JULY 2023
IEEE Thesaurus

Version 1.02

IEEE

Advancing Technology for Humanity

JULY 2023 IEEE Thesaurus

The IEEE Thesaurus is a controlled vocabulary of almost 11,570 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 Z39.4-2021, *Critera for Inde*xes. 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 Z39.4-2021 Criteria for Indexes, Sections 5 through 8 for detailed information on controlled vocabularies, display formats, usage and spelling, and selection criteria for descriptors (http://www.niso.org/publications/z394-2021-indexes).

JULY 2023 IEEE Thesaurus

1/f noise
UF: 1f
Pink noise
BT: Noise

3-DOF
UF: 3 DOF
3 degrees of freedom
BT: Robot motion
RT: 5-DOF
6-DOF
Motion analysis

3D audio
BT: Audio systems
Augmented reality
RT: Virtual reality

3G mobile communication
UF: 3G
3rd generation mobile communication
IMT-2000
Third generation mobile communication
UMTS
Universal mobile telecommunication service
BT: Cellular technology
Mobile communication
RT: 4G mobile communication
Ambient networks
Cellular radio
MIMO communication
Multiaccess communication
Next generation networking
OFDM
Radio access networks
Spread spectrum communication
Telecommunication computing
Time division synchronous code division multiple access

3GPP
UF: 3G partnership project
3rd generation partnership project
BT: Standards organizations
RT: New Radio

3GPP Standards
BT: Standards publications
NT: Long Term Evolution

4G mobile communication
UF: 4th generation mobile communication
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

5-DOF
UF: 5 DOF
5 degress of freedom
BT: Robot motion
RT: 3-DOF
6-DOF
Motion analysis

5G mobile communication
UF: 5G
5th generation mobile systems
5th generation systems
5th generation wireless systems
BT: Cellular technology
Mobile communication
RT: 4G mobile communication
6G mobile communication
Cellular radio
Edge computing
Land mobile radio
Next generation networking
Tactile Internet
Ultra-dense networks
NT: Enhanced mobile broadband
New Radio

6-DOF
UF: 6 DOF
6 degrees of freedom
BT: Robot motion

RT: 3-DOF
5-DOF
Motion analysis

6G mobile communication
BT: Mobile communication
RT: 5G mobile communication
Cellular radio
NT: Space-air-ground integrated networks

Abdomen
BT: Body regions

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 machines
UF: Alternating current machines
BT: Electric machines
RT: AC-AC converters
Pulse width modulation
Sensorless control
Windings
NT: AC motors
Induction machines
Synchronous machines

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
AC-AC power conversion
BT: Converters
Power conversion
RT: AC machines

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

Accelerated aging
BT: Aging
Materials testing

Accelerator architectures
BT: Computer architecture

Accelerator magnets
BT: Magnetic devices
Particle accelerators

Accelerometers
UF: Acceleration measurement
BT: Measurement
RT: 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
Identification of persons
Smart cards
Trust management
Zero Trust
NT: Accesslists
Authorization
Blocklists
Multi-factor authentication
Non-repudiation
Passwords

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

Accesslists
UF: Access lists
Allow lists
BT: Access control
Information filters

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
NT: Acoustic communication (telecommunication)
Acoustic imaging
Acoustic testing

Acoustic arrays
BT: Acoustic transducers
RT: Acoustic signal processing
Array signal processing
Sonar

Acoustic beams
BT: Beams

Acoustic communication (telecommunication)
BT: Acoustic applications
Telecommunication services
RT: Mobile communication
OFDM
Wireless networks

Acoustic devices
UF: Ultrasonic devices
BT: Acoustics
RT: Piezoelectric devices
NT: Acoustic waveguides
Acousto-optical devices
Acoustoelectric devices
Bulk acoustic wave devices
Film bulk acoustic resonators
Surface acoustic wave devices

Acoustic diffraction
BT: Acoustic propagation

Acoustic distortion
BT: Distortion

Page 5

RT: Acoustic noise
Acoustic signal processing
Loudspeakers
Nonlinear acoustics

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 noise
UF: Audible noise
Audio restoration
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
BT: Acoustics
RT: Acoustic propagation

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

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 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: Music
        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
        Nonlinear acoustics
        Psychoacoustics
        Reverberation
        Spectral shape
        Underwater acoustics

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

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

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

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

Activation analysis
BT: Chemical analysis

Active appearance model
BT: Computer vision

Active circuits
BT: Circuits
NT: Active inductors
        Gyrators
        Operational amplifiers

Active contours
BT: Motion analysis

Active distribution networks
BT: Power distribution networks

Active filters
BT: Filters
NT: 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 light emitting diodes
- UF: AMOLEDs
- Active matrix organic LEDs
- Active matrix organic light-emitting diodes
- BT: Active matrix technology
- Diodes
- Organic light emitting diodes

Active matrix technology
- UF: Active-matrix
- BT: Displays
- NT: Active matrix addressing
- Active matrix liquid crystal displays
- 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

Activity recognition
- BT: Cognition
- Pattern recognition
- Sensor systems
- RT: Computer vision
- NT: Human activity recognition

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

Acupuncture
- BT: Medical treatment

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

Adaptation models
    BT: Adaptive algorithms

Adaptive algorithms
    BT: Algorithms
    NT: Adaptation models

Adaptive arrays
    UF: Adaptive antenna arrays
    BT: Antenna arrays
    RT: Adaptive signal detection
             Array signal processing
             Radar countermeasures
             Radio communication
countermeasures

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 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
             Extensibility
             Learning systems
             Neural networks
    NT: Adaptive control
             Cognitive radar
             Line enhancers
             Multi-agent systems
             Variable structure 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

Addiction
    UF: Substance abuse
    BT: Medical conditions

Additive noise
    BT: Noise
    NT: AWGN
             Additive white noise

Additive white noise
    BT: Additive noise
    RT: Gaussian noise

Additives
UF:	Fuel additives
BT:	Materials
RT:	Production materials

Adenoviruses
UF:	Adenoviridae
BT:	Microorganisms

Adhesive strength
BT:	Materials testing

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

Adiabatic processes
BT:	Thermodynamics

Admission control
BT:	Quality of service
RT:	Bandwidth

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

Admittance control
BT:	Admittance
	Control systems
RT:	Human-robot interaction
	Position control
	Torque control

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

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

Advanced driver assistance systems
UF:	ADAS
BT:	Traffic control
	Vehicle safety
RT:	Automotive electronics
	Collision avoidance
	Computer vision
	Intelligent transportation systems
	Intelligent vehicles
	Mobile robots
	Object detection
	Steering systems
	Vehicle-to-everything

Adversarial machine learning
UF:	Adversarial learning
BT:	Machine learning

Advertising
BT:	Marketing management

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

Aeroponics
BT:	Agriculture

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 systems
	Electronic warfare

Military equipment
Sensor systems
Sonar
Telemetry

Aerospace biophysics
BT: Aerospace engineering
 Biophysics
RT: Human factors

Aerospace components
BT: Aerospace materials

Aerospace control
UF: Aircraft control
 Flight control
BT: Aerospace and electronic systems
RT: Aerodynamics
 Aerospace simulation
 Aircraft
 Hardware-in-the-loop simulation
 Hypersonic vehicles
 Military systems
 Missiles
 Motion control
 Space vehicles
 Velocity control
NT: Air traffic control
 Attitude control
 Ground support

Aerospace electronics
UF: Aerospace instrumentation
 Aircraft electronics
 Aircraft instrumentation
 Avionics
 Space vehicle electronics
 Space vehicle instrumentation
BT: Aerospace engineering
RT: Aircraft
 Gamma-ray telescopes
 Space vehicles
 Total ionizing dose
 X-ray telescopes

Aerospace engineering
BT: Aerospace and electronic systems
RT: Aerospace industry
 Aerospace materials
 Lightweight structures
NT: Aerospace biophysics

Aerospace electronics
Aerospace safety
Aerospace simulation
Aerospace testing
Artificial satellites
Space technology

Aerospace industry
BT: Manufacturing industries
RT: Aerospace engineering
 Aerospace materials
 Aerospace safety
 Aircraft manufacture
 Lightweight structures

Aerospace materials
UF: Aircraft materials
 Spacecraft materials
BT: Aerospace and electronic systems
 Production materials
RT: Aerospace engineering
 Aerospace industry
 Aircraft manufacture
 Lightweight structures
 Space vehicles
NT: Aerospace components

Aerospace propulsion
BT: Propulsion

Aerospace safety
BT: Aerospace engineering
 Safety
RT: Aerospace accidents
 Aerospace industry
 Ion beam effects
 Space shuttles
 Space vehicles
NT: Air safety

Aerospace simulation
UF: Flight simulation
BT: Aerospace engineering
RT: Aerospace control
 Aerospace testing
 Wind tunnels

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

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

Aggregates
- BT: Materials
- RT: Building materials

Agile manufacturing
- BT: Manufacturing systems
- RT: Computer integrated manufacturing
  Flexible manufacturing systems

Agile project management
- BT: Project management
  Software development management
- RT: Scrum (Software development)

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

Aging
- UF: Age factors
  Aged
  Ageing
- BT: Materials science and technology
- RT: Alzheimer's disease
  Ambient assisted living
  Assisted living
  Cataracts
  Electric breakdown
  Energy storage
  Gerontology
  Insulation life
  Life estimation
  Older adults
  Reliability
- NT: Accelerated aging

Agricultural engineering
- BT: Engineering - general
- RT: Agricultural machinery
  Agricultural robots
  Agriculture
  Farming

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

Agricultural products
- BT: Agriculture
- RT: Agricultural robots
  Farming
  Food products
  Food security
  Irrigation
  Pesticides
- NT: Cotton
  Crops
  Dairy products
  Sugar
  Wool

Agricultural robots
- BT: Agricultural machinery
  Robots
- RT: Agricultural engineering
  Agricultural products
  Mobile robots

Agriculture
UF:	Livestock
BT:	Industries
RT:	Agricultural engineering
	Agricultural machinery
	Animals
	Dairy products
	Farming
	Food waste
	Genetic engineering
	Pest control
	Seeds (agriculture)
	Soil pollution
	Vegetation mapping
NT:	Aeroponics
	Agricultural products
	Agrochemicals
	Aquaculture
	Greenhouses
	Irrigation
	Smart agriculture

Agrochemicals
UF:	Agrichemicals
BT:	Agriculture
	Chemical products
NT:	Fertilizers
	Pesticides

AI accelerators
UF:	AI chips
	Arificial 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

AIEE Standards
BT:	IEEE Standards

Air accidents
BT:	Aerospace accidents
RT:	Air safety
	Air traffic control

Air cleaners
UF:	Air filters
	Air purifiers
BT:	Machine components
RT:	Air pollution
	Cleaning
	Purification

Air conditioning
BT:	Cooling
RT:	Building services
	Buildings
	Compressors
	Ducts
	Fans
	HVAC
	Ventilation
	Vents
NT:	Central air conditioning

Air gaps
UF:	Air-gap
BT:	Electromagnetic analysis
RT:	Electrodes
	Spark gaps

Air pollution
UF:	Air pollutants
BT:	Air quality
	Pollution
RT:	Air cleaners
	Ash
	Atmospheric measurements
	Carbon footprint
	Carbon sequestration
	Exhaust gases
	Flue gases
	Fossil fuels
	Global warming
	Incineration
	Industrial pollution
	Meteorology
	Natural gas
	Thermal pollution

Air quality
BT:	Atmosphere
RT:	Atmospheric measurements
	Environmental factors
NT:	Air pollution
	Indoor air quality

Air safety
>　BT:　Aerospace safety
>　RT:　Air accidents

Air traffic control
>　UF:　Air traffic management
>　BT:　Aerospace control
>　RT:　Air accidents
>　　　Air transportation
>　　　Control systems
>　　　Radio navigation

Air transportation
>　BT:　Transportation
>　RT:　Air traffic control
>　　　Airline industry
>　　　Global Positioning System
>　NT:　Aircraft
>　　　Airports

Airborne radar
>　BT:　Radar
>　RT:　Synthetic aperture radar

Aircraft
>　BT:　Air transportation
>　RT:　Aerospace control
>　　　Aerospace electronics
>　　　Aircraft manufacture
>　　　Aircraft navigation
>　　　Aircraft propulsion
>　　　Airline industry
>　　　Ground support
>　　　Military aircraft
>　　　Propellers
>　NT:　Airplanes
>　　　Helicopters

Aircraft manufacture
>　BT:　Aerospace and electronic systems
>　RT:　Aerospace industry
>　　　Aerospace materials
>　　　Aircraft

Aircraft navigation
>　UF:　Aerospace navigation
>　　　Entry, descent and landing
>　BT:　Aerospace and electronic systems
>　　　Navigation
>　RT:　Aircraft
>　　　Course correction

Aircraft propulsion
>　UF:　Aero-engines
>　　　Aeroengines
>　　　Aircraft engines
>　BT:　Aerospace and electronic systems
>　　　Propulsion
>　RT:　Aircraft
>　　　Engines
>　　　Jet engines
>　　　Turbines
>　NT:　Propellers

Airline industry
>　BT:　Industries
>　RT:　Air transportation
>　　　Aircraft
>　　　Airports

Airplanes
>　BT:　Aircraft

Airports
>　UF:　Airfields
>　BT:　Air transportation
>　RT:　Airline industry
>　　　Freeports

Alarm systems
>　UF:　Warning systems
>　BT:　Security
>　RT:　Fall detection
>　　　Monitoring
>　　　Motion detection
>　　　Safety
>　　　Safety devices
>　NT:　Smoke detectors

Alcoholic beverages
>　BT:　Ethanol

Alcoholism
>　BT:　Diseases

Algae
>　BT:　Organisms

Algebra
>　BT:　Mathematics
>　RT:　Nonlinear equations
>　NT:　Abstract algebra
>　　　Boolean algebra
>　　　Linear algebra
>　　　Set theory

Algorithm design and analysis
- BT: Algorithms
- RT: Fish schools
- NT: Algorithmic efficiency
  Generative adversarial networks

Algorithm design and theory
- BT: Algorithms
- NT: Backtracking
  Consensus algorithm

Algorithmic efficiency
- BT: Algorithm design and analysis
- RT: Computational complexity
  Software performance
  Software quality
- NT: Metaheuristics

Algorithms
- UF: Subroutines
- BT: Mathematics
- RT: Biometrics (access control)
  Ciphers
  Cyclic redundancy check
  Huffman coding
  Linear programming
  Maximum likelihood decoding
  Model checking
  Numerical stability
  Random processes
  Software
  Software libraries
  Stability analysis
- NT: Adaptive algorithms
  Algorithm design and analysis
  Algorithm design and theory
  Approximation algorithms
  Artificial bee colony algorithm
  Backpropagation algorithms
  Basis algorithms
  Change detection algorithms
  Classification algorithms
  Clustering algorithms
  Compression algorithms
  Density estimation robust algorithm
  Detection algorithms
  Distributed algorithms
  Dynamic programming
  Filtering algorithms
  Genetic algorithms
  Hash functions
  Heuristic algorithms
  Inference algorithms
  MLFMA
  Machine learning algorithms
  Matching pursuit algorithms
  Maximum likelihood detection
  Multicast algorithms
  Parallel algorithms
  Partitioning algorithms
  Prediction algorithms
  Projection algorithms
  Pursuit algorithms
  Signal processing algorithms
  Software algorithms
  Viterbi algorithm
  Whale optimization algorithms

All-optical networks
- UF: All optical networks
- BT: Optical fiber networks

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
NT: Intermetallic
            Shape memory alloys

Alpha particles
BT: Nuclear physics
RT: Ions

Alternators
BT: Electric machines
RT: Synchronous generators

Altimetry
BT: Pressure measurement
RT: Atmospheric measurements

Aluminum
UF: Al
            Aluminium
BT: Chemical elements
            Metals
NT: Aluminum alloys
            Aluminum compounds

Aluminum alloys
UF: Aluminium alloys
BT: Aluminum
RT: Alloying

Aluminum compounds
UF: Aluminium compounds
BT: Aluminum
RT: Alloying
NT: Aluminum gallium nitride
            Aluminum nitride
            Aluminum oxide

Aluminum gallium nitride
BT: Aluminum compounds
            Gallium compounds
RT: III-V semiconductor materials
            Transistors

Aluminum nitride
BT: Aluminum compounds

Aluminum oxide
UF: Al2O3
            Aluminium oxide
BT: Aluminum compounds
RT: Ceramics

Alzheimer's disease
BT: Dementia
            Diseases
RT: Aging
            Gerontology
            Hippocampus
            Older adults

Ambient assisted living
UF: AAL
BT: Assisted living
            Information and communication technology
RT: Aging
            Assistive devices

Ambient intelligence
BT: Consumer electronics
            Telecommunications
RT: Intelligent systems
            Internet of Things
            Ubiquitous computing
            User interfaces

Ambient networks
UF: AN Project
BT: Mobile communication
RT: 3G mobile communication

Ambulatory surgery
BT: Surgery

Americium
BT: Chemical elements

Amino acids
BT: Biochemistry

Ammeters
BT: Electric variables measurement
RT: Current measurement

Ammonia
BT: Nitrogen compounds

Amniocentesis
BT: Medical tests
RT: Genetics
            Ultrasonic imaging
NT: Amniotic fluid
            Birth disorders

JULY 2023 IEEE Thesaurus

Amniotic fluid
  BT: Amniocentesis
    Fluids and secretions

Amorphous magnetic materials
  BT: Magnetic materials

Amorphous materials
  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

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

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

Analog integrated circuits
  UF: Analogue integrated circuits
    Linear 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
    Field programmable analog arrays

Analog memory
  BT: Memory
  RT: Analog processing circuits

Analog processing circuits
  BT: Analog circuits
  RT: Analog integrated circuits
    Analog memory

	Application specific integrated circuits	
	Mixed analog-digital integrated circuits	
	Signal processing	

Analog TV
| UF: | Analogue TV |
| BT: | TV |

Analog-digital conversion
UF:	A/D
	A/D conversion
	A/D converter
	Analog to digital conversion
	Analog to digital converter
	Analog-digital
	Analog-to-digital conversion
	Analog-to-digital converter
	Analogue-digital conversion
	Analogue-digital converters
BT:	Data conversion
RT:	Data acquisition
	Quantization (signal)
NT:	Delta modulation

Analog-digital integrated circuits
UF:	Analog digital integrated circuits
	Analogue digital integrated circuits
	Analogue-digital integrated circuits
	Minimum analog-digital integrated circuits
BT:	Integrated circuits
NT:	Mixed analog-digital integrated circuits

Analysis of variance
| UF: | ANOVA |
| BT: | Statistical analysis |

Analytic hierarchy process
UF:	Analytical hierarchy process
BT:	Decision making
RT:	Management
	Strategic planning

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

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

Anesthesia
UF:	Anaesthesia
BT:	Medical treatment
NT:	Anesthetic drugs

Anesthesiology
| BT: | Medical specialties |

Anesthetic drugs
| BT: | Anesthesia |

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

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

Animatronics
BT: Robotics and automation

Anisotropic
BT: Filters

Anisotropic conductive films
BT: Conductive films

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

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

Annotations
BT: Metadata
RT: Text analysis

Anodes
BT: Electrodes
RT: Electron tubes

Anomaly detection
UF: Novelty detection
   Outlier detection
BT: Data mining

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

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

Ant colony optimization
BT: Probability
RT: Graph theory
        Metaheuristics

Antarctica
BT: Geoscience
NT: South Pole

Antenna accessories
UF: Antenna components
BT: Antennas
NT: Radomes

Antenna arrays
UF: Distributed antennas
BT: Antennas
RT: Broadband antennas
        SIMO communication
        SISO communication
NT: Adaptive arrays
        Butler matrices
        Linear antenna arrays
        Log periodic antennas
        Microstrip antenna arrays
        Microwave antenna arrays
        Phased arrays
        Planar arrays

Antenna feeds
BT: Feeds
RT: Antennas
        Aperture coupled antennas

Antenna measurements
BT: Measurement
RT: Anechoic chambers
        Antennas
        Electromagnetic measurements

Antenna radiation patterns
UF: Radiation pattern
BT: Antennas
RT: Antenna theory
NT: Near-field radiation pattern

Antenna theory
BT: Antennas
RT: Antenna radiation patterns
        Current distribution
        Mode matching methods
NT: Frequency selective surfaces

Antenna-in-package
BT: Antennas
        Electronics packaging
        System-in-package

Antennas
BT: Antennas and propagation
RT: Antenna feeds
        Antenna measurements
        Beam steering
        Butler matrices
        Fractals
        IEEE 802.11n Standard
        Microstrip antenna arrays
        Radio communication equipment
        Spatial diversity
        Waveguide theory
NT: Antenna accessories
        Antenna arrays
        Antenna radiation patterns
        Antenna theory
        Antenna-in-package
        Apertures
        Broadband antennas
        Dielectric resonator antennas
        Dipole antennas
        Directional antennas
        Directive antennas
        Feeds
        Fractal antennas
        Helical antennas
        Horn antennas
        Leaky wave antennas
        Loaded antennas
        Log-periodic dipole antennas
        Loop antennas
        Microstrip antennas
        Microwave antennas
        Mobile antennas
        Multifrequency antennas
        Omnidirectional antennas
        Optical antennas
        Patch antennas
        Radar antennas

Receiving antennas
Rectennas
Reflector antennas
Satellite antennas
Slot antennas
Steerable antennas
Textile antennas
Transmission line antennas
Transmitting antennas
UHF antennas
Wearable antennas
Yagi-Uda antennas

Antennas and propagation
RT: Communication systems
Communications technology
Signal processing
NT: Antennas
Electromagnetic propagation
Radio astronomy

Anthropology
BT: Social sciences
RT: Behavioral sciences
Cultural differences
Humanities
Linguistics

Anthropometry
BT: Measurement
RT: Biomechanics
Biomedical measurement
Ergonomics
Human factors

Anthropomorphism
BT: Human factors

Anti-freeze
UF: Anti freeze
Antifreeze
BT: Chemical compounds
RT: Methanol

Anti-fungal
UF: Antifungal
BT: Antibiotics

Anti-parasitical
UF: Antiparasitical
BT: Antibiotics

Anti-virus software
UF: Anti virus software
BT: Software
RT: Computer viruses
Malware
Security

Antibacterial activity
UF: Anti-bacterial
Antibacterial
BT: Antibiotics

Antibiotics
UF: Anti-biotics
BT: Drugs
NT: Anti-fungal
Anti-parasitical
Antibacterial activity

Antibodies
UF: Immunoglobulin
BT: Immune system
RT: Microorganisms
NT: Monoclonal antibodies

Antidepressants
BT: Drugs

Antiferromagnetic materials
BT: Magnetic materials
RT: Antiferromagnetic resonance

Antiferromagnetic resonance
BT: Magnetic resonance
RT: Antiferromagnetic materials

Antigens
BT: Immunology

Antimony
BT: Chemical elements

Antireflection coatings
UF: Anti-reflective coatings
Antireflective coatings
BT: Coatings
RT: Optical reflection

Anxiety disorders
BT: Mental disorders
RT: Emotion recognition
Medical conditions
Mental health
Sentiment analysis

AODV
UF: Ad hoc On Demand Distance Vector
BT: Ad hoc networks
Wireless networks

Aperture antennas
BT: Apertures
RT: Aperture coupled antennas
Reflector antennas

Aperture coupled antennas
BT: Apertures
RT: Antenna feeds
Aperture antennas
Microstrip antenna arrays
Microstrip antennas

Apertures
BT: Antennas
RT: Couplers
NT: Aperture antennas
Aperture coupled antennas

Apicology
UF: Melittology
BT: Entomology
RT: Insects

Application programming interfaces
UF: Mobile application development
BT: Computer interfaces
RT: Software defined networking
NT: Restful API
WebRTC

Application security
BT: Computer security

Application software
BT: Software
NT: Decentralized applications

Application specific integrated circuits
UF: ASIC
Custom integrated circuits
Semicustom integrated circuits
BT: Circuits
Integrated circuits
RT: AI accelerators
Analog processing circuits
CMOS logic circuits

Field programmable analog arrays
NT: System-on-chip

Application specific processors
BT: Program processors

Application virtualization
UF: Cross platform virtualization
Cross-platform virtualization
BT: Computer applications
RT: Emulation
Network function virtualization
Simulation
NT: Edge computing

Applicators
BT: Production equipment
RT: Agricultural machinery
Labeling

Appraisal
BT: Human resource management
RT: Incentive schemes
Personnel

Appropriate technology
BT: Technology
RT: Microhydro power
Picohydro power

Approximate computing
BT: Computers and information processing

Approximation algorithms
BT: Algorithms

Approximation error
BT: Approximation methods

Approximation methods
UF: Approximation theory
BT: Numerical analysis
RT: Least squares approximations
Minimization methods
Signal representation
NT: Approximation error
Chebyshev approximation
Curve fitting
Extrapolation
Function approximation

Interpolation
Linear approximation
Mean square error methods
Perturbation methods

Aquaculture
UF: Fisheries
BT: Agriculture
RT: Marine animals

Aquatic robots
UF: Swimming robots
BT: Robots

Arc discharges
UF: Arc flash
        Arc-flash
BT: Dielectric breakdown
RT: Electrostatic discharges
        High intensity discharge lamps
        Light sources
        Plasmas

Archaea
BT: Organisms

Archeology
UF: Archaeology
BT: Humanities

Architecture
BT: Industries
RT: Building information management
        Buildings
        Structural engineering

Architecture description languages
UF: Architectural description languages
BT: Computer languages

Arctic
BT: Geoscience
NT: North Pole

Area measurement
BT: Measurement
RT: Size measurement

Argon
UF: Ar
BT: Gases

Arithmetic
BT: Mathematics
NT: Digital arithmetic
        Fixed-point arithmetic
        Floating-point arithmetic

Armature
BT: Electromechanical devices

Arms
BT: Extremities
NT: Wrist

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

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

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

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

Arresters
BT: Surge protection
RT: Power system protection
        Power system transients
        Varistors

Arrhythmia
BT: Medical conditions
RT: Cardiology
Heart beat

Arsenic
BT: Chemical elements
NT: Arsenic compounds

Arsenic compounds
UF: Arsenite
Arsine
BT: Arsenic

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

Arterial blood circulation
BT: Arteries

Arterial blood pressure
BT: Arteries

Arterial occlusion
BT: Arteries

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

Arteriosclerosis
BT: Diseases
NT: Atherosclerosis
Coronary arteriosclerosis

Arthritis
BT: Diseases

Artificial bee colony algorithm
UF: ABC algorithms
BT: Algorithms
RT: Cooperative systems

Optimization
Particle swarm optimization
Search problems

Artificial biological organs
UF: Artificial organs
BT: Prosthetics
RT: Biological systems
Bioprinting
NT: Artificial heart
Artificial limbs
Artificial muscles

Artificial heart
BT: Artificial biological organs

Artificial immune systems
BT: Immune system

Artificial intelligence
UF: AI
AI technologies
BT: Computational and artificial intelligence
RT: Autonomous vehicles
Computational intelligence
Data mining
Digital humans
Digital twins
Feedforward neural networks
Generative adversarial networks
Independent component analysis
Machine ethics
Minimax techniques
Natural languages
Neural networks
Neurocontrollers
Pervasive computing
Posthuman
Prediction theory
Radial basis function networks
Reinforcement learning
Robot learning
Semantic Web
Semisupervised learning
Software agents
Support vector machines
Synapses
NT: AI accelerators
Affective computing
Autonomous robots

Bio-inspired computing
Cognitive systems
Commonsense reasoning
Context awareness
Cooperative systems
Decision support systems
Intelligent systems
Knowledge based systems
Knowledge engineering
Learning (artificial intelligence)
Learning systems
Machine learning
Prediction methods
Virtual artifact

Artificial light
UF: Light pollution
BT: Lighting

Artificial limbs
BT: Artificial biological organs
Prosthetics

Artificial muscles
UF: Muscle-like actuators
BT: Artificial biological organs

Artificial neural networks
UF: Deep neural networks
BT: Neural networks
RT: Fish schools
Mathematical models
Neuromorphic engineering
Synapses
NT: Convolutional neural networks
Hebbian theory
Long short term memory
Residual neural networks
Self-organizing feature maps

Artificial satellites
BT: Aerospace engineering
RT: Satellite communication
Satellites
Space technology
Space vehicles
NT: Earth Observing System
Low earth orbit satellites
Military satellites
Space stations

ASA
UF: American Standards Association
BT: Standards organizations
RT: ANSI

ASA Standards
BT: Standards publications
RT: ANSI Standards

Ash
BT: Industrial waste
RT: Air pollution
Exhaust gases
Incineration
Volcanic ash
NT: Fly ash

Asia
BT: Continents

Asphalt
UF: Bitumen
BT: Building materials

Aspherical optics
UF: Aspheric lenses
Aspheric mirrors
Aspheric optics
Aspherical lenses
Aspherical mirrors
BT: Optics

Asphyxia
BT: Death

Aspirin
BT: Drugs

Assembly
BT: Manufacturing
RT: Assembly systems
Manipulators
Manufacturing automation
NT: Fitting
Microassembly
Preforms
Soldering

Assembly systems
BT: Industrial electronics
Manufacturing
Production systems
RT: Assembly
Fitting

10111213141516

3113223

122122

112123

12345

123456789

12345678910

Industrial control
Manipulators
Manufacturing automation
Mobile robots
Robots
NT: Flexible electronics
Robotic assembly

Asset management
UF: Asset-management
BT: Management
NT: Public infrastructure

Assisted living
BT: Medical services
RT: Aging
Assistive robots
Fall detection
Geriatrics
Older adults
NT: Ambient assisted living

Assistive devices
BT: Assistive technologies
RT: Ambient assisted living

Assistive robots
UF: Rehabilitation robotics
Rehabilitation robots
BT: Assistive technologies
Medical robotics
Service robots
RT: Assisted living
Exoskeletons
Geriatrics
Older adults
Patient monitoring
Patient rehabilitation
Social robots
Soft robotics

Assistive technologies
UF: Aids for the handicapped
Handicapped aids
BT: Biomedical equipment
RT: Braille
Communication aids
Gaze tracking
Gerontechnology
Medical control systems
Orthotics
Prosthetics
Sensory aids
Sign language
Social robots

Wearable robots
NT: Assistive devices
Assistive robots
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

Asteroids
BT: Planets

Asthma
BT: Pulmonary diseases
RT: Chronic obstructive pulmonary disease
Emphysema
Pneumonia

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
Solar system
Stars
X-ray astronomy

Astrophysics
BT: Astronomy
Physics
RT: Gravity measurement
NT: Dark matter

Orbits
Stellar dynamics

Asymptotic stability
BT: System analysis and design
RT: Discrete-time systems
Eigenvalues and eigenfunctions
Stability

Asynchronous circuits
BT: Circuits

Asynchronous communication
BT: Data communication
RT: Web services

Asynchronous transfer mode
UF: ATM
BT: Data communication
Protocols
RT: B-ISDN
Broadband communication
ISDN
Multiprotocol label switching
SONET

Atherosclerosis
BT: Arteriosclerosis

Atmosphere
BT: Geoscience
RT: Atmospheric measurements
Meteorology
NT: Air quality
Atmospheric modeling
Atmospheric waves

Atmospheric measurements
BT: Measurement
RT: Air pollution
Air quality
Altimetry
Atmosphere
Barometers
Geophysical measurements
Global warming
Meteorology
Pressure gauges
Remote sensing
Terrestrial atmosphere

Atmospheric modeling
BT: Atmosphere
Modeling

Atmospheric pressure chemical vapor deposition
UF: APCVD
BT: Chemical vapor deposition

Atmospheric waves
BT: Atmosphere
Waves

Atmospheric-pressure plasmas
BT: Plasmas

Atom lasers
UF: Single atom lasers
BT: Lasers
RT: Atom optics
Atomic beams
Gas lasers

Atom optics
UF: Atomic optics
BT: Particle beam optics
RT: Atom lasers
Atomic beams

Atomic batteries
BT: Energy conversion
Nuclear power generation

Atomic beams
BT: Particle beams
RT: Atom lasers
Atom optics

Atomic clocks
UF: Atomic frequency standards
BT: Clocks
RT: Frequency measurement
International Atomic Time
Masers

Atomic force microscopy
BT: Microscopy
RT: Casimir effect
Magnetic force microscopy
Nanotechnology
Scanning microwave microscopy

Atomic layer deposition
BT: Chemical vapor deposition

Atomic measurements
    BT: Measurement
    RT: Nuclear measurements
            Radiation detectors
            Spectroscopy

Atoms
    BT: Materials, elements, and compounds
    NT: Ultracold atoms

Atrial fibrillation
    BT: Fibrillation

Atrophy
    BT: Medical conditions

Attenuation
    UF: Acoustic wave attenuation
            Electromagnetic wave attenuation
            Light attenuation
    BT: Propagation
    RT: Attenuation measurement
            Attenuators
            Diagnostic radiography
            Insertion loss

Attenuation measurement
    BT: Electric variables measurement
    RT: Attenuation
            Loss measurement

Attenuators
    BT: Signal processing
    RT: Attenuation
    NT: Optical attenuators

Attitude control
    BT: Aerospace control
    RT: Position control

Audio coding
    BT: Encoding
            Information theory
    RT: MPEG 7 Standard
            Rate distortion theory
            Speech coding

Audio compression
    BT: Data compression

Audio databases
    BT: Database systems

    RT: File systems
            Multimedia databases

Audio recording
    BT: Recording

Audio systems
    UF: Phonographs
            Sound systems
            Stereophonic systems
    BT: Consumer electronics
    RT: Digital audio broadcasting
            Music
    NT: 3D audio
            Audio tapes
            Audio-visual systems
            Auditory displays
            Headphones
            Immersive audio
            Loudspeakers
            Microphones
            Pitch control (audio)
            Portable media players
            Sonification
            Spatial audio
            Video description

Audio tapes
    BT: Audio systems

Audio user interfaces
    UF: Auditory icons
    BT: User interfaces
    RT: Multimedia computing

Audio-visual systems
    UF: Audio video
            Audio visual systems
            Audiovisual systems
    BT: Audio systems
    RT: Educational technology

Auditory displays
    BT: Audio systems
            Communication equipment
    RT: Aerospace and electronic systems
            Communication aids

Auditory implants
    UF: Auditory midbrain implants
    BT: Implants

Auditory system
    UF: Hearing

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

Augmented reality
BT: Programming
        Virtual reality
RT: Digital representation
        Digital transformation
        Digital twins
        Extended reality
        Metaverse
        Mixed reality
        Network slicing
        Virtual museums
NT: 3D audio
        Human augmentation
        Immersive audio
        Immersive experience
        Spatial augmented reality
        X reality

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
RT: Blockchains
        CAPTCHAs
        Federated identity
        Image processing
        Interactive systems
        Passwords
        Video signal processing
        Zero Trust
NT: Multi-factor authentication
        Nonfungible tokens

Authoring systems
UF: Authoring tools
BT: Software tools

RT: Computer aided instruction
        Courseware
        Multimedia systems
        Web design

Authorization
UF: Authorisation
BT: Access control
RT: Privacy

Autism
BT: Medical conditions

Autobiographies
UF: Memoirs
BT: Biographies

Autocorrelation
UF: Auto correlation
BT: Correlation
RT: Signal analysis
        Time series analysis

Automata
UF: Finite state machines
BT: Robots
RT: Cognitive systems
        Cybernetics
        Intelligent systems
NT: Turing machines

Automated highways
BT: Automation
        Intelligent transportation systems
RT: Road safety
        Smart transportation

Automated teller machine
UF: ATM
BT: Banking
        Financial services
RT: Transaction databases

Automatic control
BT: Control systems
NT: Power generation control

Automatic frequency control
BT: Frequency control

Automatic generation control
BT: Automation
        Control systems
        Power generation

Automatic logic units
BT: Microprocessors

Automatic meter reading
UF: Automated meter reading
BT: Meter reading
RT: Flowmeters
Smart meters

Automatic optical inspection
BT: Inspection
RT: Machine vision
Manufacturing automation
Pattern recognition

Automatic programming
UF: Program generators
BT: Programming

Automatic repeat request
UF: ARQ
BT: Feedback communications

Automatic speech recognition
UF: ASR
BT: Speech recognition

Automatic test equipment
BT: Test equipment
RT: Automatic testing

Automatic test pattern generation
UF: ATPG
BT: Automatic testing
RT: Design automation
NT: Test pattern generators

Automatic testing
UF: Self testing
BT: Automation
Testing
RT: Automatic test equipment
Maintenance engineering
NT: Automatic test pattern generation
Ring generators

Automatic voltage control
UF: AVC
BT: Voltage control
RT: Voltage
Voltage measurement

Automation
BT: Robotics and automation

RT: Bagging
Biometrics (access control)
Flash memories
Home automation
Information technology
Substation automation
Zigbee
NT: Automated highways
Automatic generation control
Automatic testing
Autonomous networks
Building automation
Fifth Industrial Revolution
Fourth Industrial Revolution
Intelligent automation
Manufacturing automation
Office automation
Storage automation
Vehicular automation

Automobile manufacture
BT: Manufacturing systems
RT: Automobiles
Automotive components
Automotive engineering
Automotive materials
Die casting
Engines
Tires
Wheels

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

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 control
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 control
BT: Automotive engineering
Control systems
RT: Automobiles
Automotive components
Automotive electronics
Intelligent transportation systems

Road traffic control
Road vehicles

Automotive electronics
BT: Automotive engineering
RT: Advanced driver assistance systems

Automotive control

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 control
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
UF: Aerial robots
Micro air vehicles
UAV
Uncrewed aerial systems
Uncrewed aircraft
Unmanned aerial vehicles
Unmanned air vehicles
Unmanned airborne vehicles

Unpiloted aerial vehicles
Unpiloted air vehicles
BT: Autonomous vehicles
RT: Drones
Military robotics
Military systems
Quadrotors

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
Self-driving automobiles
Self-driving car
Unmanned automobiles
Unmanned autonomous cars

BT: Autonomous vehicles

Autonomous driving
BT: Autonomous vehicles
Vehicle driving

Autonomous mental development
BT: Computational and artificial intelligence

Autonomous networks
UF: Zero touch networks
BT: Automation
Autonomous systems
Network systems

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

Autonomous systems
UF: Autonomous machines
Self managing systems
Self-managing systems
BT: Intelligent systems
Robotics and automation
RT: Border Gateway Protocol
NT: Autonomous networks
Autonomous robots
Autonomous vehicles

Autonomous underwater vehicles
UF: Underwater autonomous vehicles
Underwater drones
Underwater exploration robots
Underwater robots
Unmanned underwater vehicles
BT: Autonomous vehicles
Underwater vehicles
RT: Marine robots
Military robotics

Autonomous vehicles
UF: Autonomous trucks
Uncrewed vehicles
Unmanned autonomous vehicles
Unmanned surface vehicles

Unmanned vehicles
BT: Autonomous systems
Intelligent vehicles
RT: Artificial intelligence
Mechatronics
Multi-agent systems
Vehicular automation
NT: Autonomous aerial vehicles
Autonomous automobiles
Autonomous driving
Autonomous underwater vehicles

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

Autopsy
BT: Medical diagnosis
RT: Pathology

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

Auxetic materials
UF: Auxetics
BT: 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
	RT:	Metaverse
	NT:	Digital humans

Awards

	BT:	IEEE indexing
	RT:	IEEE Awards activities
		IEEE Medals
	NT:	Nobel Prize

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
	RT:	Automotive components
		Wheels

Axons

	BT:	Nerve fibers
	RT:	Action potentials
		Myelin
		White matter

Azimuth

	BT:	Mathematics
	NT:	Azimuthal angle
		Azimuthal component
		Azimuthal current
		Azimuthal harmonics
		Azimuthal plane

Azimuthal angle

	BT:	Azimuth

Azimuthal component

	BT:	Azimuth

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

Back

	BT:	Body regions

Background noise

	BT:	Acoustic noise

Backhaul networks

	BT:	Telecommunication network topology

Backplanes

	BT:	Data buses

Backpropagation

	UF:	Back propagation
		Backward propagation
		Backwards propagation of errors
	BT:	Learning systems
	RT:	Backpropagation algorithms
		Neural networks

Backpropagation algorithms

	BT:	Algorithms
	RT:	Backpropagation

Backscatter

	BT:	Reflection
	RT:	Meteorological radar
	NT:	Electron backscatter diffraction

Backstepping

	BT:	Control nonlinearities

Backtracking
BT:	Algorithm design and theory

Bacterial infections
BT:	Diseases

Bacteriophages
UF:	Phages
BT:	Viruses (medical)

Bagging
BT:	Packaging
RT:	Automation
	Packaging machines
	Plastic packaging

Ball bearings
BT:	Machinery
RT:	Mechanical bearings
	Metal products
	Rolling bearings

Ball grid arrays
BT:	Electronics packaging
	Surface mount technology

Ball milling
BT:	Production
RT:	Milling machines

Ballistic transport
BT:	Electron emission
NT:	Electronic ballasts

Baluns
BT:	Electromagnetic devices
	Impedance matching
	Microwave technology
	Transformers
RT:	Transmission lines

Bamboo
BT:	Natural fibers
	Plants (biology)

Band structures
BT:	Energy states

Band-pass filters
UF:	BPF
	Band pass filters
	Bandpass filters
BT:	Active filters
RT:	Frequency

	Signal processing
NT:	Filter banks

Bandwidth
BT:	Frequency
RT:	Admission control
	Coherence time
	Computer network management
	Direct sequence spread spectrum communication
	Information theory
	Radio communication
	Signal processing
	Spectral efficiency
	Spectroscopy
NT:	Narrowband
	Wideband

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

Banking
BT:	Financial industry
RT:	Finance
NT:	Automated teller machine
	Online banking
	Open banking

Bankruptcy
BT:	Finance
RT:	Business
	Commercial law
	Economics

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

Barium
UF:	Ba
BT:	Metals
NT:	Barium compounds

Barium compounds
BT:	Barium
RT:	Alloying
	Yttrium barium copper oxide

Barometers
BT: Instruments
RT: Atmospheric measurements
Meteorology

Baroreflex
UF: Baroreceptor reflex
BT: Cardiovascular system

Bars
BT: Structural shapes
NT: Billets

Basal cell carcinoma
BT: Skin cancer

Basal ganglia
BT: Brain

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

Baseband
BT: Digital communication
Radio communication
RT: Passband

Basis algorithms
BT: Algorithms

Batch production systems
UF: Batch manufacturing
Batch processing
BT: Manufacturing systems

Bathymetry
BT: Measurement
Sea floor

Batteries
UF: Flow batteries
Secondary cells
Storage batteries
Storage battery
BT: Electrochemical devices
Energy conversion
Energy storage
RT: Battery charge measurement

