Thermooptic effects**

UF: Thermo-optic effects

BT: Thermal factors

RT: Birefringence

Optical propagation

Optical reflection

Optical refraction

Thermooptical devices

NT: Thermal lensing

Thermochromism

Thermoreflectance

**Thick film devices**

BT: Electron devices

RT: Thick film circuits

Thick films

NT: Thick film inductors

**Thick film inductors**

BT: Inductors

RT: Thick film devices

Microstrip components

Thick film circuits

Thick films

**Thick film sensors**

UF: Thick-film sensors

BT: Sensors

**Thick films**

BT: Films

RT: Dielectric films

Semiconductor films

Superconducting films

Thick film devices

Thick film inductors

**Thick-film sensors**

USE: Thick film sensors

**Thermooptical devices**

UF: Thermo-optical devices

BT: Integrated optics

Optical switches

Solid lasers

Thermooptic effects

**Thermoresistivity**

BT: Thermal factors

RT: Temperature measurement

Thermistors

**Thermorefractive imaging**

BT: Optical imaging

RT: Spectroscopy

**Thermoresistivity**

BT: Thermal factors

RT: Temperature measurement

Thermistors

**Thermostats**

BT: Control equipment

**Thesauri**

UF: Thesaurus

BT: Knowledge representation

Writing

RT: Ontologies

**Thesaurus**

USE: Thesauri

**Thick film circuits**

BT: Circuits

Integrating circuits

Integrated circuits

RT: Thick film inductors

**Thin film circuits**

BT: Circuits

Integrating circuits

RT: Hybrid integrated circuits

Silicon-on-insulator

Thin film devices

Thin film inductors

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2021 IEEE Thesaurus

**Thin film deposition**
USE: Sputtering

**Thin film devices**
- BT: Electron devices
- RT: Amorphous semiconductors
- Doping profiles
- Giant magnetoresistance
- Thin film circuits
- Thin films
- NT: Film bulk acoustic resonators
- Thin film inductors
- Thin film transistors

**Thin film inductors**
- BT: Inductors
- Thin film devices
- RT: Thin film circuits
- Thin films

**Thin film sensors**
- BT: Sensors

**Thin film transistors**
- UF: TFT
- Thin-film transistors
- BT: Active matrix technology
- Field effect transistors
- Thin film devices
- RT: Displays
- Liquid crystal devices
- NT: Organic thin film transistors

**Thin films**
- BT: Films
- RT: Diamond-like carbon
- Dielectric films
- Epitaxial layers
- Magnetic films
- Metasurfaces
- Molecular beam epitaxial growth
- Molecular beams
- Self-assembly
- Semiconductor films
- Superconducting films
- Superconducting thin films
- Thin film devices
- Thin film inductors
- NT: Buffer layers
- Epitaxial growth
- Semiconductor thin films

**Thin-film transistors**
USE: Thin film transistors

**Third generation mobile communication**
USE: 3G mobile communication

**Thomson effect**
- BT: Temperature measurement

**Thorax**
- BT: Body regions
- Skeleton
- NT: Ribs
- Sternum

**Thorium**
- BT: Chemical elements

**Threat assessment**
- BT: Risk analysis
- RT: Law enforcement
- Terrorism

**Three dimensional displays**
USE: Three-dimensional displays

**Three dimensional integrated circuits**
USE: Three-dimensional integrated circuits

**Three-dimensional displays**
- UF: 3-D displays
- 3-D modeling
- 3-D reconstruction
- 3D displays
- 3D modeling
- 3D reconstruction
- Three dimensional displays
- BT: Displays
- RT: Reconstruction algorithms
- Shadow mapping
- Sprites (computer)
- Structure from motion
- NT: Bundle adjustment
- X3D

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Three-dimensional integrated circuits
UF: 3D integrated circuits
Three-dimensional integrated circuits
BT: Integrated circuits

Three-dimensional printing
UF: 3D printing
Additive manufacturing
BT: Manufacturing systems
Printing
RT: Ink jet printing
Rapid prototyping

Three-dimensional television
BT: TV

Three-dimensional vision
USE: Stereo vision

Three-phase electric power
BT: Power electronics
RT: Conductors
Voltage control

Three-term control
BT: Process control

Threshold current
BT: Current
RT: Electron devices
Lasers

Threshold voltage
BT: Voltage
Integrated circuit noise
MOSFET circuits
Transistors
NT: Subthreshold current

Thresholding (Imaging)
BT: Image segmentation
RT: Image edge detection

Thrombosis
BT: Medical conditions

Through-silicon vias
UF: TSV
BT: Integrated circuits

Throughput
UF: Network throughput
Communication channels

Thymel (communication systems)
USE: Information rates

Thulium
BT: Chemical elements

Thumb
BT: Fingers

Thyratrons
BT: Electron tubes
RT: Gas discharge devices

Thyristor circuits
BT: Circuits
RT: Thyristors

Thyristors
UF: Diacs
SCR
Semiconductor controlled rectifiers
Silicon controlled rectifiers
Triacs
BT: Power semiconductor
switches
RT: Thyristor circuits
NT: Photothyristors

Thyroid
BT: Glands

Ti
USE: Titanium

Tides
BT: Oceans
RT: Ocean circulation

Tiles
BT: Building materials
Ceramic products
Ceramics
Floors

Timbre
BT: Music

Time complexity
BT: Computational complexity
RT: Computational modeling
NT: Reversible computing

Time delay
USE: Delay effects

Time difference of arrival
UF: Time-difference-of-arrival
BT: Object detection

Time dissemination
BT: Time measurement
RT: Satellite navigation systems
Synchronization

Time division multiplexed
USE: Time division multiple access

Time division multiple access
UF: Time division multiaccess
BT: Multiaccess communication

Time domain analysis
USE: Time-domain analysis

Time factors
BT: System analysis and design
RT: Bang-bang control
NT: Continuous time systems
Discrete-time systems
Time invariant systems
Time-varying systems

Time frequency analysis
USE: Time-frequency analysis

Time invariant systems
BT: Time factors

Time measurement
BT: Measurement
RT: Time-frequency analysis
Watches
Clocks
Time dissemination
Timing

Time of arrival estimation
UF: TOA estimation
BT: Parameter estimation
RT: Array signal processing
Direction-of-arrival estimation
Signal detection

Time series analysis
UF: time-series analysis
BT: Statistics
RT: Autocorrelation
Autoregressive processes
Chaotic communication
Modeling
Random processes
Spectral analysis
Statistical analysis

Time sharing computer systems
UF: Time-sharing computer systems
BT: Computers and information processing
RT: Mainframes

Time to market
BT: Design methodology
Product development
Concurrent engineering

Time varying circuits
BT: Circuits

Time varying systems
USE: Time-varying systems

Time warp simulation
BT: Discrete event simulation

Time-difference-of-arrival
USE: Time difference of arrival
## Time-domain analysis

**UF:** FDTD

**BT:** Electromagnetic analysis

**RT:** Phase noise

State-space methods
Waves

### Time-frequency analysis

**UF:** Time frequency analysis

**BT:** Frequency-domain analysis

**RT:** Biomedical signal processing

Fourier transforms
Frequency measurement
Image processing
Power systems
Time measurement
Video signal processing

### Time-of-arrival estimation

**USE:** Time of arrival estimation

### time-series analysis

**USE:** Time series analysis

### Time-sharing computer systems

**USE:** Time sharing computer systems

### Time-sharing systems

**USE:** Time sharing computer systems

### Time-varying channels

**BT:** Communication channels

**RT:** Mobile communication

Wireless LAN

### Time-varying systems

**UF:** Time varying systems

**BT:** Time factors

**RT:** Control systems

**NT:** Switched systems

### Timing

**BT:** Time measurement

**RT:** Clocks

Logic design
System dynamics
Timing jitter

**NT:** Bit rate

Delays
Synchronization

### Timing jitter

**BT:** Jitter

**RT:** Timing

### Tin

**UF:** Sn

**BT:** Metals

**NT:** Tin alloys

Tin compounds

### Tin alloys

**BT:** Tin

**RT:** Alloying

**NT:** Niobium-tin

### Tin compounds

**BT:** Tin

### Tire pressure

**BT:** Pressure measurement

Tires

**UF:** Tyres

**BT:** Mechanical products

Rubber products

**RT:** Automobile manufacture

Automotive components

Vehicles

Wheels

**NT:** Tire pressure

### Tissue damage

**BT:** Lesions

### Tissue engineering

**UF:** Tissue scaffolds

**BT:** Biomedical engineering

**RT:** Biological materials

Colloidal lithography

Diamond-like carbon

Genetic engineering

**NT:** Regeneration engineering

### Tissue scaffolds

**USE:** Tissue engineering

### Tissues

**USE:** Biological tissues

### Titanates

**USE:** Titanium compounds

### Titania

**USE:** Titanium dioxide
Titanium
- UF: Ti
- BT: Chemical elements
- Metals
- NT: Titanium alloys
  - Titanium compounds
  - Titanium dioxide
  - Titanium nitride

Titanium alloys
- BT: Titanium
- RT: Alloying

Titanium compounds
- UF: Titanates
- BT: Titanium

Titanium dioxide
- UF: Titania
- BT: Titanium

Titanium nitride
- BT: Titanium

TMR
- USE: Tunneling magnetoresistance

TOA estimation
- USE: Time of arrival estimation

Toddler
- USE: Pediatrics

Tokamak devices
- BT: Tokamaks
- RT: Magnetic confinement
  - Toroidal magnetic fields

Tokamaks
- BT: Fusion reactors
- Plasma applications
- Plasma devices
- RT: Magnetic confinement
- Plasma simulation
- NT: Tokamak devices

