

## **IMPORTANT**

In accordance with the IEEE Bylaws, the following requirements must be met:

**Nominator:** Any person, including non-members, is eligible to serve as a nominator with the following exceptions: members of the IEEE Board of Directors, the IEEE Fellow Committee, IEEE Society/Technical Council Fellow Evaluating Committee Chairs, IEEE Society/Technical Council Fellow Evaluating Committee members reviewing the nomination, or IEEE Staff. Self-nomination is not permitted.

**Nominee:** The nominee must hold IEEE Senior Member or IEEE Life Senior Member grade at the time the nomination is submitted and must be a member in good standing in any grade of IEEE membership for five years or more preceding January 1 of the year of elevation.

**Note:** IEEE affiliate membership does not apply. The nominee cannot be on the IEEE Fellow Committee, the IEEE Society/Technical Council Fellow Evaluating Committee Chair, or a member of an IEEE Society/Technical Council Evaluating Committee reviewing the nomination.

**Note:** Individuals, who are prohibited from publishing in IEEE publications, as identified by the Publication Services and Products Board, may not be considered for Fellow grade.

### **General Information**

**Adhere to Space Limitations** All statements must be limited to the space provided for each item. Font size should be no smaller than 8.5 point. A nomination will not be accepted if a smaller font or reduction of copy to fit more words in the space provided is used.

**Handwritten Copy** Only typewritten copy will be accepted. **No exceptions.**

**Signatures** Not required.

**Deadline Date** **March 01, 2010** (no exceptions).

**Faxes** Not acceptable.

**E-mails** Attachments in e-mails of nominations, references, or endorsements are not acceptable.

**Where to mail forms** All forms must be mailed to: IEEE Fellow Committee, 445 Hoes Lane, Piscataway, New Jersey, 08854, USA

**Old Forms** Only current forms may be used.

**Proper and Accurate Description of Contribution** A concise and accurate description of the technical contribution of the nominee is of paramount importance. Superfluous or exaggerated prose may detract from, rather than enhance, the nomination. Avoid undefined technical jargon. Use an acronym only if the full name has been spelled out previously.

**Source of Nomination Data** The nominator is expected to be personally aware of the nominee's contribution. For confidential purposes, the necessary facts should be obtained from the nominee only if the complete and correct background information is not available elsewhere.

**IMPORTANT:** The nominator is the sole contact in the nomination process.  
Nominees should have no contact with IEEE regarding their own nominations.

**New Fellows Announcement** The newly elevated IEEE Fellows are announced shortly after the November/December IEEE Board of Directors meeting. IEEE notifies successful nominees and their nominators by e-mail, fax, and/or first class mail. Nominators of unsuccessful nominees are notified by e-mail, fax, and/or first class mail. **IMPORTANT: It is the responsibility of nominators to ensure that correct contact information is on file with the IEEE Fellow Staff.**

**Evaluation Process** The process consists of two evaluations. The first evaluation is completed by the IEEE Society/Technical Council that the Nominator identifies on the nomination form. The IEEE Society/Technical Council evaluation is extremely important, because it is an impartial and even-handed view of the nominee's merit, by persons who are familiar with his or her work. Once the IEEE Society/Technical Council review is completed, their comments are given to the IEEE Fellow Committee.

All nomination materials are forwarded in confidence to the IEEE Fellow Committee. The IEEE Fellow Committee has 51 members plus a Chair. All committee members are IEEE Fellows and selected to represent the 10 IEEE Regions and have expertise in the technical areas represented by IEEE Societies/Technical Councils.

The IEEE Fellow Committee recommends nominees to the IEEE Board of Directors, according to the following criteria.

Significant contribution as Applications Engineer/Practitioner, Educator, Research Engineer/Scientist, or Technical Leader

Evidence of technical accomplishment

Evaluation by the IEEE Society/Technical Council selected by the nominator

Confidential opinions of references and endorsers

Service to other professional engineering societies

Total years in the profession

Each nominee is rated numerically on the basis of this information.

## ***INSTRUCTIONS FOR COMPLETING THE IEEE FELLOW GRADE NOMINATION FORM***

### **Responsibilities of a Nominator**

*Prepare the IEEE Fellow Grade Nomination Form and submit it to the IEEE Fellow Committee by 01 March. Identify a minimum of 5 References, and provide them with a IEEE Fellow Grade Reference Form with instructions to submit the form to the IEEE Fellow Committee by 01 March.*

*Identify an IEEE Society/Technical Council that best reflects the nominee's field of technical accomplishment. Identify Endorsements (optional) and provide them with an IEEE Fellow Grade Endorsement Form with instructions to submit the form to the IEEE Fellow Committee by 01 March.*

*Note: IEEE Fellow Grade Endorsement Forms will be shared with the IEEE Society/Technical Council reviewing the nomination.*

### **COMPONENTS OF THE IEEE FELLOW GRADE NOMINATION FORM:**

**1. Nominee Information** Please ensure nominee information is accurate and complete on the nomination form (i.e., Last name first, entire current email address).