Battery chargers
Emergency power supplies
Lithium
Lithium compounds
Power generation
Uninterruptible power systems
NT: Lead acid batteries
Lithium batteries
Lithium-ion batteries
Lithium-sulfur batteries
Nickel cadmium batteries
Solid state batteries

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
Charging stations
NT: Electric vehicle charging
State of charge

Battery management systems
BT: Electrochemical devices

Battery powered vehicles
BT: Electric vehicles
RT: Battery charge measurement
Charging stations
Energy storage
Hybrid electric vehicles
Solar powered vehicles
Traction motors
Vehicle-to-grid

Bayes methods
UF: Bayesian approach
Bayesian belief networks
Bayesian estimation
Bayesian inference
Bayesian learning
Bayesian methods
Bayesian networks
BT: Probability
RT: Belief propagation

Reinforcement learning
Relevance vector machines
Semisupervised learning
NT: Naive Bayes methods
Recursive estimation

Beak
BT: Animal structures
RT: Birds

Beam steering
BT: Microwave technology
RT: Antennas
NT: Steerable antennas

Beams
UF: Electromagnetic beams
BT: Physics
NT: Acoustic beams
Laser beams
Molecular beams
Optical beams
Particle beams

Bean model
UF: Pry and Bean model
BT: Superconductivity

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

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

Bellows
BT: Mechanical products
RT: Pistons
Pneumatic systems
Pumps
Vacuum systems

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

Benchmark testing
UF: Benchmark problems
Benchmark tasks
Benchmarking
BT: Testing
RT: Performance evaluation

Bending
BT: Mechanical factors

Benign tumors
UF: Benign masses
BT: Tumors

Berry phase
BT: Waves

Beryllium
BT: Chemical elements

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

Beta rays
          BT: Nuclear physics
          RT: Electrons

Beverage industry
          BT: Industries
          RT: Bottling
                       Food industry

Beyond CMOS
          BT: Integrated circuit
technology

Bibliographies
          BT: Writing
          RT: Publishing

Bibliometrics
          BT: Publishing
          NT: Citation analysis

BiCMOS integrated circuits
          UF: BiMOS integrated circuits
          BT: Bipolar transistor circuits

Bicycles
          BT: Land vehicles
          RT: Sports equipment

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

Bidirectional power flow
          BT: Power system control

Bifurcation
          BT: Nonlinear equations
          RT: Chaos

Big Data
          BT: Data collection
          RT: Buffer storage
                       Data handling
                       Data lakes
                       Data mining
                       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

Billets
          BT: Bars

Bills of materials
          BT: Inventory management
                       Materials requirements
planning

Binary codes
          BT: Codes
          NT: Reflective binary codes

Binary decision diagrams
          BT: Data structures

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

Binary search trees
          BT: Binary trees

Binary sequences
          BT: Sequences

Binary trees
          BT: Tree data structures
          NT: Binary search trees

Bio-inspired computing
          UF: Bio-computing
                       Biocomputing
                       Bioinspired computing
                       Biologically inspired
computing
          BT: Artificial intelligence
                       Bio-inspired engineering
          RT: Behavioral sciences
                       Bio-inspired materials
                       Biology
                       Machine learning
                       Mathematics
                       Neural networks
                       Social factors

Bio-inspired control
UF: Biologically inspired control
BT: Bio-inspired engineering

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 materials
UF: Bio inspired materials
Bioinspired materials
BT: Materials
RT: Bio-inspired computing
Biomimetics
Nanotechnology
Organic inorganic hybrid materials
NT: Self-assembly

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

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

Biochemical analysis
BT: Biochemistry
RT: Biochips

Biochemistry
UF: Hormones
Metabolic networks
Metabolism
BT: Biology
Chemistry
RT: Biogeochemistry
Biological cells
Bioreactors
Cell signaling
Chemical reaction network theory
Computational biochemistry

Drugs
Entomology
Hydrolysis
Molecular biophysics
Pharmaceutical technology
Pharmaceuticals
NT: Amino acids
Biochemical analysis
Peptides
Proteins
Receptor (biochemistry)

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

Biodegradable materials
BT: Biodegradation
RT: Cellulose

Biodegradation
BT: Environmental management
RT: Waste management
NT: Biodegradable materials

Biodiversity
BT: Biology
NT: Biogeography

Bioelectric phenomena
UF: Bioelectronics
Electrobiology
BT: Biology
RT: Brain
Electrical accidents
Electroencephalography
Electromyography
Electrooculography
Nervous system
NT: Electric shock

Biofilms
BT: Biological materials
Microorganisms

Biofuels
BT: Fuels
RT: Food waste

Biogeochemistry
BT: Chemistry
Geology

RT:	Biochemistry

Biogeography
BT:	Biodiversity
NT:	Biomes

Biographies
BT:	Writing
RT:	Engineering profession
NT:	Autobiographies

Biohazards
UF:	Germ warfare
BT:	Hazards
RT:	Chemical hazards
	Green products
	Medical treatment
	Terrorism
NT:	Biological weapons

Bioimpedance
BT:	Biomedical engineering
	Current
RT:	Blood flow

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

Biological cells
UF:	Cell biology
	Chromosomes
BT:	Biology
RT:	Biochemistry
	Biological materials
	Biomembranes
	DNA
	Microorganisms
	Self-assembly
NT:	Cell signaling
	Cells (biology)
	Chromosome mapping
	Endothelial cells
	Fibroblasts
	RNA
	Stem cells

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

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 materials
UF:	Biomaterials
BT:	Materials
RT:	Biological cells
	Biomedical materials
	Fats
	Tissue engineering
NT:	Bioceramics
	Biofilms

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

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

Biological system modeling
> BT: Biology
> RT: Mechanobiology
>   Neuromorphics
>   Synthetic biology

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

Biological techniques
> BT: Biomedical engineering
> RT: Biomedical equipment

Biological tissues
> UF: Biological tissue
>   Tissues
> BT: Anatomy
> NT: Bone tissue
>   Breast tissue
>   Cardiac tissue
>   Connective tissue
>   Glands
>   Neoplasms

Biological weapons
> UF: Bio-agents
>   Bio-weapons
>   Bioagents
>   Biological agent
>   Biological threat agents
>   Biological warfare
>   Biological warfare agents
>   Bioweapons
>   Germ warfare
> BT: Biohazards
>   Weapons
> RT: Chemical weapons
>   National security
>   Nuclear weapons
>   US Department of Homeland Security
>   Weapons of mass destruction

Biology
> BT: Engineering in medicine and biology

Science - general
> RT: Bio-inspired computing
>   Bio-inspired engineering
>   Bioinformatics
>   Computational biology
>   Immune system
>   Life sciences
> NT: Biochemistry
>   Biodiversity
>   Bioelectric phenomena
>   Biological cells
>   Biological information theory
>   Biological processes
>   Biological system modeling
>   Biological systems
>   Biology computing
>   Biophotonics
>   Biophysics
>   Botany
>   Cryobiology
>   Evolution (biology)
>   Genetics
>   Homeostasis
>   Mechanobiology
>   Microbiology
>   Microinjection
>   Nanobioscience
>   Physiology
>   Predator prey systems
>   Synthetic biology
>   Systematics
>   Systems biology
>   Vegetation
>   Zoology

Biology computing
> BT: Biology
> RT: Biomedical computing
>   Computers and information processing

Bioluminescence
> BT: Luminescence

Biomagnetics
> UF: Biomagnetism
> BT: Biophysics
>   Magnetics
> RT: Biomedical engineering
>   Magnetic fields
>   Magnetic materials
>   Magnetic particles
> NT: Magnetoencephalography

Biomarkers
- UF: Biological markers
- Human disease markers
- BT: Biological control systems
- Biomedical measurement
- NT: Molecular biomarkers

Biomass
- BT: Renewable energy sources

Biomechanics
- BT: Mechanical factors
- RT: Anthropometry
- Cell signaling
- Entomology
- Human activity recognition
- Mechanobiology
- Motion capture
- Wearable robots
- NT: Fall detection

Biomechatronics
- BT: Mechatronics

Biomedical acoustics
- UF: Bioacoustics
- Biomedical ultrasonics
- BT: Acoustics
- RT: Acoustic applications
- Acoustic measurements
- Auditory system

Biomedical applications of radiation
- UF: Biomedical applications of electromagnetic radiation
- BT: Biomedical engineering
- Nuclear and plasma sciences
- RT: Angiocardiography
- Biological effects of radiation
- Biomedical imaging
- Cancer
- Collimators
- Computed tomography
- Gamma-ray detectors
- Medical treatment
- Positron emission tomography
- Radiation effects
- Radiography
- Synchrotron radiation
- NT: Radiation therapy

Biomedical communication
- BT: Communication systems
- Engineering in medicine and biology
- RT: Fall detection
- Medical devices
- Nanocommunication
- Picture archiving and communication systems
- Point of care
- NT: Biomedical telemetry
- Telemedicine

Biomedical computing
- UF: Medical computing
- BT: Engineering in medicine and biology
- RT: Biology computing
- Biomedical signal processing
- Computer applications
- Picture archiving and communication systems
- Signal processing
- NT: Bioinformatics
- Medical expert systems
- Medical information systems

Biomedical electrodes
- BT: Biomedical equipment
- RT: Biomedical engineering
- Biomedical measurement
- Electrophysiology

Biomedical electronics
- BT: Biomedical engineering
- RT: Biomedical equipment

Biomedical engineering
- UF: Bioengineering
- BT: Engineering in medicine and biology
- RT: Biological systems
- Biomagnetics
- Biomedical electrodes
- Biomedical engineering education
- Biomedical monitoring
- Biomedical optical imaging
- Colloidal lithography
- Genetic communication
- Genetic engineering
- Hospitals
- Microfluidics

	Orthotics
NT:	Bioimpedance
	Biological techniques
	Biomedical applications of radiation
	Biomedical electronics
	Biomedical signal processing
	Bioprinting
	Biotechnology
	Cloning
	Drug delivery
	Neural engineering
	Protein engineering
	Tissue engineering
	Translational research

Biomedical engineering education
| BT: | Engineering education |
| RT: | Biomedical engineering |

Biomedical equipment
UF:	Clinical equipment
	Medical equipment
BT:	Engineering in medicine and biology
RT:	Biological techniques
	Biomedical electronics
	Biomedical measurement
	Biomedical microelectromechanical systems
	Collimators
	Electrocardiography
	Electroencephalography
	Endomicroscopy
	Insulin pumps
	Medical control systems
	Medical robotics
	Molecular biophysics
	Nanosensors
	Needles
	Orthotics
	Prosthetics
	Sensory aids
	Speech synthesis
	Surgery
	Zigbee
NT:	Assistive technologies
	Biomedical electrodes
	Biomedical telemetry
	Biomedical transducers
	Catheters
	Endoscopes
	Gerontechnology
	Hypodermic needles
	Implants
	Intracranial pressure sensors
	Lithotriptors
	Medical devices
	Medical instruments
	Pacemakers
	Pulse oximeter
	Stethoscope
	Surgical instruments
	Ventilators

Biomedical image processing
UF:	Medical image processing
BT:	Biomedical signal processing
RT:	Biomedical imaging
	Biomedical optical imaging
	Functional magnetic resonance imaging
	Magnetoencephalography
	Medical robotics
	Subtraction techniques
NT:	Imaging phantoms
	Motion artifacts
	Neuroimaging
	Radiographic image enhancement
	Radiology
	Radiomics
	Ultrasonography
	Whole body imaging

Biomedical imaging
UF:	Bioimaging
	Biological imaging
	Biomedical X-ray imaging
	Medical imaging
	Tomosynthesis
BT:	Engineering in medicine and biology
	Imaging
RT:	Biomedical applications of radiation
	Biomedical image processing
	Data visualization
	Isosurfaces
	Medical diagnosis
	Molecular biophysics
	Nanobiophotonics
	Picture archiving and communication systems
	Radiation imaging
	Tomography

		Ultrasonic imaging
NT:		Angiocardiography
		Angiography
		Biomedical optical imaging
		Cardiography
		DICOM
		Elastography
		Encephalography
		Mammography
		Medical diagnostic imaging
		Molecular imaging
		Phantoms
		Photoacoustic imaging

Biomedical materials
BT:	Materials
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
	Sensitivity and specificity
	Spirometry

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

Biomedical monitoring
BT:	Biomedical measurement
RT:	Biomedical engineering
	Epidemiology
	Internet of Medical Things
	Phonocardiography
NT:	Nanomedicine

Biomedical optical imaging
UF:	Biomedical infrared imaging
BT:	Biomedical imaging
RT:	Biomedical engineering
	Biomedical image processing
	Endomicroscopy
	Endoscopes
	Infrared imaging
	Optical communication equipment
	Optical devices

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 |

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

Biomes
| BT: | Biogeography |

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

Biomimetics
UF: Biomimetic
Biomimetic microelectronics
Biomimicry
Bionics
BT: Microprocessors
RT: Bio-inspired engineering
Bio-inspired materials
Intelligent materials
Soft robotics
Whale optimization algorithms
NT: Biomimetic materials

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

Biophotonics
BT: Biology
Photonics

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

Biopolymers
BT: Polymers

Bioprinting
BT: Biomedical engineering
Three-dimensional printing
RT: Artificial biological organs
Tissue engineering

Biopsy
BT: Medical tests

Bioreactors
BT: Chemical reactions
RT: Biochemistry

Biorthogonal modulation
BT: Wavelet transforms

Biosensors
UF: Bio-sensors
Biological sensors
BT: Chemical and biological sensors
RT: Biomedical measurement
Nanobiophotonics
Wearable sensors

Biosphere
BT: Environmental factors
Geoscience

Biotechnology
BT: Biomedical engineering
RT: Genetic engineering
Hydrolysis

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

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

Bistatic radar
BT: Radar

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

Bit rate
UF: Bit allocation
        Bitrate
BT: Timing
RT: Communication system signaling
        Computer networks
        Signal processing

Bitcoin
BT: Cryptocurrency
RT: Blockchains
        Cryptography
        Finance
        Nonfungible tokens
        Online banking

Bladder
BT: Urogenital system

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

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

Blast furnaces
BT: Furnaces
RT: Smelting

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

Blind equalizers
UF: Blind channel estimation
        Blind equalisers
        Source signal equalizers
BT: Equalizers

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

Blindness
BT: Medical conditions
RT: Braille
        Visual impairment
        Visual prosthesis

Blob detection
BT: Computer vision

	Image processing
RT:	Feature extraction

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

Block signalling
UF:	Block signaling
	Signaling block systems
	Signalling block systems
BT:	Control systems
	Railway communication
RT:	Collision avoidance
	Rail transportation

Blockchains
UF:	Block chain
	Chain codes
	Permissioned blackchains
	Private blockchains
	Public blockchains
BT:	Cryptography
	Distributed databases
RT:	Authentication
	Bitcoin
	Computer security
	Content management
	Cryptocurrency
	Data collection
	Decentralized autonomous organization
	Directed acyclic graph
	Distributed ledger
	Federated identity
	Metaverse
	Micropayments
	Proof of Work
	Trustless services
NT:	Consensus protocol
	Nonfungible tokens

Blocklists
UF:	Block listing
	Block lists
	Deny lists
BT:	Access control
	Information filters

Blogs
UF:	Blogging
	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 flow
BT:	Blood pressure
RT:	Bioimpedance
	Hemorrhaging
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
	Hypertension
	Hypotension

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
RT:	Cellular radio
	Communication equipment
	Digital communication
	IEEE 802.11 Standard
	IEEE 802.11g Standard

		IEEE 802.11n Standard
		IEEE 802.15 Standard
		Land mobile radio
		Protocols
		Spread spectrum communication
		Wireless LAN
		Wireless communication
		Zigbee
	NT:	Bluetooth Low Energy

Bluetooth Low Energy
- BT: Bluetooth

BNSC
- UF: British National Space Centre
- BT: Organizations

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

Body area networks
- UF: Body area networking
- BT: Personal area networks
- RT: Human activity recognition
  - Wearable antennas

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
- RT: Fall detection
  - Human activity recognition
  - Wearable sensors

Boilers
- BT: Heating systems
- RT: Heat recovery

		Steam engines
		Turbines
		Waste heat

Bolometers
- BT: Radiation detectors
- RT: Infrared detectors
  - Temperature measurement

Boltzmann distribution
- BT: Statistics
- NT: Lattice Boltzmann methods

Boltzmann equation
- UF: Boltzmann transport equation
- BT: Equations

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

Bonding forces
- BT: Materials testing

Bonding processes
- BT: Fabrication
  - Joining processes
- RT: Soldering
  - Welding
- NT: Bonding
  - Diffusion bonding
  - Wafer bonding

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

Bone diseases
- BT: Diseases
- NT: Osteoarthritis
  - Osteoporosis

Bone tissue
- BT: Biological tissues
- RT: Bones
- NT: Cancellous bone
  - Cortical bone

Bones
- BT: Skeleton
- RT: Bone tissue

		Skull
NT:		Bone density
		Pelvic bones

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

Border Gateway Protocol
UF:	BGP
BT:	Protocols
RT:	Autonomous systems
	Information exchange
	Peer-to-peer computing
	Routing protocols
	Telecommunication network management
	Telecommunication traffic

Boring
BT:	Machining
RT:	Drilling
	Milling
	Turning

Boron
BT:	Chemical elements
	Metals
RT:	Fertilizers
NT:	Boron alloys

Boron alloys
BT:	Boron
RT:	Magnetic materials

Bot (Internet)
UF:	WWW robot

		Web robot
BT:		Computer applications
		Internet
		World Wide Web
RT:		Crawlers

Botany
BT:	Biology
RT:	Seeds (agriculture)

Botnet
BT:	Interconnected systems
	Internet
	Software agents
RT:	Computer crime
	Distributed denial-of-service attack
	Robots

Bottling
BT:	Packaging
RT:	Beverage industry
	Glass products
	Packaging machines
	Plastic products

Boundary conditions
BT:	Boundary value problems
NT:	Upper bound

Boundary value problems
BT:	Mathematics
RT:	Partial differential equations
NT:	Boundary conditions

Boundary-element methods
UF:	Boundary element methods
BT:	Partial differential equations
RT:	Integral equations
	Method of moments

Bovine
BT:	Animals
NT:	Cows

Brachytherapy
UF:	Brachial
BT:	Medical treatment
RT:	Radiation effects

Bragg gratings
UF:	Fiber Bragg gratings
	Fiber-Bragg gratings
BT:	Filters
	Optical devices

RT:	Diffraction
	Diffraction gratings
	Laser beams
	Optical beams
	Optical transmitters
	Temperature sensors
	Wavelength division multiplexing
NT:	Fiber gratings

Braille

BT:	Writing
RT:	Assistive technologies
	Blindness
	Haptic interfaces
	Tactile sensors

Brain

BT:	Nervous system
RT:	Bioelectric phenomena
	Cerebrospinal fluid
	Cognition
	Cognitive informatics
	Cognitive science
	Diffusion tensor imaging
	Electroencephalography
	Encephalography
	Head
	Intracranial pressure sensors
	Magnetoencephalography
	Soma
	Synapses
	White matter
NT:	Amygdala
	Basal ganglia
	Brain cells
	Brain injuries
	Brain modeling
	Brain ventricles
	Brainstem
	Cerebellum
	Cerebral cortex
	Cerebrum
	Corpus callosum
	Forebrain
	Frontal lobe
	Hindbrain
	Hypothalamus
	Limbic system
	Midbrain
	Neural activity
	Neural implants
	Neurodynamics
	Neurophysiology
	Neuroprostheses
	Neuropsychology
	Neurotechnology
	Occipital Lobe
	Parietal lobe
	Primary motor cortex
	Sleep
	Temporal lobe
	Thalamus
	Ventricle system
	Virtual artifact

Brain cells

| BT: | Brain |

Brain injuries

| BT: | Brain |
| | Injuries |

Brain mapping

| BT: | Nervous system |
| NT: | Neuroimaging |

Brain modeling

UF:	Brain modelling
BT:	Brain
	Modeling

Brain stimulation

| BT: | Medical treatment |
| NT: | Deep brain stimulation |

Brain ventricles

| BT: | Brain |

Brain-computer interfaces

UF:	BCI
	Brain computer interfaces
	Brain interfaces
	Brain machine interfaces
	Brain-computer interaction
	Brain-computer-interfaces
	Brain-machine interfaces
	Mind-machine interfaces
BT:	User interfaces
RT:	Fifth Industrial Revolution
	Neural engineering
	Neuroprostheses

Brainstem

| UF: | Brain stem |
| BT: | Brain |

Brainstem implants
UF: Brain stem implants
BT: Implants

Brakes
BT: Control systems
        Mechanical products
RT: Automotive components

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

Brazing
BT: Soldering
RT: Welding

Breadboard
UF: Plugboard
        Solderless breadboard
BT: Electronic circuits
        Prototypes

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
UF: Breast tumor
        Breast tumour
        Breast tumours
BT: Breast
        Tumors

Bremsstrahlung
BT: Electromagnetic radiation

Bridge circuits
BT: Circuits
RT: Rectifiers

Bridges
BT: Structural shapes
RT: Civil engineering
        Structural engineering
        Transportation

Brightness
BT: Optics
NT: Brightness temperature

Brightness temperature
BT: Brightness

Brillouin scattering
BT: Scattering

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

Broadband amplifiers
UF: Wideband amplifiers
BT: Amplifiers
        Broadband communication

Broadband antennas
UF: Wideband antennas
BT: Antennas
RT: Antenna arrays
        Microstrip
        Microwave propagation
        UHF propagation
NT: Ultra wideband antennas
        Vivaldi antennas

Broadband communication
UF:	Broadband networks
BT:	Communication systems
RT:	Asynchronous transfer mode
	Cable TV
	Frequency division multiaccess
	IEEE 802.16 Standard
	IPTV
	Multimedia communication
	Optical fiber communication
	Ultra wideband communication
	Video on demand
NT:	B-ISDN
	Broadband amplifiers

Broadcast technology
NT:	Broadcasting

Broadcasting
UF:	Broadcasts
BT:	Broadcast technology
RT:	Entertainment industry
	Journalism
NT:	Digital audio broadcasting
	Digital multimedia broadcasting
	Digital video broadcasting
	Motion pictures
	NVIS
	Radio broadcasting
	Satellite broadcasting
	Web TV

Bromine
BT:	Chemical elements
NT:	Bromine compounds

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

Bronchoscopy
BT:	Medical diagnosis

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

Browsers
UF:	Google Chrome
	Web browsers
BT:	Computer interfaces
RT:	User interfaces

Brushes
BT:	Contacts
RT:	Rotating machines

Brushless DC motors
UF:	Brushless direct current motors
BT:	Brushless motors
	DC motors

Brushless machines
BT:	Electric machines

Brushless motors
BT:	Motors
RT:	Switched reluctance motors
NT:	Brushless DC motors

Buck converters
BT:	DC-DC power converters

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

Buffer overflows
BT:	Computer crashes

Buffer storage
UF:	Data storage systems
BT:	Data systems
RT:	Big Data
	In-memory computing
	Random access memory
	Storage area networks
NT:	Triples (Data structure)

Building automation
BT:	Automation
	Building services
RT:	Construction industry

Building information management
UF:	BIM
	Building information modelling
BT:	Buildings

JULY 2023 IEEE Thesaurus

	Modeling
RT:	Architecture
	Building management systems
	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
	Solar panels
	Structural beams
NT:	Asphalt
	Concrete
	Floors
	Mortar
	Tiles
	Windows

Building services
BT:	Buildings
RT:	Access control
	Air conditioning
	Building information management
	Building integrated photovoltaics
	Furnaces
	Lighting
	Solar panels
	Space heating
	Wiring

NT:	Building automation
	Elevators
	Facilities management

Buildings
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 management systems
	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 |
| RT: | Film bulk acoustic resonators |

Bulk storage
| BT: | Material storage |
| RT: | 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
BT:	Object detection
RT:	Geophysical measurements
	Ground penetrating radar
NT:	Landmine detection

Burnishing
BT:	Surface finishing
RT:	Machining

Burst switching
BT:	Packet switching
NT:	Optical burst switching

Business
BT:	Engineering management
RT:	Bankruptcy
	Business process integration
	Business process management
	Commercial law
	Consortia
	Contracts
	Employment
	Enterprise resource planning
	Finance
	Industrial communication
	Industries
	International trade
	Leadership
	Manufacturing
	Productivity
	Service computing
NT:	Business data processing
	Business intelligence
	Commerce and trade
	Disruptive innovation
	Entrepreneurship
	Franchising
	Industrial relations
	Management
	Operations research
	Organizations

Business communication
BT:	Organizational aspects
RT:	Best practices

Business continuity
BT:	Management
RT:	Security
	System recovery
	Venture capital

Business data processing
BT:	Business
	Data processing
RT:	Data governance
	Information processing

Business intelligence
UF:	BI
BT:	Business
	Data analysis
RT:	Competitive intelligence
	Data mining
	Strategic planning

Business Process Execution Language
UF:	BPEL
	WP-BPEL
	Web services business process execution language
BT:	Computer languages
	Web services
RT:	Business process re-engineering
	Information processing

Business process integration
BT:	Enterprise resource planning
	Process planning
RT:	Business
	Resource management
	Supply chain management
	Systems engineering and theory

Business process management
BT:	Management
	Process planning
RT:	Business
	Resource management
	Supply chain management
	Systems engineering and theory
NT:	Task analysis

Business process re-engineering
UF:	BPR
BT:	Management

RT: Business Process Execution Language

Corporate acquisitions
Organizational aspects
Total quality management

Butler matrices
UF: Butler matrix
BT: Antenna arrays
RT: Antennas
IEEE 802.11 Standard
Phase shifters
Wireless LAN

Buttocks
BT: Extremities

C languages
BT: Computer languages
RT: Object oriented programming
NT: C# languages
C++ languages

C# languages
UF: C sharp languages
BT: C languages
RT: Object oriented programming

C++ languages
BT: C languages

C-band
UF: C band
BT: Microwave bands

Cable insulation
BT: Insulation
RT: Cables
Oil filled cables
NT: Power cable insulation

Cable shielding
BT: Electromagnetic shielding
RT: Cables

Cable TV
UF: Community antenna television
BT: TV
RT: Broadband communication
Image communication
NT: Must-carry regulations

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

Cache memory
BT: Memory
RT: In-memory computing
NT: Cache storage

Cache storage
BT: Cache memory

Cadaver
UF: Corpse
BT: Pathological processes

CADCAM
BT: Computer aided manufacturing
Design automation
RT: Computer integrated manufacturing
Integrated manufacturing systems
Rapid prototyping
Virtual manufacturing

Cadmium
BT: Metals
NT: Cadmium compounds

Cadmium compounds
BT: Cadmium

Calcination
BT: Heat treatment
RT: Kilns

Calcium
UF: Ca
BT: Metals
RT: Alloying
NT: Calcium compounds

Calcium compounds
  UF: Calcium carbonate
       Calcium phosphate
  BT: Calcium

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

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

Calibration
  UF: Intercalibration
  BT: Measurement techniques
  RT: Odometry

Californium
  BT: Chemical elements

Call admission control
  BT: Telecommunication congestion control
  RT: Internet telephony

Call conference
  BT: Collaborative tools

Calorimetry
  BT: Measurement
  RT: Energy measurement
       Thermal variables measurement

CAMAC
  UF: Computer automated measurement and control
  BT: Control systems
  RT: Data buses
       Data communication
       Data processing
       Nuclear measurements

Cameras
  BT: Imaging
  RT: Digital photography
       Image capture
       Image sensors
       Motion pictures
       Photography
       Photorealism

  NT: Digital cameras
       Smart cameras
       Webcams

Cams
  BT: Machine components
  RT: Engines
       Mechanical power transmission
  NT: Camshafts

Camshafts
  BT: Cams
       Shafts
  RT: Automotive components
       Belts
       Engines

Cancellous bone
  BT: Bone tissue
  RT: Osteoporosis

Cancer
  UF: Malignancy
       Malignant
  BT: Diseases
  RT: Biomedical applications of radiation
       Chemotherapy
       Medical diagnostic imaging
       Oncological surgery
       Oncology
       Single photon emission computed tomography
       Tumors
  NT: Breast cancer
       Cervical cancer
       Liver cancer
       Lung cancer
       Metastasis
       Ovarian cancer
       Pancreatic cancer
       Prostate cancer
       Skin cancer
       Thyroid cancer

Cancer detection
  BT: Medical tests

Cancer drugs
  BT: Drugs

Cancer treatment
  BT: Medical treatment
  RT: Monoclonal antibodies

		Radiation therapy
	NT:	Cell therapy

Canning
	BT:	Packaging
	RT:	Containers
		Material storage
		Materials handling
		Materials processing

Capability engineering
	BT:	Systems engineering and theory

Capability maturity model
	BT:	Software engineering
	RT:	Software performance
		Software reusability

Capability-based security
	BT:	Security
	RT:	Access control

Capacitance
	BT:	Electric variables
	RT:	Capacitance measurement
		Capacitance-voltage characteristics
		Capacitive transducers
		Capacitors
		Supercapacitors
		Transmission line theory
	NT:	Parasitic capacitance
		Quantum capacitance

Capacitance measurement
	BT:	Electric variables measurement
	RT:	Capacitance
		Capacitors
		Dielectric measurement
		Supercapacitors

Capacitance-voltage characteristics
	BT:	Electric variables
	RT:	Capacitance
		Voltage

Capacitive sensors
	UF:	Strain based sensors
		Strain sensors
	BT:	Mechanical sensors

Capacitive transducers
	BT:	Transducers

	RT:	Capacitance
		Position control
		Sensors

Capacitors
	UF:	Capacitor testing
		Electric condensers
	BT:	Dielectric devices
		Electronic components
		Voltage multipliers
	RT:	Capacitance
		Capacitance measurement
		Dielectric constant
		Electrets
		MOS capacitors
		Q-factor
		Switched capacitor networks
	NT:	Ceramic capacitors
		Power capacitors
		Varactors

Capacity planning
	BT:	Production planning
	RT:	Supply chain management
	NT:	Storage management

CAPTCHAs
	BT:	Symbols
	RT:	Access protocols
		Authentication

Carbon
	BT:	Chemical elements
	RT:	Carbon compounds
		Low-carbon economy
		Organic compounds
	NT:	Carbon nanotubes
		Diamonds
		Fullerenes
		Graphene
		Graphite

Carbon capture and storage
	BT:	Carbon dioxide
	NT:	Carbon sequestration

Carbon compounds
	BT:	Organic compounds
	RT:	Carbon
	NT:	Carbon dioxide
		Carbon emissions
		Carbon monoxide

Carbon dioxide
BT:	Carbon compounds
RT:	Carbon footprint
	Carbon tax
NT:	Carbon capture and storage
	Carbon neutral

Carbon emissions
BT:	Carbon compounds
	Gases
RT:	Climate change
	Emissions trading
	Global warming
	Greenhouse effect
	Methane
	Pollution control
NT:	Carbon footprint
	Carbon neutral

Carbon footprint
BT:	Carbon emissions
RT:	Air pollution
	Carbon dioxide
	Carbon neutral
	Climate change
	Environmental factors
	Greenhouse effect

Carbon monoxide
BT:	Carbon compounds

Carbon nanotubes
UF:	Carbon nanotube
	Carbon-nanotube
	Single-wall carbon nanotubes
BT:	Carbon
	Nanotubes
RT:	CNTFETs

Carbon neutral
BT:	Carbon dioxide
	Carbon emissions
RT:	Carbon footprint
	Climate change

Carbon sequestration
BT:	Carbon capture and storage
RT:	Air pollution
	Environmental factors
	Global warming
	Greenhouse effect

Carbon tax
BT:	Environmental economics
RT:	Carbon dioxide

Cardiac arrest
UF:	Cardiopulmonary arrest
	Heart arrest
	Heart attack
BT:	Cardiovascular diseases

Cardiac disease
BT:	Cardiovascular diseases

Cardiac function
BT:	Heart

Cardiac tissue
BT:	Biological tissues
	Cardiology

Cardiography
BT:	Biomedical imaging
RT:	Cardiology
	Sputter etching
NT:	Echocardiography
	Electrocardiography
	Phonocardiography

Cardiology
BT:	Medical specialties
RT:	Arrhythmia
	Cardiography
	Defibrillation
	Heart
	Pacemakers
	Phonocardiography
NT:	Cardiac tissue

Cardiovascular diseases
UF:	Heart failure
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

Carotid arteries
UF:	Carotoid arteries
BT:	Arteries

Carrier confinement
BT:	Charge carrier processes

Cartilage
BT:	Musculoskeletal system

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

Cast iron
BT:	Iron
RT:	Casting
	Production materials

Casting
BT:	Materials processing
RT:	Cast iron
	Foundries
NT:	Die casting
	Tape casting

Catalysis
BT:	Chemical reactions
RT:	Hydrolysis
NT:	Electrocatalysis
	Photocatalysis

Catalysts
BT:	Materials
NT:	Electrocatalysts
	Photocatalysts

Cataracts
BT:	Eyes
	Medical conditions
RT:	Aging
	Visual impairment

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

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

Cats
UF:	Felines
BT:	Animals

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

CCD image sensors
BT:	Image sensors
RT:	Digital photography

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

JULY 2023 IEEE Thesaurus

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

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

Cell therapy
UF: Cell transplantation
       Cellular therapy
       Cytotherapy
BT: Cancer treatment
RT: Oncology

Cells (biology)
BT: Biological cells
NT: Extracellular
       Ganglia
       Glial cells
       Membrane potentials
       Progenitor cells

Cellular biophysics
BT: Biophysics
RT: Molecular biophysics
       Nanomedicine

Cellular manufacturing
BT: Manufacturing systems
RT: Flexible manufacturing systems
       Production control

Cellular networks
BT: Cellular radio
RT: Cellular technology
       Cloud radio access networks
       Device-to-device communication
       Handover
NT: Femtocell networks
       Macrocell networks
       Microcell networks
       Ultra-dense networks

Cellular neural networks
BT: Neural networks

Cellular phones
UF: Cell phones
BT: Telephone equipment

Cellular radio
UF: Cellular land mobile radio
       Land mobile radio cellular systems
       Land-mobile radio cellular systems
BT: Land mobile radio
RT: 3G mobile communication
       4G mobile communication
       5G mobile communication
       6G mobile communication
       Bluetooth
       Channel estimation
       Code division multiplexing
       Cross layer design
       Digital multimedia broadcasting
       Downlink
       Film bulk acoustic resonators
       Intercell interference
       Location awareness
       Multiuser detection
       NOMA
       Network resource management
       Personal communication networks
       Software radio
       Time division synchronous code division multiple access
NT: Cellular networks
       Paging systems

Cellular technology
BT: Mobile communication
       Radio communication
RT: Cellular networks
NT: 3G mobile communication
       4G mobile communication
       5G mobile communication
       GSM
       Land mobile radio networks
       Multiaccess communication

Cellulose
BT: Polymers
RT: Biodegradable materials
       Paper pulp
       Polymer fibers

JULY 2023 IEEE Thesaurus

Cement industry
BT: Manufacturing industries

Censorship
BT: Law
RT: Consumer protection
Government policies
Law enforcement
Legal factors

Central air conditioning
UF: Central air-conditioning
BT: Air conditioning

Central nervous system
BT: Nervous system
RT: Hypothalamus
NT: Grey matter
Midbrain
White matter

Central office
BT: Communication networks

Central Processing Unit
UF: CPU
BT: Electronic circuits
RT: Hardware acceleration
NT: VLIW

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

Cepstrum
BT: Cepstral analysis
RT: Fourier transforms

Ceramic capacitors
BT: Capacitors
Ceramic products

Ceramic glazes
BT: Glazes

Ceramic products
BT: Manufactured products
RT: Ceramics
Glass products
Insulators
Porcelain
Tiles
NT: Ceramic capacitors

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

Cerium
BT: Chemical elements

Cermet
    BT: Composite materials
    RT: Ceramics
              Metallic materials

Certification
    BT: Training
    RT: Conformance testing

Cervical cancer
    BT: Cancer

Cesium
    UF: Caesium
    BT: Chemical elements

Chalcogenides
    BT: Chemical compounds

Change detection algorithms
    BT: Algorithms

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
              Information theory
    RT: Communication channels
              Convolutional codes
              Polar codes
              Rate distortion theory
              Space-time codes
    NT: Block codes
              Combined source-channel coding
              Turbo codes

Channel estimation
    UF: Channel state estimation
              Channel-state estimation
    BT: Communication channels
    RT: Cellular radio
              Equalizers
              Land mobile radio
              Multipath channels
              Signal detection
              Spread spectrum communication

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
    RT: Optical fiber applications
              Rate distortion theory

Channel state information
    BT: Communication channels

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

Chaotic communication
    BT: Chaos
    RT: Cryptography
              Synchronization
              Time series analysis

Character generation
    BT: Graphics
    RT: Computer graphics
              Displays
              Printing

Character recognition
    UF: Print readers
    BT: Pattern recognition
    RT: License plate recognition
              Text recognition

JULY 2023 IEEE Thesaurus

Characteristic mode analysis
    BT: Electromagnetic analysis

Charge carrier density
    UF: Carrier density
    BT: Charge carriers

Charge carrier lifetime
    UF: Carrier lifetime
    BT: Charge carriers

Charge carrier mobility
    BT: Charge carriers

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

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

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

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

Charge pumps
    UF: Charge-pumping
    BT: Circuits
    RT: Voltage multipliers

Charge transfer
    BT: Charge carrier processes

Charge-coupled image sensors
    BT: Image sensors
           Optoelectronic devices

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

Chatbots
    UF: Bot
           ChatGPT
    BT: Human computer interaction
           Natural language processing
           Speech synthesis
    RT: Auditory system
           Digital humans
           Human factors
           Question answering (information retrieval)

Chebyshev approximation
    BT: Approximation methods
    RT: Discrete cosine transforms

Checkpointing
    BT: System recovery

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: Materials, elements, and compounds
NT: Aluminum
Americium
Antimony
Arsenic
Beryllium
Boron
Bromine
Californium
Carbon
Cerium
Cesium
Chlorine
Dysprosium
Europium
Fluorine
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
Process design

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

Chemical industry
BT: Industries
RT: Chemical engineering
Chemical reactions
Chemical technology
Electrochemical processes
Pesticides
Petrochemicals
Petroleum industry

Pipelines
Plastic products
Plastics industry
Rubber industry

Chemical lasers
BT: Lasers
RT: Gas lasers

Chemical processes
BT: Chemical analysis
NT: Leaching
Molecular sieves
Osmosis
Oxidation
Reverse osmosis
Solvents
Thermolysis
Water splitting

Chemical products
BT: Manufactured products
RT: Chemical engineering
Chemistry
Glass products
Pesticides
Plastic products
Production materials
NT: Agrochemicals
Fats
Inhibitors
Lacquers
Mortar
Paints
Petrochemicals
Petroleum
Pharmaceuticals
Plastics
Propellants

Chemical reaction network theory
BT: Mathematics
RT: Biochemistry
Chemical reactions

Chemical reactions
UF: CSTR
BT: Chemical technology
RT: Chemical industry
Chemical reaction network theory
Crystallizers
Process control
Water splitting
NT: Bioreactors

Catalysis
Chemical reduction
Continuous-stirred tank reactor

Hydrolysis
Ignition
Solvation

Chemical reduction
BT: Chemical reactions
NT: Redox

Chemical sensors
BT: Chemical technology
RT: Detectors

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

Chemical transducers
BT: Transducers
RT: Gas detectors

Chemical vapor deposition
UF: CVD
Chemical vapour deposition
BT: Plasma materials processing
RT: Coatings
Epitaxial layers
Films
NT: Atmospheric pressure chemical vapor deposition
Atomic layer deposition
MOCVD
Pulsed laser deposition

Chemical weapons
UF: Chemical warfare
BT: Chemical hazards
Weapons
RT: Biological weapons

National security
Nuclear weapons
Terrorism
US Department of
Homeland Security
Weapons of mass
destruction

Chemicals
BT: Chemical analysis

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

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

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

Chirp
BT: Signal processing

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

Chlorine
BT: Chemical elements
NT: Chlorine compounds

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

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

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

Chronic kidney disease
UF: CKD
BT: Kidney
        Medical conditions

Chronic obstructive pulmonary disease
UF: COPD
BT: Pulmonary diseases
RT: Asthma
        Emphysema
        Pneumonia

JULY 2023 IEEE Thesaurus

Chronobiology
UF: Biological clocks
BT: Biological processes

Cinematography
BT: Photography
RT: Motion pictures
       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 breakers
BT: Switchgear
RT: Interrupters
       Power system protection
       Protection
       Switching circuits
NT: Molded case circuit breakers

Circuit faults
BT: Circuits
NT: Electrical fault detection

Circuit noise
BT: Circuits
RT: Transmission lines
NT: Thermal noise

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

Circuit simulation
BT: Circuits
RT: Design automation
       Semiconductor process 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
NT: Inductive coupling

Circuit topology
BT: Digital circuits
RT: Graph theory
       Tree graphs
NT: Current mirrors

Circuits
BT: Circuits and systems
RT: Flow graphs
       Impedance matching
       Oscillators
       Phase transformers
       Poles and zeros
       Scattering parameters
NT: Active circuits
       Adders
       Analog circuits

Application specific
integrated circuits
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
circuits
Driver circuits
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
circuits
Monolithic integrated
circuits
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

Rail to rail operation
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

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

Circular waveguides
BT: Electromagnetic
waveguides

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

Circulatory system
UF: Vascular system
BT: Anatomy

Citation analysis
UF: Citation identification
        Citation studies
BT: Bibliometrics

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

Cladding techniques
BT:	Coating techniques
RT:	Claddings

Claddings
BT:	Coatings
	Optical fiber cables
RT:	Cladding techniques
NT:	Laser cladding

Clamps
UF:	Clamping
BT:	Production equipment
RT:	Machine tools
	Machining

Classification algorithms
BT:	Algorithms
NT:	Relevance vector machines

Classification tree analysis
BT:	Decision trees
RT:	Formal concept analysis

Cleaning
BT:	Materials handling
RT:	Air cleaners
	Refining
NT:	Purification
	Surface cleaning

Client-server systems
UF:	Client server model
	Client server systems
	Client-server model
	Clientserver systems
BT:	Distributed computing
	Software architecture
RT:	Dew computing

	Unified modeling language
NT:	Middleware
	Servers

Climate change
UF:	Climate fluctuations
	Climate mitigation
	Climate variability
	Climate variations
	Climate warming
	Climatic change
BT:	Environmental factors
RT:	Carbon emissions
	Carbon footprint
	Carbon neutral
	Emissions trading
NT:	Global warming

Climbing robots
BT:	Mobile robots

Clinical diagnosis
UF:	Clinical analysis
	Clinical engineering
	Clinical information
BT:	Medical services
RT:	Point of care
NT:	Clinical neuroscience