Token networks
- BT: Communication systems
- Computer networks
- Digital systems
- RT: Local area networks
  - Metropolitan area networks
  - Wide area networks

Tokenization
- BT: Data security
- Natural language processing

Tolerance analysis
- UF: Circuit tolerance analysis
- Tolerating problems
- BT: Manufacturing
- RT: Circuit analysis
- Circuit optimization
- Semiconductor device breakdown
- Sensitivity

Tolerating problems
- USE: Tolerance analysis

Tomographic
- USE: Tomography

Tomography
- UF: Tomographic
- BT: Imaging
- RT: Biomedical imaging
- Geophysical measurement techniques
- Image reconstruction
tomography
- Electrical capacitance
tomography
tomography
- Optical coherence
tomography
- Positron emission
- Reconstruction algorithms

Tomosynthesis
- USE: Biomedical imaging

Tongue
- BT: Digestive system
- RT: Stomatognathic system

Tools
- BT: Manufactured products
- NT: Hand tools

Tooth
- USE: Teeth

Topography (earth)
USE: Terrain mapping

Topological insulators
BT: Insulators

Topology
BT: Mathematics
RT: Graph theory
Morphological operations

TOPSIS
UF: Technique for order of preference by simularity to ideal solution
BT: Decision theory
RT: Decision making
Fuzzy set theory
Operations research
Optimization

Tornado
USE: Tornadoes

Tornadoes
UF: Tornado
Tornados
BT: Geoscience

Tornadoes
USE: Tornadoes

Toroidal magnetic fields
BT: Magnetic fields
RT: Tokamak devices

Torpedoes
USE: Missiles

Torque
BT: Mechanical factors
Torque control
RT: Torque converters
Torque measurement

Torque control
control
BT: Mechanical variables
RT: Motor drives
Torque

Torque converters
UF: Torque convertors
BT: Mechanical power
transmission
RT: Automotive components
Drives

Engineers (IEEE) for the benefit of humanity.
USE: Tactile sensors

Tourism industry
    BT: Industries

Towers
    USE: Poles and towers

Town gas
    USE: Coal gas

Toxic chemicals
    BT: Chemical hazards
    Toxicology

Toxicology
    UF: Poisons
    BT: Hazards
    RT: Chemical hazards
    Hazardous materials
    Occupational health
    Pollution
    NT: Toxic chemicals

Toy industry
    BT: Industries

Toy manufacturing industry
    UF: Toys
    BT: Manufacturing industries
    RT: Electronics industry

Toys
    USE: Toy manufacturing industry

TQM
    USE: Total quality management

Tracheal intubation
    USE: Intubation

Tracking
    BT: Motion measurement
    RT: Iterative learning control
    Maximum likelihood estimation
    Particle tracking
    Position measurement
    Tracking loops
    Velocity measurement
    NT: Object tracking
    Target tracking
    Trajectory tracking
    Underwater tracking
    Video tracking

Tracking loops
    UF: Delay lock loops
    BT: Linear feedback control systems
    Signal processing
    Modulation
    Synchronization
    Tracking

Traction motors
    BT: Motors
    RT: Battery powered vehicles
    Fuel cell vehicles
    Hybrid electric vehicles
    Propulsion
    Solar powered vehicles

Traction power supplies
    BT: Power supplies

Tractors
    USE: Agricultural machinery

Trade
    USE: Business

Trade (international)
    USE: International trade

Trade agreements
    UF: Free trade
    GATT
    General agreement on
    tariffs and trade
    BT: Economics
    RT: Globalization
    International collaboration
    International trade
    Tariffs

Trade unions
    USE: Industrial relations

Trademarks
    BT: Law
    Legal factors
    RT: Copyright protection

Traffic congestion
    BT: Road transportation
    RT: Traffic control

Traffic control
    UF: Traffic pattern
Traffic simulation
  BT: Control systems
  RT: Communication systems
  Computer network

Traffic congestion
  NT: Queueing analysis
  Road traffic control
  Vehicle routing

Traffic load
  USE: Telecommunication traffic

Traffic pattern
  USE: Traffic control

Traffic simulation
  USE: Traffic control

Training
  UF: Technician training
  BT: Education
  RT: Accreditation
    Continuing education
    Continuing professional
dev
  Electronic learning
  Learning management

Training data
  BT: Data analysis

Trajectory
  BT: Path planning
  RT: Motion control
    Object tracking
  NT: Trajectory optimization

Trajectory optimization
  BT: Optimization
  Trajectory

Trajectory planning
  BT: Path planning

Trajectory tracking
  BT: Path planning
  Tracking
  RT: Motion control
  Robot control

Trans human
  USE: Transhuman

Trans-human
  USE: Transhuman

Transaction databases
  BT: Databases
  NT: Itemsets

Transaction control
  USE: Transactive energy

Transactive energy
  UF: Transactive control
  BT: Energy management
  RT: Power distribution
    Power markets
    Power system economics
    Smart grids

Transceivers
  BT: Communication equipment
  RT: Land mobile radio
equipmen
  Mobile communication
  Mobile handsets
  Software radio
  NT: Radio transceivers

Transcoding
  BT: Encoding
  RT: Data compression
    Image coding
    Multimedia communication
    Video coding

Transconductance
  UF: Mutual conductance
  BT: Conductivity
  RT: Transconductors

Transconductors
  BT: CMOS integrated circuits
  RT: Transconductance

Transcranial direct current stimulation
  BT: Neuroscience
  Neurostimulation
<table>
<thead>
<tr>
<th>Term</th>
<th>Branch of Knowledge (BT)</th>
<th>Real-Time (RT)</th>
<th>Notation (NT)</th>
<th>Use (USE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcranial magnetic stimulation</td>
<td>Neuroscience</td>
<td>Neurostimulation</td>
<td></td>
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<tr>
<td>Transducers</td>
<td>Electronic components</td>
<td>Electric variables</td>
<td>Measurement</td>
<td></td>
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<tr>
<td></td>
<td>Measurement</td>
<td>Mechanical variables</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Solenoids</td>
<td>Temperature sensors</td>
<td>Thermal variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NT: Acoustic transducers</td>
<td>Biomedical transducers</td>
<td>Capacitive transducers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical transducers</td>
<td>Inductive transducers</td>
<td>Piezoelectric transducers</td>
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<td></td>
<td>Resistive transducers</td>
<td>Ultrasonic transducer</td>
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<tr>
<td>Transformer cores</td>
<td>Magnetic cores</td>
<td>Magnetic devices</td>
<td>Power transformers</td>
<td>Transformers</td>
</tr>
<tr>
<td>Transformer oil</td>
<td>USE: Oil insulation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Transformer windings</td>
<td>USE: Windings</td>
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**Translational science**

**Transmembrane potential**

**Transmembrane potential**

**Transmembrane potential**

**Transmembrane potential**
### 2021 IEEE Thesaurus

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<td>BT: Communication equipment</td>
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<td>RT: Linearization techniques</td>
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<td>Traveling wave tubes</td>
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<tr>
<td>BT: NP-hard problem</td>
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<tr>
<td>RT: Optimization methods</td>
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<td>Shortest path problem</td>
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### 2021 IEEE Thesaurus

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<tr>
<th>BT: Electron tubes</th>
<th>BT: Cooling Heating systems Power generation</th>
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<td>Triples (Data structure)</td>
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<td>UF: SPO</td>
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<td>RT: Circuit topology</td>
<td>Semantic triple Subject predicate object</td>
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<td>Triplestore BT: Data storage systems</td>
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<tr>
<td>USE: Decision trees</td>
<td>Database systems Information retrieval</td>
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<tr>
<td>Trees (botanical)</td>
<td>Metasearch Relational databases</td>
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<td>USE: Vegetation</td>
<td>Text mining</td>
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<tr>
<td>Trees - insulation</td>
<td>Triplestore USE: Triples (Data structure)</td>
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<td>UF: Water trees</td>
<td>Tritium batteries USE: Atomic batteries</td>
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<td>BT: Insulators</td>
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<tr>
<td>RT: Humidity</td>
<td>UF: Trojans BT: Malware RT: Cyber espionage</td>
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<td>Insulation life</td>
<td>Trojan horses USE: Trojan horses</td>
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<td>Moisture</td>
<td>Trolley cars USE: Public transportation</td>
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<td>Trellis codes</td>
<td>Tropical cyclones</td>
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<tr>
<td>USE: Convolutional codes</td>
<td>UF: Cyclonic storms Storm systems Tropical depressions Tropical storms</td>
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<td>Triacs</td>
<td>BT: Cyclones</td>
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<td>USE: Thyristors</td>
<td>Tropical depressions USE: Tropical cyclones</td>
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<td>Triboelectricity</td>
<td>Tropical storms USE: Tropical cyclones</td>
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<tr>
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<td>UTE: Tropical cyclones</td>
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<td>Electrostatic processes</td>
<td>Troposphere USE: Terrestrial atmosphere</td>
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<td>Surface charging</td>
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<td>RT: Nanogenerators</td>
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<td>Tribology</td>
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<td>BT: Motion measurement</td>
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<td>Trigen</td>
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<tr>
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<td>UF: CHCP Combined heat, cooling</td>
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<td>and power Combined heat, cooling,</td>
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2021 IEEE Thesaurus

Truncation errors
USE: Finite wordlength effects

Trust management
BT: Decision making
Information security
RT: Access control
Computer security
Cryptography
Privacy
NT: Trusted computing

Trusted computing
BT: Computer security
Trust management

Tsunami
BT: Geoscience

TSV
USE: Through-silicon vias

Tubes
USE: Electron tubes

Tumor
USE: Tumors

Tumor cells
USE: Tumors

Tumor detection
USE: Tumors

Tumors
UF: Tumor
Tumor cells
Tumor detection
Tumours
BT: Medical conditions
Cancer
Medical diagnostic imaging
Oncology
Positron emission tomography
computed tomography
Single photon emission