**2. Education** Provide entire name and location of educational institutions and year that degrees were earned.

**3. Professional History** List employers and job positions in descending chronological order. It is not necessary to list every position held.

**4. Proposed Citation**

The citation should be no more than 20 **words**.

The citation should be complete, correct, and succinct.

The citation may begin with the following words:

- For contributions to (in)...
- For developments in...
- For leadership of (in)...
- For discovery of...

Avoid superfluous phrases. Adding an adjective to the above words, such as “outstanding”, is superfluous since the member’s work must be outstanding to fulfill the requirements for Fellow grade.

Use care when incorporating words like “discovery” and “invention”. Evidence of a discovery or invention must be included in the information provided.

Citations should be free of reference to gender (“his” and “her”).

Only in exceptional cases should the citation include the name of a particular country where the nominee’s work is especially recognized.

Avoid references to specific companies or organizations.

Examples of citations may be found on the IEEE Fellow Web Site at [www.ieee.org/fellows](http://www.ieee.org/fellows).

**5. Nominator Information** Please ensure nominator information is current and accurate.

**6. Individual Contributions** Since the IEEE Fellow Committee must compare nominees in varied disciplines and situations, objective information on your nominee’s excellence is required.

Contributions are not always theoretical in nature or new inventions; for instance, engineering efforts that bring a design or theory to fruition through economic, governmental, or other applications can also be important contributions to society. The IEEE Fellow Committee recognizes that it may be more difficult to document the contributions of the practitioner engineer and technical leader because of proprietary constraints on publication. Part of the nominator's job is to request the nominee's organization to provide the information necessary to document the contributions of the nominee. It is important for the nominator to select a category that best defines the nominee's significant contributions, and the IEEE Fellow Committee will review the submission with an emphasis on the defined area. The IEEE Fellow Committee recognizes that contributions may fall under one of the following disciplines within the engineering profession.

**Application Engineer/Practitioner** What product development, advancement in systems, application or operation, project management or construction activity, process development, manufacturing innovation, codes or standards development, or other application of technology was the direct result of the nominee's personal effort? Describe the innovation, creativity, and importance of the development, advancement or application of technology. List the most important tangible and verifiable evidence of the nominee's contributions and, if pertinent, relevant significant technical publications, e.g. patents, reports, articles. Where a team effort was involved, identify and document the specific technical contributions of the nominee. Describe and verify the lasting impact of the nominee's contribution on society.

**Educator** What impact has the nominee had on education in the field of interest of the IEEE? What unique and innovative curricula or courses has the nominee personally developed? What innovative and unique contributions has the nominee made to engineering education as an administrator? Has the nominee written a pioneering text in his/her field? What impact have these innovations had? What is the range of acceptance, local, regional or worldwide? Describe and verify the lasting impact of these efforts on engineering education.

**Research Engineer/Scientist** What inventions, discoveries or advances in the state of the art made by the nominee indicate innovation, creativity, and importance of the nominee's research? List patents, papers published in refereed journals and other tangible and verifiable evidence of the nominee's accomplishments. Where a team effort was involved, identify and document the specific technical contributions of the nominee. Describe and verify the lasting impact of the nominee's contributions to society.

**Technical Leader** What outstanding engineering application or scientific accomplishments resulted from a managerial, team, or company-wide effort that was lead by this nominee? Explain the technical innovation, difficulties and risk involved, achieving economic acceptability, and other advantages. The nominee's organizational position, while important, cannot be used as the sole evidence of achievements or technical contribution. Describe and verify the specific technical contributions that the nominee made which made the achievement possible? Describe and verify the lasting impact of the nominee's contribution to society.

- 7. Evidence of Technical Accomplishment** Tangible evidence is defined as documentation, which a reference or evaluation committee member may review to assess the nominee's technical contribution or engineering achievement. The achievement may be described in internal organization reports that could be made available for evaluation. If the technical achievement has not resulted in any products, papers or reports, the achievement must be described and validated by the references and/or the Technical Society/Council evaluation. Describe the originality, novelty, complexity, usage, distribution and other characteristics of each of the nominee's technical contributions or engineering achievements. Please list all documentation in English. **Please do not provide copies of any publications, unpublished speeches, patents, actual documents or resumes for item 7.**

## **Technical Publications**

Books (authored; edited)  
Refereed papers in archival journals  
Papers in technical conference proceedings  
Technical reports (published; or internal, if available)  
Published standards (specify nominee's role)<sup>1</sup>  
Other publications  
Technical Presentations (printed talks, television or video scripts, course outlines)

Internal reports should be identified for verification. Indicate the names of co-authors. Indicate the nature of the nominee's contributions to all co-authored publications and reports (principal author, subsidiary author, contributor to work, leader of group). Nominations must provide names of all co-authors, complete citations and, for each document, in a few concise sentences summarize the significance of this work, its impact, and the role of the nominee in this work.