Clinical neuroscience
UF:	Cloud security
BT:	Clinical diagnosis
	Neuroscience

Clinical trials
UF:	Clinical analysis
BT:	Medical treatment

Clocks
BT:	Time measurement
RT:	Timing
NT:	Atomic clocks
	Watches

Cloning
UF:	Cell clones
	Clone
	Clones
	Human cloning
	Molecular clones
	Reproductive cloning
BT:	Biomedical engineering
RT:	DNA
	Stem cells

JULY 2023 IEEE Thesaurus

Closed box
UF:	Blackbox
	Closed-box
BT:	Software
	System analysis and design
RT:	Software testing
	System testing

Closed captioning
BT:	Assistive technologies
	Communication aids
RT:	Media
	TV

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

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

Clothing
UF:	Garments
BT:	Consumer products
RT:	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

Cloud computing
BT:	Internet
RT:	Big Data applications
	Dew computing
	Distributed computing
	Edge computing
	Grid computing
	Internet of Things
	Network function virtualization
	Service computing
	Software as a service
	Software defined networking
	Virtual power plants
	Web services
NT:	Cloud computing security
	Cloud gaming
	Elastic computing
	Platform as a service
	Serverless computing

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

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
	Fish schools
NT:	Pattern clustering

Clutter
BT:	Interference
RT:	Echo interference

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

CMOS image sensors
BT: Image sensors

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

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

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

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

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

CNTFETs
UF: CNFETs
Carbon nanotube FETs
Carbon nanotube field effect transistors
Carbon nanotube field-effect transistors
Carbon-nanotube FETs
Carbon-nanotube field effect transistors
Carbon-nanotube field-effect transistors
BT: Field effect transistors
RT: Carbon nanotubes
Quantum capacitance

Coagulation
UF: Blood clots
Clotting
Coagulate
BT: Biological processes
Blood
RT: Blood platelets

Coal
BT: Fuels
RT: Coal gas
Coal mining

Coal gas
UF: Coal gasification
Illumination gas
Town gas
BT: Gases
RT: Coal
Fuels

Coal industry
BT:	Industries
RT:	Coal mining

Coal mining
BT:	Mining industry
RT:	Coal
	Coal industry

Coating techniques
BT:	Coatings
NT:	Cladding techniques

Coatings
BT:	Materials processing
RT:	Chemical vapor deposition
	Chrome plating
	Corrosion
	Films
	Magnetic multilayers
	Painting
	Spraying
	Sputtering
	Vapor deposition
NT:	Antireflection coatings
	Claddings
	Coating techniques
	Dip coating
	Epitaxial layers
	Glazes
	Lacquers
	Paints
	Powders

Coaxial cables
BT:	Cables
RT:	Electromagnetic waveguides
	Transmission lines
NT:	Coaxial components
	Hybrid fiber coaxial cables

Coaxial components
BT:	Coaxial cables

Cobalt
BT:	Metals
RT:	Alloying
	Magnets
NT:	Cobalt alloys

Cobalt alloys
BT:	Cobalt
RT:	Alloying

Cochlear implants
BT:	Implants
RT:	Ear

Code division multiplexing
UF:	Code division multiplexed
	OCDM
	Optical code division multiplexing
BT:	Communication switching
	Multiplexing
RT:	Cellular radio
	Codes
	Multicarrier code division multiple access
	Optical fiber applications
	Software radio
	Spread spectrum communication

Code refractoring
UF:	Refractoring
BT:	Encoding
RT:	Information theory
	Software engineering

Codecs
UF:	Coder-decoders
BT:	Communication equipment
RT:	Decoding
	Encoding
NT:	Speech codecs
	Video codecs

Codes
UF:	Parity check
BT:	Information theory
RT:	Ciphers
	Code division multiplexing
	Cryptography
	Decoding
	Encoding
	Error correction
	Redundancy
	Sequences
	Vector quantization
NT:	Binary codes
	Convolutional codes
	Cyclic redundancy check codes
	Error correction codes
	Parity check codes
	Product codes
	Space-time codes
	Zero correlation zone

JULY 2023 IEEE Thesaurus

Coercive force
UF:	Coercivity
BT:	Magnetic forces

Cogeneration
UF:	CHP
	Cogen
	Combined heat and power
BT:	Heating systems
	Power generation
RT:	Industrial power systems
	Trigeneration
	Waste heat

Cognition
UF:	Reasoning
BT:	Behavioral sciences
RT:	Active perception
	Brain
	Cognitive systems
	Digital intelligence
	Psychology
NT:	Activity recognition
	Cognitive load
	Cognitive neuroscience
	Cognitive processes
	Commonsense reasoning
	Metacognition
	Self-aware

Cognitive informatics
BT:	Cybernetics
	Informatics
RT:	Brain

Cognitive load
BT:	Cognition
RT:	Cognitive processes
	Memory

Cognitive neuroscience
BT:	Cognition
	Neuroscience

Cognitive processes
BT:	Cognition
RT:	Cognitive load

Cognitive radar
BT:	Adaptive systems
	Radar

Cognitive radio
UF:	Cognitive radio network
BT:	Wireless communication

Cognitive robotics
UF:	Cognitive robots
BT:	Robots
RT:	Autonomous robots

Cognitive science
UF:	Mental models
BT:	Cybernetics
RT:	Brain
	Computational and artificial intelligence
	Human factors
	Inference mechanisms
	Logic
	Psychology
	Uncertainty
NT:	Human intelligence
	Problem-solving

Cognitive systems
UF:	Cognitive computing
	Reasoning
BT:	Artificial intelligence
	Learning systems
RT:	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

Coherence time
BT:	Coherence
	Quantum mechanics
RT:	Bandwidth
	Electromagnetic scattering
	Quantum computing
	Qubit

Coilguns
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
Social Internet of Things
NT: Collaborative tools
Discussion forums
Teamwork
Virtual groups

Collaborative filtering
BT: Filtering theory
RT: Recommender systems

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

Collaborative software
UF: Groupware
BT: Collaborative tools
RT: Communication system software
Federated learning

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

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

NT: Fish schools

Colliding beam accelerators
BT: Colliding beam devices
Particle accelerators
RT: Klystrons
Particle beams
Synchrotrons

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 systems
Lane detection
Vehicle crash testing

Collision mitigation
BT: Motion control

Colloidal crystals
BT: Crystals
RT: Crystallizers

Colloidal lithography
BT: Lithography
Nanopatterning
RT: Biomedical engineering
Nanobioscience

Nanotopography
Polymers
Surface treatment
Tissue engineering

Colloidal nanocrystals
BT: Nanocrystals
        Optical materials

Colon
BT: Digestive system
NT: Colonic polyps

Colonic polyps
BT: Colon
        Tumors

Colonography
BT: Medical diagnosis

Colonoscopy
BT: Medical tests
NT: Virtual colonoscopy

Color
BT: Optics
RT: Electrochromism
        Imaging
        Photochromism
NT: Color gamut
        Color temperature
        Pigmentation

Color gamut
UF: Colour gamut
BT: Color
RT: Image color analysis
        Light sources
        Printing

Color temperature
UF: Colour temperature
BT: Color
        Temperature

Color TV
BT: TV

Colored noise
UF: Coloured noise
BT: Noise

Colossal magnetoresistance
BT: Magnetoresistance

Comb filters
BT: Filters

Combinational circuits
UF: Combinational logic circuits
BT: Logic circuits

Combinatorial mathematics
BT: Mathematics
NT: Graph theory
        Steiner trees

Combinatorial testing
UF: Combinatorial software testing
BT: Software testing
RT: Design for testability

Combined source-channel coding
UF: Combined source channel coding
BT: Channel coding

Combustion
BT: Oxidation
RT: Exhaust gases
NT: Plasma-assisted combustion

Comets
BT: Planets

Command and control systems
UF: Military command and control
BT: Aerospace and electronic systems
RT: Military communication
        Military systems

Command languages
BT: Computer languages

Commerce and trade
BT: Business
NT: Free economic zones
        Product delivery

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

Commercialization
    BT: Engineering management

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

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

Commonsense reasoning
    UF: common sense knowledge
               common sense reasoning
               common-sense knowledge
               common-sense reasoning
               commonsense knowledge
               reasoning about programs
    BT: Artificial intelligence
               Cognition

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

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

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 channels
               Throughput
               Time-varying channels

Communication effectiveness
    BT: Professional
communication
    RT: Cooperative communication
               Federated learning

Communication engineering education
    BT: Engineering education

Communication equipment
    BT: Communications
technology
    RT: Bluetooth
               Communication systems
               Multiplexing equipment
               Satellite ground stations
    NT: Auditory displays
               Codecs
               Modems
               On board unit
               Optical 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 networks
- UF: PSTN
  Public switched telephone network
- BT: Communication systems
- RT: Network security
- NT: Central office
  Cyberspace
  Industrial communication
  Maritime communications
  Radio access technologies
  Relay networks
  Telecommunication network performance
  Virtual links

Communication standards
- UF: Telecommunication standards
- BT: Standards categories
- RT: Communication systems
  FDDI
  IEC
  ISO
  ISO Standards
  Radio spectrum management
- NT: Data over cable service interface specification
  Long Term Evolution
  Near field communication
  SONET
  Synchronous digital hierarchy
  Universal Serial Bus

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

Communication symbols
- BT: Professional communication
  Symbols
- RT: Pragmatics

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 security
- UF: Communication system privacy
  Telecommunication security
  Wireless security
- BT: Communication systems
- RT: Access control
  Cryptography
  Data security
  Electronic warfare
  Hardware security
  Privacy
- NT: Denial-of-service attack
  Impersonation attacks
  Quantum key distribution
  Radio communication countermeasures

Communication system signaling
- UF: Signaling systems
  Telecom signaling
  Telecom system signaling
  Telecommunication signalling
- BT: Communication systems
- RT: Bit rate
  Communication system operations and management
  Handover
- NT: Received signal strength indicator

Communication system software
- BT: Communication systems
- RT: Collaborative software
- NT: Streaming media

Communication system traffic
- UF: Mice flows
- BT: Communication systems

RT: Telecommunication traffic

Communication system traffic control
 BT: Communication systems

Communication systems
 BT: Communications technology
 RT: Antennas and propagation
   Communication channels
   Communication equipment
   Communication industry
   Communication standards
   Communication system operations and management
   Digital systems
   Huffman coding
   Information theory
   Office automation
   Telecontrol equipment
   Traffic control
 NT: ARPANET
   Biomedical communication
   Broadband communication
   Communication networks
   Communication system control
   Communication system security
   Communication system signaling
   Communication system software
   Communication system traffic
   Communication system traffic control
   Computer networks
   Cross layer design
   Data buses
   Data communication
   Device-to-device communication
   Digital communication
   Duplex communication systems
   FDDI
   Facsimile
   IP networks
   ISDN
   Indoor communication
   Internet
   Local area networks
   Low latency communication
   MIMO communication

   MISO communication
   Machine-to-machine communications
   Magnetic communication
   Metropolitan area networks
   Microwave communication
   Military communication
   Mobile communication
   Molecular communication
   Multiaccess communication
   Multicast communication
   Multimedia communication
   NOMA
   Nanocommunication
   Narrowband
   Optical fiber communication
   Personal communication networks
   Protocols
   Quality of experience
   Quality of service
   Quantum communication
   Radio communication
   Regional area networks
   Routing
   SIMO communication
   SISO communication
   Satellite communication
   Satellite ground stations
   Spatial diversity
   Submillimeter wave communication
   Subscriber loops
   Switching systems
   Synchronous digital hierarchy
   Telecommunications
   Teleconferencing
   Telegraphy
   Telephony
   Teleprinting
   Teletext
   Terahertz communications
   Token networks
   UHF communication
   Underwater communication
   Vehicle-to-everything
   Video conferencing
   Videophone systems
   Videotex
   Visual communication
   Wide area networks
   Wideband
   Wireless communication
   Wireless mesh networks

Wireless sensor networks

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

Community networks
BT: Social networking (online)
RT: Social computing

Commutation
BT: Motors

Commutators
BT: DC motors

Compaction
BT: Waste reduction
RT: Materials handling

Companies
BT: Organizations

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

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

Competitive learning
BT: Unsupervised learning

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

Complex systems
BT: Systems engineering and theory
RT: Bio-inspired engineering
Configuration management
Large-scale systems

Complexity theory
UF: Circuit complexity
Communication complexity
Complexity
BT: Chaos
RT: Computation theory
Econophysics
NT: Computational complexity
NP-complete problem
NP-hard problem

Component architectures
UF: Component-based systems
BT: Components, packaging, and manufacturing technology

Components, packaging, and manufacturing technology
NT: Component architectures
Electronic components
Electronic equipment manufacture
Electronics packaging
Environmentally friendly manufacturing techniques
Integrated circuit manufacture
Integrated circuit packaging
Semiconductor device packaging
Thermal management of electronics

Composite materials
BT: Materials
RT: Intelligent materials
NT: Cermet

Compounds
BT: Materials, elements, and compounds

NT: Bismuth compounds
 Gallium compounds
 Indium compounds
 Inorganic compounds
 Lead compounds
 Organic compounds
 Silicon compounds

Compressed sensing
 UF: Compressive sensing
 BT: Sampling methods

Compression algorithms
 BT: Algorithms

Compression molding
 UF: Compression moulding
 BT: Production
 RT: Injection molding

Compressive stress
 BT: Stress

Compressors
 BT: Electric machines
 RT: Air conditioning
 Pumps
 Turbines
 Turbomachinery

Computation theory
 BT: Computational intelligence
 RT: Complexity theory
 NT: Computational complexity
 Concurrent computing
 Greedy algorithms
 Support vector machines
 Turing completeness

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
 Graph drawing
 Semidefinite programming
 NT: Time complexity

Computational cultural modeling
 UF: Computational cultural dynamics
 Computational social and behavioral modeling
 BT: Computational modeling

Computational efficiency
 BT: Mathematics

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

Computational geometry

BT:	Geometry	
RT:	Computer graphics	
	Layered manufacturing	
	Surface fitting	
NT:	Fractals	
	Geometric modeling	

Computational intelligence

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

Computational linguistics

BT:	Systems, man, and cybernetics	
RT:	Context modeling	
NT:	Machine translation	
	Sentiment analysis	

Computational materials science

BT:	Computational modeling	
	Materials science and technology	
RT:	Informatics	

Computational modeling

UF:	Computational life sciences	
	Life sciences computing	
	ZINDO	
BT:	Modeling	
RT:	Fish schools	
	Neuroinformatics	
	Time complexity	
NT:	Agent-based modeling	
	Computational cultural modeling	
	Computational materials science	
	Reversible computing	

Computational neuroscience

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

Computational systems biology

BT:	Computational biology	

Computed tomography

UF:	CT scan	
	Computed microtomography	
	Computerised axial tomography	
	Computerised tomography	
	Computerized axial tomography	
	Computerized tomography	
BT:	Tomography	
RT:	Biomedical applications of radiation	
NT:	Single photon emission computed tomography	

Computer aided analysis

BT:	Computer applications	
RT:	Digital simulation	
	Geophysics computing	
	Independent component analysis	
	Simulation	

Computer aided diagnosis

UF:	Computer assisted diagnosis	
	Computer-aided diagnosis	
	Computer-assisted diagnosis	
BT:	Medical diagnosis	

Computer aided engineering

UF:	CAE	
BT:	Computer applications	

Computer aided instruction

UF:	CAI	
	Computer aided learning	
	Computer-aided instruction	
	Computer-aided learning	
	Teaching machines	
BT:	Computer applications	
	Educational technology	
RT:	Authoring systems	
	Continuing education	
	Courseware	
	Educational courses	
	Electronic learning	
	Matlab	
	Technology acceptance model	
NT:	Hybrid learning	
	Learning management systems	

JULY 2023 IEEE Thesaurus

Computer aided manufacturing
  UF: CAM
  BT: Industrial electronics
       Manufacturing automation
  RT: Computer integrated manufacturing
       Integrated manufacturing systems
  NT: CADCAM
       Silicon compiler

Computer aided software engineering
  BT: Software engineering
  RT: Programming environments
       Software tools

Computer applications
  UF: Volunteer computing
  BT: Computers and information processing
  RT: Biomedical computing
       Computational electromagnetics
       Computerized monitoring
       Edge computing
       Electrical engineering computing
       Flexible manufacturing systems
       Humanities
       Information technology
       Learning management systems
       Middleware
       Mobile agents
       Software agents
       Software packages
  NT: Application virtualization
       Big Data applications
       Bot (Internet)
       Computer aided analysis
       Computer aided engineering
       Computer aided instruction
       Computer generated music
       Computer integrated manufacturing
       Control engineering computing
       Engineering computing
       Green computing
       High energy physics instrumentation computing
       Knowledge management
       Mathematics computing

Medical information systems
Military computing
Mobile applications
Physics computing
Power engineering computing
Power system analysis computing
Publishing
Scientific computing
Telecommunication computing
Virtual assistants
Virtual enterprises
Virtual manufacturing
Web sites
World Wide Web

Computer architecture
  UF: Architecture (computer)
  BT: Computers and information processing
  RT: Microprogramming
  NT: Accelerator architectures
       Data structures
       Dynamic voltage scaling
       Memory architecture
       Memory management
       Multiprocessor interconnection
       Parallel architectures
       Reconfigurable architectures

Computer bugs
  UF: Bugs
  BT: Computer crashes

Computer crashes
  BT: Computer errors
  NT: Buffer overflows
       Computer bugs

Computer crime
  UF: Cyber crime
       Cyber-crime
       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
Hardware security
Privacy-invasive software
Threat modeling
Unsolicited e-mail
NT: Counterfeiting
Cyber terrorism
Cyber threat intelligence
Cyberattack
SQL injection

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

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

Emojis
Rendering (computer graphics)
Shadow mapping
Sprites (computer)
Video sequences
Virtual reality
Visualization
X3D

Computer hacking
UF: Hacker
Hacks
BT: Computer security

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
Browsers
Field buses
Firewire
Haptic interfaces
Hypertext systems
Input devices
Interface phenomena
Interface states
Musical instrument digital interfaces
Ports (computers)
System buses

JULY 2023 IEEE Thesaurus

Computer languages

UF:	Programming languages
BT:	Formal languages
RT:	Data structures
	Natural languages
	Software
NT:	Architecture description languages
	Business Process Execution Language
	C languages
	Command languages
	Database languages
	Hardware design languages
	High level languages
	Markup languages
	Python
	R language
	Specification languages
	Style sheet languages
	Systems Modeling Language
	Visual BASIC

Computer mediated communication

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

Computer network management

BT:	Computer networks
RT:	Bandwidth
	Computer security
	Data security
	Network function virtualization
	Software defined networking
	Traffic control
NT:	Computer network reliability
	Disruption tolerant networking
	Management information base
	Middleboxes
	Network address translation
	Network synthesis

Computer network reliability

BT:	Computer network management
	Network topology
NT:	Fault tolerant computer networks

Computer networks

UF:	Mice flows
BT:	Communication systems
	Computers and information processing
RT:	Bit rate
	Cyber terrorism
	Cyber warfare
	Data communication
	Delay estimation
	Distributed computing
	Edge computing
	File servers
	Firewalls (computing)
	Frame relay
	Hypercubes
	IEEE 802.11 Standard
	IEEE 802.11g Standard
	IEEE 802.11n Standard
	IEEE 802.16 Standard
	IEEE 802.3 Standard
	IPTV
	Internetworking
	LAN interconnection
	Middleware
	Multiprocessing systems
	Multiprocessor interconnection
	Network security
	Open systems
	Personal area networks
	Ports (computers)
	Radial basis function networks
	TCPIP
	Web sites
NT:	Ad hoc networks
	Computer network management
	Content distribution networks
	Cyberspace
	Diffserv networks
	Domain Name System
	Ethernet
	Heterogeneous networks
	IP networks
	Internet
	Intserv networks
	Metropolitan area networks
	Multiprocessor interconnection networks
	Network function virtualization
	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 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 science
BT: Computers and information
processing
RT: Function approximation
         Logic
         Software
NT: Computational
neuroscience

Formal languages
Network theory (graphs)
Programming

Computer science education
UF: Computer engineering
education
BT: Engineering education

Computer security
BT: Computers and information
processing
         Security
RT: Access control
         Blockchains
         Computer network
management
         Cryptography
         Cyber threat intelligence
         Data protection
         Data security
         Digital forensics
         Eavesdropping
         Hardware security
         Operating systems
         Privacy
         Privacy-invasive software
         Threat modeling
         Trust management
NT: Application security
         Authentication
         Cloud computing security
         Computer crime
         Computer hacking
         Cross-site scripting
         Cyber espionage
         Cyber warfare
         Cyberattack
         Data integrity
         Denial-of-service attack
         Firewalls (computing)
         Honey pot (computing)
         Identity management
systems
         Internet security
         Mobile security
         Passwords
         Penetration testing
         Permission
         Phishing
         Proof of Work
         Trusted computing

Computer simulation
BT: Simulation
RT: Digital twins
         EMTP
         Fish schools
         Human in the loop

NT:	Synthetic data

Computer viruses

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

Computer vision

BT:	Robots
RT:	Activity recognition
	Advanced driver assistance systems
	Conditional random fields
	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
	Smart cameras
	Visual odometry

Computer worms

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

Computerized instrumentation

| UF: | Computerised instrumentation |
| BT: | Instrumentation and measurement |

Computerized monitoring

UF:	Computerised monitoring
BT:	Monitoring
RT:	Computer applications

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 computing
	Image processing
	Memory
	Mobile computing
	Molecular computing
	Multitasking
	Open systems
	Optical computing
	Parallel processing
	Pattern recognition
	Pervasive 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

Concatenated codes
BT:	Programming

Concave programming
BT:	Optimization methods

Concrete
BT:	Building materials
RT:	Pressure vessels

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
management	
	Time to market
	Virtual manufacturing

Condition monitoring
BT:	Preventive maintenance

Conditional random fields
UF:	CRF
BT:	Graph theory
	Random processes
	Statistical analysis
RT:	Computer vision
	Feature extraction
	Image segmentation
	Learning (artificial
intelligence)	

		Natural language
processing		
		Text analysis

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
transmission	

Wiring

Conference management
BT: Management

Conferences
UF: Meetings (technical)
Symposia
Workshops
BT: Meetings

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

Congestive heart failure
BT: Medical conditions

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

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: Decentralized applications
Swarm robotics

Consensus protocol
UF: Consensus mechanism
BT: Blockchains
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 theory
BT: Integer linear programming

Construction
UF: Erection
BT: Industries
RT: Building materials
Civil engineering
Construction industry
Structural engineering
NT: Buildings
Green buildings
Modular construction
Prefabricated construction
Stairs

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
    Electronic commerce
    Food waste
    Market opportunities
    Technology acceptance model
NT: Neuromarketing
    Self-service

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
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

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
NT: Freight containers

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

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

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

Content management
>BT: Electronic publishing
>Management
>RT: Blockchains
>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

Context
>BT: Professional
communication
>RT: Pragmatics

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

Continuous wavelet transforms
>BT: Wavelet transforms

Continuous-stirred tank reactor
>BT: Chemical reactions

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 simulation

Control engineering education
BT: Engineering education
RT: Control engineering
Control engineering computing

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

Microcontrollers
Regulators
Remote control
Servosystems
Switches
Switchgear
Telecontrol equipment
Thermostats

Control nonlinearities
BT: Control theory
RT: Nonlinear control systems
NT: Backstepping
Feedback linearization

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
Control charts
Control system security
Cybernetics
Discrete-event systems
Discrete-time systems
Estimation

Flexible structures
Force control
Game theory
H infinity control
Interconnected systems   systems
Inventory control
Legged locomotion
Linear systems   control
Linearization techniques
MIMO communication
Manipulators
Microcontrollers
Microsensors
Mobile robots
Neuromodulation
Nonlinear systems
Parameter estimation
Poles and zeros
Real-time systems
Robots
Robustness
Sensitivity
Stability
State estimation
Stochastic systems
Switched systems
Target tracking
Time-varying systems
Transfer functions
Uncertain systems

Fluidics
Gaze tracking
Homeostasis
Linear feedback control
Magnetic variables control
Mechanical variables
Medical control systems
Missile control
Moisture control
Motion compensation
Networked control systems
Nonlinear control systems
Open loop systems
Optical control
Optimal control
PD control
PI control
Pneumatic systems
Positive train control
Pressure control
Proportional control
Radio control
Robot control
SCADA systems
Sensorless control
Sliding mode control
Supervisory control
Thermal variables control
Traffic control

NT: Admittance control
Automatic control
Automatic generation control
Automotive control
Autopilot
Bidirectional control
Block signalling
Brakes
CAMAC
Centralized control
Closed loop systems
Control design
Control engineering
Control equipment
Control system synthesis
Controllability
Cruise control
Decentralized control
Delay systems
Digital control
Fault tolerant control
Feedback
Feedback linearization
Fluid flow control

Control theory
    BT: Cybernetics
    RT: Dynamics
        Feedback circuits
    NT: Control nonlinearities
        Iterative learning control
        Observability

Controllability
    BT: Control systems

Convection
    UF: Mixed convection
        Rayleigh-Benard convection
    BT: Heat transfer

Convergence
    BT: Mathematics

Convergence of numerical methods
    BT: Numerical analysis

Converters
UF: Convertors
        Switching convertors
BT: Power electronics
RT: Data conversion
        Inrush current
        Pulse width modulation
        Pulse width modulation inverters
        Rectennas
        Space vector pulse width modulation
NT: AC-AC converters
        DC-AC power converters
        Digital-to-frequency converters
        Frequency conversion
        Multilevel converters
        Power conversion
        Pulse width modulation converters
        Resonant converters
        Static power converters
        Voltage-source converters
        Wavelength converters

Convex functions
UF: Convex optimization
BT: Mathematics
NT: Semidefinite programming

Convolution
BT: Signal processing
RT: Deconvolution
        Numerical analysis
NT: Convolvers

Convolutional codes
UF: Trellis codes
BT: Codes
RT: Channel coding
        Digital multimedia broadcasting
        Error correction
        Error correction codes
        Radio communication
        Satellite communication
        Telecommunications

Convolutional neural networks
UF: CNN
        Convolutional networks
        Convolutional neural nets
BT: Artificial neural networks
RT: Deep learning

        Generative adversarial networks
        Graph neural networks
        Image augmentation
        Machine learning

Convolvers
BT: Convolution

Coolants
UF: Antifreeze materials
BT: Cooling
RT: Space cooling
NT: Refrigerants

Cooling
BT: Temperature control
RT: Electronics cooling
        Electronics packaging
        HVAC
        Heat pipes
        Thermal engineering
        Water pumps
NT: Air conditioning
        Cold plates
        Coolants
        Heat sinks
        Immersion cooling
        Laser cooling
        Liquid cooling
        Refrigeration
        Solar cooling
        Space cooling
        Thermal quenching
        Trigeneration
        Ultracold atoms
        Ventilation

Cooperative caching
BT: System performance

Cooperative communication
UF: Amplify-and-forward cooperative communication
BT: Federated learning
        Wireless communication
RT: Communication effectiveness
        Professional communication

Cooperative systems
UF: Cooperative networks
BT: Artificial intelligence

RT: Artificial bee colony algorithm

Coordinate measuring machines
UF: CMM
BT: Measurement
RT: Inspection
Machine tools
Quality control

Coplanar transmission lines
BT: Planar transmission lines
NT: Coplanar waveguides

Coplanar waveguides
UF: CPW
BT: Coplanar transmission lines
RT: Conformal mapping
Electromagnetic waveguides

Copper
UF: Cu
BT: Metals
NT: Copper alloys
Copper compounds

Copper alloys
BT: Copper
RT: Alloying

Copper compounds
BT: Copper

Coprocessors
BT: Circuits
Integrated circuits
Microprocessors
RT: AI accelerators
Digital arithmetic

Copyright protection
BT: Legal factors
RT: Digital rights management
Plagiarism
Public domain software
Publishing
Trademarks
Watermarking
NT: Intellectual property
Software protection

Core dumps
BT: System recovery

Core loss
UF: Core losses
BT: Energy loss
RT: Conductors
Transformers

Cornea
BT: Eyes
RT: Ophthalmology

Corner detection
BT: Computer vision
Image processing
RT: Image edge detection
Motion detection

Corona
BT: Electric breakdown
RT: Partial discharges

Coronary arteriosclerosis
BT: Arteriosclerosis

Coronaviruses
UF: Corona virus
BT: Viruses (medical)
RT: Epidemics
Pandemics
NT: COVID-19

Corporate acquisitions
UF: Mergers
BT: Organizational aspects
RT: Business process re-engineering

Corpus callosum
UF: Callosal commissure
BT: Brain

Correlation
BT: Statistics
RT: Correlation coefficient
NT: Autocorrelation

Correlation coefficient
BT: Statistics
RT: Correlation
Regression analysis

Correlators
BT: Electromagnetic radiation
RT: Signal detection
Signal processing

Corrosion
BT: Surfaces
RT: Coatings
  Corrosion inhibitors
  Galvanizing
  Grain boundaries
  Magnetic flux leakage
  Passivation

Corrosion inhibitors
BT: Inhibitors
  Materials
RT: Corrosion
  Galvanizing
  Materials preparation
  Materials processing

Corrugated surfaces
BT: Rough surfaces
  Surfaces

Cortical bone
BT: Bone tissue

Cosmic rays
BT: Extraterrestrial phenomena
RT: Electrons
  Elementary particles
  Mesons
  Neutrons
  Protons

Cost accounting
UF: Valuation
BT: Costing
  Management accounting
RT: Costs
  Economics
  Profitability

Cost benefit analysis
UF: Cost analysis
  Cost-benefit analysis
BT: Costs
RT: Functional point analysis

Cost function
BT: Optimization

Costing
UF: Capital cost reduction
  Operating cost reduction
BT: Financial management
NT: Cost accounting

Costs
BT: Economics
RT: Cost accounting
  Econometrics
  Exchange rates
NT: Cost benefit analysis

Cotton
BT: Agricultural products
  Textiles
RT: Natural fibers
  Textile fibers
  Textile industry
  Weaving

Counterfeiting
UF: Counterfeit goods
BT: Computer crime

Counting circuits
BT: Circuits
RT: Logic circuits
  Radiation detector circuits

Coupled mode analysis
BT: Circuit analysis
RT: Multiconductor transmission lines

Couplers
BT: Communications technology
RT: Apertures
  Coupling circuits
  Electromagnetic coupling
NT: Directional couplers

Coupling circuits
UF: Coupled circuits
BT: Circuits
RT: Couplers

Couplings
UF: Linkages
BT: Mechanical products
RT: Fasteners
  Joining processes
  Machine components
  Shafts

Course correction
UF: Course-correction
BT: Navigation
RT: Aircraft navigation
  Path planning

Courseware
BT:	Educational technology
RT:	Authoring systems
	Computer aided instruction
	Hybrid learning
	Software

Covariance matrices
UF:	Covariance matrix
BT:	Statistics

COVID-19
BT:	Coronaviruses
RT:	Pandemics
	Viruses (medical)

Cows
UF:	Cattle
BT:	Bovine

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

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)

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:	Superconductivity
RT:	Superconducting materials
	Thermal factors

Critical infrastructure
UF:	Critical national infrastructure
BT:	Public infrastructure

Crops
BT:	Agricultural products
	Vegetation
RT:	Fertilizers
	Greenhouses
	Irrigation
	Water storage
	Yield estimation
NT:	Seeds (agriculture)

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

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

Cross-phase modulation
UF:	Cross phase modulation
	XPM
BT:	Optical modulation
	Phase modulation
RT:	Kerr effect
	Nonlinear optics
	Refractive index

Cross-site scripting
UF:	XSS
BT:	Computer security

Crosstalk
UF:	Crosstalk noise
BT:	Interference
RT:	Electromagnetic interference
	Interchannel interference
	Transmission line theory

Crowdsensing
BT:	Crowdsourcing
RT:	Collective intelligence
	Mobile computing

Crowdsourcing
BT:	Federated learning
	Internet
RT:	Collective intelligence
	Distributed processing
	Mobile computing
	Outsourcing
	Social computing
	Social networking (online)
NT:	Crowdsensing
	Product development

Cruise control
BT:	Control systems
	Electromechanical systems
RT:	Velocity control

Cryobiology
BT:	Biology
	Temperature measurement

Cryogenic electronics
BT:	Industrial electronics
RT:	Cryogenics
	Superconducting devices
	Superconducting materials

Cryogenics
UF:	Cryonics
BT:	Industry applications
	Temperature measurement
RT:	Cryogenic electronics
NT:	Liquid nitrogen

Cryotherapy
BT:	Medical treatment
	Temperature measurement

Cryptocurrency
UF:	Crypto currency
BT:	Cryptography
	Currencies
RT:	Blockchains
	Digital systems
	Distributed ledger
	Finance
	Micropayments
	Nonfungible tokens
	Online banking
NT:	Bitcoin

Cryptographic hash function
BT:	Cryptography
	Hash functions

Cryptographic protocols
BT:	Protocols

Cryptography
UF:	Cryptographic
BT:	Data security
	Security
RT:	Bitcoin
	Chaotic communication
	Codes
	Communication system security
	Computer security
	Data handling
	Encoding
	Hash functions
	Message authentication
	Physical unclonable function
	Privacy
	Quantum key distribution
	Random sequences
	Trust management
NT:	Blockchains
	Ciphers
	Cryptocurrency
	Cryptographic hash function
	Encryption
	Multi-party computation
	Public key
	Quantum cryptography
	Random number generation
	Side-channel attacks
	Steganography
	Zero knowledge proof

Crystal growth
    BT: Crystallization
    RT: Epitaxial growth
              Semiconductor growth

Crystal microstructure
    BT: Crystals
    RT: Electron backscatter diffraction
              Microstructure

Crystalline materials
    BT: Materials
    NT: Martensite
              Nanocrystals
              Perovskites
              Superlattices

Crystallization
    UF: Crystallisation
    BT: Crystallography
    NT: Crystal growth

Crystallizers
    UF: Crystallisers
    BT: Chemical technology
    RT: Chemical reactions
              Colloidal crystals
              Crystallography
              Crystals

Crystallography
    BT: Crystals
    RT: Crystallizers
              Diffraction
              X-ray detectors
    NT: Crystallization

Crystals
    BT: Materials
    RT: Crystallizers
              Epitaxial growth
              Materials science and technology
              Molecular beam epitaxial growth
              Phonons
              Piezoelectric materials
              Semiconductor materials
              Solids
    NT: Colloidal crystals
              Crystal microstructure
              Crystallography
              Grain boundaries
              Grain size

              Liquid crystals
              Quartz crystals

CSA Group
    UF: Canadian Standards Association
    BT: Standards organizations

CSA Group Standards
    BT: Standards publications

CubeSat
    BT: Small satellites

Cultural aspects
    BT: Social implications of technology
    RT: Museums
    NT: Cultural differences

Cultural differences
    BT: Cultural aspects
              Social implications of technology
    RT: Anthropology
              Cross-cultural communication
              Developing countries
              Digital divide
              Memetics
              Museums
              Social intelligence
              Virtual museums

Curing
    BT: Materials processing
    RT: Heat treatment
              Kilns

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
Inrush current
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
NT: 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
Inrush current
NT: Current density
Current distribution

Current mirrors
BT: Circuit topology

Current slump
BT: Current

Current supplies
BT: Power supplies

RT: Current

Current transformers
BT: Transformers
RT: Current

Current-mode circuits
UF: Current mode circuits
BT: Integrated circuits

Current-voltage characteristics
UF: Current voltage characteristics
BT: Electric variables

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

Customer profiles
BT: Customer relationship management
RT: Consumer behavior
Market opportunities

Customer relationship management
BT: Management
RT: 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
           Electronic commerce
           Market research
           Product customization
           Quality management
NT: Quality of experience
           Quality of service

Customer services
BT: Customer relationship management
RT: Customer satisfaction
NT: Self-service

Cutoff frequency
UF: Cut-off frequency
BT: Integrated circuit modeling

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

Cyber espionage
UF: Cyber spying
           Cyberespionage
           Cyberspying
BT: Computer security
           Information security
RT: Malware
           Trojan horses

Cyber terrorism
UF: Cyberterrorism
BT: Computer crime
           Terrorism
RT: Computer networks

Cyber threat intelligence
UF: CTI
BT: Computer crime
RT: Computer security
           Cyberattack
           Information integrity
           Information security
           Information sharing
           Threat modeling

Cyber warfare
UF: Cyberwarfare

BT: Computer security
RT: Computer networks
           Cyberattack
           National security

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

Cyberattack
UF: Cyber attack
           Cyber attacks
BT: Computer crime
           Computer security
RT: Cyber threat intelligence
           Cyber warfare
           Cyberethics
           Threat modeling
           US Department of Homeland Security

Cyberbullying
UF: Cyber bullying
           Cyber harrassment
           Cyberharrassment
           Internet bullying
           Online bullying
BT: Cyberspace
           Social computing
           Social networking (online)
           User experience
RT: Behavioral sciences
           Cyberethics
           Privacy
           Social implications of technology
           Unsolicited e-mail

Cybercare
BT: Medical services

Cyberethics
UF: Cyber ethics
BT: Ethics

RT:	Behavioral sciences
	Cyberattack
	Cyberbullying
	Intellectual property
	Privacy
	Social implications of technology

Cybernetics

UF:	Biocybernetics
BT:	Systems, man, and cybernetics
RT:	Automata
	Cognitive systems
	Control systems
	Cyberspace
	Econometrics
	Ergonomics
	Information theory
	Learning systems
	Man-machine systems
	Neural networks
	Radial basis function networks
	Robots
NT:	Adaptive systems
	Cognitive informatics
	Cognitive science
	Control theory
	Decision theory
	Econophysics
	Emergent phenomena
	Intelligent control
	Linear feedback control systems

Cybersickness

UF:	Cyber sickness
BT:	Medical conditions
	Virtual reality

Cyberspace

UF:	Cyber-space
BT:	Communication networks
	Computer networks
RT:	Computers
	Cybernetics
	Electromagnetics
	Internet
	Telematics
	Virtual reality
	World Wide Web
NT:	Cyberbullying

Cyclic redundancy check

BT:	Mathematics
RT:	Algorithms
	Data communication
	Error analysis
	Error correction
	Information theory
	Noise
NT:	Cyclic redundancy check codes

Cyclic redundancy check codes

UF:	CRC codes
BT:	Codes
	Cyclic redundancy check
RT:	Decoding
	Error analysis
	Error correction

Cyclones

UF:	Polar cyclones
BT:	Geoscience
NT:	Hurricanes
	Tropical cyclones

Cyclotrons

BT:	Particle accelerators

D-HEMTs

UF:	Depletion mode HEMTs
	Depletion-mode HEMTs
BT:	HEMTs

Dairy products

UF:	Butter
	Cheese
	Milk
BT:	Agricultural products
	Food products
RT:	Agriculture

Damascene integration

BT:	Electronic equipment manufacture
RT:	Very large scale integration

Damping

BT:	Mechanical factors
RT:	Hysteresis
	Impedance
	Oscillators
	Propagation
	Shock absorbers
	Stability
	Transfer functions

JULY 2023 IEEE Thesaurus

Transient response
Vibration control
Vibrations

Dams
- BT: Geotechnical structures
  Water storage
- RT: Environmental management
  Hydroelectric power generation
  Reservoirs

Dark current
- BT: Current

Dark energy
- BT: Physics

Dark matter
- BT: Astrophysics

Dark states
- BT: Laser applications

Dark Web
- BT: Internet
  Overlay networks
- RT: Web services

Data acquisition
- UF: DAQ
- BT: Data systems
- RT: Analog-digital conversion
  Data handling
  Data processing
  High energy physics instrumentation computing
  Measurement
- NT: Data transparency
  Fastbus
  User-generated content

Data aggregation
- BT: Data collection
- RT: Data assimilation
  Data handling
  Data integration
  Database systems
  Information management

Data analysis
- UF: Data analytics
- BT: Data processing
- RT: Big Data applications

Data collection
Data mining
Digital twins
Formal concept analysis
R language
Text categorization
- NT: Business intelligence
  Data augmentation
  Data science
  Itemsets
  Training data

Data assimilation
- BT: Data handling
- RT: Data aggregation
  Meteorology

Data augmentation
- BT: Data analysis
  Data handling
- RT: Deep learning
  Image augmentation
  Learning (artificial intelligence)
  Machine learning
  Synthetic data

Data breach
- UF: Data spill
- BT: Information security
- RT: Data security
  Privacy breach
- NT: Network intrusion

Data buses
- UF: Computer buses
- BT: Communication systems
  Data communication
- RT: CAMAC
  Computer interfaces
  IEEE 1394 Standard
- NT: Backplanes

Data center power
- BT: Data centers
  Power systems

Data centers
- UF: Data centres
- BT: Data systems
- NT: Data center power

Data collection
- BT: Data processing
- RT: Blockchains

	Data analysis
	Information processing
NT:	Big Data
	Data aggregation
	Data lakes

Data communication

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

Data compression

BT:	Data systems
RT:	Encoding
	Entropy coding
	Fourier series
	Quantization (signal)
	Rate-distortion
	Streaming media
	Transcoding
	Video compression
NT:	Adaptive coding

	Audio compression
	Huffman coding
	Neural network compression
	Point cloud compression
	Source coding
	Test data compression
	Transform coding

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 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
	Cryptography

Data acquisition
Data aggregation
Data processing
Data security
Encoding
Enterprise resource planning
General Data Protection Regulation
- NT: Data assimilation
  Data augmentation
  Data dissemination
  Data encapsulation
  Data governance
  Data integrity
  Document handling
  Merging
  Open data
  Sorting
  Turing completeness

Data integration
- UF: Data fusion
- BT: Data processing
- RT: Data aggregation
  Data dissemination

Data integrity
- UF: Data freshness
  Data quality
- BT: Computer security
  Data handling
- RT: Data governance
  Digital preservation
  Quality assurance
  Quality control
- NT: Non-repudiation

Data lakes
- UF: Data swamp
- BT: Data collection
- RT: Big Data
  Data mining
  Data warehouses

Data mining
- BT: Pattern recognition
- RT: Artificial intelligence
  Big Data
  Business intelligence
  Data analysis
  Data lakes
  Data visualization
  Digital forensics
  Knowledge discovery

Naive Bayes methods
Nearest neighbor methods
Predictive analytics
R language
- NT: Anomaly detection
  Association rules
  Data privacy
  Text analysis
  Text mining
  Web mining

Data models
- BT: Modeling
- RT: Data governance
  Database systems
  Semantic Web
  Semantic technology
- NT: Data-driven modeling
  Metadata