Tunables circuits and devices
BT: Circuits and systems
Frequency control
Inductors
Tuners
Tuning
NT: RLC circuits
Tuned circuits

Tuned circuits
BT: Tunable circuits and devices

Tuners
BT: Instruments
Tuning
RT: Frequency control
Frequency synthesizers
Resonators
Tuned circuits and devices

Tungsten
UF: Wolfram
BT: Metals

Tuning
BT: Frequency control
Tunable circuits and devices
RT: Tunable circuits and devices
NT: Laser tuning
Optical tuning
Tuners

Tuning forks
USE: Vibrations

Tunnel effect
USE: Tunneling

Tunnel field effect transistors
USE: TFETs

Tunneling
UF: Tunnel effect
BT: Electron devices
Quantum mechanics
RT: Quantum well devices
Semiconductor materials
NT: Gate leakage
Josephson effect
Magnetic tunneling
Resonant tunneling devices
# 2021 IEEE Thesaurus

## Superconductive tunneling
- Tunneling

## Tunneling magnetoresistance
- **UF:** TMR
- **BT:** Magnetoresistance
- **RT:** Magnetoresistive devices

## Turbines
- **BT:** Turbomachinery
- **RT:** Aircraft propulsion
- **Compressors**
- **Wind energy**
- **Wind turbines**

## Turbogenerators
- **USE:** Turbogenerators

## Turbo codes
- **BT:** Channel coding
- **RT:** Error correction
- **Viterbi algorithm**

## Turbo generators
- **USE:** Turbogenerators

## Turbomachinery
- **UF:** Turbomachine blades
- **BT:** Power generation
- **Blades**
- **Compressors**
- **Engines**
- **Motor shaft**
- **Pumps**
- **NT:** Turbines
- **Turbogenerators**

## Turbulent media
- **USE:** Random media

## Turing machines
- **BT:** Automata
- **RT:** Digital computers

## Turning
- **BT:** Machining
- **RT:** Boring
- **Machine tools**

## Turnkey project
- **BT:** Project engineering
- **Project management**

## Tutorials
- **BT:** Educational programs
- **IEEE indexing**

## TV
- **UF:** Mobile television
- **TV broadcasting**
- **Television**
- **BT:** Communications
technology
- **RT:** Closed captioning
- **Electronic learning**
- **Entertainment industry**
- **Flat panel displays**
- **HbbTV Standards**
- **Image communication**
- **Must-carry**
- **TV equipment**
- **Telecommunication**

## TV broadcasting
- **USE:** TV

## TV equipment
- **BT:** Communication equipment
- **RT:** TV
- **Video equipment**

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Large screen displays
TV receivers

TV interference
BT: Interference
RT: Echo interference
gaussian noise

TV receivers
BT: TV equipment

Twitter
USE: Blogs AND
Social networking (online)

Two dimensional displays
UF: 2-D displays
2D displays
Two-dimensional displays
BT: Displays
RT: Sprites (computer)
Structure from motion

Two dimensional hole gas
UF: 2-d hole gas
2d hole gas
BT: Quantum well devices
RT: Quantum well lasers
Quantum wells

Two dimensional photonic crystals
USE: Photonic crystals

Two-dimensional displays
USE: Two dimensional displays

Two-dimensional electron gas FETs
USE: MODFETs
television

Two-dimensional photonic crystals
USE: Photonic crystals

Two-term control
BT: Process control

Type II superconductors
BT: Superconducting materials
RT: Flux pinning
Niobium

Type interference
USE: Reasoning about programs

Type testing
USE: Conformance testing

Typesetting
BT: Text processing
RT: Printing

Tyres
USE: Tires

Uber
USE: Public transportation

Ubicomp
USE: Pervasive computing

Ubiquitous computing
UF: Ubiquitous wireless*
BT: Pervasive computing
RT: Ambient intelligence
NT: Context-aware services

Ubiquitous wireless*
USE: Ubiquitous computing

UDN
USE: Ultra-dense networks

UHD
USE: UHDTV

UHDTV
UF: 4K UHD
8K UHD
Super hi-vision
UHD
Ultra HD
Ultra HD TV
Ultra-high definition TV
Ultra-high definition
television

BT: HDTV
RT: ITU Standards
TV

UHF antennas
BT: Antennas
UHF technology
UHF devices

UHF circuits
UF: Ultra-high-frequency
circuits
BT: Circuits
UHF technology
UHF devices

RT: Analog circuits

NT: UHF integrated circuits
<table>
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<td>Ultra-high-frequency</td>
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## 2021 IEEE Thesaurus

### Ultrawideband communication
- **BT**: Ultra wideband technology
- **RT**: Broadband communication
- **Military communication**: Multipath channels
- **Spread spectrum**: Military communication

### Ultra wideband radar
- **UF**: UWB radar
- **BT**: Radar
- **RT**: Ground penetrating radar
- **Synthetic aperture radar**: Radar imaging
- **Ultra wideband antennas**: Radar detection

### Ultra wideband technology
- **UF**: UWB technology
- **BT**: Communications
- **RT**: Ultra wideband technology

### Ultra-dense networks
- **UF**: UDN
- **BT**: Cellular networks
- **RT**: 5G mobile communication

### Ultra-high definition television
- **USE**: UHDTV

### Ultra-high definition TV
- **USE**: UHDTV

### Ultra-high definition video
- **BT**: High definition video

### Ultra-high-frequency circuits
- **USE**: UHF circuits

### Ultra-high-frequency communication

### Ultra-high-frequency devices
- **USE**: UHF devices

### Ultra-high-frequency integrated circuits
- **USE**: UHF integrated circuits

### Ultra-high-frequency measurements
- **USE**: UHF measurements

### Ultra-high-frequency technology
- **USE**: UHF technology

### Ultra-low power
- **USE**: Low-power electronics

### Ultra-reliable low latency communication
- **USE**: Ultra reliable low latency communication

### Ultra-wide-band
- **USE**: Ultra wideband technology

### Ultracapacitors
- **USE**: Supercapacitors

### Ultrafast electronics
- **BT**: High-speed electronics

### Ultrafast optics
- **BT**: Optics

### Ultrasonic applications
- **USE**: Acoustic applications

### Ultrasonic devices
- **USE**: Acoustic devices

### Ultrasonic imaging
- **UF**: Ultrasonic techniques
- **USE**: Ultrasound

---

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<table>
<thead>
<tr>
<th>BT:</th>
<th>Ultrasonics, ferroelectrics, and frequency control</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT:</td>
<td>Amniocentesis</td>
</tr>
<tr>
<td></td>
<td>Biomedical imaging</td>
</tr>
<tr>
<td>NT:</td>
<td>Ultrasonography</td>
</tr>
</tbody>
</table>

**Ultrasonic techniques**

**USE:** Ultrasonic imaging

**Ultrasonic transducer arrays**

**BT:** Transducers

**Ultrasonic transducers**

**BT:** Ultrasonics, ferroelectrics, and frequency control

**RT:** Nondestructive testing

**Piezoelectricity**

**Sonar**

**Ultrasonic variables measurement**

**BT:** Measurement

**Ultrasonics**

**USE:** Acoustics

**Ultrasonics, ferroelectrics, and frequency control**

**NT:** Ferroelectric materials

**Frequency control**

**Piezoelectricity**

**Pyroelectricity**

**Ultrasonic imaging**

**Ultrasonic transducers**

**Ultrasonography**

**BT:** Biomedical image processing

**Ultrasonic imaging**

**NT:** Sonogram

**Ultrasound**

**USE:** Ultrasonic imaging

**Ultraviolet sources**

**UF:** UV sources

**Ultra violet**

**Ultra-violet**

**BT:** Light sources

**RT:** Lamps

**Lasers**

**Ultrawideband**

**USE:** Ultra wideband technology

**Ultrawideband antennas**

**USE:** Ultra wideband antennas

**Ultrawideband communication**

**USE:** Ultra wideband communication

**Ultrawideband radar**

**USE:** Ultra wideband radar

**Ultrawideband technology**

**USE:** Ultra wideband technology

**Umbilical cable**

**UF:** Power supplies to apparatus

**BT:** Power supplies

**UML**

**USE:** Unified modeling language

**UMTS**

**USE:** 3G mobile communication

**Uncertain systems**

**UF:** Parameter uncertainty

**BT:** Mathematics

**RT:** Control systems

**Linear matrix inequalities**

**Robustness**

**Uncertainty**

**BT:** Probability

**RT:** Cognitive science

**Fuzzy sets**

**Nonlinear dynamical systems**

**Uncertain systems**

**NT:** Evidence theory

**Forecast uncertainty**

**Underarm**

**USE:** Axilla

**Underground communication cables**

**USE:** Communication cables

**Underground object detection**

**USE:** Buried object detection

**Underground objects**

**USE:** Buried object detection

**Underground power cables**

**BT:** Power cables
Undersea communication
USE: Underwater communication

Underwater acoustics
BT: Acoustics

Underwater autonomous vehicles
USE: Autonomous underwater vehicles

Underwater cables
UF: Marine cables
Sub-sea cables
Submarine cables
Subsea cables
BT: Cables
Marine technology

Underwater communication
UF: Undersea communication
BT: Communication systems
Marine technology
Underwater technology

Underwater equipment
UF: Diving equipment
Flotation devices
BT: Marine technology
Underwater technology
RT: Underwater vehicles
NT: Rebreathing equipment