### ***Example for listing a paper in a journal:***

Publication:

1. Author 1, Author 2, Author 3, Author 4, "A theory for multiresolution signal decomposition: the wavelet representation," IEEE Transaction on xxxxx, vol. xx, p. xxx-xxx, July xxxx.  
Author 1 is one of the pioneers for the development of wavelet technologies and in particular to their application to image processing. This publication first introduced the multiresolution theory that makes the bridge between the first wavelet bases that were discovered in mathematics and the subband filtering algorithms used in signal processing. This publication also introduced the fast wavelet transform which has become the basis for almost all wavelet applications. Wavelets and the fast wavelet transforms are used in a considerable number of signal and image processing applications and products, among which the image compression standard JPEG-2000. The use of techniques described in this publication has directly led to the JPEG-2000 standard which is universally used today in applications much broader than signal processing. This publication has been cited more than 1000 times in referred journal articles. Author 1 personally developed the theory behind the fast wavelet transform and also developed the multiresolution theory highlighted in the publication. His contributions were enabling to the content of the publication.

### ***Example for listing a book:***

(1) Author, The Wireless Mobile Internet -Architectures, Protocols and Services, UK: John Wiley & Sons, 2003.  
The nominee is the sole author of this book as the first comprehensive text that covers both core network and access network technological aspects of the wireless Internet. This book bridges the gap between the previous research texts written by cellular and computer experts. In addition to providing comprehensive descriptions of the current technologies for the wireless Internet, it gives a forward look at crucial features of future mobile Internet architectures. The book not only facilitates engineering research and education for this emerging technology but also opens several research topics to researchers and engineers.

---

<sup>1</sup> IEEE Fellow grade is awarded for outstanding original and creative work. Individuals nominated for long and dedicated service in standards activities are frequently rejected because their nominator does not identify the nominee's original and creative contributions.

## **Patents**

Nomination must provide patent number, subject and date, country of issue, names of co-inventors. Most importantly, state the significance of each patent and identify the extent of its use and the role of the nominee in the work.

### ***Example for listing a Patent:***

Patent

1. U. S. Patent #x, xxx, xxx; Author 1, Author 2, Author 3;

Method of Fabricating Composite Superconducting Wire. [8/30/1977]. This is the original patent that described the fabrication of an improved Nb- Ti/Copper composite superconducting strand. The improvements described enhanced the basic strand properties of resistivity, current carrying capability, critical temperature and magnetic field and became the enabling technology for composite superconducting wires fabricated after 1982. The prior fabrication technology has been completely replaced by the techniques disclosed in the patent. The techniques described in the patent are now used by all superconducting wire manufacturers and are the basis for a \$xx million dollar industry. This is a long-lasting impact to the superconducting wire technology. The patent was a team effort but the IEEE Fellow nominee provided the technical expertise that enabled the implementation of a conventional form of wire manufacturing while retaining the superior performance properties. The IEEE Fellow nominee developed the critical theoretical analysis and provided the engineering expertise to reduce the theory to practice. The ability to deliver superior performance with a conventional manufacturing technique has reduced the product price to the point where high quality superconducting wires are affordable in even small quantities.

## **Other Documentation**

Internal drawings or reports

Documentation of a product or system's commercial success

Document other acceptance of products or systems by society resulting from the nominee's engineering achievements

Description of Software

Authenticate the development or application of products, systems, facilities or services, including software. Cite whether the accomplishment was a sole effort or team effort. Include a careful description of the degree of the nominee's participation in the project and references to any available documentation thereon.

### ***Examples:***

Design of hydroelectric generation station at (location), the largest in country).

Described in the (19\_\_/20\_\_) annual report of X Co.

Designed system architecture and wrote the software for the first digital single loop process controller (type no. and manufacturer) to be competitive in price with analog controllers, described in the review paper by D. Smith and R. Jones, ACM Journal, Vol. 7, pp. 17-45, (1962).

Leader of group developing flight control systems for a succession of aircraft (F300, F501, A495). This work is described in a series of Air Force Avionics

Laboratory progress reports, which are available through Defense Documentation Center (Report Nos. \_\_\_\_).