Data over cable service interface specification
- UF: DOCSIS
- BT: Communication standards

Data preprocessing
- BT: Data processing

Data privacy
- UF: Data confidentiality
  Privacy preserving data mining
- BT: Data mining
- RT: Data governance
  Privacy
  Synthetic data
  Threat modeling
- NT: Data protection
  Differential privacy

Data processing
- BT: Data systems
- RT: CAMAC
  Computers and information processing
  Data acquisition
  Data handling
  Database systems
  Enterprise resource planning
  Signal processing
  Smart cards
  Technology management
- NT: Associative processing
  Business data processing

Data analysis
Data collection
Data integration
Data preprocessing
Data transfer
Information exchange
Spreadsheet programs
Text processing
Virtual enterprises

Data protection
BT: Data privacy
RT: Computer security
Data governance
Data security
Differential privacy
Information security
Privacy
NT: General Data Protection Regulation

Data science
BT: Data analysis
RT: Knowledge discovery
Neuroinformatics

Data security
UF: Security of data
System privacy management
BT: Security
RT: Communication system security
Computer crime
Computer network management
Computer security
Data breach
Data communication
Data governance
Data handling
Data protection
Network intrusion
Privacy
Privacy breach
Threat modeling
Virtual private networks
NT: Cryptography
Message authentication
Tokenization

Data structures
BT: Computer architecture
RT: Computer languages
Database systems

File systems
NoSQL databases
NT: Arrays
Binary decision diagrams
Null value
Octrees
Persistent identifiers
Table lookup
Tree data structures

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

Data transfer
BT: Data communication
Data processing
RT: Packet switching
NT: Handover
Simultaneous wireless information and power transfer

Data transparency
BT: Data acquisition

Data visualization
UF: Data visualisation
BT: Computer graphics
User interfaces
RT: Biomedical imaging
Data mining
Graph neural networks
Modeling
R language
NT: Graph drawing
Heat maps
Isosurfaces

Data warehouses
BT: Data systems
RT: Data lakes
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 systems
UF: Database management systems
  Technical data management
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
  Sharding

Databases
BT: Professional communication
NT: Database systems
  Deductive databases
  Distributed databases
  Image databases
  Multimedia databases
  Object oriented databases
  Relational databases
  Spatial databases
  Transaction databases
  Visual databases

Daylighting
BT: Lighting

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

DC power transmission
UF: Direct current power transmission
BT: Power transmission
RT: DC distribution systems

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

JULY 2023 IEEE Thesaurus

DC-DC power converters
- UF: DC-DC converters
  DC-DC power conversion
  DC-DC power convertors
- BT: Power conversion
- RT: Machine vector control
  Pulse width modulation inverters
- NT: Buck converters

Dead reckoning
- BT: Navigation

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

Decentralized applications
- UF: Decentralised applications
  dapp
- BT: Application software
  Distributed computing
- RT: Consensus control
  Peer-to-peer computing
  Smart contracts

Decentralized autonomous organization
- UF: DAO
  Decentralised autonomous organization
- BT: Organizations
- RT: Blockchains

Decentralized control
- UF: Decentralised control
  Distrbuted control
  Distributed generation
  Distributed modeling
- BT: Control systems
- RT: Flexible structures
- NT: Consensus control

Distributed parameter systems

Decision analysis
- BT: Decision making
  Information analysis

Decision feedback equalizers
- BT: Equalizers

Decision making
- BT: Management
- RT: Decision support systems
  Expert systems
  Fish schools
  Fuzzy cognitive maps
  Planning
  Risk analysis
  Signal detection
  Stakeholders
  Strategic planning
  TOPSIS
- NT: Analytic hierarchy process
  Collective intelligence
  Decision analysis
  Distributed decision making
  Game theory
  Pattern classification
  Persuasive systems
  Trust management

Decision support systems
- BT: Artificial intelligence
- RT: Competitive intelligence
  Decision making
  Knowledge based systems

Decision theory
- BT: Cybernetics
- RT: Statistical learning
- NT: Decision trees
  TOPSIS

Decision trees
- UF: Tree searching
- BT: Decision theory
- RT: Random forests
- NT: Classification tree analysis
  Regression tree analysis

Decoding
- UF: Decoder
- BT: Information theory
- RT: Codecs
  Codes

	Cyclic redundancy check codes
	Demodulation
	Parity check codes
	Product codes
	Signal processing
	Space-time codes
	Speech codecs
	Video codecs
NT:	Maximum likelihood decoding

Decontamination
BT:	Materials handling
RT:	Chemical technology
	Contamination
	Environmental monitoring
	Pollution control
	Purification

Deconvolution
BT:	Inverse problems
RT:	Convolution
	Integral equations
	Numerical analysis
	Signal processing
	Signal restoration

Decorrelation
| BT: | Signal processing |

Dedicated short range communication
UF:	DSRC
BT:	Wireless communication
RT:	Intelligent vehicles
	On board unit
	Vehicular ad hoc networks

Deductive databases
UF:	Intelligent databases
BT:	Database systems
	Databases
RT:	Knowledge based systems

Deep architecture
UF:	Deep learning architecture
BT:	Software architecture
	Systems architecture
RT:	Machine learning
	Neural networks
NT:	Deep learning

Deep brain stimulation
| BT: | Brain stimulation |
| | Neurosurgery |

| RT: | Neural implants |
| | Neurostimulation |

Deep learning
UF:	Deep structured learning
	Hierarchical learning
BT:	Deep architecture
	Machine learning
RT:	Convolutional neural networks
	Data augmentation
	Feature extraction
	Graph neural networks
	Image classification
	Image segmentation
	Learning systems
	Recurrent neural networks
	Reinforcement learning
	Semantic segmentation
	Supervised learning
	Unsupervised learning

Deep level transient spectroscopy
| BT: | Semiconductor materials |
| | Spectroscopy |

Deep-space communications
UF:	Deep space
BT:	Space communications
RT:	Telemetry

Deepfakes
UF:	Deep fake
BT:	Fake news
	Videos
RT:	Information integrity
	Photorealism

Defense industry
UF:	Defence industry
BT:	Industries
RT:	Military equipment
	Weapons

Defibrillation
BT:	Medical treatment
RT:	Cardiology
	Fibrillation

Deformable models
| BT: | Modeling |

Deformation
| BT: | Mechanical factors |

	RT:	Electron backscatter diffraction

Degenerative diseases
	BT:	Diseases

Degradation
	BT:	Materials science and technology

Delamination
	BT:	Materials testing

Delay effects
	UF:	Time delay
	BT:	Electromagnetic analysis
	RT:	Delay lines
		Delay systems
		Distortion
		Phase distortion
	NT:	Propagation delay

Delay estimation
	BT:	Delays
	RT:	Computer networks
		Multiaccess communication
		Speech processing

Delay lines
	BT:	Delay systems
	RT:	Delay effects

Delay systems
	BT:	Control systems
	RT:	Delay effects
		Telerobotics
	NT:	Added delay
		Delay lines

Delays
	BT:	Timing
	NT:	Delay estimation

Delta modulation
	BT:	Analog-digital conversion
		Digital signal processing
	NT:	Delta-sigma modulation
		Sigma-delta modulation

Delta-sigma modulation
	UF:	DDSM
		Delta sigma modulators
		Delta-sigma modulators
	BT:	Delta modulation

Demagnetization
	UF:	Demagnetisation
	BT:	Magnetics

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:	Medical conditions
	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

Demography
	BT:	Social factors

Demultiplexing
	BT:	Multiplexing
	RT:	Arrayed waveguide gratings

Dendrites (neurons)
	UF:	Dendrons
	BT:	Neurons

Denial-of-service attack
	UF:	DDos attack
		DoS attack
	BT:	Communication system security
		Computer security
	RT:	Proof of Work
	NT:	Distributed denial-of-service attack

Density estimation robust algorithm
- UF: DER
- BT: Algorithms

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
- UF: Dental
- BT: Medical treatment

Dependability management
- BT: Management
- RT: Reliability
- Safety management

Depression
- UF: Major depressive disorder
- BT: Medical conditions
- RT: Psychiatry

Dermatology
- BT: Medical specialties

Dermis
- BT: Skin

Desalination
- BT: Water conservation
- Water resources
- RT: Reverse osmosis

Description logic
- BT: Knowledge representation
- Ontologies

Design automation
- UF: CAD
- Circuit CAD
- Circuit design (CAD)
- Circuit layout CAD
- Computer aided design
- Computer-aided design
- BT: Electronic design automation and methodology

- RT: Automatic test pattern generation
- Circuit simulation
- Design tools
- EMTDC
- Hardware design languages
- Laser sintering
- SPICE
- NT: CADCAM
- Logic design
- PSCAD

Design engineering
- BT: Engineering - general
- RT: Building information management
- Design optimization
- Digital twins
- NT: Design tools

Design for disassembly
- BT: Design methodology
- RT: Pollution
- Process design
- Product design
- Waste reduction

Design for experiments
- BT: Design methodology

Design for manufacture
- UF: Design for manufacturabilty
- BT: Design methodology
- RT: Design tools

Design for quality
- BT: Design methodology
- RT: Process design
- Product design
- Quality assurance
- Quality control
- Quality management
- Total quality management

Design for testability
- UF: Design-for-test
- Design-for-testability
- Design-for-testing
- BT: Design methodology
- RT: Built-in self-test
- Combinatorial testing
- Logic design
- Logic testing

Design methodology
UF: Design
BT: Electronic design automation and methodology
RT: Ergonomics
Industrial engineering
Logic design
Optical design techniques
Rapid prototyping
System analysis and design
NT: Design for disassembly
Design for experiments
Design for manufacture
Design for quality
Design for testability
Design standards
Design tools
Extensibility
Graphics
Green design
Integrated design
Process design
Product design
Prototypes
Technical drawing
Time to market
User centered design
Virtual prototyping

Design optimization
BT: Optimization methods
RT: Design engineering
NT: Constraint optimization
Space mapping

Design standards
BT: Design methodology

Design tools
BT: Design engineering
Design methodology
RT: Design automation
Design for manufacture
Instruments
Media
Product design
Visualization

Desktop publishing
BT: Electronic publishing
Publishing
RT: Document handling
Office automation
Page description languages
Text processing

Detection algorithms
BT: Algorithms

Detectors
BT: Sensor systems and applications
RT: Chemical sensors
Demodulation
Fall detection
Nonlinear filters
Readout electronics
NT: Envelope detectors
Semiconductor detectors

Deuterium
BT: Hydrogen

Developing countries
BT: Economics
Social factors
RT: Cultural differences
Digital divide
Globalization
Government policies
International trade
Investment

Device drivers
BT: Input-output programs
RT: Computer peripherals

Device-to-device communication
UF: D2D
BT: Communication systems
RT: Base stations
Cellular networks

Dew computing
UF: Cloud-dew architecture
Cloud-dew computing
Dew servers
BT: Distributed processing
Software architecture
RT: Client-server systems
Cloud computing
Edge computing

DH-HEMTs
UF: Double heterojunction HEMTs
BT: HEMTs

Diabetes
UF: Diabetic
BT: Medical conditions

Page 110

RT: Endocrinology
Insulin pumps
NT: Diabetic retinopathy

Diabetic retinopathy
BT: Diabetes
Retinopathy
RT: Retinal vessels

Diagnostic expert systems
BT: Expert systems
RT: Failure analysis
Fault diagnosis

Diagnostic radiography
BT: Radiography
RT: Attenuation
Magnetic resonance
imaging
Medical diagnosis
X-ray detection

Diakoptics
BT: System analysis and design

Diamagnetic materials
BT: Magnetic materials

Diamond-like carbon
UF: Diamond carbon
Diamond like carbon
Hard amorphous carbon
BT: Amorphous materials
RT: Biomedical materials
Thin films
Tissue engineering

Diamonds
BT: Carbon

DICOM
UF: Digital Imaging and
Communications in Medicine
BT: Biomedical imaging
Digital communication

Dictionaries
BT: Information services
Terminology
Writing

Die casting
BT: Casting
RT: Automobile manufacture
Dies
Materials handling

Melt processing
Metals

Dielectric breakdown
UF: Dielectric strength
Voltage breakdown
BT: Electric breakdown
RT: Dielectric measurement
Insulation
Lightning
NT: Arc discharges
Discharges (electric)
Electrostatic discharges
Flashover
Glow discharges
Partial discharges
Surface discharges
Vacuum breakdown

Dielectric constant
BT: Dielectrics
RT: Capacitors
Permittivity
NT: High-k gate dielectrics

Dielectric devices
BT: Dielectrics
RT: Dielectric materials
Dielectric resonator
antennas
Electrets
NT: Capacitors
Ferroelectric devices
Piezoelectric devices
Pyroelectric devices

Dielectric elastomer actuators
BT: Actuators
NT: Dielectric elastomers

Dielectric elastomers
UF: Smart elastomers
BT: Dielectric elastomer
actuators
RT: Smart materials

Dielectric films
BT: Dielectric materials
Films
RT: Planarization
Thick films
Thin films
NT: Dielectric thin films
Piezoelectric films

Dielectric liquids
  UF: Liquid insulation
  BT: Dielectric materials
Dielectric loss measurement
  BT: Dielectric measurement
  RT: Dielectric losses

Dielectric losses
  UF: Dielelectric loss
  BT: Dielectrics
  RT: Dielectric loss
measurement

          Insulation

Dielectric materials
  UF: Antiferroelectric materials
          Paraelectric materials
  BT: Materials
  RT: Ceramics
          Dielectric devices
          Dielectric thin films
          Electrohydrodynamics
          Electrokinetics
          Ferroelectric materials
          Glass
          Insulation
          Loaded waveguides
          Permittivity
          Plastic insulation
  NT: Dielectric films
          Dielectric liquids
          Electrets
          Epoxy resins
          High-k dielectric materials
          Piezoelectric materials

Dielectric measurement
  UF: Dielectric measurements
  BT: Electric variables
measurement
  RT: Capacitance measurement
          Dielectric breakdown
          Electromagnetic
measurements
  NT: Dielectric loss
measurement

          Permittivity measurement

Dielectric resonator antennas
  BT: Antennas
  RT: Dielectric devices
          Resonance

Dielectric substrates
  UF: Dielectric substrate

  BT: Dielectrics
Dielectric thin films
  BT: Dielectric films
  RT: Dielectric materials
          Polymer films
          Semiconductor films

Dielectrics
  UF: Dielectric properties
          Electrical insulation
  BT: Dielectrics and electrical
insulation
  NT: Dielectric constant
          Dielectric devices
          Dielectric losses
          Dielectric substrates
          Dielectrophoresis
          Electrohydrodynamics
          Electrokinetics
          Electrostriction

Dielectrics and electrical insulation
  NT: Dielectrics
          Electric breakdown
          Insulation

Dielectrophoresis
  BT: Dielectrics

Dies
  UF: Dies (machine tools)
  BT: Machine tools
  RT: Cutting tools
          Die casting
          Presses

Diesel engines
  BT: Internal combustion
engines
  RT: Automotive engineering

Difference engines
  BT: Calculators

Difference equations
  BT: Equations
  RT: Discrete-time systems
          Numerical analysis
          Piecewise linear techniques

Differential algebraic equations
  BT: Differential equations

Differential amplifiers
BT: Amplifiers

Differential equations
BT: Calculus
RT: Differential games
Higher order statistics
Integrodifferential equations
Numerical analysis
Predator prey systems
Stability analysis
Time invariant systems
NT: Differential algebraic equations
Differential operators
Navier-Stokes equations
Ordinary differential equations
Partial differential equations
Transfer functions

Differential games
BT: Game theory
RT: Differential equations

Differential operators
BT: Differential equations

Differential phase shift keying
UF: DPKS
Differential phase-shift keying
BT: Phase modulation

Differential privacy
BT: Data privacy
Statistics
RT: Data protection
Information security
Privacy

Differential quadrature phase shift keying
BT: Quadrature phase shift keying

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

Diffraction gratings
BT: Optical diffraction
RT: Bragg gratings

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

Diffuse reflectance spectroscopy
UF: DIffuse reflectance spectra
BT: Reflectivity
Spectroscopy

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

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

Pharynx
Stomach
Tongue

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

Digital art
BT: Art
RT: Virtual museums

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 players
UF: MP3
BT: Digital audio broadcasting

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
        TCPIP

NT: Teleprinting
        Baseband
        DICOM
        DSL
        Digital audio broadcasting
        Digital images
        Digital multimedia
broadcasting
        Digital video broadcasting
        ISDN
        Passband
        Portable media players
        SONET
        Spread spectrum
communication

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

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

Digital filters
BT: Filters
RT: Frequency response

		Line enhancers
		Optical resonators
		Transversal filters
	NT:	Finite impulse response filters

Digital forensics
	UF:	Cyber forensics
		Cyberforensics
	BT:	Forensics
	RT:	Computer security
		Data mining
		Law enforcement
		Non-repudiation

Digital humans
	BT:	Avatars
	RT:	Artificial intelligence
		Chatbots
		Human computer interaction
		Human factors
		Natural language processing
		Social factors
		Virtual assistants
		Virtual reality

Digital images
	UF:	Digital imaging
	BT:	Digital communication
	NT:	Pixel
		Virtual museums

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 modulation
	BT:	Modulation
	NT:	Constellation diagram
		Partial response signaling

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 photography
	BT:	Photography
	RT:	CCD image sensors
		Cameras
		Digital cameras
		Transform coding
		Virtual museums

Digital preservation
	BT:	Digital systems
		Information management
	RT:	Data integrity
		Virtual museums

Digital printing
| | BT: | Printing |
| | RT: | Publishing |

Digital Radio Mondiale
| | BT: | Digital audio broadcasting |

Digital recording
	BT:	Recording
	RT:	Digital communication
		Digital systems
		Virtual museums

Digital relays
- BT: Relays

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

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

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

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
- RT: Computer aided analysis
  - Modeling
  - Power system analysis computing
- NT: Digital twins
  - Discrete event simulation

Digital storage
- BT: Digital systems
  - Storage management
- NT: Solid state drives

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 networks
- NT: Digital preservation
  - Digital storage
  - Digital transformation
  - ISDN
  - Internet
  - Local area networks
  - Metropolitan area networks
  - Smart agriculture
  - Token networks
  - Virtual artifact

Digital transformation
- BT: Digital systems
- RT: Augmented reality
  - Internet of Things
  - Virtual reality
- NT: Fifth Industrial Revolution
  - Fourth Industrial Revolution

Digital TV
- BT: TV
- RT: Digital multimedia broadcasting
  - Digital signal processing
  - HbbTV Standards
- NT: HDTV
  - IPTV

Digital twins
- UF: virtual twins
- BT: Cyber-physical systems
  - Digital simulation
- RT: Artificial intelligence
  - Augmented reality
  - Computer simulation
  - Data analysis
  - Design engineering
  - Internet of Things
  - Product design
  - Solid modeling

Systems engineering and theory

Virtual reality

Digital video broadcasting
UF: Digital video broadcasts
BT: Broadcasting
        Digital communication
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-controlled oscillators
BT: Oscillators

Digital-to-frequency converters
BT: Converters

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

Dinosaurs
BT: Animals

Diode lasers
UF: Laser diodes
BT: Diodes
        Lasers

Diodes
BT: Electronic components
        Voltage multipliers
RT: Breakdown voltage
        Optical transmitters
        Semiconductor diodes
NT: Active matrix organic light emitting diodes
        Diode lasers
        Light emitting diodes

Organic light emitting diodes

        P-i-n diodes
        Schottky diodes
        Semiconductor lasers
        Superluminescent diodes

Dip coating
BT: Coatings

Dipole antennas
BT: Antennas

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

Direct-sequence code-division multiple access
UF: Direct sequence CDMA
        Direct sequence code division multiple access
        Direct-sequence CDMA
BT: Multiaccess communication

Directed acyclic graph
BT: Graph theory
RT: Blockchains

Directed graphs
BT: Graph theory
NT: Fuzzy cognitive maps

Direction-of-arrival estimation
UF: Bearing estimation
        DOA estimation
        Direction of arrival
        Direction of arrival estimation
        Estimation of the 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

Disaster management
UF: Disaster and recovery
Disaster planning
BT: Contingency management
RT: Stormwater

Discharge lamps
BT: Lamps
NT: High intensity discharge lamps

Discharges (electric)
UF: Dielectric barrier discharges
Gas discharges
Ozone generators
Ozonizers
BT: Dielectric breakdown
RT: Electrostatic processes
Gas discharge devices
Gases
Ionization
Plasmas

Discrete cosine transforms
UF: DCT
BT: Discrete transforms
RT: Chebyshev approximation

Discrete event simulation
BT: Digital simulation
NT: Time warp simulation

Discrete Fourier transforms
UF: DFT
BT: Fourier transforms
RT: Discrete Hartley transforms
Signal processing
Text detection

Discrete Hartley transforms
BT: Discrete transforms
RT: Discrete Fourier transforms

Discrete transforms
BT: Transforms
NT: Discrete Hartley transforms
Discrete cosine transforms

Discrete wavelet transforms
BT: Wavelet transforms

RT: Finite impulse response filters

Text detection

Discrete-event systems
UF: Discrete event systems
BT: Signal analysis
RT: Control systems
Manufacturing
Petri nets
Production systems

Discrete-time systems
UF: Discrete time systems
BT: Time factors
RT: Asymptotic stability
Control systems
Difference equations
Time invariant systems
NT: Sampled data systems

Discussion forums
BT: Collaboration

Diseases
BT: Medical conditions
RT: Epidemics
Medical diagnosis
Metastasis
Pandemics
Pathology
NT: Acquired immune deficiency syndrome
Alcoholism
Alzheimer's disease
Arteriosclerosis
Arthritis
Bacterial infections
Bone diseases
Cancer
Cardiovascular diseases
Degenerative diseases
Epilepsy
Eye diseases
Human immunodeficiency virus
Infectious diseases
Influenza
Multiple sclerosis
Muscular dystrophy
Neurological diseases
Parasitic diseases
Parkinson's disease
Pathogens
Plant diseases

Pulmonary diseases
Tuberculosis

Disk drives
　　BT:　Computer peripherals
　　RT:　Disk recording
　　　　Perpendicular magnetic recording

Disk recording
　　BT:　Recording
　　RT:　Disk drives

Dispatching
　　BT:　Object oriented programming
　　RT:　Materials handling

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

Displacement control
　　BT:　Mechanical variables control

Displacement measurement
　　BT:　Mechanical variables measurement

Display systems
　　BT:　Displays

Displays
　　BT:　Optical devices
　　RT:　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
　　　　Head-up displays
　　　　Liquid crystal devices
　　　　Microdisplays
　　　　Readout electronics
　　　　Three-dimensional displays
　　　　Two dimensional 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 gas analysis
　　BT:　Fault diagnosis

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

Distance measurement
　　UF:　Distance
　　　　Ranging
　　BT:　Measurement
　　RT:　Micrometers
　　　　Position measurement
　　NT:　Euclidean distance
　　　　Odometers

Distillation equipment
　　UF:　Distillation columns
　　BT:　Chemical technology

Distortion
　　UF:　Distortion information
　　BT:　Signal processing
　　RT:　Delay effects
　　　　Distortion measurement
　　　　Image restoration
　　　　Interference
　　　　Noise
　　　　Rate distortion theory
　　　　Signal restoration
　　NT:　Acoustic distortion

Four-wave mixing
Jitter
Nonlinear distortion
Phase distortion

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

Distributed algorithms
BT: Algorithms

Distributed amplifiers
BT: Amplifiers

Distributed Bragg reflectors
UF: DBR
BT: Mirrors
RT: Integrated optics
        Vertical cavity surface emitting lasers

Distributed computing
UF: Autonomic computing
BT: Computers and information processing
RT: Cloud computing
        Computer networks
        Concurrency control
        Data communication
        Distributed ledger
        Local area networks
        Metropolitan area networks
        Mobile agents
        Multiprocessing systems
        Semantic Web
        Software agents
        Software architecture
NT: Client-server systems
        Cluster computing
        Decentralized applications
        Diffserv networks
        Distributed databases
        Distributed information systems
        Internet
        Metacomputing

Peer-to-peer computing

Distributed databases
BT: Databases
        Distributed computing
RT: Concurrency control
        Distributed ledger
        NoSQL databases
NT: Blockchains

Distributed decision making
BT: Decision making

Distributed denial-of-service attack
UF: DDoS
BT: Denial-of-service attack
RT: Botnet
        Computer crime

Distributed feedback devices
UF: Distributed feedback lasers
BT: Laser applications
RT: Feedback circuits
        Optical feedback

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

Distributed ledger
UF: DLT
        Hyper ledger
        Hyperledger
        Shared ledger
BT: Online banking
RT: Blockchains
        Cryptocurrency
        Distributed computing
        Distributed databases
        Nonfungible tokens
        Peer-to-peer computing

Distributed management
BT: Distributed information systems
        Management
RT: Collaborative intelligence

Distributed parameter circuits
UF: Nonuniform transmission lines
        Transmission line circuits
BT: Circuits

RT: Microwave circuits
Millimeter wave circuits
Transmission lines

Distributed parameter systems
BT: Decentralized control

Distributed power generation
UF: Dispersed power generation
Distributed energy resources
Distributed generation
Embedded power generation
BT: Power generation
RT: Hybrid power systems
Microgrids
Vehicle-to-grid
NT: Virtual power plants

Distributed processing
UF: Volunteer computing
BT: System analysis and design
RT: Cluster computing
Crowdsourcing
Software defined networking
NT: Dew computing
Edge computing
Message passing
Sharding

Distributed vision networks
BT: System analysis and design

Distribution functions
BT: Statistical distributions
RT: Probability
Probability density function

Distribution networks
BT: Supply chains

Distribution strategy
BT: Marketing management

District heating
UF: Central heating
District heating and cooling
Heat networks
Teleheating
BT: Heating systems
RT: Space heating

Water heating

Disturbance observers
BT: Observers
RT: Adaptive control
Robust control

Diversity methods
UF: Diversity gain
BT: Transmitters
RT: Fading channels
Multipath channels
Radio communication

Diversity reception
BT: Signal resolution
RT: SIMO communication
SISO communication
Telecommunications

Diversity schemes
BT: Telecommunication network reliability
RT: Fading channels
Interference

DNA
BT: Genetics
RT: Biological cells
Biological information theory
Cloning
DNA computing
Electrophoresis
Epigenetics
Genetic communication
Molecular biophysics
NT: Genetic mutations

DNA computing
BT: Computers and information processing
Nanobioscience
RT: DNA
Molecular computing

Document delivery
BT: Information services

Document handling
BT: Data handling
Information management
RT: Content management
Desktop publishing

Information retrieval
Office automation
Publishing
Semantic Web
Text processing
NT: Document image processing
Portable document format

Document image processing
BT: Document handling
RT: Portable document format

Documentation
UF: Computer documentation
Software documentation
BT: Writing
RT: Engineering drawings
Manuals
Software
NT: Point of care

Dogs
BT: Animals

Dolphins
BT: Marine animals

Domain Name System
BT: Computer networks

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

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 effect
UF: Doppler
BT: Waves
RT: Doppler measurement
Doppler radar
NT: Doppler shift

Doppler measurement
BT: Measurement
RT: Doppler effect
Doppler radar
Frequency measurement
Motion measurement
Velocity measurement

Doppler radar
BT: Radar
RT: Doppler effect
Doppler measurement

Doppler shift
BT: Doppler effect

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

Double heterojunction bipolar transistors
UF: DHBTs
BT: Heterojunction bipolar transistors

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

Downlink
BT: Satellite communication

	RT:	Cellular radio

Drag
	BT:	Fluid dynamics
	RT:	Friction

DRAM chips
	UF:	DRAM
	BT:	Random access memory
	RT:	Solid state drives

Drilling
	BT:	Machining
	RT:	Boring
		Deburring
		Drilling machines
		Geoengineering
		Oil drilling

Drilling machines
	BT:	Machine tools
	RT:	Drilling

Driver circuits
	BT:	Circuits
	RT:	Power transistors

Drives
	BT:	Machinery
	RT:	Mechanical power transmission
		Sensorless control
		Torque converters
	NT:	Hydraulic drives
		Motor drives
		Variable speed drives

Drones
	UF:	Flying robots
	BT:	Remotely guided vehicles
	RT:	Autonomous aerial vehicles
		Mobile robots
		Quadrotors

Droughts
	BT:	Meteorology

Drug delivery
	UF:	Drug delivery systems
	BT:	Biomedical engineering
	RT:	Hydrogels
		Nanocarriers
	NT:	Targeted drug delivery

Drugs
	BT:	Pharmaceuticals
	RT:	Biochemistry
		Chemical analysis
		Chemistry
		Chemotherapy
		Molecular biomarkers
	NT:	Antibiotics
		Antidepressants
		Aspirin
		Cancer drugs
		Insulin

Dry etching
	BT:	Etching

DSL
	UF:	Digital subscriber lines
		Digital subscriber loops
	BT:	Digital communication

Dual band
	UF:	Dual-band
		Dualband
	BT:	Mobile communication
	RT:	GSM
		Mobile handsets
		Roaming

Ducts
	BT:	Structural shapes
	RT:	Air conditioning
		Vents

Duplex communication systems
	BT:	Communication systems
	NT:	Full-duplex system
		Half-duplex system

Dusty plasmas
	UF:	Dusty plasma
	BT:	Plasma properties

DVD
	UF:	DVD-ROM
		Digital versatile discs
		Digital video discs
	BT:	Video coding
	RT:	Video recording

Dynamic compiler
	BT:	Runtime

Dynamic equilibrium
	BT:	Measurement techniques

JULY 2023 IEEE Thesaurus

NT: Steady-state

Dynamic programming
BT: Algorithms
RT: Markov processes
Neural networks
Viterbi algorithm

Dynamic range
BT: Measurement
NT: High dynamic range

Dynamic scheduling
BT: Scheduling

Dynamic spectrum access
BT: Radio transceivers
RT: Telecommunication network topology
Wireless communication

Dynamic voltage scaling
UF: Self-dynamic voltage scaling
BT: Computer architecture
Voltage

Dynamical systems
UF: Dynamic systems
BT: Mathematics
NT: Nonlinear dynamical systems

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

Dynamometers
UF: Dyno
BT: Force measurement
Meters
Power measurement
Torque measurement

Dyslexia
BT: Medical conditions
Neurology
RT: Learning systems

Dysprosium
BT: Chemical elements

Ear
BT: Head
Sense organs
RT: Cochlear implants

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

Earth Observing System
UF: EOS
Earth observation system
BT: Artificial satellites
Observers
NT: Global Earth Observation System of Systems

Earthquake engineering
UF: Seismic retrofitting
BT: Earthquakes
RT: Seismology

Earthquakes
BT: Geoscience
RT: Seismic waves
Seismology
NT: Earthquake engineering

Eating disorders
UF: Anorexia
Anorexia nervosa
Binge eating
Bulimia
Bulimia nervosa
BT: Mental disorders

Eavesdropping
UF: Cyber eavesdropping
Cybereavesdropping
BT: Privacy
RT: Computer security

Echo cancellers
UF: Echo cancellation
BT: Active noise reduction

JULY 2023 IEEE Thesaurus

Echo interference
BT: Interference
RT: Clutter
        TV interference

Echocardiography
UF: ECHOEG
BT: Cardiography

Ecodesign
UF: Eco design
        Eco-design
BT: Green design
RT: Energy conservation
        Environmental factors

Ecology
BT: Environmental factors
RT: Entomology
        Seeds (agriculture)

Econometrics
BT: Economics
RT: Costs
        Cybernetics
        Mathematics
        Profitability
        Regression analysis
        Statistics
NT: Economic forecasting

Economic forecasting
BT: Econometrics
        Forecasting
RT: 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
        Harmonized index of
consumer prices
        Index of production
        Interest rates
        RPI
        Retail price index
BT: Economics
RT: Economic forecasting

        Exchange rates
NT: Share prices

Economics
BT: Engineering management
RT: Bankruptcy
        Commercial law
        Cost accounting
        Digital divide
        Econophysics
        Finance
        Food security
        Freeports
        Planning
NT: Access charges
        Costs
        Developing countries
        Econometrics
        Economic indicators
        Electronic commerce
        Environmental economics
        Exchange rates
        Free economic zones
        Fuel economy
        International trade
        Macroeconomics
        Microeconomics
        Monopoly
        Oligopoly
        Power generation
economics
        Profitability
        Sharing economy
        Stock markets
        Supply and demand
        Trade agreements
        Venture capital
        Virtual enterprises

Economies of scale
BT: Microeconomics
RT: Industrial economics

Econophysics
BT: Cybernetics
RT: Chaos
        Complexity theory
        Economics
        Fractals
        Information theory
        Knowledge acquisition
        Nonlinear dynamical
systems
        Philosophical
considerations

Science - general

Ecosystems
  BT: Environmental factors
  RT: Consensus protocol
          Low-carbon economy
  NT: Wetlands

Eczema
  UF: Atopic dermatitis
  BT: Medical conditions

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

Edge computing
  UF: Fog computing
  BT: Application virtualization
          Distributed processing
  RT: 5G mobile communication
          Cloud computing
          Computer applications
          Computer networks
          Dew computing
          Internet of Things
          Mobile computing
          Resource management
          Wireless sensor networks
  NT: Multi-access edge
computing

Education
  UF: Inverted classroom
          Reverse teaching
          Teaching
  RT: Hybrid learning
          Personnel
  NT: Adaptive learning
          Career development
          Educational courses
          Educational institutions
          Educational programs
          Educational technology
          Engineering education
          Humanities
          Training

Educational courses
  BT: Education

  RT: Computer aided instruction
          Educational programs
          Hybrid learning
          STEM
  NT: Curriculum development
          Open Educational
Resources

Educational institutions
  UF: Colleges
          Schools
          Universities
  BT: Education
  RT: Hybrid learning
  NT: Museums

Educational programs
  BT: Education
  RT: Curriculum development
          Educational courses
  NT: Accreditation
          Continuing education
          Pre-college engineering
          STEM
          Scholarships
          Self-study courses
          Seminars
          Tutorials

Educational robots
  BT: Robots
  RT: Engineering education
          Social robots

Educational technology
  UF: Audio-visual instructional
aids
          Instructional aids
          Programmed instruction
          Smart education
          Smart learning
  BT: Education
  RT: Audio-visual systems
          Visualization
  NT: Computer aided instruction
          Courseware
          Electronic learning

Effective mass
  BT: Energy states

Effluents
  BT: Waste materials
  RT: Flue gases
          Industrial waste
          Waste disposal

| | | Waste management |
| | | Water pollution |

Eigenvalues and eigenfunctions

	UF:	Eigenfunctions
		Eigenfunctions and
eigenvalues		
		Eigenplaces
		Eigenvalues
	BT:	Mathematics
	RT:	Asymptotic stability
		Functional analysis
		Linear algebra
		Vectors

Elastic computing

| | BT: | Cloud computing |
| | | Resource management |

Elastic recovery

| | BT: | Materials testing |

Elasticity

| | BT: | Material properties |
| | RT: | Strain |

Elastodynamics

	BT:	Dynamics
	RT:	Seismic waves
		Vibrations

Elastography

| | BT: | Biomedical imaging |

Elastomers

| | BT: | Polymers |

Elbow

| | BT: | Extremities |

Electo-optic effects

	UF:	Electrooptic effects
		Electrooptical effects
	BT:	Lasers and electrooptics
	RT:	Electro-optic devices
		Electroluminescence
		Nonlinear optics
	NT:	Electrochromism
		Kerr effect
		Optical bistability
		Stark effect

Electrets

| | BT: | Dielectric materials |
| | RT: | Capacitors |

| | | Ceramics |
| | | Dielectric devices |

Electric breakdown

	UF:	Breakdown
	BT:	Dielectrics and electrical
insulation		
	RT:	Aging
		Electrostatic discharge
protection		
		Fault currents
	NT:	Avalanche breakdown
		Corona
		Dielectric breakdown
		Sparks

Electric current control

	BT:	Current control
	RT:	Inrush current
		Power control
		Power transmission
		Voltage control
	NT:	Power factor correction
		Shunts (electrical)

Electric fences

| | BT: | Electric machines |

Electric fields

	UF:	Electric field
	BT:	Electromagnetic fields
	RT:	Electrohydrodynamics
		Electrokinetics
		Electrostatic analysis
		Electrostatic discharge
protection		
		Electrostatic processes
		Inrush current
		Maxwell equations
		Synchrotrons
	NT:	Acoustoelectric effects
		Casimir effect
		Nonuniform electric fields

Electric generators

| | BT: | Generators |
| | RT: | Nanogenerators |

Electric machines

	BT:	Machinery
	RT:	Windings
	NT:	AC machines
		Alternators
		Brushless machines
		Compressors

Conductors
DC machines
Electric fences
Generators
Permanent magnet
machines
Rotating machines
Rotors
Stators
Washing machines

Electric motors
BT: Motors
NT: Planar motors

Electric potential
BT: Electric variables
RT: Electrostatic discharge
protection

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 variables
UF: Current voltage
characteristics
Electric characteristics
Electrical characteristics
BT: Instrumentation and
measurement
RT: Electric variables control
Electric variables
measurement
Frequency
NT: Admittance
Capacitance
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
NT: Admittance measurement
Ammeters
Attenuation measurement
Capacitance measurement
Conductivity measurement
Current measurement
Dielectric measurement
Electrical resistance
measurement
Electrostatic measurements
Energy measurement
Impedance measurement
Inductance measurement

Partial discharge
measurement

Phasor measurement units
Power measurement
Q measurement
Rydberg atoms
Transmission line
measurements

Voltage measurement

Electric vehicle charging
UF: EV charging
BT: Battery chargers
          Electric vehicles
NT: Smart charging

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

Electrical accidents
BT: Accidents
RT: Bioelectric phenomena
          Electric shock
          Electrical safety

Electrical ballasts
BT: Current control
          Lighting
RT: High intensity discharge
lamps
          Inductors
          Resistors

Electrical capacitance tomography
BT: Tomography

Electrical engineering
BT: Engineering - general
RT: Engineering profession
          Research and development
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
RT: Electrostatic discharge
protection

Electrical impedance tomography
BT: Tomography

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
          Electronics industry
NT: Electrical products

Electrical resistance measurement
UF: Ohmmeters
BT: Electric variables
measurement
RT: Resistance

Electrical safety
BT: Power system protection
RT: Domestic safety
          Electrical accidents
          Islanding
          Partial discharge
measurement
NT: Fault protection
          Grounding

Electrical stimulation
UF: Electric stimulation therapy

Electrical brain stimulation
Microelectronic stimulation
Spinal cord stimulation
BT: Medical treatment

Electricity
BT: Science - general
NT: Photoelectricity
Piezoelectricity
Pyroelectricity
Thermoelectricity
Triboelectricity

Electricity supply industry
UF: Electric utilities
Electricity market
Power supply industry
BT: Power industry
RT: Electrical equipment
industry

Power demand
Power distribution
Power quality
Power system faults
Power system planning
Power system restoration
Public infrastructure
NT: Electricity supply industry
deregulation

Electricity supply industry deregulation
UF: Electricity supply industry
liberalisation
Electricity supply industry
liberalization
Electricity supply industry
privatisation
Electricity supply industry
privatization
BT: Electricity supply industry
Power generation
economics
RT: Power system economics
NT: Power markets

Electro-absorption modulators
UF: EAM
Electroabsorption
modulators
Electroabsorptive
modulators
Franz-Keldysh effect
BT: Optical modulators
RT: Laser beams

Electro-optic deflectors
UF: Electrooptic devices
Electrooptical devices
BT: Electro-optic devices

Electro-optic devices
UF: Electro-optical devices
Electrooptic devices
Electrooptical devices
BT: Lasers and electrooptics
RT: Electo-optic effects
Electroluminescent devices
Liquid crystal devices
Optical bistability
Optoelectronic devices
NT: Electro-optic deflectors
Electrochromic devices

Electro-optic modulators
UF: Electro-optical modulators
Electrooptic modulators
Electrooptical modulators
Pockels readout optical
modulator
BT: Optical modulators
RT: Integrated optics
Intensity modulation
Laser beams
Microwave photonics
Optical waveguides
P-i-n diodes
Phase modulation
Quantum well devices

Electro-optical waveguides
UF: EO waveguides
Electrooptic waveguides
Electrooptical waveguides
BT: Optical waveguides

Electro-osmosis
BT: Osmosis

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
	Vapor deposition

Electrochemical devices
BT:	Industry applications
RT:	Electrochemical processes
	Power engineering and energy
	Synapses
NT:	Amperometric sensors
	Batteries
	Battery management systems
	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-optic devices
RT:	Electrochromism

Electrochromism
BT:	Electo-optic 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

Electrohydraulics
UF:	Electro hydraulics
BT:	Hydraulic systems
RT:	Fluid flow
	Liquids
	Magnetohydrodynamics

Electrohydrodynamics
UF:	Electro-fluid dynamics
	Electrofluid dynamics
	Electrostrictive hydrodynamics
BT:	Dielectrics
	Hydrodynamics
RT:	Dielectric materials
	Electric fields

Electrokinetics

Electrokinetics
- BT: Dielectrics
- RT: Dielectric materials
  Electric fields
  Electrohydrodynamics

Electroluminescence
- BT: Luminescence
- RT: Electo-optic effects
  Organic light emitting diodes
- NT: Electroluminescent devices

Electroluminescent devices
- BT: Electroluminescence
  Light sources
  Luminescent devices
- RT: Electro-optic devices

Electrolytes
- BT: Conducting materials
- RT: Electrochemical processes
  Supercapacitors

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 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
  Radar

Electromagnetic coupling
- BT: Electromagnetics
- RT: Circulators
  Couplers
  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
Windings

Electromagnetic forces
    BT: Electromagnetic analysis
    RT: Electromagnetic launching
           Magnetic forces
           Mie scattering

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
           Immunity testing
           Noise
           Open area test sites
           TEM cells
    NT: Radiofrequency interference
           Specific absorption rate

Electromagnetic launching
    UF: Electromagnetic guns
           Electromagnetic propulsion
           Launching (electromagnetic)
    BT: Propulsion
    RT: Electromagnetic forces
           Electrothermal launching
    NT: Coilguns
           Railguns

Electromagnetic measurements
    BT: Measurement
    RT: Anechoic chambers
           Antenna measurements
           Dielectric measurement
           Electric variables measurement
           Frequency measurement
           Mie scattering
           Reflectometry
           Wavelength measurement
    NT: Electromagnetic modeling
           Linearity
           Microwave measurement
           Millimeter wave measurements
           Parameter extraction
           Polarimetry
           Radiometry
           Submillimeter wave measurements

Electromagnetic metamaterials
    BT: Electromagnetics
           Metamaterials
    RT: Optical metamaterials
           Photonics
           Split ring resonators
    NT: Microwave metamaterials
           Terahertz metamaterials