Underwater exploration robots
USE: Unmanned underwater vehicles

Underwater robots
USE: Unmanned underwater vehicles

Underwater sensor networks
USE: Wireless sensor networks

Underwater structures
BT: Marine technology
Underwater technology

Underwater technology
UF: Submarine technology
BT: Marine technology

Underwater tracking
BT: Tracking

Underwater vehicles
UF: Aquatic vehicles
Submarines
Submersibles
BT: Marine vehicles
RT: Marine robots
Marine technology
Underwater equipment
Underwater technology

Undulators
UF: Wiggler magnets
BT: Magnetic devices
Synchrotrons
RT: Free electron lasers
X-rays

Unemployment
BT: Human resource management

Uniaxial strain
BT: Strain

Unicast
BT: Computer networks
RT: Streaming media

Unified messaging
BT: Electronic mail
Electronic messaging

Unified modeling language
UF: UML
BT: Specification languages
RT: Client-server systems
Common Information Model (electricity)

Uniform Resource Identifier
USE: Uniform resource locators

Uniform resource locators
UF: URL
Uniform Resource Identifier
Uniform resource name
### BT: Web sites

| Uniform resource name | USE: Uniform resource locators |

### BT: Power systems

<table>
<thead>
<tr>
<th>Uninterruptible power systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Power systems</td>
</tr>
<tr>
<td>RT: Batteries</td>
</tr>
<tr>
<td>Emergency power supplies</td>
</tr>
<tr>
<td>Power supplies</td>
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<tr>
<td>Protection</td>
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### BT: Organizations

<table>
<thead>
<tr>
<th>United Kingdom Space Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: UK Space Agency</td>
</tr>
<tr>
<td>BT: Organizations</td>
</tr>
</tbody>
</table>

### BT: Communication standards

<table>
<thead>
<tr>
<th>Universal Serial Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: USB</td>
</tr>
<tr>
<td>BT: Communication standards</td>
</tr>
<tr>
<td>Information technology</td>
</tr>
</tbody>
</table>

### BT: Educational institutions

<table>
<thead>
<tr>
<th>Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE: Educational institutions</td>
</tr>
</tbody>
</table>

### BT: Autonomous vehicles

<table>
<thead>
<tr>
<th>Unmanned autonomous vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Unmanned autonomous cars</td>
</tr>
<tr>
<td>BT: Autonomous vehicles</td>
</tr>
<tr>
<td>NT: Autonomous aerial vehicles</td>
</tr>
<tr>
<td>Autonomous underwater vehicles</td>
</tr>
</tbody>
</table>

### BT: Electronic mail

<table>
<thead>
<tr>
<th>Unsolicited e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>UF: Junk e-mail</td>
</tr>
<tr>
<td>Junk email</td>
</tr>
<tr>
<td>Spam</td>
</tr>
<tr>
<td>Spamming</td>
</tr>
<tr>
<td>Unsolicited electronic e-mail</td>
</tr>
</tbody>
</table>

### BT: Learning systems

<table>
<thead>
<tr>
<th>Unsupervised learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT: Learning systems</td>
</tr>
<tr>
<td>RT: Formal concept analysis</td>
</tr>
</tbody>
</table>

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2021 IEEE Thesaurus

Generative adversarial networks
Semisupervised learning

Uplink
BT: Satellite communication

Upper bound
BT: Boundary conditions

Uranium
BT: Chemical elements

Urban areas
UF: Cities and towns
City
Metropolitan areas
Urban environments
BT: Geography
RT: Public infrastructure
Public transportation
NT: Smart cities
Urban planning

Urban environments
USE: Urban areas

Urban heat islands
USE: Thermal pollution

Urban modeling
USE: Urban planning

Urban planning
UF: City planning
Urban modeling
BT: Urban areas
RT: Public infrastructure
NT: Urban policy

Urban policy
BT: Urban planning

Urban pollution
BT: Pollution

Urinary calculi
USE: Kidney stones

URL
USE: Uniform resource locators

URLLLC
USE: Ultra reliable low latency

Urogenital system
BT: Anatomy
NT: Bladder
Kidney

US activities
USE: IEEE United States activities

US Department of Agriculture
BT: US Government

US Department of Commerce
BT: US Government
NT: NIST
NTIA

US Department of Defense
UF: DoD
BT: US Government

US Department of Energy
UF: DoE
BT: US Government

US Department of Health and Human Services
BT: US Government agencies
NT: National Institutes of Health

US Department of Homeland Security
BT: US Government
RT: Cyberattack
Terrorism

US Department of Transportation
UF: DOT
BT: US Government

US Government
BT: Government
NT: US Department of Agriculture
American
US Department of Commerce
US Department of Defense
US Department of Energy
US Department of Homeland Security
US Department of Transportation

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## 2021 IEEE Thesaurus

### US Government agencies
- **BT**: US Government
- **RT**: Patents
- **NT**: FAA
- **FCC**
- **FDA**
- **NASA**
- **US Department of Health**

### US local government
- **BT**: US Government

### Usability
- **BT**: Software design

### USB
- **USE**: Universal Serial Bus

### User centered design
- **UF**: User-centered design
- **BT**: Design methodology
- **RT**: Technology acceptance

### User computer interfaces
- **USE**: User interfaces

### User experience
- **BT**: Ergonomics
- **RT**: Affective computing
- **Human computer interaction**
- **Human factors**
- **Mobile computing**
- **Quality of experience**
- **Technology acceptance**

### User friendliness
- **USE**: Human computer interaction

### User generated content
- **USE**: User-generated content

### User interfaces
- **UF**: Man-machine interfaces
- **BT**: Systems, man, and cybernetics
- **RT**: Adaptive learning

### Affordances
- **Ambient intelligence**
- **Browsers**
- **Computer interfaces**
- **Computer peripherals**
- **Displays**
- **Gaze tracking**
- **User experience**
- **Web design**
- **Audio user interfaces**
- **Brain-computer interfaces**
- **Data visualization**
- **Emotion recognition**
- **Exoskeletons**
- **Graphical user interfaces**
- **Human computer interaction**
- **Human-robot interaction**
- **Human-vehicle systems**
- **Smart cards**

### User-generated content
- **UF**: Consumer-generated media
- **User generated content**
- **User-created content**
- **BT**: Data acquisition

### Utility programs
- **BT**: System software

### Utility theory
- **BT**: Mathematics
- **RT**: Supply and demand

### UV sources
- **USE**: Ultraviolet sources

### UWB antennas
- **USE**: Ultra wideband antennas

### UWB communication
<table>
<thead>
<tr>
<th>Term</th>
<th>USE:</th>
<th>BT:</th>
<th>RT:</th>
<th>NT:</th>
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<tbody>
<tr>
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<td>Ultra wideband communication</td>
<td>Electron devices</td>
<td>Field emitter arrays</td>
<td>Gettering</td>
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<tr>
<td>UWB radar</td>
<td>Ultra wideband radar</td>
<td>Space charge</td>
<td>Photomultipliers</td>
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</tr>
<tr>
<td>UWB technology</td>
<td>Ultra wideband technology</td>
<td>Vacuum systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V2G</td>
<td>Vehicle-to-grid</td>
<td>VAD</td>
<td>Voice activity detection</td>
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<tr>
<td>V2I</td>
<td>Vehicle-to-infrastructure</td>
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<td>Cost accounting</td>
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<td>Vehicular ad hoc networks</td>
<td>Valves</td>
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<td>Vehicle-to-everything</td>
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<td></td>
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<td>Medical services</td>
<td>Vanes</td>
<td>Blades</td>
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<tr>
<td>Vacuum arc remelting</td>
<td>Melt processing</td>
<td>VANET</td>
<td>Vehicular ad hoc networks</td>
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<tr>
<td>Vacuum arcs</td>
<td>Vacuum breakdown</td>
<td>VAR</td>
<td>Reactive power</td>
<td></td>
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<tr>
<td></td>
<td>Electron emission</td>
<td></td>
<td>Fluid flow control</td>
<td>Manifolds</td>
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<td></td>
<td>Thermionic emission</td>
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<td>Dielectric breakdown</td>
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<tr>
<td></td>
<td>Electron emission</td>
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<td></td>
<td>Vacuum systems</td>
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<td></td>
<td>Gettering</td>
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<tr>
<td>Vacuum electronics</td>
<td>Vacuum technology</td>
<td>Varactors</td>
<td>Capacitors</td>
<td>Semiconductor diodes</td>
</tr>
<tr>
<td>Vacuum energy</td>
<td>Elementary particle vacuum</td>
<td></td>
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<td>Vacuum systems</td>
<td>Vacuum technology</td>
<td>Variable frequency drives</td>
<td>Variable speed drives</td>
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<td></td>
<td>Bellows</td>
<td>Variable optical attenuators</td>
<td>Optical attenuators</td>
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<tr>
<td></td>
<td>Casimir effect</td>
<td>Variable selection</td>
<td>Input variables</td>
<td></td>
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<tr>
<td></td>
<td>Leak detection</td>
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<td></td>
<td>Vacuum arcs</td>
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<td></td>
<td>Gettering</td>
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<td>Vanadium</td>
<td>Chemical elements</td>
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<td>Vanes</td>
<td>Blades</td>
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<tr>
<td>VANET</td>
<td>Vehicular ad hoc networks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>Reactive power</td>
<td></td>
<td></td>
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<tr>
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<td>Capacitors</td>
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<td>Input variables</td>
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<td>Variable speed drives</td>
<td>Variable frequency drives</td>
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<tr>
<td></td>
<td>Drives</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magnetic gears</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor drives</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Pitch control (audio)

Variable structure systems
BT: Adaptive systems

Varistors
BT: Resistors
RT: Arresters
Semiconductor devices

Vascular system
USE: Circulatory system

VCO
USE: Voltage-controlled oscillators

VCR
USE: Video recording

VCSEL
USE: Vertical cavity surface emitting lasers

Vector optimization
USE: Pareto optimization

Vector processors
BT: Microprocessors

Vector quantisation
USE: Vector quantization

Vector quantization
UF: Trees (botanical)
BT: Biology
RT: Forestry
NT: Vegetation mapping