A nominee's contributions should be subdivided by area of contribution (patents on computers, patents on optics), and/or by activity (publications, internal project reports, facilities developed products and their applications, commercial successes, patents, etc.) Indicate at least one of the following: name of conference for keynote or conference digest papers; the inviting organizer for the presentation; the short course developed or taught.

**8. IEEE Activities - Awards, Offices Held, Committee Memberships** Separately list IEEE awards and major activities (offices, committee/board memberships, etc.) in descending chronological order by date.

**9. Non-IEEE Activities - Awards, Professional Society Memberships, Committee Memberships (Major Professional, Government, or International) Professional Engineer's License** Separately list awards and memberships/activities in descending chronological order by date. If possible, briefly define the scope of the awards listed. Society memberships: provide membership grade and note major volunteer service participation. Describe technical contributions to government, international and educational committee work, trade associations and those services of a professional or public nature having a technical content. Include college honor societies; please do not use acronyms.

#### **10. References of Nomination**

A Reference must be an eligible IEEE Fellow (Note: waiver is noted below for Region 9) in good standing, as defined in IEEE Bylaw I-104.14(2), "when applied to an IEEE member, the term member in good standing shall mean an IEEE member of any grade who is not under suspension." The following individuals are ineligible to serve as IEEE Fellow References: members of the IEEE Board of Directors, members of the IEEE Fellow Committee, IEEE Society/Technical Council Fellow Evaluating Committee Chairs reviewing the nomination, IEEE Society/Technical Council Fellow Evaluating Committee Members reviewing the nomination or IEEE Staff. In addition, a nominator may not serve as reference for a nomination he/she is submitting.

Note: References will be accepted if a reference is an IEEE Senior or Life Senior Member from Region 9 in good standing and the nominee they are serving as a reference for resides in Region 9.

A nomination must be supported by at least five, but no more than eight references from active IEEE Fellows, who are listed on the IEEE Fellow Web Site at [www.ieee.org/fellows](http://www.ieee.org/fellows). (Note: waiver is noted above for Region 9)

The selection of references is very important. References must be qualified to judge the nominee's work. That is, they must have personal knowledge of the nominee's technical accomplishments and have the ability to address the accomplishments in some detail. To ensure that the reference is qualified, it is recommended that you personally ask the individual to serve as a reference. Broad generalities may serve to weaken your nominee's nomination.

The nominator is encouraged to select references from outside the nominee's own organization when possible, or to minimize the number from within. The impartiality of the references may be questioned if most are from the nominee's organization. Also, the perception of the nominee's distinction may be questioned. However, if the nominee's contributions consist primarily of product advancements known only within his own organization, it is acceptable for many of the references to come from that source, so that the appropriate level of detail may be cited. For instance, the knowledge of an internal source might be especially important in the case of an individual's particular contribution in a group effort.

The following information applies to nominations of nominees who reside in Region 9: If it is not possible to identify the required five IEEE Fellows to serve as references for a nominee who resides in this region, the IEEE Fellow Committee will accept references from IEEE Senior or Life Senior Members. However, nominators are strongly encouraged to obtain references from IEEE Fellow Grade Members. This waiver is reviewed annually and may be withdrawn in future years as the number of IEEE Fellows increases globally. Please remember that a person who serves as a reference must be qualified to judge the work of the nominee from a personal knowledge standpoint.

**NOTE: It is the nominator's responsibility to follow up with references to confirm that all reference forms are submitted to the IEEE Fellow Committee prior to the 01 March deadline. The IEEE Fellow Staff will be unable to supply information on which material, if any, is missing from a particular nominee's nomination package.**

**11. Endorsements of Nomination (Optional)**. Any person, including non-IEEE members, can serve an IEEE Fellow Endorsement. The following individuals are ineligible to serve as endorsements for IEEE Fellow nominations: members of the IEEE Board of Directors, the IEEE Fellow Committee, IEEE Society/Technical Council Fellow Evaluating Committee Chairs, the IEEE Society/Technical Council Fellow Evaluating Committee members reviewing the nomination or IEEE Staff. In addition, a nominator may not serve as an Endorsement for a nomination he/she is submitting.

A maximum of three endorsements will be accepted. An endorsement of a nominee is optional; the submission of such material will contribute to the evaluation process and should not be overlooked. An endorsement will strengthen a nomination if it contains information on specific contributions that, in the opinion of the endorser, qualify the nominee for IEEE Fellow. An IEEE Section, Chapter, Committee, or Board to which the nominee has contributed time and talents may endorse the nomination through its executive body. A non-IEEE organization or individual may also provide an endorsement. Endorsements will be shared with the IEEE Society/Technical Council Fellow Evaluating Committee reviewing the nomination.