Electromagnetic modeling
    UF: Electromagnetic model
           Electromagnetic modelling
    BT: Electromagnetic measurements

Electromagnetic propagation
    UF: Electromagnetic wave propagation
    BT: Antennas and propagation
           Propagation
    RT: Electromagnetic fields
           Electromagnetic transients
           Electromagnetic waveguides
           Magnetostatic waves
           Mie scattering
           Waves
    NT: Electromagnetic diffraction
           Electromagnetic propagation in absorbing media
           Electromagnetic reflection

Microwave propagation
Millimeter wave propagation

Optical propagation
Propagation constant
Propagation losses
Radio propagation
Radiowave propagation
Submillimeter wave propagation

UHF propagation

Electromagnetic propagation in absorbing media
BT: Electromagnetic propagation

Electromagnetic radiation
BT: Electromagnetics
RT: Electromagnetic fields
        Electromagnetic wave polarization

        Radiofrequency exposure
        Radiofrequency safety
        Waves
        X-ray detection
        X-ray detectors
        X-rays
NT: Bremsstrahlung
        Correlators
        Electromagnetic wave absorption

        Frequency
        Gamma-rays
        Line-of-sight propagation
        Terahertz radiation

Electromagnetic radiative interference
BT: Interference

Electromagnetic reflection
UF: Electromagnetic wave reflection
BT: Electromagnetic propagation

        Reflection
RT: Electromagnetic fields
        Electromagnetic scattering
        Reflectometry
NT: Optical reflection

Electromagnetic refraction
BT: Electromagnetic analysis
RT: Electromagnetic fields

Electromagnetic scattering
UF: Electromagnetic wave scattering

        Electromagnetic waves
BT: Scattering
RT: Coherence time
        Electromagnetic fields
        Electromagnetic reflection
        Electromagnetic transients
        Waves
NT: Coherence
        Microwave plasmas
        Mie scattering
        Optical scattering
        Polarization
        Radar scattering
        Raman scattering
        Rayleigh scattering

Electromagnetic shielding
BT: Electromagnetics
RT: EMP radiation effects
        Electromagnetic coupling
NT: Cable shielding
        Magnetic shielding

Electromagnetic spectrum
BT: Electromagnetic fields

Electromagnetic transients
UF: Electromagnetic pulse propagation

        Electromagnetic pulse scattering
BT: Electromagnetics
RT: Electromagnetic propagation

        Electromagnetic scattering
        Transient analysis
NT: EMP radiation effects
        EMTDC
        EMTP
        Power system transients
        Surges

Electromagnetic wave absorption
BT: Electromagnetic radiation
NT: Electromagnetic absorbers
        Terahertz wave absorption

Electromagnetic wave polarization
UF: Electromagnetic wave polarisation
BT: Electrodynamics
RT: Electromagnetic radiation

Photonic band gap

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

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 backscatter diffraction
- UF: EBSD
- BT: Backscatter
  Diffraction
- RT: Crystal microstructure
  Deformation
  Grain boundaries
  Grain size
  Scanning electron microscopy

Electron beam applications
- BT: Electron beams
- RT: Flyback transformers
  Scanning electron microscopy

Electron beams
- BT: Particle beams
- RT: Electrodynamics
  Electron accelerators
  Electron emission
  Electron sources
  Electrons
  Flyback transformers
  Free electron lasers
  Gyrotrons
  Relativistic effects
  Transmission electron microscopy
- NT: Electron beam applications

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
Semiconductivity
Semiconductor devices
Single electron devices
Thick film devices
Thin film devices
Tunneling
Vacuum technology

Electron emission
UF: Field electron emission
Secondary electron emission
BT: Nuclear and plasma sciences
RT: Cathodes
Electrodes
Electron beams
Electron guns
Electron multipliers
Electron sources
Electron tubes
Electrons
Photoelectricity
Thermionic emission
Vacuum arcs
Vacuum breakdown
NT: Ballistic transport

Electron guns
BT: Electron devices
RT: Electron emission

Electron microscopy
BT: Microscopy
NT: Photoelectron microscopy
Scanning electron microscopy
Transmission electron microscopy

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
Particle beam optics
RT: Electrodynamics

Electron paramagnetic resonance
UF: Biological EPR
Electron spin resonance
BT: Spectroscopy

Electron sources
BT: Electrons
RT: Electron accelerators
Electron beams
Electron emission

Electron traps
BT: Charge carrier processes
RT: Leakage currents
Reliability

Electron tubes
UF: Thermionic valves
Tubes
Vacuum tubes
BT: Electron devices
RT: Anodes
Cathodes
Electrodes
Electrodynamics
Electron emission
Electron multipliers
Gettering
NT: Field emitter arrays
Klystrons
Magnetrons
Thyratrons
Traveling wave tubes

Electronic ballasts
UF: Ballasts
Electric ballast
Electrical ballast
BT: Ballistic transport

Electronic circuits
BT: Circuits

NT: Breadboard
            Central Processing Unit
            Multivibrators
            Stripboard circuit

Electronic commerce
UF: E-commerce
            Ecommerce
            Home shopping
            Online shopping
BT: Economics
RT: Consumer behavior
            Customer satisfaction
            Financial management
            Internet
            Marketing management
            Neuromarketing
            Online banking
            Product delivery
            Supply chain management
            Virtual enterprises
            Web sites

Electronic components
BT: Components, packaging, and manufacturing technology
NT: Capacitors
            Coils
            Connectors
            Diodes
            Electrodes
            Fuses
            Inductors
            Resistors
            Structural plates
            Switches
            Transducers

Electronic countermeasures
UF: ECCM
            ECM
            Electronic counter-countermeasures
BT: Electronic warfare
RT: Jamming
            Military communication
            Radar countermeasures
            Radio communication countermeasures
            Spread spectrum communication
            Spread spectrum radar
            Weapons

Electronic design automation and methodology
UF: EDA
RT: VHDL
NT: Design automation
            Design methodology

Electronic equipment
BT: Electronics industry
RT: Electronic equipment manufacture
            Electronic equipment testing
            Low-power electronics
NT: Electronic voting systems
            Microelectronics
            Organic electronics
            Smart devices
            Soft electronics

Electronic equipment manufacture
BT: Components, packaging, and manufacturing technology
RT: Electronic equipment
            Electronics industry
            Optical device fabrication
NT: Damascene integration
            Micromachining
            Radiation hardening (electronics)
            Semiconductor device manufacture

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
            Digital healthcare
            E health
            Ehealth
BT: Information processing
            Medical services
RT: Smart healthcare
            Wearable Health Monitoring Systems

Electronic learning
UF: E learning

E-learning
Elearning
Online learning
Virtual learning
- BT: Educational technology
Learning systems
- RT: Computer aided instruction
Computers and information processing
Distance learning
Internet
Learning (artificial intelligence)
Learning management systems
Online services
TV
Training
Wide area networks
- NT: Mobile learning

Electronic mail
- UF: E-mail
Email
Mail (electronic)
- BT: Message systems
- RT: Blogs
Office automation
Postal services
Social networking (online)
Voice mail
- NT: Unified messaging
Unsolicited e-mail

Electronic medical prescriptions
- BT: Medical treatment
- RT: Electronic medical records

Electronic medical records
- UF: E-health records
Electronic health records
- BT: Medical information systems
- RT: Electronic medical prescriptions
Patient monitoring

Electronic messaging
- UF: Text messaging
- BT: Message systems
- RT: Emojis
- NT: Instant messaging
Unified 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 publishing
- UF: Digital publishing
E-books
E-publishing
E-reader
Electronic books
Epublishing
Kindle
- BT: Publishing
- RT: CD-ROMs
Journalism
Multimedia systems
Open data
- NT: Content management
Desktop publishing

Electronic switching systems
- BT: Communication switching
Switching systems

Electronic voting
- UF: E-voting
Online voting
- BT: Voting

Electronic voting systems
- BT: Electronic equipment

Electronic warfare
- BT: Aerospace and electronic systems
- RT: Communication system security
Radio communication countermeasures
Spread spectrum communication
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: 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: Antenna-in-package
Ball grid arrays
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
Schrodinger equation
NT: Electron sources
Quantum wells
Trions

Electrooculography
UF: EOG
Electro oculography
Electro-oculography
BT: Biomedical measurement
Gaze tracking
RT: Bioelectric phenomena
Electroencephalography
Eyes

Electrophoresis
BT: Separation processes
RT: DNA
Medical diagnosis

Electrophotography
UF: Xerography
BT: Electrostatic processes
Photoconducting devices
RT: Gas discharge devices
Photography

Electrophysiology
BT: Biomedical measurement
RT: Biomedical electrodes
Electrodes
Voltage

Electroporation
UF: Electropermeabilization
BT: Medical treatment
Microbiology

Electrostatic actuators
UF: Electrostatic actuation
BT: Actuators
RT: Electrostatic devices

Electrostatic analysis
BT: Electrostatic processes
RT: Electric fields
Electromagnetic analysis
Electrostatic measurements

Electrostatic devices
BT: Industry applications

RT: Electrostatic actuators
Electrostatic processes

Electrostatic discharge protection
UF: ESD protection
BT: Electrostatic discharges
Protection
RT: Electric breakdown
Electric fields
Electric potential
Electrical fault detection
Failure analysis
Integrated circuit reliability
Integrated circuit technology
Semiconductor device reliability
Triboelectricity

Electrostatic discharges
UF: Charged device model
ESD
Electrostatic charges
BT: Dielectric breakdown
RT: Arc discharges
Electrostatic interference
NT: Electrostatic discharge protection

Electrostatic induction
UF: Induction (electrostatic)
BT: Electrostatic processes

Electrostatic interference
BT: Interference
RT: Electrostatic discharges
NT: Immunity testing

Electrostatic levitation
BT: Electrostatics
Levitation

Electrostatic measurements
BT: Electric variables measurement
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
UF: Electrostatic self assembly
BT: Self-assembly

Electrostatics
UF: Electrostatic charges
BT: Electrostatic processes
RT: Poisson equations
NT: Electrostatic levitation

Electrostriction
BT: Dielectrics
RT: Mechanical factors
Piezoelectricity

Electrothermal actuators
BT: Actuators
Thermal sensors
RT: Resistance heating
Thermal expansion

Electrothermal effects
BT: Thermoelectricity
RT: Electrothermal launching
NT: Proton effects

Electrothermal launching
UF: Launching (electrothermal)
BT: Propulsion
RT: Electromagnetic launching
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
     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
     Elliptic curve cryptosystems
BT: Public key cryptography

Elliptic curves
BT: Geometry

Elliptic design
UF: Elliptical design
BT: Geometry
NT: Ellipsoids

Elongation
BT: Material properties
RT: Strain

Embedded computing
BT: Embedded systems

Embedded multicore processing
BT: Multicore processing

Embedded software
BT: Software

Embedded systems
UF: Embedded system
BT: Operating systems
RT: Cyber-physical systems
     Hardware-in-the-loop simulation
     Microprocessors
NT: Embedded computing

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

Emergency lighting
BT: Lighting
RT: High intensity discharge lamps

JULY 2023 IEEE Thesaurus

Emergency power supplies
UF: Standby power supplies
BT: Power supplies
RT: Batteries
        Standby generators
        Uninterruptible power
systems

Emergency services
UF: Emergency management
        Emergency response
BT: Safety
RT: Accidents
        Fires
        Food security
        Internet of Medical Things
        Medical services
        Rescue robots
        Stormwater

Emergent phenomena
BT: Cybernetics
RT: System of systems

Emissions trading
UF: Cap and trade
        Cap-and-trade
        Carbon trading
BT: Environmental economics
        Pollution
RT: Carbon emissions
        Climate change
        Market opportunities
        Power markets
        Pricing

Emojis
BT: Computer graphics
        Symbols
RT: Electronic messaging
        Emotion recognition

Emotion recognition
UF: Emotion models
        Emotion theory
        Models of emotion
BT: User interfaces
RT: Affective computing
        Anxiety disorders
        Behavioral sciences
        Emojis
        Emotional responses
        Image recognition
        Psychology
        Sentiment analysis

        Social robots
        Speech recognition

Emotional responses
BT: Psychology
RT: Emotion recognition

EMP radiation effects
UF: Electromagnetic pulse
BT: Electromagnetic transients
RT: Electromagnetic shielding

Emphysema
BT: Pulmonary diseases
RT: Asthma
        Chronic obstructive
pulmonary disease
        Pneumonia

Empirical mode decomposition
UF: Hilbert?Huang transforms
BT: Transforms
RT: Signal processing

Employee rights
BT: Employment

Employee welfare
UF: Conditions of employment
        Counseling
        Counselling
        Maternity benefits
        Sick pay
        Working conditions
BT: Human resource
management
RT: Incentive schemes
        Industrial psychology
        Occupational health
        Occupational safety
        Occupational stress
        Pensions
        Psychology
        Remuneration

Employment
UF: Work-place
        Workplace
BT: Human resource
management
RT: Business
        Employment law
        Engineering profession
        Jobs listings

JULY 2023 IEEE Thesaurus

Personnel
Programming profession
NT: Employee rights
Termination of employment

Employment law
BT: Law
RT: Contract law
Employment

EMTDC
UF: Electromagnetic transients DC
Electromagnetic transients including DC
BT: Electromagnetic transients
Geophysics
Software packages
RT: Design automation
PSCAD

EMTP
UF: Electromagnetic transient program
BT: Electromagnetic transients
RT: Computer simulation

Emulation
BT: Modeling
RT: Application virtualization
Simulation

Encapsulation
BT: Packaging
RT: Integrated circuit packaging
Plastic packaging

Encephalography
BT: Biomedical imaging
RT: Brain

Encoding
UF: Coding
BT: Information theory
RT: Codecs
Codes
Cryptography
Data compression
Data handling
Hash functions
Modulation
Modulation coding

Quantization (signal)
Semantic technology
Signal processing
Vector quantization
NT: Audio coding
Channel coding
Code refractoring
Digital representation
Entropy coding
Precoding
Source coding
Speech coding
Transcoding

Encryption
BT: Cryptography
RT: Ciphers
NT: Homomorphic encryption

Encyclopedias
BT: Information services

End effectors
UF: End-effectors
BT: Manipulators
RT: Grippers

Endocrine system
BT: Anatomy

Endocrinology
BT: Medical specialties
RT: Diabetes
Thyroid

Endomicroscopy
BT: Endoscopes
Microscopy
RT: Biomedical equipment
Biomedical optical imaging
Digestive system
Medical robotics
Optical devices
Real-time systems

Endoscopes
UF: Endoscopy
BT: Biomedical equipment
RT: Biomedical optical imaging
Image sensors
Laser applications
Surgery
NT: Endomicroscopy

JULY 2023 IEEE Thesaurus

Endothelial cells
    BT: Biological cells
    RT: Blood vessels

Energy
    BT: Power engineering and energy
    RT: Thermal energy
    NT: Energy barrier
               Energy capture
               Energy consumption
               Energy conversion
               Energy dissipation
               Energy exchange
               Energy harvesting
               Energy management
               Energy resources
               Energy states
               Energy storage

Energy barrier
    BT: Energy

Energy capture
    BT: Energy

Energy conservation
    BT: Energy management
    RT: Ecodesign
               Energy resources
               Power demand
               Waste heat
    NT: Green computing
               Potential energy
               Renewable energy sources

Energy consumption
    BT: Energy
    RT: Load monitoring

Energy conversion
    BT: Energy
    NT: Atomic batteries
               Batteries
               Fuel cells
               Motors
               Photovoltaic cells
               Potential well
               Solar heating
               Thermoelectricity
               Waste heat
               Wave energy conversion
               Wind energy conversion

Energy dissipation
    BT: Energy

Energy efficiency
    UF: Energy efficient
    BT: Energy management
    RT: Energy informatics
    NT: Energy efficient computing
               Energy efficient ethernet

Energy efficient computing
    UF: Energy-efficient computing
    BT: Energy efficiency

Energy efficient ethernet
    UF: EtherEEE
    BT: Energy efficiency
               Ethernet

Energy exchange
    UF: Energy transfer
    BT: Energy
    NT: Inductive charging

Energy harvesting
    UF: Energy scavenging
               Power harvesting
    BT: Energy
    NT: Nanogenerators

Energy informatics
    BT: Energy management
               Informatics
    RT: Energy efficiency
               Global warming
               Green design
               Information and communication technology
               Machine learning
               Smart cities
               Smart grids

Energy Internet
    UF: Internet of Energy
    BT: Power systems
    RT: Internet
               Internet of Things
               Power distribution
               Power engineering computing
               Power generation
               Power grids
               Power system control
               Power system interconnection

JULY 2023 IEEE Thesaurus

Power system management
Power transmission
Smart grids

Energy loss
BT: Energy measurement
NT: Core loss

Energy management
BT: Energy
NT: Demand side management
   Energy conservation
   Energy efficiency
   Energy informatics
   Energy management
systems
   Load management
   Transactive energy

Energy management systems
BT: Energy management

Energy measurement
BT: Electric variables
measurement
RT: Calorimetry
   Enthalpy
   Watthour meters
NT: Energy loss

Energy resolution
BT: Nuclear imaging
RT: Nuclear medicine
   Solid scintillation detectors

Energy resources
BT: Energy
RT: Civil engineering
   Energy conservation
   Environmental economics
   Natural gas
   Power demand
NT: Fuels
   Geothermal energy
   Nuclear fuels
   Solar energy
   Wave power
   Wind energy
   Wind farms

Energy states
UF: Energy levels
   Levels, energy

BT: Energy
NT: Band structures
   Effective mass
   Fermi level
   Orbital calculations
   Polaritons
   Quasi-Fermi level
   Surface states

Energy storage
UF: Energy storage systems
   Stored energy
BT: Energy
RT: 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

Engine cylinders
BT: Machine components
RT: Engines
   Gaskets
   Pistons
   Structural rings

Engineering - general
RT: STEM
   Technology
NT: Acoustical engineering
   Agricultural engineering
   Bio-inspired engineering
   Chemical engineering
   Civil engineering
   Concurrent engineering
   Design engineering
   Electrical engineering
   Engineering profession
   Environmental engineering
   Maintenance engineering
   Marine engineering
   Mechanical engineering
   Optical engineering

Precision engineering
Production engineering
Research and development
Reverse engineering
Sanitary engineering
Standardization
Thermal engineering

Engineering computing
BT: Computer applications
Engineering drawings
BT: Graphics
RT: Documentation
       Technical drawing
NT: Flowcharts

Engineering education
BT: Education
RT: 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

Engineering 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 management
       Research initiatives
       Software development management

Engineering profession
UF: Careers
BT: Engineering - general
RT: Biographies
       Electrical engineering
       Employment
       Ethics
       Programming profession
       Research and development
       Research and development management
NT: Professional aspects

Engineering students
UF: Student engineers
BT: Engineering education

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

NT: Heat engines
           Internal combustion engines

           Jet engines

Enhanced magnetoresistance
BT: Magnetoresistance
RT: Nanocontacts

Enhanced mobile broadband
UF: eMBB
BT: 5G mobile communication
RT: 4G mobile communication

Ensemble learning
UF: Ensemble approach
           Ensemble methods
BT: Machine learning
           Statistics
RT: Predictive models
NT: Fish schools

Enterprise architecture management
BT: Information architecture
           Information management
RT: Best practices
           Enterprise resource planning

Enterprise resource planning
BT: Management
RT: Business
           Data handling
           Data processing
           Enterprise architecture management
           Software
           System integration
           Venture capital
NT: Business process integration

Entertainment industry
BT: Industries
RT: Broadcasting
           Films
           Games
           Motion pictures
           TV
NT: Sports

Enthalpy
BT: Thermodynamics
RT: Energy measurement
           Thermal management

Entomology
BT: Zoology
RT: Biochemistry
           Biomechanics
           Ecology
           Insects
           Morphology
           Physiology
NT: Apicology

Entrepreneurship
UF: Entrepreneurial
BT: Business
RT: Disruptive innovation
           Innovation management
           Venture capital

Entropy
BT: Physics
RT: Heating systems
           Nuclear thermodynamics

Entropy coding
BT: Encoding
RT: Data compression
NT: Huffman coding

Envelope detectors
BT: Detectors

Environmental economics
BT: Economics
           Environmental factors
RT: Energy resources
           Environmental management
           Pollution
NT: Carbon tax
           Emissions trading

Environmental engineering
BT: Engineering - general
RT: Environmental factors
           Environmental management
           Resource management

Environmental factors
UF: Environmental problems
BT: Geoscience and remote sensing
           Social implications of technology
RT: Acoustic noise
           Air quality

	Carbon footprint
	Carbon sequestration
	Civil engineering
	Ecodesign
	Electromagnetic
interference	
	Environmental engineering
	Epidemiology
	Food security
	Green buildings
	Green computing
	Greenhouse effect
	Health and safety
	International collaboration
	Meteorology
	Occupational health
	Ozonation
	Safety
NT:	Biosphere
	Climate change
	Ecology
	Ecosystems
	Environmental economics
	Environmental monitoring
	Global warming
	Green manufacturing
	Green products
	Green transportation
	Pollution

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

Environmental monitoring

BT:	Environmental factors
	Monitoring
RT:	Decontamination

	Pollution control
	Pollution measurement

Environmentally friendly manufacturing techniques

BT:	Components, packaging, and manufacturing technology

Enzymes

BT:	Proteins
RT:	Hydrolysis

Epidemics

BT:	Epidemiology
RT:	Coronaviruses
	Diseases
	Influenza
	Pathogens
	Virology
NT:	Pandemics

Epidemiology

BT:	Science - general
RT:	Biomedical monitoring
	Environmental factors
	Public healthcare
NT:	Epidemics

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	

Epitaxial layers
BT: Coatings
Films
RT: Chemical vapor deposition
Semiconductor growth
Thin films
NT: Superconducting epitaxial layers

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
Erasable programmable read only memory
BT: PROM

Equal opportunities
BT: Human resource management
RT: Industrial relations
Labor resources
Personnel
Recruitment
NT: Gender equity
Gender issues

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

Erbium
UF: Er
BT: Metals
RT: Erbium-doped fiber amplifiers
Lasers and electrooptics
Optical amplifiers
Optics

Erbium-doped fiber amplifiers
UF: EDFA
Er-doped fiber amplifier
BT: Optical amplifiers
RT: Erbium

Erbium-doped fiber lasers
UF: Er-doped fiber lasers
Erbium-doped fiber laser
Erbiumdoped fiber laser
BT: Fiber lasers

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 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
NT:	Forward error correction

Error correction codes
UF:	ECC
	Error correcting codes
	Error-correcting codes
	Error-correction codes
	Errorcorrection codes
BT:	Codes
RT:	Convolutional codes
	Error correction
	Polar codes
NT:	Reed-Muller codes
	Reed-Solomon codes

Error probability
BT:	Probability

Error-free operations
UF:	Error free operation
BT:	Testing

Escalators
BT:	Transportation
RT:	Buildings
	Mechanical products
	Stairs

Esophagus
BT:	Digestive system

Estimation
UF:	Signal estimation
BT:	Mathematics
RT:	Control systems
	Error analysis
	Filtering theory
	Kalman filters
	Measurement uncertainty
	Prediction methods
	Prediction theory
	Reduced order systems
	Signal processing
	Spectral analysis
NT:	Estimation error
	Estimation theory
	Functional point analysis
	Life estimation
	Maximum likelihood estimation
	Pose estimation
	State estimation
	Yield estimation

Estimation error
BT:	Estimation

Estimation theory
BT:	Estimation
RT:	Mean square error methods
	Signal processing
	Statistics
NT:	Cramer-Rao bounds
	Maximum a posteriori estimation

Etching
UF:	Deep etching
BT:	Materials processing
	Surface treatment
RT:	Fabrication
	Micromachining
NT:	Dry etching
	Wet etching

Ethanol
UF:	Ethyl alcohol

Grain alcohol
BT: Chemical compounds
NT: Alcoholic beverages

Ethernet
BT: Computer networks
RT: IEEE 802.3 Standard
Local area networks
Virtual links
NT: EPON
Energy efficient ethernet

Ethical aspects
BT: Social implications of technology
RT: Digital divide
Ethics
Genetic engineering
Legal factors
Management
Philosophical considerations

Ethics
UF: Morals
BT: Social implications of technology
RT: Digital intelligence
Engineering profession
Ethical aspects
General Data Protection Regulation
Neuromarketing
NT: Cyberethics
Machine ethics

ETSI
UF: European Telecommunications Standards Institute
BT: Standards organizations

ETSI Standards
BT: Standards publications
NT: HbbTV Standards
SONET
Synchronous digital hierarchy

Euclidean distance
UF: Euclidean measurement
Euclidean metric
BT: Distance measurement
Mathematics

NT: Hilbert space

Europe
BT: Continents

European Space Agency
UF: ESA
BT: Organizations
RT: NASA

Europium
BT: Chemical elements

Event detection
BT: Wireless sensor networks

Evidence theory
UF: Belief functions
Dempster?Shafer theory
BT: Uncertainty
RT: Belief propagation

Evolution (biology)
UF: Evolution
BT: Biology
NT: Memetics
Phylogeny

Evolutionary computation
UF: Evolutionary algorithm
BT: Computational intelligence
RT: Metaheuristics
NT: Evolutionary robotics
Particle swarm optimization

Evolutionary robotics
BT: Evolutionary computation
Robots

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

Excitons
BT: Charge carrier processes
RT: Semiconductor materials

Exhaust gases
BT: Gases
RT: Air pollution
         Ash
         Combustion
         Exhaust systems
         Flue gases
         Internal combustion engines
         Jet engines

Exhaust systems
UF: Catalytic converters
         Catalytic convertors
         Mufflers
BT: Machine components
         Production systems
RT: Engines
         Exhaust gases
         Manifolds

Exoplanet
UF: Extrasolar planetary mass
BT: Extrasolar planets

Exoskeletons
BT: User interfaces
RT: Assistive robots

Expectation-maximization algorithms
UF: Expectation-maximisation algorithms
BT: Iterative methods

Expert systems
BT: Knowledge based systems
RT: Cause effect analysis
         Decision making
         Intelligent systems
         Knowledge acquisition
         Knowledge representation
NT: Diagnostic expert systems
         Medical expert systems

Explosion protection
BT: Protection
         Safety
RT: Accident prevention
         Flammability
         Hazards
         Military equipment

Explosions
BT: Hazards
RT: Accidents
         Chemical hazards
         Flammability
         Hazardous areas
         Safety
         Seismic waves
NT: Explosives

Explosives
BT: Explosions

Exponential distribution
BT: Probability distribution

Extended reality
UF: HumanXR
BT: Human computer interaction
         Man-machine systems
         Virtual reality
RT: Augmented reality

Extensibility
BT: Design methodology
RT: Adaptive systems
         Scalability

External stimuli
UF: PhysiStimuli
BT: Interactive systems
         Physiology

Extinction coefficients
BT: Optics
NT: Extinction ratio

Extinction ratio
BT: Extinction coefficients

Extracellular
BT: Cells (biology)
NT: Local field potentials

Extranets
BT: Virtual private networks
RT: Data communication
         Information systems

Internet
Web sites

Extraordinary magnetoresistance
BT: Magnetoresistance

Extrapolation
BT: Approximation methods
RT: Statistics

Extrasolar planets
UF: Exo planets
        Exo-planets
        Exoplanets
        Extra solar planets
        Extra-solar planets
        Super earths
BT: Astronomy
RT: Extraterrestrial measurements
        Extraterrestrial phenomena
NT: Exoplanet

Extraterrestrial measurements
UF: Planetary composition
        Space measurements
BT: Measurement
RT: Astronomy
        Extrasolar planets
        Extraterrestrial phenomena
        Interstellar chemistry

Extraterrestrial phenomena
UF: Space phenomena
BT: Geophysics
RT: Extrasolar planets
        Extraterrestrial measurements
        Planets
        Space technology
NT: Cosmic rays
        Solar radiation

Extreme learning machines
BT: Feedforward neural networks
RT: 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

Eye diseases
BT: Diseases
RT: Vision defects
        Visual impairment
NT: Glaucoma
        Macular degeneration
        Retinopathy

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
RT: Electrooculography
        Gaze tracking
        Ophthalmology
        Optical coherence tomography
NT: Cataracts
        Cornea
        Eyelashes
        Eyelids
        Iris
        Pupils
        Retina

FAA
UF: Federal Aviation Administration
BT: US Government agencies

Fabrication
UF:	Fabrication process
BT:	Manufacturing
RT:	Etching
	Materials processing
NT:	Bonding processes
	Microfabrication
	Optical device fabrication
	Soldering
	Welding

Fabrics
UF:	Knitted fabric composites
	Woven fabric composites
BT:	Textiles
RT:	Clothing
	Weaving
	Wool

Fabry-Perot
BT:	Interferometry
NT:	Fabry-Perot interferometers

Fabry-Perot interferometers
BT:	Fabry-Perot

Face detection
BT:	Computer vision
RT:	Facial animation
NT:	Facial features

Face recognition
UF:	Facial recognition
BT:	Biometrics (access control)
	Identification of persons
	Pattern recognition
RT:	Gaze tracking
	Image recognition

Faces
BT:	Head
RT:	Stomatognathic system
NT:	Facial muscles

Facial animation
BT:	Animation
RT:	Face detection

Facial features
UF:	Facial attributes
BT:	Face detection

Facial muscles
BT:	Faces

Facilities management
BT:	Building services
	Management
	Organizational aspects
RT:	Building information management

Facsimile
BT:	Communication systems
	Image communication

Fading channels
BT:	Signal processing
RT:	Diversity methods
	Diversity schemes
	Intercell interference
	Meteorological factors
	Multipath channels
	Radio propagation
NT:	Frequency-selective fading channels
	Rayleigh channels
	Weibull fading channels

Failure analysis
UF:	Failure analytics
	Failure mechanisms
BT:	Testing
RT:	Cause effect analysis
	Diagnostic expert systems
	Electrostatic discharge protection
	Fatigue
	Fault diagnosis
	Fault trees
	Green's function methods
	Life estimation
	Quality control
	Reliability
	Remaining life assessment
	Root cause analysis
	Shear testing
	Weibull distribution
NT:	Equipment failure
	Semiconductor device breakdown

Failure state
BT:	Systems engineering and theory

Fake news
UF:	Fake content
	Fake reviews
	False information

		Misinformation
BT:		Media
RT:		Information integrity
NT:		Deepfakes

Fall detection

BT:	Biomechanics
	Domestic safety
RT:	Accelerometers
	Alarm systems
	Assisted living
	Biomedical communication
	Biomedical signal

processing

	Body sensor networks
	Detectors
	Geriatrics
	Home automation
	Human activity recognition
	Image motion analysis
	Image recognition
	Injuries
	Patient monitoring
	Video signal processing
	Wearable computers

Fans

BT:	Machinery
	Ventilation
RT:	Air conditioning
	Blades
	Jet engines

Faraday effect

UF:	Faraday rotation
BT:	Magnetooptic effects
RT:	Gyromagnetism
	Gyrotropism

Farming

BT:	Industries
RT:	Agricultural engineering
	Agricultural products
	Agriculture
	Food products

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

Fasteners

UF:	Bolts
	Hinges
	Nuts (fasteners)
	Screws
	Zip fasteners
BT:	Control equipment
	Mechanical products
RT:	Belts
	Couplings
	Joining processes
	Welding

Fatigue

BT:	Mechanical factors
RT:	Failure analysis
	Life estimation

Fats

BT:	Chemical products
	Food products
RT:	Biological materials
	Lipidomics
	Oils

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 computer networks
Fault tolerant computing
Fault tolerant control
Redundancy

Fault tolerant computer networks
BT: Computer network reliability
Fault tolerance
RT: Fault tolerant computing
Fault tolerant control
Fault tolerant systems

Fault tolerant computing
BT: Fault tolerance
RT: Fault tolerant computer networks
Fault tolerant control
Fault tolerant systems

Fault tolerant control
BT: Control systems
Fault tolerance
RT: Fault tolerant computer networks
Fault tolerant computing

Fault tolerant systems
BT: System analysis and design
RT: Fault tolerant computer networks
Fault tolerant computing

Fault trees
BT: Risk analysis
RT: Boolean functions
Failure analysis
Fault location

FCC
UF: Federal Communications Commission
BT: US Government agencies

FDA
UF: Food and Drug Administration
BT: US Government agencies

FDDI
UF: Fiber distributed data interface
BT: Communication systems
Optical fiber communication
RT: Communication standards
Local area networks

Feathers
BT: Animal structures

Feature detection
BT: Computer vision
Image processing
RT: Feature extraction
Saliency detection

Feature extraction
BT: Image processing
RT: Blob detection
Conditional random fields
Deep learning
Feature detection
Graph neural networks
Image annotation
Image edge detection
Image recognition
Independent component analysis
License plate recognition
Mixture models
Motion capture
Pattern classification
Pattern recognition
Principal component analysis
Saliency detection
Signal processing
Speech recognition

Federated identity
UF: FIM
BT: Identity management systems
RT: Authentication
Blockchains
Token networks
Tokenization

Federated learning
UF: Collaborative learning

Collaborative networking
Collaborative problem solving

Collaborative work
Cooperative work
Federated-learning
- BT: Machine learning
- RT: Collaborative software
  Communication effectiveness

  Multimedia computing
  Professional communication
- NT: Collaborative intelligence
  Cooperative communication
  Crowdsourcing
  Social computing

Feedback
- UF: Saturation detection
- BT: Circuits
  Control systems
- RT: Control design
  Positive train control
  SIMO communication
  Scrum (Software development)
  System dynamics
  Time invariant systems
- NT: Feedback circuits
  Negative feedback
  Neurofeedback

Feedback amplifiers
- UF: NFB
  Negative feedback amplifier
- BT: Operational amplifiers

Feedback circuits
- UF: Circuit feedback
- BT: Feedback
- RT: Control theory
  Distributed feedback devices
  Feedback communications
- NT: Output feedback

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

Feedforward neural networks
- UF: Feed-forward neural networks
  Feedforward neural nets
- BT: Neural networks
- RT: Artificial intelligence
  Pattern recognition
  Self-organizing feature maps
  Support vector machines
- NT: Extreme learning machines
  Multilayer perceptrons

Feedforward systems
- BT: Intelligent control
- RT: Forward error correction
  Open loop systems

Feeds
- BT: Antennas
- NT: Antenna feeds

FeFETs
- UF: Ferroelectric FETs
- BT: Field effect transistors

Femtocell networks
- UF: Access point base station
- BT: Cellular networks
- RT: Base stations

Femtocells
- BT: Base stations

Fermi level
- UF: Fermi energy
  Fermi-level
- BT: Energy states
  Thermodynamics
- RT: Quasi-Fermi level

Ferrimagnetic films
- BT: Ferrimagnetic materials
  - Films
  - Magnetic films
  - Magnetic materials

Ferrimagnetic materials
- BT: Magnetic materials
- NT: Ferrimagnetic films
  - Ferrite films
  - Ferrites
  - Garnet films
  - Garnets

Ferrite devices
- BT: Magnetic devices
- RT: Ferrites
  - Flyback transformers
  - Gyrators
- NT: Circulators

Ferrite films
- BT: Ferrimagnetic materials
  - Ferrites
  - Films
  - Magnetic films
  - Magnetic materials

Ferrites
- BT: Ferrimagnetic materials
  - Magnetic materials
- RT: Ferrite devices
  - Gyromagnetism
- NT: Ferrite films

Ferroelectric devices
- BT: Dielectric devices
- RT: Ferroelectric materials

Ferroelectric films
- BT: Ferroelectric materials
- RT: Magnetic field induced strain

Ferroelectric materials
- BT: Ultrasonics, ferroelectrics, and frequency control
- RT: Dielectric materials
  - Ferroelectric devices
  - Magnetic field induced strain
  - Pyroelectricity
- NT: Ferroelectric films
  - Relaxor ferroelectrics

Ferrofluid
- UF: LiquiFerrofluid
- BT: Fluids
  - Magnetic materials

Ferromagnetic materials
- BT: Magnetic materials

Ferromagnetic resonance
- BT: Magnetic resonance

Ferroresonance
- BT: Power engineering
  - Resonance
- RT: Magnetic resonance
  - Nonlinear magnetics

Fertilizers
- UF: Fertilisers
- BT: Agrochemicals
- RT: Boron
  - Crops

FET circuits
- BT: Solid state circuits
- RT: Nuclear electronics
  - Operational amplifiers
- NT: FET integrated circuits
  - JFET circuits
  - MESFET circuits
  - MODFET circuits
  - MOSFET circuits

FET integrated circuits
- BT: FET circuits
  - Integrated circuits
- RT: Field effect transistors
- NT: Field effect MMIC
  - MESFET integrated circuits

Fetal heart
- BT: Heart

Fetal heart rate
- BT: Heart rate

Fetus
- BT: Embryonic structures

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 optics
UF:	Fibre optics
BT:	Optics
NT:	Fiber nonlinear optics
	Optical fibers

Fiber reinforced plastics
UF:	Fibre reinforced plastics
BT:	Plastics
RT:	Plastic insulators

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
	Double-gate FETs
	FeFETs
	HEMTs
	JFETs
	MESFETs
	MISFETs
	MODFETs
	MOSFET
	MOSHFETs
	OFETs
	Schottky gate field effect transistors
	TFETs
	Thin film transistors

Field emitter arrays
BT:	Electron tubes
RT:	Vacuum technology

Field programmable analog arrays
UF:	FPAA
	Field programmable analogue arrays
BT:	Analog integrated circuits
	Programmable circuits
RT:	Application specific integrated circuits
	Field programmable gate arrays
	Space technology

Field programmable gate arrays
UF:	FPGA
	Field-programmable gate arrays
BT:	Integrated circuits
RT:	AI accelerators
	Field programmable analog arrays
	Reconfigurable devices
	VHDL

Field-flow fractionation
UF:	EFFF
	FFF
	Field flow fractionation
BT:	Fractionation

Fifth Industrial Revolution
UF:	5IR
	IR 5.0
	Industrial Revolution 5.0
BT:	Automation
	Digital transformation
RT:	Brain-computer interfaces
	Fourth Industrial Revolution

		Human computer
interaction		
		Internet of Things

Filament lamps
| | BT: | Lamps |
| | RT: | Lighting |

File servers
	BT:	Computers and information
processing		
	RT:	Computer networks
		Data communication
		Local area networks

File systems
	BT:	System software
	RT:	Audio databases
		Data structures
		Database systems
		Information systems

Fill factor (solar cell)
| | BT: | Photovoltaic systems |

Filler metals
| | BT: | Joining materials |
| | RT: | Metals |

Filling
	BT:	Freight handling
	RT:	Containers
		Loading
		Packaging

Film bulk acoustic resonators
	UF:	FBAR
		FBARs
	BT:	Acoustic devices
		Thin film devices
	RT:	Bulk acoustic wave devices
		Cellular radio
		Mobile communication
		Radio communication
		Resonance
		Telecommunications

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

Filter banks
| | UF: | Filterbank |
| | BT: | Band-pass filters |

Filtering
	BT:	Circuits and systems
	RT:	Noise cancellation
	NT:	Filters
		Information filtering

Filtering algorithms
	UF:	Loop-filtering algorithm
		Post-filtering algorithm
	BT:	Algorithms

Filtering theory
	UF:	Filter-theory
	BT:	Filters
	RT:	Estimation
		Line enhancers
		Matched filters
		Maximum likelihood
detection		
		Transversal filters
	NT:	Collaborative filtering
		Image filtering

Filters
	BT:	Filtering
		Signal processing
	RT:	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

Filtration
UF: Nanofiltration
BT: Materials science and
technology
RT: Sieving
NT: Microfiltration

Finance
UF: Taxes
BT: Financial management
RT: Banking
        Bitcoin
        Business
        Cryptocurrency
        Economics
        Open banking
NT: Bankruptcy
        Currencies

Financial industry
UF: Finance sector
BT: Industries
NT: Banking
        Financial services

Financial management
UF: Financial planning
        Money management
BT: Management
RT: Electronic commerce
        Profitability
        Public finance
NT: Costing
        Credit cards
        Finance
        Insurance
        Investment
        Loans and mortgages
        Management accounting
        Mutual funds

Pricing
Venture capital

Financial services
BT: Financial industry
NT: Automated teller machine
        Micropayments

FinFETs
BT: MOSFET

Fingerprint recognition
UF: Fingerprint identification
        Fingerprint indexing
        Fingerprint matching
        Fingerprint modality
        Fingerprint sensing
        Fingerprint sensors
        Fingerprint verification
        Fingerprinting
BT: Biometrics (access control)
        Identification of persons
        Pattern recognition
RT: Image matching

Fingers
BT: Extremities
NT: Thumb

Finishing
BT: Surface treatment
RT: Machining
        Materials processing
        Planing
NT: Surface finishing

Finite difference methods
UF: FDTD
        Finite difference time
domain analysis
        Finite difference time
domain methods
        Finite-difference methods
        Finite-difference time-
domain methods
BT: Mathematics
        Numerical analysis
RT: Computational
electromagnetics
        Perfectly matched layers

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 impulse response filters
UF: FIR
        FIR filters
BT: Digital filters
RT: Discrete wavelet transforms
        Frequency response

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

Finline
BT: Planar transmission lines

Fire extinguishers
BT: Safety devices
RT: Fire safety

Fire safety
BT: Safety
RT: Fire extinguishers

Fires
UF: Flames
        Wild fires
        Wildfires
BT: Hazards
RT: Accidents
        Emergency services
        Flammability
        Hazardous areas
        Safety
        Smoke detectors

Firewalls (computing)
BT: Computer security

RT: Computer networks
        Hardware
        Software

Firewire
UF: FireWire
BT: Computer interfaces
RT: Computer peripherals
        Consumer electronics
        Data communication
        Home computing
        IEEE 1394 Standard
        Video signal processing

Fireworks algorithm
BT: Optimization methods
RT: Particle swarm optimization

Firing
BT: Materials preparation
RT: Ceramics
        Heat treatment
        Kilns

Fish
BT: Organisms

Fish schools
UF: Fish schooling
BT: Collective intelligence
        Ensemble learning
RT: Algorithm design and
analysis
        Artificial neural networks
        Behavioral sciences
        Clustering methods
        Computational modeling
        Computer simulation
        Decision making
        Neural networks
        Neuroscience
        Particle swarm optimization
        Predictive models
        Random forests
        Training data

Fission reactors
UF: Nuclear fission
        Nuclear reactors (fission)
BT: Nuclear power generation
RT: Pressure vessels
        Radiation protection

Fitting
BT: Assembly

RT: Assembly systems

Fixed-point arithmetic
UF: Fixed point arithmetic
BT: Arithmetic

Fixtures
UF: Fixturing
Jigs
BT: Production equipment
RT: Machine tools

Flame retardants
UF: Fire retardants
Fireproofing
BT: Retardants
RT: Bromine compounds
Flammability
Materials preparation