Vegetation mapping
BT: Geoscience and remote sensing
RT: Agriculture
Forestry
Geophysical measurement
techniques
Remote sensing
Terrain mapping
Vegetation

Vehicle crash testing
BT: Automotive engineering
Product safety engineering
RT: Vehicles

Vehicle detection
BT: Automotive engineering

Vehicle driving
BT: Automotive engineering

Vehicle dynamics
BT: Automotive engineering
RT: Hardware-in-the-loop simulation
Vehicles
NT: Rollover

Vehicle routing
BT: Traffic control
RT: Intelligent vehicles
Path planning

Vehicle safety
BT: Automotive engineering
Safety
RT: Vehicle-to-everything
NT: Advanced driver assistance systems
Lane departure warning
Lane detection

Vehicle to vehicle communication
USE: Vehicular ad hoc networks
# 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>UF: V2X</th>
<th>BT: Communication systems</th>
<th>RT: Advanced driver assistance systems</th>
</tr>
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<tbody>
<tr>
<td>NT: Vehicle-to-infrastructure</td>
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</table>

<table>
<thead>
<tr>
<th>UF: V2G</th>
<th>BT: Electric vehicles</th>
<th>RT: Battery powered vehicles</th>
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<tbody>
<tr>
<td>NT: Vehicle-to-infrastructure</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>UF: V2I</th>
<th>BT: Vehicle-to-everything</th>
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</table>

| USE: Vehicular ad hoc networks |

<table>
<thead>
<tr>
<th>UF: V2V</th>
<th>BT: Ad hoc networks</th>
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<table>
<thead>
<tr>
<th>UF: Rotational measurement</th>
<th>BT: Mechanical variables</th>
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<table>
<thead>
<tr>
<th>UF: Speed measurement</th>
</tr>
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<table>
<thead>
<tr>
<th>UF: Dedicated short range communication</th>
<th>BT: Mobile communication</th>
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<table>
<thead>
<tr>
<th>UF: Vehicular and wireless technologies</th>
<th>BT: Intelligent vehicles</th>
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<table>
<thead>
<tr>
<th>UF: Vehicular automation</th>
</tr>
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</table>

<table>
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<th>UF: Vehicular technologies</th>
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| UF: Vehicular and wireless technologies |

<table>
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<tr>
<th>UF: Vehicular ad hoc networks</th>
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<table>
<thead>
<tr>
<th>UF: V2V</th>
<th>BT: Ad hoc networks</th>
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| UF: Vehicle to vehicle communication |

<table>
<thead>
<tr>
<th>UF: Rotational speed</th>
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</table>

<table>
<thead>
<tr>
<th>UF: Angular velocity</th>
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<table>
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<th>UF: Mechanical variables</th>
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<table>
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<tr>
<th>UF: Angular velocity control</th>
</tr>
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</table>

<table>
<thead>
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<th>UF: Velocity control</th>
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<table>
<thead>
<tr>
<th>UF: Velocity measurement</th>
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</table>

<table>
<thead>
<tr>
<th>UF: Doppler measurement</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>UF: Flowmeters</th>
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</table>
### Motion measurement
- Slow light
- Tracking

### Ventilation
**BT:** Cooling
**RT:** Air conditioning
- HVAC
- Temperature control
- Vents
**NT:** Fans

### Ventilators
**BT:** Biomedical equipment
**RT:** Intubation
- Respiratory system

### Ventricle system
**BT:** Brain

### Vents
**BT:** Mechanical products
**RT:** Air conditioning
- Buildings
- Ducts
- Space heating
- Ventilation
- Windows

### Venture capital
**BT:** Economics
- Financial management
**RT:** Business continuity
- Enterprise resource planning
- Research and development
- Risk analysis

### Venus
**BT:** Planets

### Vermin control
**USE:** Pest control

### Veroboard
**USE:** Stripboard circuit

### Vertical cavity surface emitting lasers
**USE:** Vertical cavity surface emitting lasers

### Very high speed integrated circuits
**UF:** VHSIC
**BT:** Integrated circuits

### Very large scale integration
**UF:** VLSI
**BT:** Circuits
- Integrated circuits
- Large scale integration
- Damascene integration
- Nanotechnology
- Parameter extraction
- Neuromorphics
- Wafer scale integration

### Very long instruction word
**USE:** VLIW

### Very-high-frequency circuits
**USE:** VHF circuits

### Very-high-frequency devices
**USE:** VHF devices

### Very-large-scale-integration
**USE:** Very large scale integration
### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>VHF circuits</th>
<th>Integrated circuits</th>
<th>Parallel programming</th>
</tr>
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<tbody>
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<td>UF:</td>
<td>Very-high-frequency circuits</td>
<td></td>
</tr>
<tr>
<td>BT:</td>
<td>Circuits</td>
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<tr>
<td>RT:</td>
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<td></td>
<td>Helical antennas</td>
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<tr>
<td></td>
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**Vibrometers**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT:</td>
<td>Vibration measurement</td>
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</table>

**Video analytics**

| USE: | Visual analytics |

**Video annotation**

| USE: | Image annotation |

**Video codecs**

<table>
<thead>
<tr>
<th>BT:</th>
<th>Codecs</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Communication equipment</td>
</tr>
<tr>
<td></td>
<td>Video equipment</td>
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**Video coding**

<table>
<thead>
<tr>
<th>UF:</th>
<th>Advanced video coding</th>
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<td></td>
<td>Videocoding</td>
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<table>
<thead>
<tr>
<th>BT:</th>
<th>Video signal processing</th>
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<table>
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<tr>
<th>RT:</th>
<th>MPEG 4 Standard</th>
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<td></td>
<td>MPEG standards</td>
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<table>
<thead>
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<th></th>
<th>Rate distortion theory</th>
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<tbody>
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<td>Streaming media</td>
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<table>
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<tr>
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<td></td>
<td>Vector quantization</td>
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<table>
<thead>
<tr>
<th>NT:</th>
<th>DVD</th>
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<tbody>
<tr>
<td></td>
<td>High efficiency video coding</td>
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**Video compression**

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**Video description**

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<tr>
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|     | Videos |

**Video equipment**

<table>
<thead>
<tr>
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Video games

USE: Games

Video on demand

BT: Streaming media
RT: Broadband communication
NT: Motion detection

broadcasting Multimedia Web sites

Video recording

UF: VCR
VTR

BT: Recording
RT: DVD

Image storage
Mobile video
Video equipment
NT: High definition video
Videos
Webcams

Video reviews

BT: IEEE indexing

Video sequence

USE: Video sequences

Video sequences

UF: Video sequence

BT: Computer graphics
Image databases
RT: Image processing
Multimedia computing

Video sharing

BT: Information retrieval
Internet
Multimedia Web sites
NT: MySpace

Video sharing Web sites

USE: Multimedia Web sites

Video signal processing

BT: Multidimensional signal processing
RT: Authentication

Video streaming

USE: Streaming media

Video surveillance

BT: Surveillance
RT: Motion detection

Video tracking

BT: Image motion analysis
Tracking

video-game

USE: Games

Videocoding

USE: Video coding

Videoconferences

BT: Collaborative tools

Videoconferencing

USE: Teleconferencing

Videophone systems

UF: Picture phones
Picturephones
BT: Communication systems
RT: Image communication
Telephony
Visual communication

Videos

UF: Multimedia products

BT: Video equipment
Video recording
NT: Video description

Videotex

USE: Viewdata
### Virtual groups
- **UF:** Virtual teams
- **BT:** Collaboration

### Virtual machine monitors
- **UF:** Hypervisors
  - **VMMs**
- **BT:** Computers and information processing
- **RT:** Platform virtualization

### Virtual machines
- **USE:** Virtual machining

### Virtual manufacturing
- **UF:** Digital factories
- **BT:** Virtual factories
  - **RT:** CADCAM
  - **Virtual manufacturing**
- **NT:** Virtual machining

### Virtual office
- **USE:** Teleworking

### Virtual private networks
- **UF:** VPN
- **BT:** Computer networks
  - **RT:** Data security
  - **Internet**
  - **Local area networks**
  - **Wide area networks**
  - **EXTRANETS**

### Virtual prototyping
- **BT:** Design methodology
- **RT:** Product development
- **Prototypes**

---

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<table>
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<td>Fluids</td>
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<td>Measurement</td>
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<td>Vision</td>
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<tr>
<td>Vision (biological)</td>
<td>Virtual systems</td>
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<tr>
<td>Vision Based Robot Control</td>
<td>Visual servoing</td>
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<td>Vision defects</td>
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<td>Color blindness</td>
<td>Myopia</td>
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<td>Sensors</td>
<td>Image processing</td>
<td></td>
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<tr>
<td>Vision systems (nonbiological)</td>
<td>Machine vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual analytics</td>
<td>Video analytics</td>
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<td>Computer languages</td>
<td>Software engineering</td>
<td>Software tools System software</td>
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</table>
2021 IEEE Thesaurus

Visual communication
BT: Communication systems
RT: Image communication
Image resolution
TV
Videophone systems

Visual databases
UF: Moving object databases
BT: Databases

Visual effects
BT: Visualization
RT: Animation
Computer graphics

Visual odometry
BT: Computer vision
Robots

Visual perception
BT: Visual systems

Visual prostheses
USE: Visual prosthesis

Visual prosthesis
UF: Electronic visual prosthesis
Visual prostheses
Prosthetics
BT: Blindness