**NOTE: It is the nominator's responsibility to follow up with endorsers to confirm that all endorsement forms are submitted to the IEEE Fellow Committee prior to the 01 March deadline. The IEEE Fellow Staff will be unable to supply information on which material, if any, is missing from a particular nominee's nomination package.**

**12. Evaluation by IEEE Society/Technical Council** To assist the IEEE Fellow Committee in evaluating the qualifications of the nominee, the nominator is responsible for identifying an IEEE Society/Technical Council that best reflects the nominee's field of technical accomplishment. Attached is a list of the scopes of each IEEE Society/Technical Council.

## **Aerospace and Electronic Systems**

The fields of interest are the organization, design, development, integration, and operation of complex systems for space, air, ocean or ground environments. These systems include but are not limited to navigation, avionics, mobile electric power and electronics, radar, sonar, telemetry, military, law-enforcement, automatic test simulators, and command and control. Many AES members are concerned with the practice of systems engineering.

## **Antennas and Propagation**

The field of interest includes the following: antennas, including analysis, design, development, measurement, and testing; radiation, propagation, and the interaction of electromagnetic waves with discrete and continuous media; and applications and systems pertinent to antennas, propagation, and sensing, such as applied optics, millimeter- and sub-millimeter-wave techniques, antenna signal processing and control, radio astronomy, and propagation and radiation aspects of terrestrial and space-based communication, including wireless, mobile, satellite, and telecommunication.

## **Biometrics Council**

The Council works to advance the theory, design, and application of biometric characterization of human beings, based on physiological and/or behavioral features and traits, in particular for identification, identity verification, authentication, encryption, recognition and medical diagnosis

## **Broadcast Technology**

The fields of interest shall encompass devices, equipment, techniques and systems related to broadcast technology, including the production, distribution, transmission, and propagation aspects.

## **Circuits And Systems**

The fields of interest include the theory, analysis, design (computer aided design), and practical implementation of circuits, and the application of circuit theoretic techniques to systems and to signal processing. The coverage of this field includes the spectrum of activities from, and including, basic scientific theory to industrial applications.

## **Communications**

The IEEE Communications Society embraces the science, technology and applications supporting the transfer and organization of information, of diverse media types and formats, through communication networks and channels.

This may include:

- \* Architecture, control, management, performance, and applications of electronic, optical, and wireless communication networks;
- \* Technologies and services for existing and emerging networks and the Internet;
- \* Theory and techniques of modulation, detection, coding, and signaling through channels; design and operation of packet- and circuit-switched networks;
- \* Switching and routing systems;
- \* Communication protocols, software, and middleware;
- \* Techniques for achieving quality of service and reliability;
- \* Communications capabilities of terminals, appliances, and information systems;
- \* Communications standards and specifications; and
- \* The impact of communications technologies on societies and individuals

### **Components, Packaging and Manufacturing Technology**

The fields of interest encompass the scientific, engineering, and production aspects of materials, component parts, modules including hybrids, and electronic systems. This includes the selection, application, assembly, interconnection, packaging, handling, thermal management, reliability, testing and control of the above as they apply in design and manufacturing. Emphasis shall be placed upon research, analysis, development and application that will aid in advancing the state-of-art within this scope.

### **Computational Intelligence**

The field of interest of the Society and its activities and programs shall be the theory, design, application and development of biologically and linguistically motivated computational paradigms emphasizing neural networks, including connectionist systems, genetic algorithms, evolutionary programming, fuzzy systems, and hybrid intelligent systems in which these paradigms are contained.

### **Computer**

The purposes of the Society shall be scientific, literary, and educational in character. The Society shall strive to advance the theory, practice, and application of computer and information processing science and technology and shall maintain a high professional standing among its members. The Society shall promote cooperation and exchange of technical information among its members and to this end shall hold meetings for the presentation and discussion of technical papers, shall publish technical journals, and shall through its organization and other appropriate means provide for the needs of its members. The scope of the Society shall encompass all aspects of theory, design, practice, and application relating to computer and information processing science and technology.

### **Consumer Electronics**

The fields of interest are the consumer related aspects of leisure, video, and audio electronics; home information and communications systems, and interactive information and display systems. Products included in, but not limited to, these categories are receivers and video signal generation and distribution, projection TV, still and motion electronic cameras, Advanced TV Systems, consumer computing hardware and software, home business control/security systems, telephones and accessories, electronic games and toys, digital audio systems, home health care electronic devices, home and mobile audio/communications systems, and music electronics.