Flammability
UF: Inflammability
BT: Hazards
RT: Explosion protection
Explosions
Fires
Flame retardants
Hazardous materials

Flanges
BT: Mechanical products
RT: Rails
Structural plates
Wheels

Flash memories
UF: NAND flash
BT: Memory
RT: Automation
Computer peripherals
Solid state drives
NT: Flash memory cells

Flash memory cells
BT: Flash memories
NT: Split gate flash memory cells

Flashover
BT: Dielectric breakdown

Flat panel displays
UF: Plasma display panel
BT: Displays
RT: Consumer electronics

TV

Flexible AC transmission systems
UF: FACTS
Flexible ac transmission systems
BT: Power transmission

Flexible electronics
BT: Assembly systems
RT: Graphene devices
Soft electronics

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
Soft robotics
Structural engineering

Flight recording
UF: Black box
Flight recorder
BT: Recording

Flip chip solder joints
UF: Castellations
BT: Soldering
RT: Flip-chip devices

Flip-chip devices
UF: Flip chip
Flip-chip
BT: Semiconductor device manufacture
Semiconductor devices
RT: Flip chip solder joints
Microassembly
Microprocessor chips
Microprocessors

Flip-flops
BT:	Pulse circuits
RT:	Logic circuits

Floating-point arithmetic
UF:	Floating point arithmetic
BT:	Arithmetic

Floods
BT:	Hazards
	Hydrology
RT:	Land use planning
	Rain
	Rivers
	Stormwater
	Structural engineering

Floors
BT:	Building materials
RT:	Construction industry
	Tiles

Floppy disks
BT:	Magnetic memory

Flow graphs
UF:	Data flow graphs
	Signal flow graphs
BT:	Programmable control
RT:	Circuits

Flow production systems
UF:	Sequential production
BT:	Manufacturing systems
RT:	System dynamics
NT:	Continuous production

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
RT:	Hydrodynamics
	Lattice Boltzmann methods
NT:	Buoyancy
	Computational fluid dynamics
	Drag
	Navier-Stokes equations
	Rheology

Fluid flow
UF:	Flow
	Gas flow
	Liquid flow
	Smoothed particle hydrodynamics
BT:	Physics
RT:	Electrohydraulics
	Flowmeters
	Fluid flow measurement
	Fluidics
	Hydraulic systems
	Hydrodynamics
	Magnetohydrodynamics
NT:	Fluid dynamics
	Hydraulic diameter
	Hydrology
	Pipelines
	Supersonic flow
	Valves

Fluid flow control
BT:	Control systems
RT:	Valves

Fluid flow measurement
UF:	Anemometers
BT:	Measurement
RT:	Fluid flow
	Hydrologic measurements
	Pressure gauges

Fluidic microsystems
BT:	Micromechanical devices
RT:	Microfluidics

Fluidics
BT:	Control systems
RT:	Fluid flow
	Nanotechnology

Pneumatic systems
NT: Microfluidics
Nanofluidics

Fluidization
UF: Fluidisation
BT: Chemical technology
RT: Fluids

Fluids
BT: Materials
RT: Buoyancy
Fluidization
Oils
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

Fly ash
UF: Coal ash
Flue ash
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

Focusing
BT: Imaging
RT: Lenses

Food industry
BT: Manufacturing industries
RT: Beverage industry
Consumer products
Food preservation
Food products
Food technology
Smart agriculture
Sugar industry
Sugar refining
NT: Food manufacturing

Food manufacturing
BT: Food industry
Manufacturing systems
RT: Consumer products
Food preservation
Food products
Food technology
Food waste
NT: Food packaging

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

Food products
BT: Manufactured products

	Production
RT:	Agricultural products
	Consumer products
	Farming
	Food industry
	Food manufacturing
	Food packaging
	Food preservation
	Seeds (agriculture)
	Smart agriculture
	Sugar industry
	Sugar refining
	Vegetable oils
NT:	Dairy products
	Fats
	Food security
	Food waste
	Sugar

Food security
BT:	Food products
	Security
RT:	Agricultural products
	Economics
	Emergency services
	Environmental factors
	Measurement
	Social factors
	Supply chain management
	Sustainable development

Food technology
BT:	Industry applications
RT:	Food industry
	Food manufacturing
	Food packaging
	Smart agriculture
	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 |

Footwear
UF:	Shoes
BT:	Clothing
RT:	Clothing industry
	Footwear industry

Footwear industry
UF:	Shoe manufacture
BT:	Manufacturing industries
RT:	Clothing industry
	Consumer products
	Footwear

Force
BT:	Mechanical factors
RT:	Dynamics
	Force control
	Magnetic forces
NT:	Gravity

Force control
BT:	Mechanical variables control
RT:	Control systems
	Force
	Robot control

Force feedback
| BT: | Haptic interfaces |

Force measurement
BT:	Mechanical variables measurement
RT:	Gravity
	Pressure gauges
NT:	Dynamometers
	Gravity measurement

Force sensors
| BT: | Sensors |

Forebrain
UF:	Prosencephalon
BT:	Brain
RT:	Hindbrain
	Midbrain
NT:	Olfactory bulb

Forecast uncertainty
| BT: | Forecasting |
| | Uncertainty |

Forecasting
| BT: | Probability |

RT: Prediction methods
NT: Demand forecasting
           Economic forecasting
           Forecast uncertainty
           Technology forecasting

Forehead
BT: Head

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 specifications
BT: Standardization
RT: Service-oriented systems engineering

Formal verification
BT: Software engineering
RT: Circuits and systems
           Model checking

Formation control
BT: Motion control
RT: Multi-agent systems
           Robot control

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
UF: Four wave mixing
BT: Distortion
           Optics
RT: Multiwave mixing

Fourier series
BT: Mathematics
RT: Data compression
           Signal processing
           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
NT: Discrete Fourier transforms
           Fast Fourier transforms

Fourier transform infrared spectroscopy

Fourth Industrial Revolution
- UF: Industrial Revolution 4.0
- Industry 4.0
- BT: Automation
- Digital transformation
- Manufacturing
- RT: Fifth Industrial Revolution
- Internet of Things
- Machine-to-machine communications
- Smart devices
- Smart manufacturing

Fracking
- UF: Fraccing
- Hydraulic fracking
- BT: Hydrological techniques
- RT: Mining industry
- Natural gas

Fractal antennas
- BT: Antennas

Fractal art
- BT: Art

Fractals
- BT: Computational geometry
- RT: Antennas
- Chaos
- Computer graphics
- Econophysics

Fractional calculus
- BT: Mathematical analysis

Fractionation
- BT: Separation processes
- RT: Chemical analysis
- Oils
- Petroleum industry
- NT: Field-flow fractionation

Frame relay
- BT: Communication switching
- Packet switching
- RT: B-ISDN
- Computer networks
- ISDN
- Protocols
- Wide area networks

Franchising
- UF: Franchises
- BT: Business

Fraud
- BT: Law

Free economic zones
- UF: Free economic territories
- Free zones
- BT: Commerce and trade
- Economics
- RT: International trade
- Tariffs
- Trade agreements
- NT: Freeports

Free electron lasers
- UF: Cerenkov lasers
- BT: Lasers
- RT: Electron beams
- Relativistic effects
- Undulators

Free-space optical communication
- BT: Optical fiber communication
- RT: NOMA

Freeports
- UF: Free ports
- BT: Free economic zones
- RT: Airports
- Economics
- International trade
- Seaports
- Trade agreements

Freeware
- UF: WhatsApp
- BT: Software

Freight containers
- BT: Containers
- RT: Freight handling
- Transportation

Freight handling
- UF: Cargo handling
- BT: Materials handling
- RT: Freight containers
- Lifting equipment
- Pulleys
- Transmission line discontinuities

NT: Filling
               Loading

Frequency
     BT: Electromagnetic radiation
     RT: Band-pass filters
               Electric variables
               Transmission line theory
     NT: Bandwidth
               Frequency dependence
               Frequency diversity
               Frequency synchronization
               Resonant frequency

Frequency control
     UF: Frequency regulation
     BT: Ultrasonics, ferroelectrics,
and frequency control
     RT: Electric variables control
               Frequency locked loops
               Mechanical variables
control
               Optical variables control
               Ring oscillators
               Tuners
     NT: Automatic frequency control
               Tunable circuits and
devices
               Tuning

Frequency conversion
     UF: Frequency division
               Frequency multiplication
               Harmonic generation
     BT: Converters
     RT: Image converters
               Image intensifiers
     NT: Mixers
               Optical frequency
conversion

Frequency dependence
     UF: Frequency dependent
     BT: Frequency

Frequency diversity
     BT: Frequency

Frequency division multiaccess
     UF: FDMA
     BT: Multiaccess communication
     RT: Broadband communication

Frequency division multiplexing
     UF: FDM

               Frequency multiplexing
     BT: Multiplexing
     RT: Layered division
multiplexing

Frequency estimation
     BT: Frequency measurement
               Parameter estimation
     RT: Spectral analysis
               Speech analysis

Frequency locked loops
     UF: FLL
     BT: Linear feedback control
systems
               Signal processing
     RT: Frequency control
               Frequency synthesizers
               Phase locked loops
               Synchronization

Frequency measurement
     BT: Measurement
     RT: Acoustic measurements
               Atomic clocks
               Doppler measurement
               Electric variables
measurement
               Electromagnetic
measurements
               Frequency response
               Mechanical variables
measurement
               Optical variables
measurement
               Phase frequency detectors
               Time-frequency analysis
               Wavelength measurement
     NT: Frequency estimation
               Frequency-domain analysis

Frequency modulation
     UF: FM
     BT: Modulation
               Radio broadcasting
     RT: Demodulation
     NT: Frequency shift keying

Frequency response
     BT: Testing
     RT: Amplifiers
               Digital filters
               Finite impulse response
filters
               Frequency measurement

Impulse testing

Frequency selective surfaces
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-selective fading channels
BT: Fading channels

Fresnel reflection
UF: Fresnel integral
Fresnel lenses
Fresnel zones
BT: Reflection

Friction
BT: Mechanical factors
RT: Drag
Dynamics
Lubrication
NT: Mechanical bearings

Frontal lobe
UF: BrainLobe
BT: Brain

Fuel cell vehicles
BT: Electric vehicles
RT: Energy storage
Fuel cells
Traction motors
Vehicle-to-grid

Fuel cells
UF: Enzymatic fuel cells
Microbial eletrolysis cells
Microbial fuel cells
Solid oxide electrolyzer
cells
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
RT: Containers
Energy storage
Fuel cells
Fuel processing industries
Fuels

Fuels
BT: Energy resources
Manufactured products
RT: Coal gas
Fuel processing industries
Fuel pumps
Fuel storage
Methanol
Petrochemicals
Waste materials
NT: Biofuels
Coal

Fossil fuels
Fuel economy
Nuclear fuels
Petroleum

Full stack
UF: Software stack
Solution stack
BT: Software engineering

Full-duplex system
UF: FDX
Full duplex system
BT: Duplex communication systems

Fullerenes
UF: Buckeyballs
Buckminsterfullerene
Buckyballs
Buckytubes
CarboFullerene
Fullerites
BT: Carbon

Function approximation
BT: Approximation methods
RT: Computer science

Functional analysis
BT: Mathematics
RT: Eigenvalues and eigenfunctions
Frequency-domain analysis
Inverse problems
Lyapunov methods
Wave functions

Functional magnetic resonance imaging
UF: fMRI
BT: Magnetic resonance imaging
RT: Biomedical image processing

Functional near-infrared spectroscopy
UF: fnirs
BT: Functional neuroimaging
Spectroscopy
RT: Infrared imaging
Infrared spectra
Neuroimaging

Functional neuroimaging
BT: Neuroimaging
NT: Functional near-infrared spectroscopy

Functional point analysis
BT: Estimation
Size measurement
RT: Cost benefit analysis
Software engineering

Functional programming
BT: Programming
RT: Python

Fungi
BT: Microorganisms

Furnaces
BT: Machinery
RT: Building services
Foundries
Gas appliances
Heating systems
NT: Blast furnaces
Kilns

Fuses
BT: Electronic components
RT: Interrupters
Power system protection
Protection
Switchgear

Fusion power generation
BT: Nuclear and plasma sciences
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 sciences
RT: Fusion power generation
NT: Fusion reactor design
Tokamaks

JULY 2023 IEEE Thesaurus

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 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 networks
UF:	Fuzzy neural nets
	Neuro fuzzy networks
	Neuro-fuzzy networks
BT:	Fuzzy systems

Fuzzy reasoning
BT:	Inference mechanisms
RT:	Fuzzy cognitive maps
	Fuzzy logic

Fuzzy set theory
BT:	Set theory
RT:	Fuzzy cognitive maps
	Fuzzy sets
	Fuzzy systems
	Power system faults
	TOPSIS

Fuzzy sets
BT:	Set theory
RT:	Fuzzy control
	Fuzzy logic
	Fuzzy set theory
	Fuzzy systems
	Nonlinear dynamical systems
	Uncertainty

Fuzzy systems
BT:	Computational intelligence
RT:	Fuzzy cognitive maps
	Fuzzy logic
	Fuzzy set theory
	Fuzzy sets
	Large-scale systems
	Soft sensors
	Takagi-Sugeno model
NT:	Fuzzy control
	Fuzzy neural networks
	Hybrid intelligent systems

Gabor filters
BT:	Filters
RT:	Image processing

Gadolinium
BT:	Chemical elements
NT:	Gadolinium oxide

Gadolinium oxide
BT:	Gadolinium

Gain
BT:	Electric variables

Gain control
UF:	Automatic gain control
BT:	Electric variables control

Gain measurement
BT:	Measurement
RT:	Electric variables measurement
	Refractive index

Gait recognition
BT:	Biometrics (access control)
RT:	Motion capture

Gallbladder
BT:	Digestive system

Page 172

Gallium
UF:	Ga	
BT:	Metals	
	Semiconductor materials	
RT:	Epitaxial growth	
	Gallium compounds	
	Molecular beam epitaxial growth	
	Semiconductor thin films	
NT:	Gallium alloys	

Gallium alloys
BT:	Gallium
RT:	Alloying
	Wide band gap semiconductors

Gallium arsenide
UF:	GaAs
	Gallium-arsenide
	Gallium-arsenide (GaAs)
BT:	Gallium compounds
	Semiconductor materials

Gallium compounds
UF:	Gallium devices
	Gallium materials
BT:	Compounds
RT:	Alloying
	Gallium
NT:	Aluminum gallium nitride
	Gallium arsenide
	Gallium nitride
	Indium gallium arsenide
	Indium gallium nitride

Gallium nitride
BT:	Gallium compounds

Galois fields
UF:	Field multiplication
	Finite fields
BT:	Abstract algebra

Galvanizing
UF:	Galvanising
BT:	Surface treatment
RT:	Corrosion
	Corrosion inhibitors
	Protection

Game theory
BT:	Decision making
RT:	Control systems
	Games
	Minimax techniques
	Multi-armed bandit problem
	Oligopoly
	Optimal control
	Predator prey systems
NT:	Differential games
	Nash equilibrium

Games
BT:	Consumer products
RT:	Entertainment industry
	Game theory
	Metaverse
	Sports
NT:	Cloud gaming
	Serious games

Gamma distribution
BT:	Statistics
RT:	Probability

Gamma-ray bursts
UF:	Cosmic gamma ray bursts
	Gamma ray bursters
	Gamma ray bursts
BT:	Gamma-rays

Gamma-ray detection
UF:	Gamma ray detection
BT:	Gamma-rays

Gamma-ray detectors
UF:	Gamma radiation detectors
	Gamma ray detectors
BT:	Radiation detectors
RT:	Astronomy
	Biomedical applications of radiation
	X-ray detectors
	X-ray imaging

Gamma-ray effects
UF:	Gamma ray effects
BT:	Gamma-rays
	Radiation effects

Gamma-ray telescopes
UF:	Gamma ray telescopes
BT:	Telescopes
RT:	Aerospace electronics

Gamma-rays
UF:	Gamma rays
BT:	Electromagnetic radiation

Nuclear and plasma sciences
- RT: Collimators
  Nuclear medicine
- NT: Gamma-ray bursts
  Gamma-ray detection
  Gamma-ray effects

Ganglia
- UF: Ganglion
- BT: Cells (biology)
  Nervous system

Gap waveguide
- BT: Electromagnetic waveguides
- RT: Waveguide components

Garnet films
- BT: Ferrimagnetic materials
  Films
  Garnets
  Magnetic films
  Magnetic materials

Garnets
- BT: Ferrimagnetic materials
  Magnetic materials
- NT: Garnet films

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
  Thyratrons
- NT: Glow discharge devices

Gas industry
- BT: Industries
- RT: Petroleum industry

Gas insulated transmission lines
- UF: GITL
  Gas-insulated lines
  Gas-insulated transmission
- BT: Power transmission lines
- RT: Gas insulation

Gas insulation
- UF: Gas insulated switchgear
- BT: Insulation
- RT: Gas insulated transmission lines
  Gases
- NT: Sulfur hexafluoride

Gas lasers
- UF: Atomic lasers
  Metal vapor lasers
- BT: Lasers
- RT: Atom lasers
  Chemical lasers
  Gases

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

Gastroenterology
    UF: Gastroenterologists
    BT: Medical specialties

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

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

Gaussian processes
    BT: Stochastic processes
    RT: Inference mechanisms
           Learning (artificial intelligence)
           Prediction methods
    NT: Gaussian mixture model

Gaze tracking
    BT: Control systems
           Human computer interaction
    RT: Assistive technologies

           Computer vision
           Eyes
           Face recognition
           Motion measurement
           Position measurement
           User interfaces
           Video signal processing
    NT: Electrooculography

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 equity
    BT: Equal opportunities
    RT: Transgender issues

Gender issues
    UF: Gender equality
           Women's issues
    BT: Equal opportunities
    RT: Digital divide
    NT: Transgender issues

Gene expression
    BT: Gene therapy

Gene therapy
    BT: Genetics
    NT: Gene expression

General Data Protection Regulation
    UF: GDPR
    BT: Data protection
           Government policies
           Legislation
    RT: Data handling
           Ethics
           Privacy

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
	Radioisotope thermoelectric generators
	Standby generators

Genetic algorithms
BT:	Algorithms
	Computational intelligence
RT:	Job shop scheduling
	Metaheuristics
	Pareto optimization
	Search methods

Genetic communication
BT:	Genetics
	Information theory
RT:	Biological information theory
	Biomedical engineering
	DNA

Genetic engineering
UF:	Genetically modified crops
BT:	Engineering in medicine and biology
RT:	Agriculture
	Biomedical engineering
	Biotechnology
	Ethical aspects
	Genetics
	Molecular biophysics
	Seeds (agriculture)
	Tissue engineering

Genetic expression
BT:	Genetics

Genetic mutations
BT:	DNA

Genetic programming
BT:	Genetics

Genetics
BT:	Biology
RT:	Amniocentesis
	Genetic engineering
	Memetics
	Molecular biophysics
NT:	DNA
	Epigenetics
	Gene therapy
	Genetic communication
	Genetic expression
	Genetic programming
	Genomics
	Optogenetics

Genomics
UF:	Genomes
BT:	Genetics
	Molecular biomarkers

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
            Geographical information systems
    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

Geology
    BT: Geoscience
    RT: Geoengineering
            Geologic measurements
            Geophysics
    NT: Biogeochemistry
            Landslides
            Minerals
            Rocks

Geomagnetic storms
    UF: Geomagnetic disturbances
    BT: Geomagnetism
            Storms

Geomagnetism
    UF: Geomagnetic navigation
            Geomatics
    BT: Magnetic fields
    RT: Electromagnetic induction
            Geophysical measurements
            Geophysics
            Magnetosphere
    NT: Geomagnetic storms

Geometric modeling
    BT: Computational geometry
            Mathematical models

Geometrical 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
    BT: Geophysical measurement techniques
            Image processing

Geophysical measurement 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 measurements
    UF: Geophysical techniques
    BT: Geoscience and remote sensing
            Measurement
    RT: Atmospheric measurements
            Buried object detection
            Geologic measurements
            Geomagnetism
            Geophysical signal processing
            Geophysics
            Gravity measurement
            Pressure gauges

                Remote sensing
                Soil measurements
                Terrain mapping

NT: Geodesy
                Sea measurements
                Seismic measurements

Geophysical signal processing
      BT: Geoscience and remote sensing
                Signal processing
      RT: Geophysical measurements

Geophysics
      BT: Geoscience
                Physics
      RT: Earth
                Geochemistry
                Geoengineering
                Geology
                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
                Science - general
      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
                Natural resources
                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
                Radiometry
                Remote sensing
                Terrain mapping
                Terrestrial atmosphere
                Vegetation mapping

Geospatial analysis
      BT: Geographic information systems
      RT: Geography
                Software

Geostationary satellites
      UF: Geostationary communication satellites
                Geosynchronous communication satellites
                Geosynchronous satellites

	BT:	Satellites
	RT:	Orbits

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
	BT:	Power generation
	RT:	Geothermal energy

Geriatrics
	BT:	Medical treatment
	RT:	Assisted living
		Assistive robots
		Fall detection
		Gerontology
		Older adults

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

Gerontechnology
	BT:	Biomedical equipment
		Gerontology
	RT:	Assistive technologies

Gerontology
	BT:	Medical specialties
	RT:	Aging
		Alzheimer's disease

		Geriatrics
		Older adults
	NT:	Gerontechnology

Gesture recognition
	BT:	Pattern recognition
	NT:	Sign language

Gettering
	UF:	Getters
	BT:	Vacuum systems
	RT:	Electron tubes
		Integrated circuit manufacture
		Semiconductor device manufacture
		Vacuum technology

Giant magnetoresistance
	BT:	Magnetoresistance
	RT:	Hard disks
		Magnetoresistive devices
		Thin film devices

Glands
	UF:	Endocrine glands
		Exocrine glands
	BT:	Biological tissues
	NT:	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 box
	UF:	Glass-box
		White box
		White-box
	BT:	Software
		System analysis and design
	RT:	Software testing
		System testing

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

Glaucoma
BT: Eye diseases

Glazes
BT: Coatings
RT: Ceramics
NT: Ceramic glazes

Glial cells
UF: Neuroglia
BT: Cells (biology)
Nervous system

Global communication
UF: Global groups
Global teams
BT: Professional communication
NT: Cross-cultural communication
Geographic information systems

Global Earth Observation System of Systems
UF: GEOSS
BT: Earth Observing System

Global navigation satellite system
UF: GNSS
BT: Satellite navigation systems
RT: Global Positioning System

Global Positioning System
UF: DGPS
Differential GPS
GPS
Global Navigational Positioning System
BT: Satellite navigation systems
RT: Air transportation
Global navigation satellite system
Indoor navigation
Land transportation
Marine transportation
Military satellites
Road transportation
Satellite broadcasting
Satellite communication
Telecommunications
Terrain mapping

Global warming
UF: Global dimming
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
Thermal pollution

Globalization
UF: Global markets
Globalisation
BT: Social implications of technology
RT: Developing countries
International collaboration
International relations
International trade
Trade agreements

Glow discharge devices
BT: Gas discharge devices

Glow discharges
BT: Dielectric breakdown

JULY 2023 IEEE Thesaurus

Glucose
  BT: Sugar

Glucose sensors
  BT: Sensors

Glycomics
  BT: Molecular biomarkers

Gold
  UF: Au
  BT: Metals
  NT: Gold alloys

Gold alloys
  BT: Gold
  RT: Alloying

Goniometers
  BT: Meters

Government
  BT: Organizations
  RT: Governmental factors
      Leadership
      Macroeconomics
      Public finance
  NT: Electronic government
      Government policies
      Legislation
      Local government
      US Government
      Voting

Government policies
  BT: Data governance
      Government
  RT: Censorship
      Developing countries
      Food waste
      Open data
      Public infrastructure
  NT: General Data Protection
Regulation
      Must-carry regulations
      Public policy
      Regulation

Governmental factors
  BT: Management
  RT: Government
      Legal factors
      Social factors
  NT: Public finance

Gradient methods
  BT: Mathematics
      Numerical analysis
      Optimization methods
  RT: Level set
      Search methods

Grain boundaries
  BT: Crystals
  RT: Conductivity
      Corrosion
      Electron backscatter
diffraction
      Grain size
      Thermal conductivity

Grain size
  BT: Crystals
  RT: Electron backscatter
diffraction
      Grain boundaries

Grammar
  BT: Professional
communication
      Writing
  RT: Syntactics

Granular computing
  BT: Programming
  RT: Concurrent computing
      Information processing
      Quantization (signal)

Granular superconductors
  BT: Superconducting materials
  RT: High-temperature
superconductors

Graph drawing
  BT: Data visualization
  RT: Computational complexity
      Graph theory
      Knowledge representation
      Mathematics computing
      Social sciences

Graph neural networks
  UF: GNN
      Graph neural nets
  BT: Graph theory
      Neural networks
  RT: Convolutional neural
networks
      Data visualization

   Deep learning
   Feature extraction
   Pattern classification
   Recommender systems
   Supervised learning

Graph theory
- BT: Combinatorial mathematics
   Mathematics
- RT: Ant colony optimization
   Belief propagation
   Circuit topology
   Graph drawing
   Topology
- NT: Bipartite graph
   Conditional random fields
   Directed acyclic graph
   Directed graphs
   Graph neural networks
   Optimal matching
   Reachability analysis
   Shortest path problem
   Tree graphs

Graphene
- BT: Carbon
- NT: Graphene devices

Graphene devices
- BT: Graphene
- RT: Field effect transistors
   Flexible electronics
   Molecular electronics
   Nanoelectronics

Graphical models
- BT: Modeling

Graphical user interfaces
- UF: GUI
   Graphic user interfaces
- BT: Product development
   User interfaces
- NT: Avatars

Graphics
- BT: Design methodology
- RT: Art
   Displays
   Technical drawing
- NT: Animation
   Character generation
   Computer graphics
   Engineering drawings
   Layout

   Shape
   Symbols
   Virtual reality
   Visualization

Graphics processing units
- UF: GPU
   VPU
- BT: Program processors
- RT: AI accelerators
   Computer graphics
   Hardware acceleration

Graphite
- UF: Plumbago
- BT: Carbon
- RT: Lead

Grasping
- BT: Haptic interfaces

Gratings
- UF: Optical gratings
   Transient gratings
- BT: Periodic structures
- RT: Optical devices

Gravitational waves
- BT: Astronomy
   Gravity

Gravity
- UF: Gravitational force
- BT: Force
- RT: Force measurement
- NT: Gravitational waves

Gravity measurement
- UF: Gravimeter
   Gravitometer
- BT: Force measurement
- RT: Astrophysics
   Geophysical measurements

Gray-scale
- UF: Grayscale
- BT: Image processing

Greedy algorithms
- BT: Computation theory

Green buildings
- BT: Construction
   Green products
- RT: Environmental factors

Page 182

Green design

Green cleaning
BT: Green products

Green computing
BT: Computer applications
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 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 methods
UF: Green function
Green's function
Green's functions
BT: Modeling
RT: Failure analysis
Materials reliability

Greenhouse effect
UF: Greenhouse gas
BT: Infrared heating
RT: Carbon emissions
Carbon footprint
Carbon sequestration
Environmental factors
Global warming
Low-carbon economy
Pollution control

Greenhouses
BT: Agriculture
Production facilities
RT: Crops

Grey matter
UF: Gray matter
BT: Central nervous system

Grid computing
UF: Grid maze
BT: Metacomputing
RT: Cloud computing

Grinding machines
BT: Machine tools

Grippers
UF: Microgrippers
Worms
BT: Materials handling equipment
RT: End effectors
Loading
Soft robotics

Ground penetrating radar
UF: GPR
Ground-penetrating radar
BT: Imaging
Radar
RT: Buried object detection
Radar detection
Radar imaging
Synthetic aperture radar
Ultra wideband radar

Ground support
UF: Aerospace ground equipment
Aerospace ground services
BT: Aerospace control
RT: Aircraft
Military equipment
Missiles
Navigation
Rockets
Space vehicles

Grounding
UF: earthing
BT: Electrical safety
RT: Circuit stability
Electric shock
Fault currents

Power system protection
Protection

Group technology
BT: Production
RT: Product design
Production control

GSM
UF: Global System for Mobile Communications
BT: Cellular technology
Wireless communication
RT: Dual band
Roaming
NT: GSM-R

GSM-R
UF: GSM-Railway
BT: GSM
Railway communication

Guidelines
BT: Standardization
RT: IEEE publishing
Publishing

Gunn devices
UF: Transferred electron devices
BT: Semiconductor devices

Guns
BT: Weapons

Gunshot detection systems
BT: Geographic information systems
Sensor systems

Gynecology
UF: Gynaecology
BT: Medical specialties

Gyrators
BT: Active circuits
RT: Active inductors
Ferrite devices

Gyromagnetism
BT: Magnetics
RT: Faraday effect
Ferrites
Gyrotropism

Gyroscopes
UF: Gyros
Non-gyroscopes
Nongyroscopes
BT: Level control
RT: Laser applications
Ring lasers

Gyrotrons
BT: Masers
RT: Electron beams

Gyrotropism
BT: Magnetooptic effects
RT: Faraday effect
Gyromagnetism

H infinity control
UF: H-infinity control
BT: Optimization methods
RT: Closed loop systems
Control systems
Intelligent control
Optimal control

Hafnium
UF: Hf
BT: Chemical elements
Metals
RT: Nuclear physics
NT: Hafnium compounds

Hafnium compounds
BT: Hafnium
RT: Alloying
NT: Hafnium oxide

Hafnium oxide
BT: Hafnium compounds

Hair
BT: Integumentary system
NT: Eyebrows
Eyelashes
Hair follicle

Hair follicle
BT: Hair

Half-duplex system
UF: HDX
Half duplex system
Semi-duplex systems
BT: Duplex communication systems

Hall effect
UF: Hall mobility
BT: Magnetoelectric effects
RT: Hall effect devices

Hall effect devices
BT: Semiconductor devices
RT: Hall effect

Ham radios
BT: Radio communication equipment

Hamming distances
BT: Information theory

Hamming weight
BT: Information theory

Hand tools
BT: Tools
RT: Machine tools

Handover
BT: Communication switching
Data transfer
RT: Cellular networks
Communication system signaling
Satellite communication

Handwriting recognition
UF: Signature detection
Signature verification
Written character recognition
Written characters
Written-character recognition
BT: Identification of persons
Pattern recognition
RT: Biometrics (access control)
NT: Forgery

Haptic interfaces
UF: Haptic systems
Haptics
BT: Computer interfaces
RT: Braille
Modeling
Touch sensitive screens
NT: Data gloves
Force feedback
Grasping
Tactile Internet

Hard disks
UF: Hard disc drives
Hard discs
Hard disk drives
Hard-disc drives
Hard-disk drives
BT: Magnetic memory
RT: Giant magnetoresistance

Hardware
UF: Computer hardware
BT: Computers and information processing
RT: Firewalls (computing)
Ports (computers)
NT: Hardware acceleration
Hardware security
Input devices
Open source hardware
Reconfigurable devices
Wireless access points

Hardware acceleration
UF: 3D accelerators
Accelerated computing
Cryptographic accelerators
Hardware accelerators
BT: Computer performance
Hardware
RT: Central Processing Unit
Graphics processing units

Hardware design languages
UF: HDL
HDVL
Hardware description languages
IEEE 1364
BT: Computer languages
RT: Design automation
NT: VHDL

Hardware security
UF: Security of hardware
BT: Hardware
Security
RT: Communication system security
Computer crime
Computer security
Information security
Mobile security
Network security

Physical layer security
Power system security
Security management

Hardware-in-the-loop simulation
UF: HIL simulation
BT: Simulation
RT: Aerospace control
Control engineering
computing
Control system synthesis
Embedded systems
Real-time systems
Testing
Vehicle dynamics

Harmonic analysis
UF: Harmonics
BT: Mathematics
Signal analysis
RT: Fast Fourier transforms
Fourier transforms
Spectral analysis
Wavelet transforms

Harmonic distortion
BT: Nonlinear distortion
RT: Power conversion
harmonics
NT: Harmonics suppression
Total harmonic distortion

Harmonic filters
BT: Filters

Harmonics suppression
BT: Harmonic distortion

Hash functions
BT: Algorithms
RT: Cryptography
Encoding
NT: Cryptographic hash
function

Hate speech
BT: Speech

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

Hazards
BT: Safety
RT: Contamination
Explosion protection
Landslides
Occupational stress
Pest control
Rescue robots
Working environment noise
NT: Biohazards
Chemical hazards
Explosions
Fires
Flammability
Floods
Hazardous areas
Hazardous materials
Toxicology

HbbTV Standards
BT: ETSI Standards
RT: Digital TV
TV

HDTV
UF: ATV
Advanced TV
EDTV
Extended definition TV
High definition television
High-definition TV
IDTV
Improved definition TV
BT: Digital TV
NT: UHDTV

Head
BT: Body regions
RT: Auditory system

Brain
Visual systems
NT: Cranium
Ear
Faces
Forehead
Lips
Mouth
Nose
Scalp
Skull

Head-mounted displays
UF: Head-worn displays
Helmet mounted displays
BT: Displays
Human computer
interaction

Head-up displays
UF: Heads up displays
BT: Displays
Human computer
interaction

Headphones
UF: Earphones
Head sets
Headsets
BT: Audio systems

Health and safety
BT: Safety
RT: Environmental factors
NT: Occupational health
Occupational safety
Personal protective
equipment

Health information management
BT: Medical services

Hearing aids
BT: Sensory aids
RT: Auditory system
Speech enhancement

Heart
BT: Cardiovascular system
RT: Cardiology
NT: Cardiac function
Fetal heart
Heart rate
Heart valves
Heart ventricles

Heart beat
UF: Heartbeat
BT: Heart rate
RT: Arrhythmia

Heart rate
UF: HR
BT: Heart
NT: Fetal heart rate
Heart beat
Heart rate detection
Heart rate interval
Heart rate measurement
Heart rate variability

Heart rate detection
BT: Heart rate

Heart rate interval
BT: Heart rate

Heart rate measurement
BT: Heart rate
RT: Phonocardiography

Heart rate variability
UF: HRV
BT: Heart rate

Heart valves
UF: Aortic semilunar valves
Atrioventricular valves
Bicuspid valves
Mitral valves
Pulmonary semilunar
valves
Semilunar valves
Tricuspid valves
BT: Heart

Heart ventricles
BT: Heart

Heat engines
BT: Engines
NT: Steam engines
Stirling engines

Heat maps
BT: Data visualization

Heat pipes
BT: Heating systems
RT: Cooling
Heat transfer

JULY 2023 IEEE Thesaurus

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
	Thermomechanical processes
NT:	Annealing
	Calcination

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
NT:	Boilers
	Cogeneration
	District heating
	Electromagnetic heating
	Heat pipes
	Heat recovery
	Induction heating
	Infrared heating
	Resistance heating
	Solar heating
	Space heating
	Thermal energy
	Trigeneration
	Water heating

Heavily-tailed distribution
UF:	Heavily tailed distribution
BT:	Probability distribution

Hebbian theory
UF:	Hebb's methods
	Hebb's rule
	Hebbian learning
	Hebbian principle
BT:	Artificial neural networks

Helical antennas
BT:	Antennas
RT:	Electromagnetic waveguides
	Telecommunications
	Transmission lines
	VHF circuits
	Waveguide components

Helicopters
BT:	Aircraft
RT:	Military systems
NT:	Quadrotors

Helium
BT:	Chemical elements
	Gases

Hemodynamics
UF:	Hemorheology
BT:	Blood flow

Hemorrhaging
UF:	Bleeding
	Haemorrhaging
BT:	Medical conditions
RT:	Blood flow

HEMTs
UF:	Heterostructure FETs
	High electron mobility transistors
	High electron-mobility transistors
	High-electron mobility transistors
	High-electron-mobility transistors

BT: Field effect transistors
RT: MODFETs
NT: D-HEMTs
           DH-HEMTs
           PHEMTs
           mHEMTs

Hepatectomy
BT: Medical treatment
           Surgery

Hermetic seals
BT: Seals

Hetero-nanocrystal memory
BT: Single electron memory

Heterogeneous networks
BT: Computer networks

Heterojunction bipolar transistors
UF: HBT
BT: Transistors
RT: Heterojunctions
           Integrated optoelectronics
           Semiconductor devices
NT: Double heterojunction bipolar transistors

Heterojunctions
BT: Junctions
RT: Heterojunction bipolar transistors

Heuristic algorithms
UF: Dynamic algorithms
BT: Algorithms
RT: Metaheuristics

Hidden Markov models
BT: Modeling
RT: Markov processes
           Pattern recognition

Hierarchical systems
BT: Systems engineering and theory
NT: Multilevel systems

High definition video
UF: HD
           HD video
BT: Video recording
NT: Ultra-high definition video

High dynamic range
UF: Expanded dynamic range
           Extended dynamic range
           Wide dynamic range
BT: Dynamic range
RT: Photography

High efficiency video coding
UF: HEVC
           High-efficiency video coding
BT: Video coding
RT: MPEG 4 Standard

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 intensity discharge lamps
BT: Discharge lamps
RT: Arc discharges
           Electrical ballasts
           Emergency lighting
           Light sources
           Lighting
           Lighting control

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
BT: Microwave generation

High-frequency transformers
UF: High frequency transformers
BT: Transformers

High-k dielectric materials
UF: High K
High-K
BT: Dielectric materials
RT: Semiconductor materials

High-k gate dielectrics
BT: Dielectric constant
Semiconductor device manufacture

High-resolution imaging
UF: High resolution imaging
BT: Image resolution

High-resolution transmission electron microscopy
UF: HRTEM
BT: Transmission electron microscopy

High-speed electronics
UF: High speed electronics
High speed techniques
High-speed techniques
BT: Communications technology
NT: High-speed integrated circuits
High-speed networks
Ultrafast electronics

High-speed integrated circuits
UF: High speed integrated circuits
BT: High-speed electronics
RT: Integrated circuit technology
Microcontrollers

High-speed networks
UF: High speed networking
High speed networks
High-speed networking
BT: High-speed electronics
RT: Long Term Evolution

High-speed optical techniques
UF: High speed optical methods
High speed optical techniques
High-speed optical methods
BT: Optical design techniques
RT: Laser pulses
Light fidelity

High-speed rail transportation
UF: High speed rail transportation
BT: Rail transportation
RT: Magnetic levitation vehicles

High-temperature superconductors
UF: HTS
High T_c superconductors
High Tc superconductors
High temperature superconductors
High-T_c superconductors
High-Tc 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

Hilbert space
- BT: Euclidean distance

Hindbrain
- UF: Rhombencephalon
- BT: Brain
- RT: Forebrain
  - Midbrain

Hip
- BT: Extremities

Hippocampus
- BT: Temporal lobe
- RT: Alzheimer's disease

Histograms
- BT: Statistics

Histopathology
- UF: Histology
- BT: Pathology

History
- BT: Humanities

Hobbing machines
- BT: Machining

Holey fibers
- UF: Holey fibres
- BT: Photonic crystal 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
  - Image reconstruction
  - Laser applications
  - Photorefractive materials

Home appliances
- UF: Appliances
  - Domestic appliances
  - Domestic induction appliances
  - Household appliances
- BT: Consumer products
- NT: Gas appliances
  - Microwave ovens
  - Ovens
  - Refrigerators
  - Washing machines

Home automation
- UF: Home networks
- BT: Consumer electronics
- RT: Automation
  - Fall detection
  - Service robots
- NT: Portable media players
  - Refrigerators
  - Smart homes
  - Washing machines

Home computing
- BT: Consumer electronics
- RT: Computers and information processing
  - Firewire

Microcomputers

Homeostasis
  BT: Biology
         Control systems

Homomorphic encryption
  UF: Privacy perserving
computation
         Privacy-perserving
computation
  BT: Encryption
  RT: Privacy
         Public key cryptography

Homopolar machines
  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 neural networks
  UF: Hopfield networks
  BT: Recurrent neural networks

Horn antennas
  BT: Antennas

Horses
  BT: Animals

Horticulture
  BT: Industries
  NT: Hydroponics

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
         Secondary generated hot
electron injection
         Substrate hot electron
injection

Hot carriers
  BT: Charge carriers
  RT: Semiconductor devices
  NT: Hot carrier effects
         Hot carrier injection

HTML
  BT: Markup languages

Huffman coding
  BT: Data compression
         Entropy coding
  RT: Algorithms
         Communication systems
         Multimedia communication
         Multimedia databases
         Multimedia systems
         Symbols

Human activity recognition
  UF: HAR
         Human action recognition
         Human motion recognition
  BT: Activity recognition
  RT: Biomechanics
         Body area networks
         Body sensor networks
         Fall detection
         Image motion analysis
         Image recognition
         Learning (artificial
intelligence)
         Pattern recognition

Human anatomy
  BT: Anatomy

Human augmentation
  UF: Human enhancement
  BT: Augmented reality
         Human factors

Human computer interaction
  UF: HCI

	Human machine interaction
	Human-centered computing
	Human-computer
interaction	
	Human-computer interfaces
	Human-machine interaction
	User friendliness
BT:	User interfaces
RT:	Adaptive learning
	Cyber-physical systems
	Digital humans
	Fifth Industrial Revolution
	Human factors
	Human-vehicle systems
	Immersive audio
	Man-machine systems
	User experience
NT:	Affective computing
	Chatbots
	Extended reality
	Gaze tracking
	Head-mounted displays
	Head-up displays
	Human in the loop
	Immersive experience
	Telepresence
	Telexistence

Human factors

UF:	Human factors engineering
	Stress (psychological)
BT:	Systems, man, and
cybernetics	
RT:	Aerospace biophysics
	Affective computing
	Androids
	Anthropometry
	Behavioral sciences
	Chatbots
	Cognitive science
	Digital humans
	Digital intelligence
	Ergonomics
	Human computer
interaction	
	Man-machine systems
	Persuasive systems
	Problem-solving
	Productivity
	Social engineering
(security)	
	Telerobotics
	User experience
NT:	Anthropomorphism
	Human augmentation

	Human image synthesis
	Human intelligence
	Mental health
	Pedestrians
	Technology acceptance
model	

Human image synthesis

BT:	Human factors
	Image synthesis
RT:	Films
	Photorealism

Human immunodeficiency virus

UF:	HIV
BT:	Diseases
RT:	Acquired immune
deficiency syndrome	

Human in the loop

UF:	HITL
	Human-in-the-loop
BT:	Human computer
interaction	
	Simulation
RT:	Computer simulation
	Modeling

Human intelligence

BT:	Cognitive science
	Human factors
NT:	Digital intelligence
	Hyper-intelligence