Visual servoing
UF: Vision Based Robot Control
BT: Motion control
Robot vision systems

Visual systems
UF: Vision (biological)
BT: Sense organs
Head
Machine vision
Salient detection
NT: Vision defects
Visual perception

Visualisation
USE: Visualization

Visualization
UF: Visual
Visualisation
Qualification
BT: Computer graphics
Graphics

Viterbi algorithm
BT: Algorithms
RT: Dynamic programming
Information theory
Mathematics
Multiaccess communication
Probability
Speaker recognition
Stochastic processes
Turbo codes

Vitrification
BT: Chemical technology
RT: Radioactive waste disposal

Vivaldi antennas
UF: Vivaldi-antennas
BT: Broadband antennas

VLC
USE: Visible light communication

VLIW
UF: Very long instruction word
Very-long-instruction-word
BT: Central Processing Unit

VLSI
USE: Very large scale integration

VMMs
USE: Virtual machine monitors

Vocabulary
BT: Information retrieval
RT: Ranking (statistics)

Vocational training
UF: NVQ
National vocational qualification
BT: Training
RT: Industrial training
2021 IEEE Thesaurus

Multiskilling

Vocoders

BT: Communication equipment
Telephone equipment
RT: Speech codecs
Speech coding

Voice activity detection

UF: Speech activity detection
Speech detection
VAD
BT: Speech processing
Speech coding
Speech recognition
Speech synthesis

Voice mail

BT: Message systems
RT: Electronic mail
Office automation

Voice over Internet protocol

USE: Internet telephony

Voice over IP

USE: Internet telephony

Voice print

USE: Spectrogram

Voice response systems

USE: Speech synthesis

Voice tract

USE: Larynx

Voice-over-Internet protocol

USE: Internet telephony

Voicegram

USE: Spectrogram

Voiceprint

USE: Spectrogram

VOIP

USE: Internet telephony

Volatile organic compounds

BT: Organic compounds

Volcanic activity

BT: Volcanoes

Volcanic ash

BT: Volcanoes
RT: Ash

Volcano

USE: Volcanoes

Volcanoes

UF: Volcano
BT: Geoscience
NT: Planetary volcanoes
Volcanic activity
Volcanic ash

Voltage

BT: Electric variables
Automatic voltage control
Capacitance-voltage
characteristics
Electrophysiology
Phase frequency detectors
Voltage control
Voltage measurement
Dynamic voltage scaling
Threshold voltage
Voltage fluctuations

Voltage breakdown

USE: Dielectric breakdown

Voltage control

UF: Voltage mode control
Voltage regulation
Voltage-mode control
BT: Electric variables control
RT: Electric current control
Limiting
Motor drives
On load tap changers
Phase frequency detectors
Power distribution control
Power factor correction
Reactive power control
Regulators
Three-phase electric power
Voltage
Voltage multipliers
NT: Automatic voltage control

Voltage controlled oscillators

USE: Voltage-controlled
oscillators

Voltage fluctuations
## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>BT: Voltage</th>
<th>Voltage-source converters</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT: Power systems</td>
<td>Converters</td>
</tr>
<tr>
<td>Voltage measurement</td>
<td>Power conversion</td>
</tr>
<tr>
<td>BT: Electric variables</td>
<td>AC-DC power converters</td>
</tr>
<tr>
<td>RT: Automatic voltage control</td>
<td>HVDC transmission</td>
</tr>
<tr>
<td>Potentiometers</td>
<td>Power electronics</td>
</tr>
<tr>
<td>Voltage</td>
<td>Pulse width modulation</td>
</tr>
<tr>
<td>Voltage transformers</td>
<td>Voltage-source converters</td>
</tr>
<tr>
<td>Voltmeters</td>
<td>USE: Voltage-source converters</td>
</tr>
<tr>
<td>NT: Low voltage</td>
<td></td>
</tr>
<tr>
<td>Medium voltage</td>
<td></td>
</tr>
</tbody>
</table>

### Voltage mode control

- Use: Voltage control

### Voltage multipliers

- BT: Circuits
- RT: AC-DC power converters
- Charge pumps
- Particle accelerators
- Rectifiers
- Transformers
- Voltage control

- NT: Capacitors
- Diodes

### Voltage regulation

- Use: Voltage control

### Voltage sags

- Use: Power quality

### Voltage source inverters

- BT: Inverters

### Voltage transformers

- UF: Potential transformers
- BT: Instrument transformers
- RT: Voltage measurement

### Voltage-controlled oscillators

- UF: VCO
- Voltage controlled
- BT: Oscillators

### Voltage-mode control

- USE: Voltage control

### Voltage-source converters

- UF: Modular multi-level
- BT: W3C
- VSC
- USE: World Wide Web
- Consortium
- BT: Standards organizations

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## 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>W3C Standards</th>
<th>BT: Standards publications</th>
</tr>
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<tbody>
<tr>
<td>Wafer bonding</td>
<td>BT: Bonding processes</td>
</tr>
<tr>
<td></td>
<td>Semiconductor device</td>
</tr>
<tr>
<td>manufacture</td>
<td></td>
</tr>
<tr>
<td>Wafer level packaging</td>
<td>USE: Wafer scale integration</td>
</tr>
<tr>
<td>Wafer scale integration</td>
<td>UF: Wafer level packaging</td>
</tr>
<tr>
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<td>Wafer-level packaging</td>
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<tr>
<td></td>
<td>BT: Circuits</td>
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<tr>
<td></td>
<td>Integrated circuits</td>
</tr>
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<td>Large scale integration</td>
</tr>
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<td></td>
<td>Very large scale integration</td>
</tr>
<tr>
<td>Wafer-level packaging</td>
<td>USE: Wafer scale integration</td>
</tr>
<tr>
<td>Walking</td>
<td>USE: Legged locomotion</td>
</tr>
<tr>
<td>WAMS</td>
<td>USE: Wide area measurements</td>
</tr>
<tr>
<td>WAN</td>
<td>USE: Wide area networks</td>
</tr>
<tr>
<td>WANs</td>
<td>USE: Wide area networks</td>
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<tr>
<td>WAP</td>
<td>USE: Wireless access points</td>
</tr>
<tr>
<td>AND</td>
<td>USE: Wireless application</td>
</tr>
<tr>
<td>protocol</td>
<td></td>
</tr>
<tr>
<td>Warehousing</td>
<td>BT: Material storage</td>
</tr>
<tr>
<td></td>
<td>RT: Production facilities</td>
</tr>
<tr>
<td></td>
<td>Stacking</td>
</tr>
<tr>
<td></td>
<td>Storage automation</td>
</tr>
<tr>
<td>Warning systems</td>
<td>USE: Alarm systems</td>
</tr>
<tr>
<td>Warranties</td>
<td>UF: Product warranties</td>
</tr>
<tr>
<td></td>
<td>Product warranty</td>
</tr>
<tr>
<td></td>
<td>BT: Product liability</td>
</tr>
<tr>
<td>Washing machines</td>
<td>BT: Electric machines</td>
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<tr>
<td></td>
<td>Electrical products</td>
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<tr>
<td></td>
<td>Home appliances</td>
</tr>
<tr>
<td></td>
<td>Home automation</td>
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<tr>
<td>Waste compaction</td>
<td>USE: Waste reduction</td>
</tr>
<tr>
<td>Waste disposal</td>
<td>BT: Waste management</td>
</tr>
<tr>
<td></td>
<td>RT: Effluents</td>
</tr>
<tr>
<td></td>
<td>Pollution</td>
</tr>
<tr>
<td></td>
<td>Radioactive waste</td>
</tr>
<tr>
<td></td>
<td>Sanitary engineering</td>
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<td></td>
<td>Slag</td>
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<tr>
<td></td>
<td>NT: Incineration</td>
</tr>
<tr>
<td></td>
<td>Radioactive waste disposal</td>
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<tr>
<td>Waste electrical and electronic equipment</td>
<td>USE: Electronic waste</td>
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<tr>
<td>Waste handling</td>
<td>BT: Waste management</td>
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<tr>
<td></td>
<td>RT: Effluents</td>
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<tr>
<td></td>
<td>Waste reduction</td>
</tr>
<tr>
<td></td>
<td>NT: Incineration</td>
</tr>
<tr>
<td></td>
<td>Remote handling</td>
</tr>
<tr>
<td>Waste heat</td>
<td>BT: Energy conversion</td>
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<td>RT: Boilers</td>
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<td>Cogeneration</td>
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<td>Energy conservation</td>
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<tr>
<td>Waste incineration</td>
<td>USE: Incineration</td>
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<td>Waste management</td>
<td>BT: Environmental</td>
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<td>RT: Biodegradation</td>
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<td></td>
<td>Effluents</td>
</tr>
<tr>
<td></td>
<td>Production management</td>
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</table>
### 2021 IEEE Thesaurus

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USE: Wave energy conversion

Wave equations
USE: Propagation

Wave functions
BT: Waves
RT: Conformal mapping
Elementary particle exchange interactions
NT: Functional analysis
Wavelet analysis
Wavelet domain

Wave power
BT: Energy resources
Ocean waves
RT: Renewable energy sources

Wave propagation
USE: Propagation

Wave scattering
USE: Scattering

Waveform analysis
USE: Signal analysis

Waveform generators
USE: Signal generators

Waveguide components
BT: Electromagnetic
waveguides
RT: Circulators
Conformal mapping
Gap waveguide
Helical antennas
Waveguide theory
NT: Optical waveguides
Power combiners
Power dividers

Waveguide discontinuities
UF: Irises
Waveguide obstacles
BT: Transmission line
discontinuities
RT: Electromagnetic
waveguides
Loaded waveguides
Waveguide theory
NT: Reflection coefficient
Waveguide transitions