### **Control Systems**

The fields of interest are the theory, design and application of Control Systems. It shall encompass components, and the integration of these components, as are necessary for the construction of such systems. The word 'systems' as used herein shall be interpreted to include physical, biological, organizational and other entities, and combinations thereof, which can be represented through a mathematical symbolism. The field of interest shall include scientific, technical, industrial or other activities that contribute to this field, or utilize the techniques or products of this field, subject, as the art develops, to additions, subtractions, or other modifications directed or approved by the IEEE Technical Activities Board.

### **Council on Electronics Design Automation**

The fields of interest span the theory, implementation and use of EDA/CAD tools to design integrated electronic circuits and systems. This includes tools that automate all levels of the design, analysis and verification of hardware and embedded software up to and including complete working systems.

### **Council on Superconductivity**

The field of interest of the Council and its activities and programs shall be to cover the science and technology of superconductors and their applications, including materials and their applications for electronics and power systems, where the superconductor properties are central to the application. Superconducting electronic

applications will include both analog and digital circuits and systems. Power applications will include the generation, storage, transmission and use of electric power.

### **Dielectrics and Electrical Insulation**

The field of interest is the study of dielectric phenomena and behavior, and development, characterization and application of all gaseous, liquid and solid electrical insulating materials and systems utilized in electrical and electronic equipment. The Society shall also be involved in the creation of voluntary engineering standards and the recommended practices related thereto.

### **Education**

The fields of interest include educational methods, educational technology, instructional materials, history of science and technology, and educational and professional development programs within the electrical engineering, computer engineering, and allied disciplines.

### **Electromagnetic Compatibility**

The field of interest of the Society involves engineering related to the electromagnetic environmental effects of systems to be compatible with themselves and their intended operating environment. This includes: standards, measurement techniques and test procedures, instrumentation, equipment and systems characteristics, interference control techniques and components, education, computational analysis, and spectrum management, along with scientific, technical, industrial, professional or other activities that contribute to this field.

### **Electron Devices**

The field of interest is all aspects of the physics, theory and phenomena of electron and ion devices such as elemental and compound semiconductor devices, quantum effect devices, optical devices, displays and imaging devices, photovoltaics, solid-state sensors and actuators, solid-state power devices, high frequency devices, micromechanics, tubes and other vacuum devices. The society is concerned with research, development, design and manufacture related to the materials, processing, technology, and applications of such devices, and the scientific, technical and other activities that contribute to the advancement of this field.

### **Engineering In Medicine and Biology**

The field of interest is the application of the concepts and methods of the physical and engineering sciences to biology and medicine. This field covers a very broad range from formalized mathematical theory through experimental science and technological development to practical clinical applications. It includes support of scientific, technological and educational activities.

### **Geoscience and Remote Sensing**

The field of interest is the theory, concepts, and techniques of science and engineering as applied to sensing the earth, oceans, atmosphere and space, and the processing, interpretation, and dissemination of this information.

### **Industrial Electronics**

The fields of interest are the theory and applications of electronics, controls, communications, instrumentation and computational intelligence to industrial and manufacturing systems and processes.

### **Industry Applications**

As a transnational organization, the scope is the global development, design, manufacture, and application of electrical systems, apparatus, devices, and controls to the processes and equipment of industry and commerce; the promotion of safe, reliable, and economic installations; industry leadership in energy conservation and environmental, health, and safety issues; the creation of voluntary engineering standards and recommended practices; and the professional development of its membership.

### **Information Theory**

The scope includes the processing, transmission, storage, and use of information, and the foundations of the communication process. It specifically encompasses theoretical and certain applied aspects of coding, communications and communications networks, complexity and cryptography, detection and estimation, learning, Shannon Theory, and stochastic processes..

### **Instrumentation and Measurement**

The fields of interest include the science of developing and using electrical and electronic instruments for the purpose of measuring, monitoring or recording various physical phenomena that may or may not be of an electrical nature. This includes analog and digital electronic instruments, systems and standards for measuring and recording electrical quantities in the frequency domain (including DC) and the time domain, and transducers to give access to non electrical quantities. Instruments with automated control and analysis functions are part of the field of interest.

### **Intelligent Transportation Systems Council**

The fields of interest are the theoretical, experimental and operational aspects of electrical and electronics engineering and information technologies as applied to Intelligent Transportation Systems (ITS), defined as those systems utilizing synergistic technologies and systems engineering concepts to develop and improve transportation systems of all kinds.

### **Magnetics**

Treatment of all matters in which the dominant factors are the fundamental developments, design, and certain applications of magnetic devices. This includes consideration of materials and components as used therein, standardization of definitions, nomenclature, symbols, and operating characteristics; and exchange of information as by technical papers, conference sessions, and demonstrations.