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

JULY 2023 IEEE Thesaurus

Human voice
BT: Speech processing

Human-robot interaction
UF: Human robot interaction
BT: User interfaces
RT: Admittance control
         Tactile Internet
         Wearable robots
NT: Social robots

Human-vehicle systems
UF: Human-vehicle interaction
BT: User interfaces
RT: Human computer interaction

Humanitarian activities
UF: Humanitarian aid
BT: IEEE Corporate activities

Humanities
UF: Dance
         Drama
         Humanities data processing
BT: Education
RT: Anthropology
         Computer applications
         Journalism
         Museums
         Philosophical considerations
NT: Archeology
         Art
         History
         Music
         Natural languages
         Social sciences

Humanoid robots
UF: Humanoid robotics
         Humanoids
BT: Robots
RT: Mobile robots
         Social robots

Humidity
BT: Meteorology
RT: Humidity control
         Humidity measurement
         Trees - insulation
NT: Humidity effects

Humidity control
BT: Moisture control

RT: Humidity
         Humidity effects

Humidity effects
BT: Humidity
RT: Humidity control
         Moisture control

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 electric vehicles
UF: HEV
         Hybrid automobiles
         Hybrid cars
BT: Electric vehicles
RT: 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
         Hybrid fibre coaxial cables
BT: 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: Computer aided instruction
Learning systems
RT: Courseware
Distance learning
Education
Educational courses
Educational institutions
Internet
Mobile learning

Hybrid power systems
BT: Power systems
RT: Distributed power generation
Photovoltaic systems

Hydraulic actuators
BT: Actuators
RT: Hydraulic drives

Hydraulic diameter
BT: Fluid flow
NT: Microchannels

Hydraulic drives
BT: Drives
RT: Hydraulic actuators

Hydraulic equipment
BT: Hydraulic systems
RT: Water pumps
NT: Valves

Hydraulic fluids
UF: Hydraulic liquids
Hydraulic oils
BT: Fluids
Hydraulic systems
RT: Production materials

Hydraulic systems
UF: Hydraulics
BT: Machinery
RT: Fluid flow
Irrigation

NT: Electrohydraulics
Hydraulic equipment
Hydraulic fluids

Hydraulic turbines
BT: Turbines
RT: Hydroelectric power generation

Hydrocarbon reservoirs
BT: Hydrocarbons

Hydrocarbons
UF: Oil sands
Oil shale
BT: Organic chemicals
Petroleum
RT: Natural gas
NT: Hydrocarbon reservoirs

Hydrodynamics
UF: Smoothed particle hydrodynamics
BT: Dynamics
Mechanical factors
RT: Fluid dynamics
Fluid flow
Microfluidics
Water
NT: Electrohydrodynamics
Magnetohydrodynamics

Hydroelectric power generation
UF: Hydroelectric power
Hydroelectricity
Hydropower
Hyrdroelectric
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

Hydrogels
BT: Polymers
RT: Drug delivery
Tissue engineering

JULY 2023 IEEE Thesaurus

Hydrogen
 BT: Chemical elements
  Gases
 RT: Water splitting
 NT: Deuterium

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
 NT: Fracking

Hydrology
 BT: Fluid flow
 RT: Water
  Wetlands
 NT: Floods
  Hydrologic measurements
  Hydrological techniques
  Ocean waves
  Stormwater
  Watersheds

Hydrolysis
 BT: Chemical reactions
 RT: Biochemistry
  Biotechnology
  Catalysis
  Enzymes
  Solvation

Hydrometers
 BT: Density measurement

Hydroponics
 BT: Horticulture

Hyper-intelligence
 UF: Super intelligence
  Superintelligence
 BT: Human intelligence

Hyper-intelligent systems
 UF: Hyper intelligent systems
  Hyperintelligent systems
 BT: Intelligent systems

Hypercubes
 BT: Multiprocessor interconnection
 RT: Computer networks

Hypermedia
 BT: Multimedia communication

Hyperparameter optimization
 BT: Machine learning

Hypersonic vehicles
 BT: Vehicles
 RT: Aerospace control
  Missiles
  Space vehicles

Hyperspectral imaging
 BT: Hyperspectral sensors

Hyperspectral sensors
 BT: Remote sensing
 RT: Geologic measurements
  Military aircraft
  Military communication
  Military satellites
  Mining industry
  Submillimeter wave measurements
  Wavelength measurement
 NT: Hyperspectral imaging

Hypertension
 BT: Blood pressure
  Medical conditions
 RT: Hypotension

Hypertext systems
 UF: Hyperlinks
 BT: Computer interfaces
  Information retrieval
 RT: Database systems

JULY 2023 IEEE Thesaurus

Hyperthermia
BT:	Medical conditions
	Medical treatment
RT:	Electromagnetic heating

Hypodermic needles
UF:	Hyperdermic needles
BT:	Biomedical equipment

Hypotension
UF:	Low blood pressure
BT:	Blood pressure
RT:	Hypertension

Hypothalamus
BT:	Brain
RT:	Central nervous system

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

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

Identification of persons
UF:	Person identification
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
NT:	Federated identity

Identity-based encryption
UF:	ID-based encryption
	Identity-based cryptography
BT:	Public key cryptography

IEC
UF:	International electrotechnical commission
BT:	Standards organizations
RT:	Communication standards
	IEC Standards
	Standardization
	Standards
NT:	Moving Pictures Experts Group

IEC Standards
UF:	IEC publications
BT:	Standards publications
RT:	Common Information Model (electricity)
	IEC
NT:	MPEG standards

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
Wireless access points
Wireless communication
Wireless fidelity
NT: IEEE 802.11ax Standard
IEEE 802.11e Standard
IEEE 802.11g Standard
IEEE 802.11n Standard
IEEE 802.11p Standard

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
Computer networks
Modulation
Protocols
Radio communication
Wireless LAN

IEEE 802.11n Standard
UF: 802.11n
BT: IEEE 802.11 Standard
RT: Antennas

Bluetooth
Communication channels
Computer networks
MIMO communication
Modulation
Protocols
Radio communication
Wireless LAN

IEEE 802.11p Standard
BT: IEEE 802.11 Standard
RT: Intelligent vehicles
Wireless Access in Vehicular Environments
Wireless communication
Wireless networks

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

JULY 2023 IEEE Thesaurus

IEEE 802.3 Standard
 UF: 802.3
 BT: IEEE 802 LAN-MAN
Standards
 RT: Communication switching
 Computer networks
 Ethernet
 Local area networks
 Packet switching
 Switches
 Wide area networks

IEEE activities
 UF: Activities
 IEEE Volunteer activities
 BT: IEEE organization
 RT: IEEE Boards
 NT: IEEE Awards activities
 IEEE Conference activities
 IEEE Corporate activities
 IEEE Educational activities
 IEEE Intersociety activities
 IEEE Local activities
 IEEE Member and
Geographic activities
 IEEE Professional activities
 IEEE Standards activities
 IEEE Technical activities
 IEEE United States
activities
 IEEE publishing

IEEE Associate Members
 BT: IEEE members

IEEE Awards activities
 BT: IEEE activities
 RT: Awards
 IEEE Educational activities
 IEEE Fellows
 IEEE Foundation
 IEEE Professional activities
 IEEE Technical activities
 IEEE United States
activities
 NT: IEEE Corporate awards
 IEEE Society awards
 IEEE Standards awards
 National Society Agreement
awards

IEEE Boards
 BT: IEEE entities
 RT: IEEE activities

IEEE books
 BT: IEEE publications

IEEE bylaws
 BT: IEEE governance

IEEE catalogs
 BT: IEEE products

IEEE Center for the History of Electrical Engineering
 UF: IEEE History Center
 BT: IEEE entities

IEEE Chapters
 BT: IEEE entities

IEEE Collabratec
 BT: IEEE products

IEEE Committees
 BT: IEEE entities

IEEE Communities
 BT: IEEE entities

IEEE Computer Society Press
 BT: IEEE entities
 RT: IEEE publishing

IEEE Conference activities
 BT: IEEE activities

IEEE conference proceedings
 BT: IEEE publications

IEEE Constitution
 BT: IEEE governance

IEEE Corporate activities
 BT: IEEE activities
 RT: IEEE Corporate awards
 IEEE Professional activities
 IEEE staff
 Legal factors
 NT: Humanitarian activities

IEEE Corporate awards
 BT: IEEE Awards activities
 RT: IEEE Corporate activities
 NT: IEEE Medals
 IEEE Recognitions
 IEEE Technical Field
awards

IEEE Corporate recognitions
BT: IEEE Recognitions

IEEE Councils
BT: IEEE entities

IEEE directories
BT: IEEE publications

IEEE Educational activities
BT: IEEE activities
RT: IEEE Awards activities
        IEEE Foundation
        IEEE Professional activities

IEEE educational products
BT: IEEE products

IEEE entities
BT: IEEE organization
NT: IEEE Boards
        IEEE Center for the History of Electrical Engineering
        IEEE Chapters
        IEEE Committees
        IEEE Communities
        IEEE Computer Society Press
        IEEE Councils
        IEEE Foundation
        IEEE Press
        IEEE Regions
        IEEE Sections
        IEEE Societies

IEEE Fellows
BT: IEEE members
RT: IEEE Awards activities

IEEE Foundation
BT: IEEE entities
RT: IEEE Awards activities
        IEEE Educational activities

IEEE governance
BT: IEEE organization
NT: IEEE Constitution
        IEEE bylaws
        IEEE policy and procedures
        IEEE staff

IEEE indexing
BT: IEEE organization
NT: Awards
        Book 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
RT: Awards

IEEE Member and Geographic activities
BT: IEEE activities

IEEE members
BT: IEEE organization
NT: IEEE Associate Members
        IEEE Fellows
        IEEE Life Members
        IEEE Senior Members

IEEE merchandise
BT: IEEE products

IEEE news
UF: Announcements
BT: IEEE organization
NT: IEEE Society news

IEEE newsletters
BT: IEEE publications

IEEE online publications
UF: Electronic publications
        IEEE on-line publications
BT: IEEE publications

IEEE organization
NT: IEEE activities
               IEEE entities
               IEEE governance
               IEEE indexing
               IEEE members
               IEEE news
               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 products
BT: IEEE organization
NT: IEEE Collabratec
               IEEE Xplore
               IEEE catalogs
               IEEE educational products
               IEEE merchandise
               IEEE publications

IEEE Professional activities
UF: Non-united-states activities
BT: IEEE activities
RT: IEEE Awards activities
               IEEE Corporate activities
               IEEE Educational activities
               IEEE Intersociety activities
               IEEE Technical activities
               IEEE United States activities

IEEE publications
BT: IEEE products
NT: IEEE books
               IEEE conference proceedings
               IEEE directories
               IEEE journals
               IEEE magazines
               IEEE newsletters
               IEEE online publications
               IEEE transactions
               Notice of Violation

IEEE publishing
BT: IEEE activities

RT: Guidelines
               IEEE Computer Society Press
               IEEE Press

IEEE Recognitions
BT: IEEE Corporate awards
NT: IEEE Corporate recognitions
               IEEE Prize Paper awards
               IEEE Service awards
               IEEE Staff recognitions

IEEE Regions
BT: IEEE entities

IEEE Sections
BT: IEEE entities

IEEE Senior Members
BT: IEEE members

IEEE Service awards
BT: IEEE Recognitions

IEEE Societies
BT: IEEE entities

IEEE Society awards
BT: IEEE Awards activities

IEEE Society news
BT: IEEE news

IEEE staff
UF: IEEE employees
BT: IEEE governance
RT: IEEE Corporate activities

IEEE Staff recognitions
BT: IEEE Recognitions

IEEE Standards
BT: Standards publications
RT: ANSI Standards
               IEEE Standards activities
NT: AIEE Standards
               IEEE 1394 Standard
               IEEE 802 LAN-MAN Standards
               IRE Standards

IEEE Standards activities
UF: IEEE Standards development

BT:	IEEE activities
RT:	IEEE Standards

IEEE Standards Association
BT:	Standards organizations

IEEE Standards awards
BT:	IEEE Awards activities

IEEE Technical activities
BT:	IEEE activities
RT:	IEEE Awards activities
	IEEE Professional activities

IEEE Technical Field awards
BT:	IEEE Corporate awards

IEEE transactions
BT:	IEEE publications

IEEE United States activities
UF:	US activities
BT:	IEEE activities
RT:	IEEE Awards activities
	IEEE Professional activities

IEEE Xplore
BT:	IEEE products
RT:	Information services
NT:	IEL

IEL
UF:	IEEE/IEE Electronic Library
BT:	IEEE Xplore

Ignition
BT:	Chemical reactions
	Internal combustion engines
	Nuclear physics
	Plasma materials processing

II-VI semiconductor materials
BT:	Semiconductor materials

III-V semiconductor materials
BT:	Semiconductor materials
RT:	Aluminum gallium nitride

IIR filters
UF:	Infinite impulse response filters
BT:	Filters

Image analysis
UF:	Scene analysis
BT:	Image processing
RT:	Image recognition
	Machine vision
NT:	Image classification
	Image motion analysis
	Image quality
	Image sequence analysis
	Image texture analysis
	Object detection
	Subtraction techniques

Image annotation
UF:	Image tagging
	Linguistic indexing
	Video annotation
BT:	Image processing
RT:	Feature extraction
	Image classification
	Image retrieval
	Learning (artificial intelligence)
	Metadata
	Video signal processing

Image augmentation
BT:	Image transformation
RT:	Convolutional neural networks
	Data augmentation
	Image classification
	Machine learning

Image capture
BT:	Image processing
RT:	Cameras
	Computer vision
	Image sensors
	Photography

Image classification
BT:	Image analysis
RT:	Deep learning
	Image annotation
	Image augmentation
NT:	Scene classification

Image coding
UF:	Image compression
BT:	Image processing
RT:	Image communication
	Image databases
	Image storage

MPEG standards
Rate distortion theory
Steganography
Transcoding
Vector quantization
Video codecs
Video coding

Image color analysis
UF: Image colour analysis
BT: Image processing
RT: Color gamut
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 converters
BT: Imaging
RT: Frequency conversion
Image sensors
NT: Image intensifiers

Image databases
BT: Database systems
Databases
RT: Geographic information systems
Image coding
Image storage
Video sequences
NT: Image retrieval

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 detection
UF: Edge detection
Image edge analysis
BT: Image recognition
RT: Corner detection
Feature extraction
Image segmentation
License plate recognition
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

Image forensics
UF: Forensic photography
BT: Forensics
Photography
RT: Image processing
Law enforcement
Visualization

Image fusion
BT: Image processing

Image intensifiers
BT: Image converters
RT: Frequency conversion
Image enhancement
Image sensors

Image matching
UF: Appearance matching
Fingerprint images
BT: Pattern matching
RT: Fingerprint recognition
Image recognition
Object detection
Object recognition
Stereo vision

Visual information retrieval

Image morphing
    BT: Image transformation
            Morphological operations

Image motion analysis
    BT: Image analysis
    RT: Fall detection
            Human activity recognition
            Motion capture
            Motion detection
            Object tracking
            Robotics and automation
    NT: Video tracking

Image preprocessing
    BT: Image processing

Image processing
    UF: Picture processing
    BT: Computers and information processing
    RT: Authentication
            Diffusion processes
            Gabor filters
            Image forensics
            Multidimensional signal processing
            Optical projectors
            Reconstruction algorithms
            Time-frequency analysis
            Video sequences
            Vision sensors
    NT: Active shape model
            Blob detection
            Corner detection
            Feature detection
            Feature extraction
            Fiducial markers
            Geophysical image processing
            Gray-scale
            Image analysis
            Image annotation
            Image capture
            Image coding
            Image color analysis
            Image decomposition
            Image denoising
            Image enhancement
            Image filtering
            Image fusion
            Image preprocessing
            Image recognition

Image reconstruction
Image registration
Image representation
Image resolution
Image restoration
Image sampling
Image segmentation
Image sequences
Image stitching
Image synthesis
Image texture
Image transformation
Machine vision
Morphological operations
Optical feedback
Pansharpening
Saliency detection
Smart pixels
Spatial coherence
Structure from motion
Table lookup
Text detection
Thresholding (Imaging)

Image quality
    BT: Image analysis
    RT: Pansharpening
            Spatial resolution

Image recognition
    BT: Image processing
    RT: Emotion recognition
            Face recognition
            Fall detection
            Feature extraction
            Human activity recognition
            Image analysis
            Image matching
            License plate recognition
            Machine vision
            Object recognition
            Video signal processing
    NT: Image edge detection

Image reconstruction
    BT: Image processing
    RT: Holography
            Image denoising
            Inverse problems
            Magnetic resonance imaging
            Pattern clustering
            Tomography

JULY 2023 IEEE Thesaurus

Image registration
BT: Image processing

Image representation
BT: Image processing
NT: Digital representation

Image resolution
BT: Image processing
RT: Image denoising
         Visual communication
NT: High-resolution imaging
         Spatial resolution
         Superresolution

Image restoration
UF: Image deblurring
BT: Image processing
RT: Distortion
         Image denoising
         Image enhancement

Image retrieval
BT: Image databases
RT: Image annotation

Image sampling
BT: Image processing

Image segmentation
BT: Image processing
RT: Conditional random fields
         Deep learning
         Image edge detection
         Image filtering
         Mixture models
         Object tracking
         Text detection
NT: Semantic segmentation

Image sensors
UF: Sensors (image)
BT: Imaging
RT: Cameras
         Endoscopes
         Image capture
         Image converters
         Image intensifiers
         Motion capture
         Motion detection
         Night vision
         Optical sensors
         Photodetectors
         Robot vision systems
         Wearable sensors

NT: Active pixel sensors
         CCD image sensors
         CMOS image sensors
         Charge-coupled image
sensors
         Infrared image sensors

Image sequence analysis
BT: Image analysis

Image sequences
BT: Image processing

Image skeletonization
BT: Image transformation
RT: Image thinning

Image stitching
BT: Image processing

Image storage
BT: Imaging
RT: Image coding
         Image databases
         Photography
         Video recording

Image synthesis
UF: Image generation
BT: Image processing
RT: Rendering (computer
graphics)
NT: Human image synthesis

Image texture
BT: Image processing

Image texture analysis
BT: Image analysis

Image thinning
BT: Image transformation
         Morphological operations
RT: Image skeletonization

Image transformation
UF: Image transforming
BT: Image processing
RT: Morphological operations
NT: Image augmentation
         Image morphing
         Image skeletonization
         Image thinning

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
Magneto electrical 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

Immersion cooling
BT: Cooling

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
BT: Anatomy
RT: Biological control systems
Biology

Immunology
Immunotherapy
Microorganisms
Sepsis
NT: Antibodies
Artificial immune systems

Immunity testing
BT: Electromagnetic compatibility
Electronic equipment testing
Electrostatic interference
RT: Anechoic chambers
Electromagnetic interference
Open area test sites

Immunology
BT: Medical specialties
RT: Immune system
NT: Antigens

Immunotherapy
UF: Biological therapy
BT: Medical treatment
RT: Immune system
Monoclonal antibodies

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
BT: Electric variables
RT: Circuits
Equalizers
Impedance
NT: Baluns

Impedance measurement
UF: Impedance methods
Impedance performance

BT: Electric variables measurement
RT: Admittance measurement
    Impedance
    Transmission line measurements

Impellers
BT: Machine components
RT: Blades
    Propellers
    Pumps

Impersonation attacks
BT: Communication system security

Implants
UF: Implantable biomedical devices
    Implantable devices
    Implantable electronics
BT: Biomedical equipment
NT: Auditory implants
    Brainstem implants
    Cochlear implants
    Microelectronic implants
    Neural implants

Impulse testing
BT: Testing
RT: Frequency response
    Insulation testing

Impurities
BT: Materials science and technology
RT: Contamination
NT: Semiconductor impurities

In vitro
BT: Medical services
NT: In vitro fertilization

In vitro fertilization
BT: In vitro

In vivo
BT: Medical services

In-memory computing
UF: IMC
    In memory computing
    In memory processing
    In-memory processing
BT: Memory management
RT: Buffer storage
    Cache memory

Incentive schemes
UF: Bonuses
    Merit pay
    Performance related pay
    Profit sharing schemes
BT: Human resource management
    Remuneration
RT: Appraisal
    Employee welfare
    Productivity

Incineration
UF: Afterburners
    Incinerators
    Refuse incineration
    Waste incineration
BT: Waste disposal
RT: Air pollution
    Ash
    Radioactive pollution
    Radioactive waste
    Radioactive waste disposal

Independent component analysis
BT: Numerical analysis
RT: Artificial intelligence
    Blind source separation
    Computer aided analysis
    Feature extraction
    Principal component analysis
    Signal processing

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 compounds
        Semiconductor materials

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: Indoor positioning systems
        Mobile communication
        Optical fiber communication
        Optical modulation
NT: Indoor environment

Indoor environment
BT: Indoor communication
NT: Indoor positioning systems

Indoor navigation
BT: Navigation
RT: Computer vision
        Global Positioning System
        Indoor positioning systems

Land mobile radio
Path planning
Radio navigation

Indoor positioning systems
BT: Indoor environment
RT: Indoor communication
        Indoor navigation

Indoor radio communication
UF: Indoor radio
        Indoor radio
communications
BT: Radio communication

Inductance
BT: Electric variables
RT: Coils
        Inductance measurement
        Inductors
        Transmission line theory

Inductance measurement
BT: Electric variables
measurement
RT: Inductance

Induction generators
BT: AC generators
        Induction machines
NT: Doubly fed induction
generators

Induction heating
BT: Heating systems
RT: Electromagnetic heating

Induction machines
BT: AC machines
        Rotating machines
NT: Induction generators
        Induction motors

Induction motor drives
BT: Induction motors

Induction motors
BT: AC motors
        Induction machines
        Motors
        Rotating machines
RT: Sensorless control
NT: Induction motor drives

Inductive charging
UF: Wireless charging

BT:	Energy exchange
	Power supplies
RT:	Wireless communication

Inductive coupling

BT:	Circuit theory
	Mutual coupling

Inductive power transmission

UF:	Inductive energy transfer
BT:	Electromagnetic induction
	Power transmission
RT:	Inductors
	Sensorless control
	Transformers

Inductive transducers

BT:	Transducers

Inductors

UF:	Chokes
	Reactors
BT:	Electronic components
RT:	Coils
	Electrical ballasts
	Inductance
	Inductive power transmission
	Magnetic cores
	Tunable circuits and devices
NT:	Active inductors
	Thick film inductors
	Thin film inductors

Industrial accidents

BT:	Accidents
RT:	Hazardous areas
	Occupational safety

Industrial communication

UF:	Organizational communication
BT:	Communication networks
	Industrial engineering
RT:	Business
	Organizational aspects

Industrial control

BT:	Industrial electronics
RT:	Assembly systems
	Computer numerical control
	Control system security

	Field buses
	Industrial engineering
	Industrial plants
	Manipulators
	Manufacturing automation
	Mobile robots
	Motor drives
	Programmable control
	Robots
NT:	Process control
	Production control

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
RT:	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
RT:	Industrial plants
	Manufacturing systems
NT:	Seaports

Industrial Internet of Things

UF:	IIOT
	Industrial IoT
BT:	Internet of Things
RT:	Machine-to-machine communications

JULY 2023 IEEE Thesaurus

Robotics and automation

Vocational training

Industrial plants
- UF: Plants (industrial)
- BT: Production facilities
- RT: Industrial control
- Industrial engineering
- Industrial facilities
- Industrial power systems
- Industries
- Manufacturing
- Paper mills
- Production systems

Industrial pollution
- BT: Pollution
- RT: Air pollution
- Industrial waste
- Land pollution
- Radioactive pollution
- Thermal pollution
- Water pollution

Industrial power systems
- UF: Commercial power systems
- BT: Power systems
- RT: Buildings
- Cogeneration
- Industrial plants
- Power distribution

Industrial psychology
- BT: Psychology
- RT: Employee welfare
- Human resource
management
- Productivity
- Psychometric testing

Industrial relations
- UF: Collective bargaining
- Industrial democracy
- Trade unions
- BT: Business
- RT: Equal opportunities

Industrial robots
- BT: Robots
- RT: Manufacturing automation

Industrial training
- BT: Training
- RT: Industrial engineering
- Multiskilling
- On the job training

Industrial waste
- BT: Waste materials
- RT: Effluents
- Industrial pollution
- Slurries
- Waste heat
- Wastewater
- NT: Ash
- Slag

Industries
- BT: Industry applications
- RT: Business
- Industrial plants
- NT: Agriculture
- Airline industry
- Architecture
- Beverage industry
- Chemical industry
- Coal industry
- Communication industry
- Computer industry
- Construction
- Construction industry
- Defense industry
- Electrical engineering
industry
- Entertainment industry
- Farming
- Financial industry
- Gas industry
- Horticulture
- Information industry
- Manufacturing industries
- Metals industry
- Mining industry
- Natural gas industry
- Petroleum industry
- Power industry
- Steel industry
- Sugar industry
- Textile technology
- Tourism industry
- Toy industry
- Transportation industry
- Wood industry

Industry applications
- NT: Accident prevention
- Chemical technology

Cryogenics
Electrochemical devices
Electrochemical processes
Electromechanical systems
Electrostatic devices
Electrostatic precipitators
Electrostatic processes
Engines
Environmental management

Food technology
High-temperature techniques

Industrial engineering
Industries
Inspection
Machinery
Manufacturing
Packaging
Paper technology
Production
Safety
Security
Wine industry

Inertial confinement
BT: Plasma confinement

Inertial navigation
BT: Navigation

Inertial sensors
BT: Sensors

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
   Fuzzy cognitive maps
   Gaussian processes
   Learning systems
NT: Belief propagation
   Fuzzy reasoning

Infinite horizon
BT: Optimal control
RT: Markov processes

Optimization methods

Influenza
BT: Diseases
   Viruses (medical)
RT: Epidemics
   Pandemics

Informatics
BT: Information processing
   Information systems
RT: Computational materials science
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
   Information technology
RT: Energy informatics
NT: Ambient assisted living

Information architecture
BT: Information systems
RT: Database systems
NT: Enterprise architecture management

Information entropy
BT: Information theory

Information exchange
BT: Data processing
   Information processing
RT: Border Gateway Protocol

Common Information Model (computing)

Common Information Model (electricity)

Information management
Information sharing
Ports (computers)
Tactile Internet

Information filtering
BT: Filtering
Information retrieval
NT: Information filters
Recommender systems

Information filters
UF: Web filters
BT: Information filtering
RT: Information retrieval
NT: Accesslists
Blocklists

Information geometry
BT: Geometry
RT: Probability

Information industry
BT: Industries

Information integrity
BT: Professional communication
RT: Cyber threat intelligence
Deepfakes
Fake news
Synthetic data

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
Enterprise architecture management

Information security

Information sharing
Knowledge transfer

Information processing
BT: Information systems
RT: Big Data
Business Process Execution Language

Business data processing
Data collection
Granular computing
Information sharing
Software as a service
Spectral efficiency
NT: Electronic healthcare
Informatics
Information exchange
Smart agriculture
Sonification

Information rates
UF: Throughput (communication systems)
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
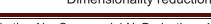Knowledge discovery
Persistent identifiers
Portals
Ranking (statistics)
Symbols
Triples (Data structure)
NT: Blogs
Content-based retrieval
Dimensionality reduction

Hypertext systems
Information filtering
Information rates
Music information retrieval
Online services
Search engines
Search methods
Social networking (online)
Tagging
Taxonomy
Terminology
Visual information retrieval
Vocabulary
Web sites

Information science
    BT: Professional communication
    NT: Quantum information science

Information security
    BT: Information management
           Security
    RT: Cyber threat intelligence
           Data protection
           Differential privacy
           Hardware security
           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: Dictionaries
           Document delivery
           Encyclopedias
           Libraries
           Teletext
           Videotex

Information sharing
    BT: Information management

    RT: Collaboration
           Cyber threat intelligence
           Information exchange
           Information processing
    NT: Data dissemination

Information systems
    BT: Professional communication
    RT: Big Data applications
           CD-ROMs
           Computers and information processing
           Database machines
           Extranets
           File systems
           Indexes
           Information resources
           Information technology
           Management information base
           Multimedia computing
           Office automation
           Strategic planning
           Technology acceptance model
    NT: Data systems
           Database systems
           Distributed information systems
           Identity management systems
           Informatics
           Information architecture
           Information management
           Information processing
           Management information systems
           Medical information systems

Information technology
    BT: Professional communication
    RT: Automation
           Biometrics (access control)
           Computer applications
           Information systems
    NT: Bring your own device
           Information age
           Information and communication technology
           Information representation
           Printing
           Semantic technology

Service computing
Telematics
Universal Serial Bus

Information theory
UF: Coding theory
Information-theoretic
Informationtheoretic
RT: Bandwidth
Code refractoring
Communication systems
Cybernetics
Cyclic redundancy check
Econophysics
Modulation coding
Quantum communication
Statistics
Teleportation
Viterbi algorithm
NT: Audio coding
Biological information theory
Channel coding
Codes
Communication channels
Decoding
Encoding
Error compensation
Genetic communication
Hamming distances
Hamming weight
Information entropy
Mutual information
Network coding
Rate distortion theory
Rate-distortion
Source coding
Speech coding
Technology acceptance model

Information-centric networking
UF: Content-centric networking
Information centric networking
Information centric networks
Information-centric networks
BT: Network architecture
RT: Telecommunication computing

Infrared detectors
BT: Radiation detectors

RT: Bolometers
Infrared surveillance
Motion detection
Photodetectors
Superconducting photodetectors
Wearable sensors

Infrared heating
BT: Heating systems
NT: Greenhouse effect

Infrared image sensors
BT: Image sensors

Infrared imaging
BT: Imaging
RT: Biomedical optical imaging
Functional near-infrared spectroscopy
Infrared surveillance
Optical imaging
Remote sensing
NT: Night vision

Infrared sensors
BT: Sensors

Infrared spectra
UF: IR Spectra
BT: Spectral analysis
RT: Functional near-infrared spectroscopy
Spectroscopy

Infrared surveillance
BT: Surveillance
RT: Infrared detectors
Infrared imaging

Inhibitors
BT: Chemical products
Production materials
RT: Retardants
NT: Corrosion inhibitors

Injection molding
UF: Injection moulding
Power injection molding
Power injection moulding
BT: Production
RT: Compression molding
Embossing

JULY 2023 IEEE Thesaurus

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

Ink jet printing
- UF: Ink-jet printers
- Ink-jet printing
- Inkjet printing
- BT: Ink
- Printing
- RT: Three-dimensional printing

Innovation management
- BT: Engineering management
- Research and development management
- RT: Entrepreneurship
- Technology management
- NT: Creativity

Inorganic chemicals
- BT: Chemistry

Inorganic compounds
- BT: Compounds
- RT: Metals
- Organic inorganic hybrid materials
- NT: Transition metal compounds

Inorganic light emitting diodes
- UF: Inorganic LEDs
- BT: Light emitting diodes

Inorganic materials
- BT: Materials
- RT: Soft electronics

Input devices
- BT: Computer interfaces
- Hardware

Input variables
- UF: Variable selection
- BT: Modeling

Input-output programs
- UF: I/O programs
- BT: Operating systems
- RT: Program processors
- NT: Device drivers

Inrush current
- UF: Input surge current
- Switch on surge
- BT: Current
- Surges
- RT: Converters
- Current measurement
- Electric current control
- Electric fields

Insects
- BT: Animals
- RT: Apicology
- Entomology

Insertion loss
- BT: Propagation
- RT: Attenuation

Inspection
- BT: Industry applications
- RT: Coordinate measuring machines
- Maintenance engineering
- Testing
- NT: Automatic optical inspection

Instant messaging
- UF: IM
- BT: Electronic messaging
- Internet

Instruction sets
- UF: Instruction repertory
- BT: Program processors
- RT: Turing completeness
- NT: Out of order
- Prefetching
- Reduced instruction set computing

JULY 2023 IEEE Thesaurus

Instrument transformers
BT:	Transformers
RT:	Protective relaying
NT:	Voltage transformers

Instrumentation and measurement
NT:	Computerized instrumentation
	Electric variables
	High energy physics instrumentation computing
	Instruments
	Measurement
	Monitoring
	Pulse oximetry
	Testing

Instruments
BT:	Instrumentation and measurement
RT:	Design tools
	Measurement
NT:	Barometers
	Compass
	Medical instruments
	Meters
	Microscopy
	Network analyzers
	Odometers
	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 insulation
	Spark gaps
NT:	Cable insulation
	Ceramics
	Gas insulation
	Insulators
	Isolation technology
	Oil insulation
	Plastic insulation

Insulation life
BT:	Insulation testing
RT:	Aging
	Insulation
	Life estimation
	Partial discharge measurement
	Trees - insulation

Insulation testing
BT:	Insulator testing
RT:	Fault location
	Impulse testing
	Insulation
	Partial discharge measurement
	Pulsed electroacoustic methods
NT:	Insulation life

Insulator testing
BT:	Testing
RT:	Insulators
	Surface discharges
NT:	Insulation testing

Insulators
UF:	Bushings
BT:	Insulation
RT:	Breakdown voltage
	Ceramic products
	Impact ionization
	Insulator testing
	Polymer foams
	Temperature distribution
NT:	Metal-insulator structures
	Plastic insulators
	Rubber
	Topological insulators
	Trees - insulation

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 interconnections
  BT: Integrated circuits

Integrated circuit layout
  BT: Integrated circuit synthesis
  RT: Layout
      Physical design
      Printed circuits

Integrated circuit manufacture
  BT: Components, packaging,
and manufacturing technology
  RT: Gettering
      Integrated circuits
      Microassembly
      Micromachining
      Silicon compiler
  NT: Surface mount technology

Integrated circuit measurements
  BT: Circuit testing
  RT: Electric variables
measurement

Integrated circuit metallization
  UF: Integrated circuit
metallisation

BT: Metallization

Integrated circuit modeling
  UF: Integrated circuit modelling
  BT: Integrated circuits
      Modeling
  NT: Cutoff frequency

Integrated circuit noise
  BT: Integrated circuits
  RT: Semiconductor device
noise
      Threshold voltage
  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: Electrostatic discharge
protection
      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: Electrostatic discharge
protection
      High-speed integrated
circuits
  NT: Beyond CMOS
      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

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
CMOS integrated circuits
Coprocessors
Current-mode circuits
Digital integrated circuits
FET integrated circuits
Field programmable gate arrays
Hybrid integrated circuits
Integrated circuit interconnections
Integrated circuit modeling
Integrated circuit noise
Integrated circuit synthesis
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

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
RT: Arrayed waveguide gratings
Distributed Bragg reflectors
Electro-optic modulators
Integrated optoelectronics
Microoptics
Nanoantennas
Optical films
Optical waveguides
Synapses
Thermooptical devices

Integrated optoelectronics
BT: Optoelectronic devices
RT: Heterojunction bipolar transistors
Integrated circuits
Integrated optics

Liquid crystal on silicon
Microoptics
Microwave photonics
Nanoantennas
Smart pixels

Integrodifferential equations
BT: Equations
RT: Differential equations
        Integral equations

Integumentary system
BT: Anatomy
NT: Hair
        Nails
        Skin

Intellectual property
UF: IP rights
        IPR
BT: Copyright protection
RT: Cyberethics
        Notice of Violation
        Patents
        Software protection
NT: Digital rights management

Intelligent actuators
UF: Smart actuators
BT: Actuators

Intelligent agents
BT: Software agents

Intelligent automation
UF: Robotic process automation
BT: Automation
        Intelligent systems
RT: Intelligent robots

Intelligent control
BT: Cybernetics
RT: Context awareness
        H infinity control
        Mechatronics
NT: Feedforward systems
        Neurocontrollers

Intelligent manufacturing systems
BT: Manufacturing systems
        Production systems
RT: Smart manufacturing

Intelligent materials
BT: Materials
RT: Biomimetics
        Composite materials
        Intelligent structures
        Polymer gels
        Smart materials

Intelligent networks
BT: Telecommunication network topology
RT: Software defined networking

Intelligent robots
BT: Intelligent systems
        Robots
RT: Autonomous robots
        Intelligent automation
        Robot vision systems

Intelligent sensors
UF: Smart sensors
BT: Sensors
RT: Electronic noses
        Mechatronics
        Soft sensors

Intelligent structures
UF: Smart structures
BT: Buildings
RT: Intelligent materials
        Intelligent systems
        Structural engineering
NT: Smart cities

Intelligent systems
BT: Artificial intelligence
RT: Ambient intelligence
        Automata
        Collaborative intelligence
        Context awareness
        Expert systems
        Hybrid intelligent systems
        Intelligent structures
        Knowledge based systems
        Massive machine type communications
        Mobile agents
        Software agents
NT: Autonomous systems
        Collective intelligence
        Hyper-intelligent systems
        Intelligent automation
        Intelligent robots

Intelligent transportation systems
  RT: Advanced driver assistance systems
     Automotive control
     Smart transportation
  NT: Automated highways
     Geographic information systems
     Intelligent vehicles
     Navigation
     Transportation

Intelligent vehicles
  BT: Intelligent transportation systems
     Vehicles
  RT: Advanced driver assistance systems
     Connected vehicles
     Dedicated short range communication
     IEEE 802.11p Standard
     Smart transportation
     Vehicle routing
     Vehicular automation
     Wireless Access in Vehicular Environments
  NT: Autonomous vehicles
     Vehicle-to-everything

Intensity modulation
  BT: Optical modulation
  RT: Amplitude modulation
     Electro-optic modulators

Interactive systems
  BT: Man-machine systems
  RT: Affordances
     Authentication
  NT: External stimuli

Intercell interference
  UF: ICIC
     Inter-cell interference
     Inter-cell interference coordination
  BT: Network resource management
     Radiofrequency interference
  RT: Cellular radio
     Fading channels
     Location awareness
     Radio communication

Interchannel interference
  UF: Adjacent channel interference
     Co-channel interference
     Cochannel interference
     Intersystem interference
  BT: Interference
  RT: Crosstalk

Interconnected systems
  UF: Composite systems
  BT: System analysis and design
  RT: Control systems
  NT: Botnet

Interest point detection
  BT: Computer vision

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
     MOSFET
  RT: Silicon-on-insulator

Interference
  UF: Interference (signal)
  BT: Electromagnetic compatibility and interference
  RT: Coherence
     Distortion
     Diversity schemes
     Noise
  NT: Clutter
     Crosstalk
     Diffraction
     Echo interference
     Electromagnetic interference
     Electromagnetic radiative interference
     Electrostatic interference
     Interchannel interference
     Interference cancellation

Interference channels
Interference constraints
Interference elimination
Interference suppression
Intersymbol interference
Rain fading
TV interference
Terrain factors

Interference cancellation
    BT: Interference

Interference channels
    BT: Interference

Interference constraints
    BT: Interference

Interference elimination
    BT: Interference

Interference suppression
    BT: Interference

Interferometers
    UF: Etalons
    BT: Interferometry
    NT: Mach-Zehnder interferometers

Interferometric lithography
    BT: Lithography

Interferometry
    BT: Measurement
    RT: Micrometers
            Talbot effect
    NT: Fabry-Perot Interferometers
            Optical interferometry
            Phase shifting interferometry
            Radar interferometry
            Radio interferometry
            Sagnac interferometers

Interleaved codes
    UF: Bit interleaved coded
            Bit-interleaved coded
    BT: Modulation coding

Intermetallic
    BT: Alloying

Intermodulation distortion
    BT: Nonlinear distortion

Internal combustion engines
    UF: HCCI engines
    BT: Engines
    RT: Automotive components
            Exhaust gases
            Hybrid electric vehicles
    NT: Diesel engines
            Ignition

Internal stresses
    BT: Stress
    RT: Surface stress

International Atomic Time
    UF: TAI
    BT: Standards categories
    RT: Atomic clocks

International collaboration
    UF: Joint ventures
    BT: Management
    RT: Environmental factors
            Environmental management
            Globalization
            International relations
            International trade
            Research and development
            Social factors
            Standards
            Trade agreements

International relations
    BT: Social implications of technology
    RT: Globalization
            International collaboration
            Social factors

International Space Station
    BT: Space stations

International System of Units
    BT: Measurement units

International trade
    UF: Trade (international)
    BT: Economics
    RT: Business
            Developing countries
            Exchange rates
            Free economic zones
            Freeports

JULY 2023 IEEE Thesaurus

<div style="margin-left:2em">

Globalization
International collaboration
Macroeconomics
Trade agreements

</div>

Internet

UF:	Google
BT:	Communication systems
	Computer networks
	Digital systems
	Distributed computing
RT:	ARPANET
	Blogs
	Cyberspace
	Diffserv networks
	Electronic commerce
	Electronic learning
	Energy Internet
	Extranets
	Hybrid learning
	IEEE 802.16 Standard
	IP networks
	IPTV
	Internetworking
	Intserv networks
	Multicast protocols
	Multiprotocol label switching
	Next generation networking
	Online services
	Open data
	Point-to-multipoint communications
	Routing protocols
	Service level agreements
	Smart TV
	Social networking (online)
	Streaming media
	TCPIP
	Virtual enterprises
	Virtual private networks
	Web sites
	World Wide Web
NT:	Bot (Internet)
	Botnet
	Cloud computing
	Crowdsourcing
	Dark Web
	Instant messaging
	Internet of Things
	Internet privacy
	Internet security
	Internet telephony
	Internet topology
	Linked data

Middleboxes
Semantic Web
Social computing
Web 2.0
Web services

Internet of Medical Things

BT:	Internet of Things
	Medical services
RT:	Biomedical monitoring
	Emergency services
	Medical treatment
	Remote monitoring
	Smart healthcare
	Wearable computers

Internet of Things

UF:	IOT
	Internet of Everything
BT:	Internet
RT:	Ambient intelligence
	Bar codes
	Cloud computing
	Cyber-physical systems
	Digital transformation
	Digital twins
	Edge computing
	Energy Internet
	Fifth Industrial Revolution
	Fourth Industrial Revolution
	Machine-to-machine communications
	Middleware
	Object detection
	Protocols
	Radiofrequency identification
	Simultaneous wireless information and power transfer
	Tagging
	Virtual environments
	Watermarking
	Wireless sensor networks
NT:	Industrial Internet of Things
	Internet of Medical Things
	Internet of Vehicles
	Social Internet of Things
	Tactile Internet

Internet of Vehicles

UF:	IOV
	Internet-of-Vehicles
BT:	Internet of Things
	Vehicles
RT:	Vehicular ad hoc networks

JULY 2023 IEEE Thesaurus

Internet privacy
  BT: Internet
       Privacy
  RT: Internet security

Internet security
  BT: Computer security
       Internet
  RT: Information security
       Internet privacy