Waveguide junctions
BT: Junctions

Waveguide lasers
BT: Electromagnetic
waves
RT: Lasers
waveguides
NT: Substrate integrated
waveguides

Waveguide obstacles
USE: Waveguide discontinuities

Waveguide theory
UF: Guided electromagnetic
wave propagation
BT: Electromagnetic
waves
RT: Antennas
Conformal mapping
Mathematics
Mode matching methods
Waveguide components
Waveguide discontinuities
Waveguide transitions

Waveguide transitions
BT: Waveguide discontinuities
RT: Waveguide theory

Wavelength assignment
BT: Optical fiber networks

Wavelength conversion
BT: Optical fibers
RT: Wavelength converters

Wavelength converters
UF: Wavelength convertors
BT: Converters
RT: Wavelength conversion

Wavelength convertors
USE: Wavelength converters

Wavelength division multiplexed
USE: Wavelength division multiplexing

Wavelength division multiplexing
UF: WDM
multiplexed
Wavelength division
multiplexed
Wavelength-division
<table>
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**Wavelength measurement**

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**Wavelet analysis**

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**Wavelet coefficients**

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**Wavelet domain**

<table>
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**Wavelet neural networks**

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<td>Neural networks</td>
<td>Wavelength division</td>
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**Wavelet packets**

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**Wavelet transforms**

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**Waves**

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**Waves**

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**Waves**

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2021 IEEE Thesaurus

Soft electronics
NT: Smart glasses

Wearable computing
USE: Wearable computers

Wearable devices
USE: Wearable computers

Wearable electronics
USE: Wearable computers

Wearable Health Monitoring System
USE: Wearable computers

Wearable robots
UF: Hardsuit
Powered armor
Powered exoskeleton
BT: Robots
RT: Assistive technology
Biomechanics
Human-robot interaction
Medical robotics
Military equipment
Mobile robots
Orthotics
Prosthetics
Service robots

Wearable sensors
BT: Sensors

Wearables
USE: Wearable computers

Weather
USE: Meteorology

Weather forecasting
UF: Weather prediction
BT: Meteorology
NT: Wind forecasting

Weather prediction
USE: Weather forecasting

Weaving
BT: Textile technology
RT: Cotton
Fabrics
Textile fibers
Textile industry
Textiles

Web 2.0
BT: Internet

Web and internet services
UF: Baidu
Internet services
BT: Web services

Web browsers
USE: Browsers

Web cams
USE: Webcams

Web design
UF: Web site design
BT: Web sites
RT: Authoring systems
NT: Web page design

Web filters
USE: Information filters

Web mining
BT: Data mining

Web ontology language
USE: OWL

Web page design
BT: Web design

Web pages
BT: Web design

Web real-time communications
USE: WebRTC

Web robot
USE: Bot (Internet)

Web search
BT: Search methods
RT: Metasearch
NT: Crawlers

Web servers
BT: Servers

Web services

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| BT: Internet | RT: Video recording |
| BT: Middleware | RT: Web services |
| BT: Asynchronous communication | |
| Cloud computing | |
| Service computing | |
| Webcams | |
| NT: Mashups | |
| Message service | |
| Service-oriented architecture | |
| protocol | |
| WS-BPEL | |
| Web TV | |
| Web and internet services | |
| Web servers | |
| WebRTC | |

**Web services business process execution language**

**USE**: WS-BPEL

**Web site design**

**USE**: Web design

**Web sites**

**UF**: Reddit
**BT**: Computer applications
**RT**: Information retrieval

**UF**: Computer networks
**BT**: Content management
**NT**: Extranets
**Internet**
**Portals**
**Social networking (online)**
**Wikipedia**
**World Wide Web**

**NT**: Multimedia Web sites
**MySpace**
**Uniform resource locators**
**Web design**

**Web television**

**USE**: Web TV

**Web TV**

**UF**: Web television
**BT**: Broadcasting
**TV**
**Web services**

**Webcams**

**UF**: Web cams
**BT**: Cameras

**Weibull distribution**

**BT**: Statistical distributions
**RT**: Failure analysis
**Probability**
**Reliability engineering**
**Statistics**

**Weibull fading channels**

**BT**: Fading channels

**Weight control**

**BT**: Mechanical variables

**Weight measurement**

**BT**: Mechanical variables

**Welding**

**BT**: Fabrication
**Joining processes**
**Bonding processes**
**Brazing**
**Fasteners**
**Manufacturing**
**Materials processing**

**NT**: Spot welding

**Well logging**

**BT**: Geophysics
**Petroleum industry**
RT: Oil drilling
Seismology

Wet etching
BT: Etching

Wetlands
BT: Ecosystems
Geoscience
RT: Hydrology
Lakes
Rivers
Water

Whale optimization algorithms
BT: Algorithms
RT: Biomimetics

Whales
BT: Marine animals

WhatsApp
USE: Freeware AND
Internet telephony

Wheelchairs
BT: Assistive technology

Wheels
BT: Mechanical products
Automobile manufacture
Automotive components
Automotive engineering
Axles
Flanges
Machine components
Manufacturing
Production
Steering systems
Structural plates
Tires

Whispering gallery modes
UF: Whispering-gallery modes
BT: Optics
RT: Microcavities

White noise
BT: Noise
RT: AWGN channels
Music
Random number generation
NT: AWGN

White spaces
BT: Radio spectrum management

Whitelists
BT: Information filters
RT: Access control
Blacklisting
Countermeasures
(computer)
Electronic mail

Whole body imaging
BT: Biomedical image processing

Whole-body PET
BT: Positron emission tomography

Wi-fi
USE: Wireless fidelity

Wi-Fi 6
USE: IEEE 802.11ax Standard

Wi-Max
USE: WiMAX

Wide area measurement systems
USE: Wide area measurements

Wide area measurements systems
Wide area measurement systems
Wide-area measurements systems
Wide-area measurements
BT: Measurement

White blood cells
BT: Blood

White matter
BT: Central nervous system

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### 2021 IEEE Thesaurus

<table>
<thead>
<tr>
<th>UF: WAN</th>
<th>BT: Communication systems</th>
<th>RT: Electronic learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>WANs</td>
<td>Computer networks</td>
<td>Frame relay</td>
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<tr>
<td></td>
<td>IEEE 802.3 Standard</td>
<td>iEEE 802.3 Standard</td>
</tr>
<tr>
<td></td>
<td>Internetworking</td>
<td>Internetworking</td>
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<tr>
<td></td>
<td>LAN interconnection</td>
<td>LAN interconnection</td>
</tr>
<tr>
<td></td>
<td>Multiprocessor</td>
<td>Multiprocessor</td>
</tr>
</tbody>
</table>

**interconnection**
- Open systems
- Protocols
- Token networks
- Virtual private networks

### Wide band gap semiconductors

| BT: Semiconductor materials | RT: Gallium alloys | Silicon compounds |

**Wide-area measurement systems**

**USE:** Wide area measurements

**Wide-area measurements**

**USE:** Wide area measurements

### Wideband

| BT: Bandwidth | RT: Narrowband |

**Wideband amplifiers**

**USE:** Broadband amplifiers

**Wideband antennas**

**USE:** Broadband antennas

### Wiener filters

| BT: Noise reduction |

**wifi**

**USE:** Wireless fidelity

### Wiggler magnets

**USE:** Undulators

### WiGig

**USE:** IEEE 802.11 Standard

### Wikipedia

| UF: Wikis | BT: Information services | RT: Collaboration |

**Wiki**

**USE:** Wikipedia

**Wild fires**

**USE:** Fires

**Wildfires**

**USE:** Fires

**Wildlife**

**BT:** Animals

**WiMax**

**USE:** WiMAX

**Wimax**

**USE:** WiMAX

**WiMAX**

**USE:** Wi-Max

**Winches**

**BT:** Materials handling equipment

**RT:** Cables

**Lifting equipment**

### Wind

**BT:** Meteorology

**RT:** Sea surface

**Wind energy**

**UF:** Wind-energy

**BT:** Energy resources

**RT:** Turbines

**Wind**

**NT:** Wind forecasting

**Wind speed**

**Wind stress**

**Wind energy conversion**
2021 IEEE Thesaurus

Wind energy conversion
  BT: Energy conversion
  Wind energy
  Wind power generation

Wind energy generation
  BT: Power generation
  RT: Wind forecasting
  Wind turbines
  NT: Wind energy integration

Wind energy integration
  UF: Wind integration
  Wind power grid integration
  BT: Power systems
  Wind energy generation
  RT: Power grids

Wind farm
  USE: Wind farms

Wind farms
  UF: Wind farm
  BT: Energy resources

Wind forecasting
  BT: Weather forecasting
  Wind
  RT: Wind energy
  Wind energy generation
  Wind turbines

Wind integration
  USE: Wind energy integration

Wind power
  USE: Wind power generation

Wind power generation
  UF: Wind power
  BT: Power generation
  RT: Turbogenerators
  Wind
  Wind energy
  NT: Wind energy conversion

Wind power grid integration
  USE: Wind energy integration

Wind speed
  BT: Wind
  RT: Wind stress

Wind stress
  BT: Stress

Wind tunnels
  BT: Aerospace testing
  Test facilities
  RT: Aerodynamics
  Aerospace simulation

Wind turbines
  BT: Turbines
  RT: Doubly fed induction generators
  Wind energy
  Wind energy generation
  Wind forecasting

Wind-energy
  USE: Wind energy

Windings
  UF: Transformer windings
  BT: Electromagnetic fields
  RT: AC machines
  Coils
  Electric machines
  Magnetic circuits
  Power transformers
  Rotating machines
  Transformers
  NT: Machine windings

Windows
  BT: Building materials
  Manufactured products
  RT: Glass products
  Vents