### **Microwave Theory and Techniques**

The field of interest of the Society shall be "Microwave Theory, Techniques and Applications" of RF, microwave, guided wave, and wireless technologies, as they relate to components, devices, circuits, transmission lines, and systems involving the generation, modulation, demodulation, control, transmission, detection, and effects of electromagnetic signals. It shall include scientific, technical, and industrial, activities, subject to timely modifications approved by IEEE TAB.

Microwave Theory and Techniques applies physical and mathematical principles to analyze structures with dimensions representing a significant fraction of a wavelength or when propagation effects need to be considered.

### **Nanotechnology Council**

The fields of interest shall be the theory, design, and development of nanotechnology and its scientific, engineering, and industrial applications. The Council will provide a focus for cooperative activities, both internally and externally, including the promotion, consolidation, and coordination of nanotechnology activities among IEEE entities.

### **Nuclear and Plasma Sciences**

The fields of interest are the nuclear and plasma sciences. The Society shall devote itself to publication or other dissemination of original contributions to the theory, experiments, educational methods and applications of these fields, and to the development of standards. Areas of technical activity shall include but not be limited to the following: Nuclear science and engineering, including: instrumentation for research; detection and measurement of radiation; nuclear biomedical applications; radiation monitoring and safety equipment; particle accelerators; nuclear instrumentation development for reactor systems; effects of radiation on materials, components, and systems; and applications of radiation and nuclear energy to other than utility power generation. Plasma science and engineering, including: magnetofluid dynamics and thermionics; plasma dynamics; gaseous electronics and arc technology; controlled thermonuclear fusion; electron, ion, and plasma

sources; space plasmas; high current relativistic electron beams; laser plasma interactions; diagnostics; plasma chemistry and colloidal and solid state plasmas.

### **Oceanic Engineering**

The fields of interest include all aspects of science, engineering, and technology that address research, development, and operations pertaining to all bodies of water. This includes the creation of new capabilities and technologies from concept design through prototypes, testing, and operational systems to sense, explore, understand, develop, use, and responsibly manage natural resources.

### **Photonics (formerly Lasers and Electro-Optics)**

The fields of interest shall be lasers, optical devices, optical fibers and associated lightwave technology and their application in systems and subsystems, in which the quantum electronic devices are key elements. The Society is concerned with the research, development, design, manufacture, and applications of materials, devices and systems, and with the various scientific and technological activities which contribute to the useful expansion of the field of quantum electronics and applications.

### **Power Electronics**

The scope includes the development of power electronics technology which encompasses the effective use of electronic components, the application of circuit theory and design techniques, and the development of analytical tools toward efficient electronic conversion, control, and conditioning of electric power.

### **Power and Energy**

The scope embraces planning, research, development, design, application, construction, installation and operation of apparatus, equipment, structures, materials and systems for the safe, reliable and economic generation, transmission, and distribution, conversion, measurement and control of electric energy. It includes the developing of engineering standards, the providing of information and instruction to the public and to legislators, as well as technical scientific, literary, educational and other activities that contribute to the electric power discipline or utilize the techniques or products within this discipline.

### **Product Safety Engineering**

The fields of interest include the theory, design, development and implementation of product safety engineering for equipment and devices used in the scientific, engineering, industrial, commercial and residential arenas. The Society will provide a focus for cooperative activities, both internal and external to IEEE, including the promotion and coordination of product safety engineering activities among IEEE entities.

### **Professional Communication**

The fields of interest include the study, development, improvement, and promotion of effective techniques for preparing, organizing, processing, editing, collecting, conserving, teaching, and disseminating any form of technical information by and to individuals and groups by any method of communication. It also includes technical, scientific, industrial, and other activities that contribute to the techniques and products used in this field.

The specific areas encompassed by the Society's field of interest include but are not limited to, the concepts, techniques, and products associated with: Printed publications; Oral presentations; Slides, motion pictures, television, and other audio visuals; Computer oriented information transfer processes, Telecommunication systems. The Society's field of interest also includes the research and development of new techniques, the definition of professional standards, and the fostering of continuing education related to these activities.

### **Reliability**

The Society is concerned with the strategies and the best practices for attaining, assessing, assuring, and sustaining system reliability throughout its life cycle.

Reliability is a design attribute of a system (encompassing service and process). Even though reliability is intangible physically, it is a true system performance measure.

Note: System reliability in this context implies the reliability of any product tier starting at the materials level, then the device / component level, then the assembly / unit / module level, to a system or system of systems. The term system is meant to be a broad term so that anyone within Reliability Engineering working on or with a product or process or service can be included within this Society.