Windscreen wipers
  USE: Automotive components

Windscreens
  USE: Automotive components

Windshield wipers
  USE: Automotive components

Windshields
  USE: Automotive components

Windup
  BT: Feedback control

Wine industry
  BT: Industry applications
<p>| NT: Wineries | IEEE 802.11 Standard IEEE 802.11p Standard IEEE 802.22 Standard Inductive charging Light fidelity |
| Wineries | Location awareness Long Term Evolution Machine-to-machine |
| BT: Wine industry | |
| Wire | Mobile applications Paging systems Reconfigurable intelligent |
| BT: Materials | |
| RT: Communication cables | |
| Conductors | communications |
| Wiring | |
| Wire drawing | Regional area networks Wireless LAN Wireless fidelity |
| BT: Wires | |
| RT: Manufacturing | surfaces |
| Production | |
| Wireless Access in Vehicular Environments | Cooperative communication Dedicated short range |
| UF: WAVE | |
| BT: Wireless networks | |
| RT: IEEE 802.11p Standard Intelligencia vehicles | communication |
| Wireless access networks | |
| USE: Wireless networks | |
| communications | Roaming |
| Wireless access points | |
| UF: WAP | |
| BT: Computer networks Hardware Mobile computing Wireless communication | |
| RT: IEEE 802.11 Standard Routing protocols Wireless LAN Wireless fidelity | protocol |
| Wireless ad hoc network | Wireless networks |
| USE: Mobile ad hoc networks | Wireless energy transmission |
| Wireless fidelity | USE: Wireless power transfer |
| UF: wi-fi wifi | |
| BT: Wireless LAN | |
| RT: IEEE 802.11 Standard | Light fidelity Radio frequency Wireless access points Wireless communication |
| Wireless application protocol | |
| Wireless cellular systems | |
| BT: Wireless networks | Wireless handheld devices |
| USE: Inductive charging | USE: Handheld computers |
| Wireless communication | Wireless LAN |
| UF: Wireless systems Communication systems Bluetooth Dynamic spectrum access | Networks |
| BT: | |
| RT: Radio LAN WLAN Wireless Metropolitan Area | |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>BT</th>
<th>RT</th>
<th>NT</th>
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<tbody>
<tr>
<td>Wireless local area networks</td>
<td>Local area networks</td>
<td>Ad hoc networks</td>
<td>Light fidelity</td>
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<td>Wireless mesh networks</td>
<td>Communication systems</td>
<td>Wireless sensor networks</td>
<td>Wireless fidelity</td>
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<td>Wireless Metropolitan Area Networks</td>
<td>Wireless LAN</td>
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<td>Wireless networks</td>
<td>Wireless access networks</td>
<td>Wireless communication</td>
<td>Nanocommunication</td>
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<td>(telecommunication)</td>
<td>IEEE 802.11p Standard</td>
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<td>AODV</td>
<td>Wireless Access in Vehicular Environments</td>
<td>Wireless mesh networks</td>
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<td>Wireless personal area networks</td>
<td>WPAN</td>
<td>Personal area networks</td>
<td>Wireless energy</td>
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<tr>
<td>Wireless power transfer</td>
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<td>Power transmission</td>
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</tbody>
</table>

**Wireless power transmission**
- BT: Power transmission
- RT: Conductors
- NT: Wireless networks

**Wireless regional area networks**
- USE: WRAN

**Wireless security**
- USE: Communication system security

**Wireless sensor networks**
- UF: Underwater sensor networks
- BT: Communication systems
- Vehicular and wireless technologies
- RT: Ad hoc networks
- Cyber-physical systems
- Distributed vision networks
- Edge computing
- Internet of Things
- Machine-to-machine communications
- Microsensors
- Nanocommunication (telecommunication)
- Sensors
- Wireless LAN
- Wireless mesh networks
- NT: Body sensor networks
- Event detection

**Wireless systems**
- USE: Wireless communication

**Wires**
- BT: Structural shapes
- RT: Nanowires
- Springs
- NT: Wire drawing

**Wiring**
- BT: Electric variables
- RT: Building services
- Cables
- Conductors
- Layout
### Metallization
Printed circuits
Wire

### Workflow management system
**USE:** Workflow management software

### Working conditions
**USE:** Employee welfare

### Working environment noise
**UF:** Environmental noise
**BT:** Acoustic noise
**RT:** Ergonomics
Hazardso
Occupational health
Occupational safety

### Workplace
**USE:** Employment

### Workshops
**USE:** Conferences

### Workstation clusters
**USE:** Cluster computing

### Workstations
**BT:** Microcomputers
**RT:** Cluster computing
Computer displays
Computer graphics
Peer-to-peer computing

### World Wide Web
**UF:** WWW
**BT:** Computer applications
**RT:** Cyberspace
Internet
Web sites
**NT:** Bot (Internet)
Mashups

### World Wide Web Consortium
**USE:** W3C

### Worldwide Interoperability for Microwave Access
**USE:** WiMAX

### Worm gears
**USE:** Gears

### Worms
**USE:** Grippers

### Word cloud
**USE:** Tag clouds

### Word processing
**USE:** Text processing

### Workspace
**USE:** Employment

### Workability
**BT:** Mechanical factors

### Workflow management software
**USE:** Workflow management system
<table>
<thead>
<tr>
<th>Term</th>
<th>USE:</th>
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<th>RT:</th>
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<tbody>
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<td>Wounds</td>
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<td>WPAN</td>
<td>Wireless personal area</td>
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### X-ray imaging

**BT:** X-ray applications  
**RT:** Gamma-ray detectors  
Phantoms  
Radiography  
X-ray detection  
X-ray detectors  
**NT:** Plasma x-ray sources

### X-ray lasers

**BT:** Lasers  
X-ray applications  
**RT:** Plasma x-ray sources  
X-rays  
**NT:** Plasma x-ray sources

### X-ray lithography

**BT:** Lithography

### X-ray scattering

**UF:** XRD  
**BT:** X-rays

### X-ray tomography

**BT:** X-rays

### X-rays

**BT:** Medical services  
Collimators  
Electromagnetic radiation  
Synchrotron radiation  
Undulators  
X-ray detectors  
X-ray lasers  
**NT:** X-ray applications  
X-ray detection  
X-ray scattering  
X-ray tomography

### X3D

**BT:** Computer graphics  
Three-dimensional displays  
**RT:** ISO Standards

### Xenon

**BT:** Gases

### Xerography

**USE:** Electrophotography

### XML

**UF:** Automatic Test Markup  
**Language:** Extensible Markup  
**BT:** Markup languages

### XR

**USE:** X reality

### XRD

**USE:** X-ray scattering

### XSS

**USE:** Cross-site scripting

### Y-Ba-Cu-O

**USE:** Yttrium barium copper oxide

### Yachts

**USE:** Boats

### Yagi-Uda antennas

**BT:** Antennas

### Yarn

**BT:** Textile fibers  
**RT:** Wool

### YBa2Cu3O7

**USE:** Yttrium barium copper oxide

### Youtube

**USE:** Multimedia Web sites

### Ytterbium

**BT:** Chemical elements
Yttrium
BT: Chemical elements
Metals
NT: Yttrium compounds

Yttrium barium copper oxide
UF: Y-Ba-Cu-O
YBCO
YBa2Cu3O7
BT: High-temperature superconductors
NT: Yttrium compounds
RT: Barium compounds

Yttrium compounds
BT: Yttrium
RT: Alloying
NT: Yttrium barium copper oxide

ZCS
USE: Zero current switching

Zero correlation zone
BT: Codes
Multiaccess communication
Sequential analysis

Zero current switching
UF: ZCS
Zero-current switching
BT: Switching circuits
RT: Inverters
Switching converters

Zero knowledge proof
BT: Cryptography
Protocols

Zero voltage switching
UF: ZVS
Zero-voltage switching
BT: Switching circuits
RT: Inverters
Switching converters

Zinc
UF: Zn
BT: Metals
NT: Zinc compounds

Zinc compounds
BT: Zinc
NT: Zinc oxide

Zinc oxide
UF: ZnO
BT: Zinc compounds
NT: Indium gallium zinc oxide

ZINDO
USE: Computational modeling

Zip fasteners
USE: Fasteners

Zirconium
BT: Chemical elements

Zn
USE: Zinc

ZnO
USE: Zinc oxide

Zoology
BT: Biology
NT: Animals
Entomology

ZVS
USE: Zero voltage switching

Yttrium barium copper oxide
UF: Y-Ba-Cu-O
YBCO
YBa2Cu3O7
BT: High-temperature superconductors
NT: Yttrium compounds
RT: Barium compounds

Yttrium compounds
BT: Yttrium
RT: Alloying
NT: Yttrium barium copper oxide

ZCS
USE: Zero current switching

Zero correlation zone
BT: Codes
Multiaccess communication
Sequential analysis

Zero current switching
UF: ZCS
Zero-current switching
BT: Switching circuits
RT: Inverters
Switching converters

Zero knowledge proof
BT: Cryptography
Protocols

Zero voltage switching
UF: ZVS
Zero-voltage switching
BT: Switching circuits
RT: Inverters
Switching converters

Zeros
USE: Poles and zeros

Zinc
UF: Zn
BT: Metals
NT: Zinc compounds

Zinc compounds
BT: Zinc
NT: Zinc oxide

Zinc oxide
UF: ZnO
BT: Zinc compounds
NT: Indium gallium zinc oxide

ZINDO
USE: Computational modeling

Zip fasteners
USE: Fasteners

Zirconium
BT: Chemical elements

Zn
USE: Zinc

ZnO
USE: Zinc oxide

Zoology
BT: Biology
NT: Animals
Entomology

ZVS
USE: Zero voltage switching