Additionally, by having Reliability as an attribute, with our broad perspective of the term, leads to the use of descriptive terms, such as: dependable, trustworthy, available, maintainable, reliable, fault-tolerant, graceful degradation, failure immunity, secure, safe, intuitive, resilient, reliant, etc. Reliability is integral to Design, Availability, Maintainability, Testability, Diagnostics, Prognostics and Health Management, Integrity, Security, Quality, Supportability, Human Engineering, and System Safety.

The Society membership encompasses engineers who are designing, analyzing, producing and assessing some portion or level of a system, be it hardware, software, devices, processes, or materials.

### **Robotics and Automation**

The Society is interested in both applied and theoretical issues in robotics and automation. Robotics and automation are here broadly defined to mean the intelligent and interactive connection of perception to action through cognition and planning. Under this general definition are included the following technologies:

Kinematics, dynamics, control and simulation of robots and automatic machines; Sensing and perception: vision and other non contact sensors; tactile and other contact sensing systems; Systems control theory and applications as related to the modeling of robotic systems; Robot mobility and navigation; Robotics related computer hardware and software components, architectures and systems; Advanced command and programming languages for robots; Linkages to computer aided design, engineering and manufacturing information systems; Electronic and manufacturing science and technology as related to robotics; Man machine interfaces as related to robotics and automation; Management of flexible automation. The Robotics and Automation Society is primarily concerned with the engineering science and generic technology of the field. Specific applications and specific technologies are the primary concern of other IEEE Societies with which this Society cooperates.

### **Sensors Council**

The fields of interest are the theory, design, fabrication, manufacturing and application of devices for sensing and transducing physical, chemical, and biological phenomena, with emphasis on the electronics, physics and reliability aspects of sensors and integrated sensor-actuators.

### **Signal Processing**

The fields of interest are the theory and application of filtering, coding, transmitting, estimating, detecting, analyzing, recognizing, synthesizing, recording, and reproducing signals by digital or analog devices of techniques. The term "signal" includes audio, video, speech, image, communication, geophysical, sonar, radar, medical, musical, and other signals.

### **Social Implications of Technology**

The fields of interest include the impact of technology (as embodied by the fields of interest of IEEE) on society, including both positive and negative effects, the impact of society on the engineering profession, the history of the societal aspects of electrotechnology, and professional, social and economic responsibility in the practice of engineering and its related technology.

### **Solid-State Circuits**

The fields of interest include the design, implementation and application of solid-state integrated circuits.

### **Systems Council**

This Council integrates IEEE activities regarding aspects of multiple disciplines and specialty areas associated with the engineering of systems. This Council covers, but is not limited to the following: Systems engineering, education, standards, processes and methodologies; Modeling, simulation and integration related to design, testing, production and support; Design aspects for robust design, human factors, safety, security and usability;

Transition of products from design to production, deployment and use; Quality control and system management; Program/product/project management interactions; Risk management; Systems architecture

### **Systems, Man, and Cybernetics**

The fields of interest include: (1) Integration of the theories of communication, control, cybernetics, stochastics, optimization and system structure towards the formulation of a general theory of systems; (2) development of systems engineering technology including problem definition methods, modeling, and simulation, methods of system experimentation, human factors engineering data and methods, systems design techniques and test and evaluation methods; and (3) application of the above at both hardware and software levels to the analysis and design of biological, ecological, socio economic, social service, computer information, and operational man machine systems.

### **Technology Management Council**

The fields of interest encompass the management sciences applicable to individuals and organizations engaged in or overseeing the management of engineering and technology.

Scope: Topics of Interest include but are not limited to: technology policy development, assessment, and transfer; strategic management and strategic planning; issues related to research, development, design, evaluation, production, and operations; innovation and entrepreneurship; program and project management; education and training related to engineering and technology management; transitioning to management; and the socioeconomic impact of engineering and technology management.

### **Ultrasonics, Ferroelectrics, and Frequency Control**

The fields of interest include the theory, technology, materials, and applications related to: (1) the generation, transmission, and detection of mechanical waves and vibrations and their interaction with other phenomena; (2) medical ultrasound, including hyperthermia, bioeffects, tissue characterization and imaging; (3) ferroelectric, piezoelectric and piezomagnetic materials, including crystals, polycrystalline solids, films, polymers, and composites; (4) frequency control, timing, and time distribution, including crystal oscillators and other means of classical frequency control, and atomic, molecular and laser frequency control standards.

### **Vehicular Technology**

The fields of interest include the theoretical, experimental and operational aspects of electrical and electronics engineering in mobile radio, motor vehicles and land transportation. (1) Mobile radio shall include all terrestrial mobile services. (2) Motor vehicles shall include the components and systems and motive power for propulsion and auxiliary functions. (3) Land transportation shall include the components and systems used in both automated and non automated facets of ground transport technology.