Internet telephony
  UF: IP telephony
       VOIP
       Voice over IP
       Voice over Internet protocol
       Voice-over-Internet protocol
       WhatsApp
  BT: Internet
  RT: Call admission control
       Point-to-multipoint
communications

Internet topology
  BT: Internet

Internetworking
  BT: Telecommunication
computing
  RT: Computer networks
       Internet
       Local area networks
       Metropolitan area networks
       Open systems
       Wide area networks
  NT: Interoperability
       LAN interconnection

Interoperability
  UF: Service composability
  BT: Internetworking
  RT: Collaboration
       Common Information Model
(electricity)
       Open systems

Interplanetary exploration
  UF: Emirates Mars Mission
       Mars Express
       Mars Odyssey
       Tianwen-1
  BT: Space exploration
  RT: Space missions

InterPlanetary File System
  UF: IPFS
       Inter Planetary File System
  BT: Peer-to-peer computing
       Protocols
  RT: World Wide Web

Interpolation
  UF: Interpolating
  BT: Approximation methods
  RT: Curve fitting
       Digital-analog conversion
       Radial basis function
networks
       Statistics
       Surface fitting

Interrupters
  UF: Interruption
  BT: Switchgear
  RT: Circuit breakers
       Fuses

Interstellar chemistry
  BT: Chemistry
  RT: Extraterrestrial
measurements

Intersymbol interference
  BT: Interference
  RT: AWGN channels
       Equalizers
       Gaussian channels

Interviews
  BT: IEEE indexing

Intestines
  BT: Digestive system

Intracranial pressure sensors
  BT: Biomedical equipment
       Sensors
  RT: Brain
       Neural engineering

Intracranial system
  BT: Cranial pressure

Intrusion detection
  BT: Information security
  RT: Network function
virtualization
  NT: Network intrusion detection

Intserv networks
UF:	Integrated services networks
BT:	Computer networks
RT:	Internet
	Multimedia communication

Intubation
UF:	Tracheal intubation
BT:	Medical treatment
RT:	Respiratory system
	Ventilators

Inventory control
BT:	Operations research
RT:	Control systems
	Production control
	Production management

Inventory management
BT:	Production management
RT:	Bar codes
	Production engineering
NT:	Bills of materials

Inverse problems
UF:	Inverse method
	Inverse methods
	Inverse modeling
	Inverse problem
	Inverse scattering
BT:	Modeling
RT:	Functional analysis
	Image reconstruction
	Integral equations
	Numerical analysis
	Signal reconstruction
NT:	Deconvolution

Inverse synthetic aperture radar
BT:	Synthetic aperture radar

Inverters
BT:	Power electronics
RT:	Maximum power point trackers
	Zero current switching
	Zero voltage switching
NT:	Multilevel inverters
	Pulse inverters
	Resonant inverters
	Voltage source inverters

Investment
BT:	Financial management
RT:	Developing countries
	Open banking

Iodine
BT:	Chemical elements
NT:	Iodine compounds

Iodine compounds
UF:	Iodides
	Iodine monofluoride
BT:	Iodine

Ion accelerators
BT:	Particle accelerators
RT:	Ion beam effects
	Ion beams
	Ion sources
	Ions
	Proton accelerators

Ion beam applications
BT:	Nuclear and plasma sciences
RT:	Ion beams
NT:	Ion implantation

Ion beam effects
BT:	Ion beams
RT:	Aerospace safety
	Ion accelerators
	Ion emission

Ion beams
BT:	Particle beams
RT:	Electrodynamics
	Ion accelerators
	Ion beam applications
	Ion emission
	Ion sources
	Ions
NT:	Ion beam effects

Ion emission
UF:	Field ion emission
	Secondary ion emission
BT:	Nuclear imaging
RT:	Ion beam effects
	Ion beams
	Ion sources
	Ions
	Thermionic emission

Ion implantation
BT:	Ion beam applications

		Materials preparation
---	RT:	Plasma sources
		Semiconductor device manufacture
	NT:	Plasma immersion ion implantation

Ion radiation effects
	BT:	Radiation effects
	RT:	Ionizing radiation
		Proton radiation effects

Ion sources
	BT:	Ions
		Nuclear physics
	RT:	Ion accelerators
		Ion beams
		Ion emission
		Plasma sources

Ionization
	UF:	Ionisation
		Photoionisation
		Photoionization
	BT:	Ions
	RT:	Discharges (electric)
		Plasmas
		Space radiation
	NT:	Impact ionization
		Ionization chambers
		Ionizing radiation
		Single event transients
		Single event upsets

Ionization chambers
	UF:	Ionisation chambers
	BT:	Ionization
	RT:	Ionizing radiation
		Smoke detectors

Ionizing radiation
	UF:	Ionising radiation
	BT:	Ionization
	RT:	Ion radiation effects
		Ionization chambers
		Radiation hardening (electronics)
		Silicon radiation detectors

Ionizing radiation sensors
	BT:	Sensors
	NT:	Position sensitive particle detectors
		Radiation detectors

X-ray detectors

Ionosphere
	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
		Trapped ions

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

IPTV
	UF:	Internet protocol television
	BT:	Digital TV
	RT:	Broadband communication
		Computer networks
		IP networks
		Internet
		Local area networks
		Protocols
		Streaming media

IRE Standards
| | BT: | IEEE Standards |

Iridium
| | BT: | Chemical elements |

Iris
BT:	Eyes
RT:	Ophthalmology

Iris recognition
BT:	Biometrics (access control)

Iron
UF:	Fe
BT:	Metals
NT:	Cast iron
	Iron alloys

Iron alloys
BT:	Iron
RT:	Alloying
	Metallurgy
NT:	Austenite

Irrigation
BT:	Agriculture
RT:	Agricultural products
	Crops
	Hydraulic systems
	Water pumps

Ischemic pain
BT:	Pain

ISDN
UF:	Integrated services digital networks
BT:	Communication systems
	Digital communication
	Digital systems
RT:	Asynchronous transfer mode
	Data communication
	Frame relay
	Image communication
	Multimedia communication
NT:	B-ISDN

Islanding
BT:	Power supplies
RT:	Electrical safety
	Generators

ISO
UF:	International organization for standardization
	International standards organization
BT:	Standards organizations
RT:	Communication standards
	ISO Standards
	Measurement standards
	Software standards
	Standardization
	Standards
NT:	Moving Pictures Experts Group

ISO Standards
BT:	Standards publications
RT:	ANSI Standards
	Communication standards
	ISO
	Quality management
	Software standards
	Standardization
	X3D
NT:	MPEG standards

Isobaric processes
BT:	Thermodynamics

Isolation technology
BT:	Insulation
RT:	Vibration control

Isolators
BT:	Circuits

Isosurfaces
BT:	Data visualization
RT:	Biomedical imaging
	Computational fluid dynamics

Isothermal processes
BT:	Thermodynamics

Isotopes
BT:	Chemical elements
	Nuclear physics
RT:	Radioactive materials

Itemsets
BT:	Data analysis
	Transaction databases

Iterative algorithms
BT:	Iterative methods
NT:	Iterative closest point algorithm
	Sum product algorithm

Iterative closest point algorithm
UF:	ICP

BT: Iterative algorithms

Iterative decoding
BT: Parity check codes

Iterative learning control
BT: Control theory
Iterative methods
RT: Adaptive control
Learning systems
Tracking

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

Jacobian matrices
UF: Jacobian matrix
BT: Matrices

Jamming
BT: Electronic warfare
RT: Electronic countermeasures
Radar clutter
Radar countermeasures
Radio communication countermeasures

Java
UF: J2EE
Jakarta EE
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
UF: JFET integrated circuit technology
BT: JFET circuits
RT: JFETs

JFETs
UF: Junction FETs
BT: Field effect transistors
RT: JFET integrated circuits

Jitter
BT: Distortion
RT: Circuit stability
Ring oscillators
NT: Timing jitter

Job design
BT: Ergonomics

Job production systems
UF: Bespoke production
BT: Manufacturing systems

Job shop scheduling
BT: Scheduling
RT: Genetic algorithms

Job specification
BT: Human resource management
RT: Multiskilling
Recruitment

Jobs listings
BT: Career development
RT: Employment

Joining materials
BT: Production materials
RT: Joining processes
Soldering equipment
NT: Filler metals
Sealing materials

Joining processes
UF: Connecting
Coupling (process)
Fastening
Linking

BT:	Manufacturing systems	
	Materials processing	
RT:	Couplings	
	Fasteners	
	Joining materials	
	Plasma welding	
	Soldering equipment	
NT:	Bonding processes	
	Crimping	
	Soldering	
	Splicing	
	Welding	

Joints
BT:	Skeleton

Josephson effect
BT:	Tunneling
RT:	Josephson junctions

Josephson junctions
UF:	Josephson logic
	Superconducting junction devices
BT:	Superconducting devices
RT:	Josephson effect

Journalism
BT:	Publishing
RT:	Broadcasting
	Electronic publishing
	Humanities
	Information services
	Multimedia communication
	Radio broadcasting
	Social networking (online)

Judd-Ofelt theory
BT:	Spectral analysis
RT:	Fluorescence
	Photoluminescence

Junctionless nanowire transistors
BT:	MOSFET
	Nanoelectronics
RT:	Nanowires
	Silicon-on-insulator

Junctions
BT:	Semiconductor devices
NT:	Heterojunctions
	Hybrid junctions

	P-n junctions
	Waveguide junctions

Jupiter
BT:	Planets

K-band
BT:	Microwave bands

Kalman filters
UF:	Kalman filtering
BT:	Filters
RT:	Estimation
	Nonlinear dynamical systems
	Prediction methods
	Sensor fusion
	Soft sensors

Karhunen-Loeve transforms
BT:	Transforms

Kelvin
BT:	Temperature measurement

Kernel
BT:	Mathematics
	Operating systems
NT:	Null space
	System kernels

Kerr effect
BT:	Electo-optic effects
RT:	Cross-phase modulation
	Magnetooptic effects

Key performance indicator
UF:	KPI
BT:	Measurement
	Performance evaluation

Keyboards
BT:	Computer peripherals
RT:	Ergonomics

Keystroke dynamics
BT:	Biometrics (access control)

Keyways
BT:	Plugs

Keyword search
UF:	Keyword searches
	Keyword searching

BT: Search methods
RT: Indexing

Kidney
BT: Urogenital system
RT: Nephrology
NT: Chronic kidney disease
        Kidney stones

Kidney stones
UF: Nephrolithiasis
        Renal calculi
        Urinary calculesis
BT: Kidney
        Medical conditions
RT: Lithotripsy
        Nephrology

Kilns
BT: Furnaces
RT: Calcination
        Curing
        Firing
        Heat treatment

Kinematics
UF: Kinematic analysis
        Kinematic faults
        Kinematic model
        Kinematic noise
BT: Mechanical factors
RT: Medical robotics
NT: Motion capture
        Motor coordination

Kinetic energy
BT: Kinetic theory
RT: Mechanical energy
        Potential energy
        Thermal energy

Kinetic theory
UF: Collision theory
        Kinetic molecular theory
        Kinetic-molecular theory
        Kinetics
BT: Motion control
        Physics
NT: Kinetic energy

Kirchhoff's Law
UF: Kirchhoff approximation
        Kirchhoff current law
        Kirchhoff law
        Kirchhoff scattering
BT: Spectroscopy

Kirk field collapse effect
UF: Kirk effect
BT: Bipolar transistors

Klystrons
UF: Gyroklystrons
BT: Electron tubes
RT: Amplifiers
        Cavity resonators
        Colliding beam accelerators
        Oscillators
        Relativistic effects
        Ring oscillators

Knee
BT: Extremities

Knee replacement
UF: Knee arthroplasty
BT: Prosthetics

Knowledge acquisition
BT: Knowledge engineering
RT: Context awareness
        Econophysics
        Expert systems
        Knowledge based systems
        Self-organizing feature maps

Knowledge based systems
UF: Knowledge systems
        Knowledge-based systems
        Rule based systems
BT: Artificial intelligence
RT: Decision support systems
        Deductive databases
        Intelligent systems
        Knowledge acquisition
        Knowledge representation
        Linked data
        Software agents
NT: Expert systems
        Mobile agents

Knowledge discovery
BT: Knowledge engineering
RT: Data mining
        Data science

Information retrieval
Knowledge management

Knowledge engineering
BT: Artificial intelligence
RT: Knowledge management
NT: Inference mechanisms
        Knowledge acquisition
        Knowledge discovery
        Knowledge representation

Knowledge graphs
BT: Knowledge representation

Knowledge management
UF: Intellectual capital
BT: Computer applications
        Management
RT: Competitive intelligence
        Information management
        Knowledge discovery
        Knowledge engineering
        Management information systems
        Semantic Web
NT: Knowledge transfer

Knowledge representation
BT: Knowledge engineering
RT: Expert systems
        Formal concept analysis
        Graph drawing
        Knowledge based systems
        Linked data
        OWL
NT: Description logic
        Fuzzy cognitive maps
        Knowledge graphs
        Ontologies
        Thesauri

Knowledge transfer
BT: Information management
        Knowledge management

Krypton
BT: Chemical elements

Kuiper belt
UF: KBO
        Kuiper belt objects
        Kuiper belts
BT: Solar system

L-band
BT: Microwave bands

Lab-on-a-chip
UF: Lab-on-chip
BT: System-on-chip

Labeling
UF: Labelling
BT: Packaging
RT: Applicators
        Packaging machines

Labor resources
UF: Labor supply
        Labour resources
        Labour supply
        Manpower planning
BT: Human resource management
        Personnel
RT: Equal opportunities
        Recruitment

Laboratories
BT: Test facilities
RT: Engineering education
        Research and development
        Student experiments
NT: Remote laboratories

Lacquers
BT: Chemical products
        Coatings
        Materials
RT: Paints

Lagrangian functions
UF: Lagrange duality
        Lagrange functions
        Lagrange relaxation
BT: Optimization methods
RT: Quantum mechanics

Lakes
BT: Geoscience
RT: Reservoirs
        Rivers
        Sediments
        Water
        Water pollution
        Water resources
        Water storage
        Wetlands

Laminates
BT: Materials
RT: Lamination

Lamination
BT: Materials processing
RT: Laminates

Lamps
BT: Lighting
RT: Light sources
Lighting control
Ultraviolet sources
NT: Discharge lamps
Electrodeless lamps
Filament lamps
Fluorescent lamps
LED lamps

LAN emulation
UF: Local area network emulation
BT: Optical fiber networks

LAN interconnection
BT: Internetworking
RT: Computer networks
Local area networks
Metropolitan area networks
Wide area networks
Wireless LAN

Land mobile radio
UF: Land mobile radio service
Land-mobile radio
Mobile radio
BT: Mobile communication
Radio communication
RT: 5G mobile communication
Ad hoc networks
Bluetooth
Channel estimation
Indoor navigation
Land mobile radio equipment
Location awareness
Mobile antennas
Mobile handsets
Multiuser detection
Personal area networks
Radio access networks
Routing protocols
Software radio
NT: Cellular radio

Land mobile radio equipment
UF: Land-mobile radio equipment
BT: Radio communication equipment
Vehicular and wireless technologies
RT: Land mobile radio
Telephone equipment
Transceivers
NT: Mobile antennas

Land mobile radio networks
BT: Cellular technology

Land pollution
BT: Pollution
RT: Industrial pollution
Land use planning
Oil pollution
Pesticides
Radioactive pollution
NT: Soil pollution

Land surface
BT: Geoscience
RT: Land surface temperature
NT: Watersheds

Land surface temperature
UF: Ground temperature
Land temperature
BT: Geoscience and remote sensing
RT: Global warming
Land surface
Ocean temperature
Remote sensing

Land transportation
UF: Ground transportation
Planetary landers
BT: Transportation
RT: Global Positioning System
Land vehicles
NT: Rail transportation
Road transportation

Land use planning
BT: Environmental management
RT: Floods
Land pollution
Reservoirs
Water storage

JULY 2023 IEEE Thesaurus

Land vehicles
- UF: Flexible fuel vehicles
- Ground vehicles
- BT: Vehicles
- RT: Land transportation
- Rail transportation
- NT: Bicycles
- Electric vehicles
- Road vehicles

Landline
- UF: Home phone
- Landline telephone
- Main line
- POTS
- BT: Telephone equipment

Landmine detection
- UF: Land mine detection
- Land mines
- Landmines
- BT: Buried object detection
- RT: Military equipment
- Radar imaging
- Remote sensing

Landslides
- BT: Geology
- RT: Hazards

Lane departure warning systems
- BT: Road safety
- Vehicle safety
- RT: Collision avoidance
- Lane detection

Lane detection
- BT: Vehicle safety
- RT: Collision avoidance
- Lane departure warning systems
- Road safety

Lanthanum
- BT: Metals
- NT: Lanthanum compounds

Lanthanum compounds
- BT: Lanthanum

Laparoscopes
- BT: Surgical instruments
- RT: Minimally invasive surgery

Laplace equations
- UF: Inverse transforms
- Laplace operator
- Laplace transform
- Laplacian
- BT: Mathematics

Lapping
- BT: Machining
- RT: Surface finishing

Large Hadron Collider
- UF: LHC
- BT: Test facilities
- RT: Particle accelerators

Large scale integration
- UF: LSI
- Large-scale integration
- BT: Circuits
- Integrated circuits
- NT: Ultra large scale integration
- Very large scale integration
- Wafer scale integration

Large screen displays
- UF: Large-screen displays
- BT: TV equipment

Large-scale systems
- BT: System analysis and design
- RT: Complex systems
- Fuzzy systems

Larynx
- UF: Voice tract
- BT: Respiratory system

Laser ablation
- BT: Laser applications

Laser applications
- BT: Lasers
- RT: CD recording
- Endoscopes
- Gyroscopes
- Heating systems
- Holography
- Measurement by laser beam
- Optical recording
- Photoacoustic effects
- Stereolithography
- NT: Dark states
- Distributed feedback devices

Laser ablation
Laser beam cutting
Laser beam machining
Laser fusion
Laser theory
Magnetooptic recording

Laser beam cutting
BT: Laser applications
RT: Laser beam machining

Laser beam machining
BT: Laser applications
       Machining
RT: Laser beam cutting

Laser beams
UF: Laser guide stars
BT: Beams
RT: Bragg gratings
       Electro-absorption modulators
       Electro-optic modulators
       Laser theory
       Lasers
       Optical beams
       Optical vortices
       Refractive index
       Supercontinuum generation
       Thermal lensing
NT: Laser cooling
       Laser pulses

Laser cavity resonators
BT: Cavity resonators
RT: Optical resonators
       Surface emitting lasers

Laser cladding
BT: Claddings
RT: Pulsed laser deposition

Laser cooling
BT: Cooling
       Laser beams
RT: Trapped ions
       Ultracold atoms

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 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 printers
BT: Printers
Laser pulses
UF: Laser pulsing
       Pulsed lasers
BT: Laser beams
RT: High-speed optical techniques
       Lasers

Laser radar
UF: Lidar
       Optical radar
BT: Radar
RT: Geophysical measurement techniques
       Optical scattering

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

JULY 2023 IEEE Thesaurus

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
- RT: Laser beams
- Laser pulses
- Laser theory
- Light sources
- Nanobiophotonics
- Optical distortion
- Oscillators
- Stereolithography
- Stimulated emission
- Superluminescent diodes
- Threshold current
- 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: Electo-optic effects
- Electro-optic devices
- Lasers
- Optics
- Optoelectronic devices
- Photonics

Latches
- BT: Bistable circuits

Lattice Boltzmann methods
- UF: Lattice Boltzmann
- BT: Boltzmann distribution
- Lattices
- RT: Fluid dynamics

Lattices
- UF: Optical lattices
- BT: Mathematics
- NT: Lattice Boltzmann methods

Law
- UF: Legal aspects
- BT: Legal factors
- NT: Censorship
- Commercial law
- Consumer protection
- Contract law
- Criminal law
- Employment law
- Forensics
- Fraud
- Law enforcement
- Patent law
- Trademarks

Law enforcement
- UF: Police
- BT: Law
- RT: Censorship
- Digital forensics
- Image forensics
- Legal factors
- Threat assessment

Layered division multiplexing
UF: LDM
        Layered-division-multiplexing
BT: Multiplexing
RT: Frequency division multiplexing

Layered manufacturing
BT: Manufacturing systems
RT: Computational geometry
        Stereolithography

Layout
BT: Graphics
RT: Art
        Geometry
        Integrated circuit layout
        Wiring

Leaching
BT: Chemical processes

Lead
UF: Pb
BT: Metals
RT: Graphite
        Lead compounds
NT: Lead isotopes

Lead acid batteries
UF: Lead-acid batteries
BT: Batteries

Lead compounds
BT: Compounds
RT: Lead

Lead isotopes
BT: Lead

Lead time reduction
BT: Production management
RT: Production planning
        Project management

Leadership
BT: Human resource management
RT: Business
        Government
        Organizations

Leak detection
BT: Sensor systems and applications
RT: Packaging
        Testing
        Vacuum systems

Leakage currents
UF: Gate leakage current
BT: Current
RT: Electron traps
        Fault currents
NT: Gate leakage

Leaky wave antennas
UF: Leaky-wave antennas
BT: Antennas

Lean production
BT: Manufacturing systems
        Production systems
RT: Production management

Learning (artificial intelligence)
BT: Artificial intelligence
RT: AI accelerators
        Conditional random fields
        Data augmentation
        Electronic learning
        Fuzzy cognitive maps
        Gaussian processes
        Human activity recognition
        Image annotation
        Logistic regression
        Manifold learning
        Soft sensors
NT: Distance learning
        Naive Bayes methods
        Nearest neighbor methods

Learning automata
UF: Learning automaton
BT: Learning systems

Learning management systems
BT: Computer aided instruction
        Learning systems
RT: Computer applications
        Electronic learning
        Management
        Training

Learning systems
UF: Learning mechanisms
        Learning methods

Learning-based method
BT: Artificial intelligence
RT: Adaptive systems
Context awareness
Cybernetics
Deep learning
Dyslexia
Inference mechanisms
Iterative learning control
Mobile agents
Pattern recognition
Software agents
White matter
NT: Backpropagation
Cognitive systems
Electronic learning
Hybrid learning
Learning automata
Learning management systems
Self-supervised learning
Semisupervised learning
Supervised learning
Unsupervised learning

Least mean squares methods
BT: Least squares approximations
Mean square error methods

Least squares approximations
UF: Least-squares approximations
BT: Numerical analysis
RT: Approximation methods
Curve fitting
Mean square error methods
Optimization
Recursive estimation
NT: Least mean squares methods

LED lamps
UF: AC llght emitting diode lamps
AC-LED lamps
Light emitting diode lamps
BT: Lamps
Light emitting diodes
RT: Light sources

Leg
BT: Extremities

Legal factors
BT: Engineering management
RT: Censorship
Ethical aspects
Governmental factors
IEEE Corporate activities
Law enforcement
NT: Copyright protection
Law
Patents
Product liability
Software protection
Trademarks

Legged locomotion
UF: Biped locomotion
Gait assessment
Gait control
Gait disorders
Walking
BT: Mobile robots
RT: Biological control systems
Control systems
Motion control
Pedestrians
Stairs

Legislation
BT: Government
NT: General Data Protection Regulation

Length measurement
BT: Measurement
RT: Micrometers
Size measurement

Lenses
UF: Lens
BT: Optical devices
RT: Focusing
Optical materials

Lesions
BT: Tumors
NT: Tissue damage

Levee
UF: Dike
Levee system
BT: Geoscience

Level control
UF:	Liquid level control	
BT:	Mechanical variables control	
NT:	Gyroscopes	

Level measurement
UF:	Liquid level measurement
BT:	Geodesy

Level set
BT:	Calculus
RT:	Gradient methods

Levitation
BT:	Physics
NT:	Electrostatic levitation
	Magnetic levitation

Libraries
BT:	Information services
NT:	Software libraries

License plate recognition
UF:	ANPR
	Automatic number plate recognition
	Automatic-number plate recognition
	Car plate recognition
	LPD
	LPR
	License plate detection
	Number plate recognition
	VLPR
	Vehicle license plate recognition
	Vehicle plate detection
BT:	Optical character recognition
	Vehicle detection
RT:	Character recognition
	Feature extraction
	Image edge detection
	Image recognition

Licenses
UF:	Licensing
BT:	Contracts
RT:	Must-carry regulations

Life estimation
UF:	Accelerated testing
BT:	Estimation
RT:	Aging

	Failure analysis
	Fatigue
	Insulation life

Life sciences
UF:	Computational life sciences
BT:	Science - general
RT:	Animals
	Biology
	Plants (biology)

Life testing
BT:	Testing
RT:	Reliability

Lifetime estimation
UF:	Lifetime management
	Lifetime measurement
	Lifetime tests
BT:	Measurement

Lifting equipment
UF:	Hoists
	Jacks
BT:	Materials handling equipment
RT:	Freight handling
	Materials handling
	Pulleys
	Winches
NT:	Cranes

Ligaments
BT:	Musculoskeletal system

Light deflectors
BT:	Optical devices

Light emitting diodes
UF:	LED
	LEDs
	Light emitters
	Light-emitting diodes
BT:	Diodes
	Optoelectronic devices
RT:	Microcavities
	Molecular beam applications
	P-n junctions
	Visible light communication
NT:	Inorganic light emitting diodes
	LED lamps
	Organic light emitting diodes

Superluminescent diodes

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 rail systems
UF: Light railways
        Streetcars
BT: Rail transportation
RT: Public transportation

Light scattering
BT: Scattering
RT: Optical scattering
        Resonance light scattering

Light sources
BT: Optics
RT: Arc discharges
        Color gamut
        High intensity discharge lamps
        LED lamps
        Lamps
        Lasers
        Lighting
        Lighting control
        Photometry
        Supercontinuum generation
        Synchrotron radiation
NT: Electroluminescent devices
        Fast light
        Luminescent devices
        Phosphors
        Slow light
        Stray light
        Superluminescent diodes
        Ultraviolet sources

Light trapping
UF: Plasmonic solar cells

BT: Photovoltaic cells
RT: Reflectivity

Lighting
UF: Arc lamps
        Illumination
BT: Optical devices
RT: Building services
        Buildings
        Filament lamps
        Fluorescent lamps
        Gas discharge devices
        High intensity discharge lamps
        Light sources
        Lighting control
        Photometry
        Quantum radar
        Visible light communication
NT: Artificial light
        Daylighting
        Electrical ballasts
        Emergency lighting
        Lamps
        Lumen
        Smart lighting
        Solid state lighting

Lighting control
UF: Illumination control
BT: Optical control
RT: High intensity discharge lamps
        Lamps
        Light sources
        Lighting

Lightly-tailed distribution
UF: Light tailed distribution
        Light-tailed distribution
        Lightlly tailed distribution
BT: Probability distribution

Lightning
BT: Meteorology
RT: Dielectric breakdown
        Electrostatic processes
        Storms
NT: Lightning protection

Lightning protection
BT: Lightning
        Protection

JULY 2023 IEEE Thesaurus

Lightweight structures
    BT: Structural shapes
    RT: Aerospace engineering
                Aerospace industry
                Aerospace materials
                Honeycomb structures
                Metal foam
                Sandwich structures
                Thin wall structures

Limbic system
    BT: Brain

Limit-cycles
    UF: Limit cycle
                Limit-cycle
    BT: Mathematics

Limiting
    BT: Signal processing
    RT: Nonlinear distortion
                Voltage control

Line enhancers
    BT: Adaptive systems
    RT: Digital filters
                Filtering theory

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 feedback control systems
    BT: Control systems
                Cybernetics
    RT: Linear systems
    NT: Frequency locked loops
                Phase locked loops
                State feedback
                Tracking loops

Linear feedback shift registers
    BT: Shift registers

Linear matrix inequalities
    BT: Mathematics
    RT: Linear systems
                Uncertain systems

Linear particle accelerator
    UF: Linac
                Particle accelerator
    BT: High energy physics
instrumentation computing

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
    Linear matrix inequalities
    Principal component analysis
    Time invariant systems
    Transfer functions

Linearity
BT: Electromagnetic measurements

Linearization techniques
UF: Linearisation techniques
BT: Mathematics
RT: Control system synthesis
    Control systems
    MOSFET circuits
    Modulation
    Operational amplifiers
    Transmitters

Linguistics
BT: Natural languages
RT: Anthropology
    Semiotics
NT: Phonetics
    Pragmatics

Link aggregation
BT: Telecommunication network topology

Linked data
BT: Internet
RT: Big Data
    Database systems
    Knowledge based systems
    Knowledge representation
    Metadata
    NoSQL databases
    Ontologies
    Open data
    Query processing
    Semantic Web

Linux
BT: High level languages

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-optic devices
    Liquid crystals
    Microdisplays
    Thin film transistors
NT: Liquid crystal displays
    Liquid crystal on silicon

Liquid crystal displays
UF: LCD
    LCDs
    Liquid-crystal displays
BT: Liquid crystal devices
NT: Active matrix liquid crystal displays

Liquid crystal on silicon
UF: Lcos
BT: Liquid crystal devices
RT: Integrated optoelectronics
    Microdisplays

Liquid crystal polymers
UF: Liquid-crystal polymers
BT: Polymers

Liquid crystals
BT: Crystals
RT: Liquid crystal devices

Liquid nitrogen
BT: Cryogenics
    Refrigerants

Liquid waveguides
BT: Hollow waveguides

Liquids
BT: Fluids
RT: Aerosols
          Electrohydraulics
          Materials science and technology
          Spraying
NT: Water

Lithium
UF: Li
BT: Metals
RT: Alloying
          Batteries
NT: Lithium compounds

Lithium batteries
BT: Batteries
          Lithium compounds

Lithium compounds
BT: Lithium
RT: Alloying
          Batteries
NT: Lithium batteries
          Lithium niobate

Lithium niobate
BT: Lithium compounds

Lithium-ion batteries
UF: Li-ion batteries
          Lithium ion batteries
BT: Batteries

Lithium-sulfur batteries
UF: Li-S batteries
BT: Batteries

Lithography
UF: Photolithography
BT: Manufacturing
RT: Nanotechnology
          Printing
          Proximity effects
NT: Colloidal lithography
          Extreme ultraviolet lithography
          Interferometric lithography
          Nanolithography
          Soft lithography
          Stereolithography
          X-ray lithography

Lithotripsy
BT: Medical treatment
RT: Kidney stones
          Lithotriptors

Lithotriptors
BT: Biomedical equipment
RT: Lithotripsy

Liver
BT: Digestive system
NT: Liver diseases

Liver cancer
BT: Cancer

Liver diseases
BT: Liver

Liver neoplasms
BT: Neoplasms

Load flow
UF: Power flow
BT: Power system management
NT: Load flow analysis

Load flow analysis
UF: Power flow analysis
BT: Load flow
RT: Power system security
          Power transmission

Load flow control
UF: Power flow control
BT: Power system control
NT: Power factor correction

Load forecasting
BT: Power demand
RT: Load management
          Load monitoring

Load management
UF: Load balancing
          Load compensation
          Load composition
          Load variations
BT: Energy management
RT: Energy storage
          Load forecasting
          Pallets
          Power demand

JULY 2023 IEEE Thesaurus

Vehicle-to-grid
NT: Load monitoring
Load shedding

Load modeling
BT: Modeling
Power system modeling
RT: Power demand

Load monitoring
BT: Load management
Monitoring
RT: Energy consumption
Load forecasting
Power system control
Power system measurements
SCADA systems

Load shedding
BT: Load management
RT: Power distribution

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 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 interconnection
Office automation
Open systems
Protocols
Regional area networks
Storage area networks
Token networks
Virtual private networks
NT: Virtual LAN
Wireless LAN

Local field potentials
BT: Extracellular
Signal processing
RT: Synapses

Local government
UF: Local authorities
BT: Government

Local oscillators
BT: Oscillators

Location awareness
UF: Geo tagging
Localization
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
Odometry
Personal communication networks
Position measurement
Wireless communication
NT: Network location awareness

Log periodic antennas
BT: Antenna arrays

Log-normal distribution
UF: Log normal distribution

BT:	Probability distribution

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
	Logic circuits
NT:	Programmable logic arrays

Logic circuits

BT:	Circuits
	Switching 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
NT:	Combinational circuits
	Logic arrays
	Programmable logic arrays
	Superconducting logic circuits

Logic design

UF:	Circuit design (logic)
	Logic CAD
BT:	Design automation
RT:	Circuit synthesis
	Design for testability
	Design methodology

	Engineering education
	Logic circuits
	Timing
NT:	Reconfigurable logic

Logic devices

BT:	Circuits and systems
RT:	Logic circuits
NT:	Logic gates
	Programmable logic devices

Logic functions

BT:	Boolean functions
RT:	Logic
	Logic circuits
	Multivalued logic

Logic gates

BT:	Logic devices
RT:	Boolean algebra
	Ring oscillators

Logic programming

BT:	Programming
NT:	Constraint handling

Logic testing

UF:	Logic circuit testing
	Logic test
BT:	Integrated circuit testing
RT:	Design for testability

Logistic regression

UF:	Logit models
	Ordered logit models
BT:	Regression analysis
RT:	Learning (artificial intelligence)
	Pattern classification
	Support vector machines

Logistics

UF:	Physical distribution management
BT:	Production management
RT:	Procurement
NT:	Reverse logistics
	Supply chains

Long short term memory

UF:	LSTM
	Long short-term memory
BT:	Artificial neural networks
RT:	Machine learning

JULY 2023 IEEE Thesaurus

Long Term Evolution
UF: LTE
          LTE advanced
BT: 3GPP Standards
          Communication standards
RT: 4G mobile communication
          High-speed networks
          Mobile communication
          Mobile handsets
          Wireless communication

Loop antennas
BT: Antennas

Lorentz covariance
UF: Lorentz force
          Lorentz invariance
BT: Physics

Loss measurement
BT: Measurement
RT: Attenuation measurement
          Magnetic losses
          Optical losses
NT: Packet loss

Lot sizing
BT: Production control
RT: Materials requirements
planning

Loudspeakers
BT: Audio systems
RT: Acoustic distortion

Low earth orbit satellites
UF: LEO
          Low-earth-orbit
BT: Artificial satellites

Low latency communication
UF: Low-latency communication
BT: Communication systems
NT: Ultra reliable low latency
communication

Low voltage
UF: Low-voltage
BT: Voltage measurement

Low-carbon economy
UF: Decarbonisation
          Decarbonised economy
          Decarbonization

          Decarbonized economy
          Low fossil fuel economy
BT: Power system economics
RT: Carbon
          Ecosystems
          Environmental
management
          Global warming
          Greenhouse effect
          Renewable energy sources

Low-frequency noise
UF: LF noise
          Low frequency noise
BT: Noise

Low-noise amplifiers
UF: Low noise amplifiers
BT: Amplifiers

Low-pass filters
UF: Low pass filters
BT: Filters

Low-power electronics
UF: Low power electronics
          Ultra low power*
          Ultra-low power*
BT: Consumer electronics
RT: Electronic equipment
          Nanogenerators
          Simultaneous wireless
information and power transfer

Low-power wide area networks
UF: LPWAN
BT: Wide area networks

Low-temperature plasmas
UF: Low temperature plasmas
BT: Plasmas
RT: Plasma applications

Lubricants
UF: Cutting fluids
BT: Production materials
RT: Lubrication

Lubricating oils
UF: Oil filters
          Oiling (lubrication)
BT: Oils

Lubrication
BT: Mechanical factors

RT:	Friction
	Lubricants
	Mechanical bearings

Lumen
- BT: Lighting
- Measurement

Luminescence
- BT: Optics
- RT: Luminescent devices
- Muon colliders
- Scintillators
- NT: Bioluminescence
- Electroluminescence
- Fluorescence
- Phosphorescence
- Photoluminescence
- Thermoluminescence

Luminescent devices
- BT: Light sources
- Optical devices
- RT: Luminescence
- Muon colliders
- NT: Electroluminescent devices

Lung
- BT: Respiratory system
- RT: Pulmonary diseases
- Pulmonology
- Spirometry

Lung cancer
- BT: Cancer

Lung neoplasms
- BT: Neoplasms

Lutetium
- UF: Lutecium
- BT: Chemical elements

Lyapunov methods
- UF: Lyapunov function
- Lyapunov stability
- BT: System analysis and design
- RT: Control design
- Functional analysis
- Stability

Lymph nodes
- BT: Lymphatic system

Lymphatic system
- BT: Anatomy
- NT: Lymph nodes

Mach-Zehnder interferometers
- UF: Mach-Zehnder modulation
- BT: Interferometers

Machine assisted indexing
- UF: Automated indexing
- Automatic indexing
- MAI
- Machine added indexing
- Machine aided indexing
- Machine indexing
- Machine-added indexing
- Machine-aided indexing
- Machine-assisted indexing
- BT: Indexes
- RT: Indexing

Machine components
- BT: Machinery
- Mechanical products
- RT: Couplings
- Engines
- Gears
- Turbomachinery
- Wheels
- 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
- BT: Ethics
- Technology
- RT: Artificial intelligence

Philosophical considerations

Machine intelligence
　　BT:　Computational and artificial intelligence
　　RT:　Machine-to-machine communications
　　NT:　Pattern analysis

Machine learning
　　UF:　Dictionary learning
　　　　　Machine-learning
　　BT:　Artificial intelligence
　　RT:　Bio-inspired computing
　　　　　Cognitive systems
　　　　　Convolutional neural networks
　　　　　Data augmentation
　　　　　Deep architecture
　　　　　Energy informatics
　　　　　Generative adversarial networks
　　　　　Image augmentation
　　　　　Linear discriminant analysis
　　　　　Long short term memory
　　　　　Naive Bayes methods
　　　　　Predictive analytics
　　　　　Radiomics
　　　　　Text detection
　　NT:　Adversarial machine learning
　　　　　Boosting
　　　　　Deep learning
　　　　　Dimensionality reduction
　　　　　Ensemble learning
　　　　　Federated learning
　　　　　Hyperparameter optimization
　　　　　Multi-armed bandit problem
　　　　　Random forests
　　　　　Reinforcement learning
　　　　　Relevance vector machines
　　　　　Representation learning
　　　　　Robot learning
　　　　　Statistical learning
　　　　　Transfer learning

Machine learning algorithms
　　BT:　Algorithms

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

Machine tools
　　BT:　Production equipment
　　RT:　Clamps
　　　　　Coordinate measuring machines
　　　　　Cutting tools
　　　　　Fixtures
　　　　　Gears
　　　　　Hand tools
　　　　　Machine shops
　　　　　Machining
　　　　　Manufacturing
　　　　　Mechanical guides
　　　　　Turning
　　NT:　Dies
　　　　　Drilling machines
　　　　　Grinding machines
　　　　　Machine tool spindles
　　　　　Metalworking machines
　　　　　Milling machines
　　　　　Presses
　　　　　Sawing machines

Machine translation
　　BT:　Computational linguistics
　　　　　Natural language processing

Machine vector control
　　BT:　Machine control
　　RT:　AC-DC power converters
　　　　　DC-DC power converters

Machine vision
　　UF:　Vision systems (nonbiological)
　　BT:　Image processing
　　RT:　Automatic optical inspection
　　　　　IEEE 1394 Standard
　　　　　Image analysis
　　　　　Image recognition
　　　　　Manufacturing automation
　　　　　Observers
　　　　　Pattern recognition

Stereo vision
Visual systems
NT: Object recognition
Object segmentation

Machine windings
BT: Windings

Machine-to-machine communications
UF: M2M
BT: Communication systems
RT: Fourth Industrial Revolution
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

Machinery
BT: Industry applications
RT: Machinery production
industries
Machining
Materials handling
equipment
Production equipment
NT: Agricultural machinery
Ball bearings
Belts
Drives
Electric machines
Fans
Furnaces
Gears
Hydraulic systems
Machine components
Motors
Printing machinery
Pumps
Textile machinery

Machinery production industries
BT: Manufacturing industries
RT: Machine shops
Machinery

Machining
BT: Materials processing
RT: Burnishing
Clamps

Deburring
Finishing
Machine shops
Machine tools
Machinery
Manufacturing
NT: Boring
Drilling
Electrochemical machining
Hobbing machines
Lapping
Laser beam machining
Milling
Planing
Sawing
Turning
Virtual machining

Macrocell networks
UF: Macrocells
BT: Cellular networks
RT: Rural areas

Macroeconomics
BT: Economics
RT: Government
International trade
Public finance
NT: Privatization

Macular degeneration
BT: Eye diseases
Visual impairment

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 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 cores
BT: Magnetic devices
RT: Inductors
NT: Transformer cores

Magnetic devices
BT: Magnetics
RT: Magnetic circuits
           Magnetic materials
NT: Accelerator magnets
           Ferrite devices
           Magnetic cores
           Magnetic gears
           Magnetic heads
           Magnetic memory
           Magnetic modulators
           Magnetooptic devices

Magnetoresistive devices
Magnetostrictive devices
Solenoids
Transformer cores
Undulators

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
interfaces

Magnetic field measurement
BT: Magnetic variables
measurement
RT: Magnetic fields

Magnetic fields
BT: Magnetics
RT: Biomagnetics
           Compass
           Electromagnetic fields
           Magnetic analysis
           Magnetic anomaly
detection
           Magnetic anomaly
detectors
           Magnetic field
measurement
           Magnetic levitation vehicles
           Maxwell equations
           Remanence
           SQUID magnetometers
           Saturation magnetization
           Synchrotrons
NT: Geomagnetism
           Magnetic reconnection
           Magnetic separation
           Magnetostatics
           Toroidal magnetic fields

Magnetic films
UF: Magnetic thin films
BT: Films
           Magnetic materials

RT: Thin films
NT: Ferrimagnetic films
Ferrite films
Garnet films

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
Nondestructive testing
RT: Corrosion
Pipelines

Magnetic force microscopy
BT: Magnetics
RT: Atomic force microscopy
Magnetic forces

Magnetic forces
BT: Magnetics
RT: Electromagnetic forces
Force
Magnetic force microscopy
Magnetic levitation
NT: Coercive force

Magnetic gears
BT: Gears
Magnetic devices
RT: Electromagnetic devices
Magnetic levitation
Permanent magnets
Power transmission
Variable speed drives

Magnetic heads
BT: Magnetic devices
RT: Magnetic recording
Magnetoresistive devices

Magnetic hysteresis
BT: Magnetics
RT: Hysteresis
Remanence

Magnetic levitation
UF: Maglev
Magnetic bearings

BT: Levitation
Magnetics
RT: Electromagnets
Magnetic forces
Magnetic gears
Rail transportation
NT: Magnetic levitation vehicles

Magnetic levitation vehicles
UF: Maglev trains
Maglev transportation
Maglev vehicles
BT: Magnetic levitation
Rail transportation
RT: Electromagnets
High-speed rail
transportation
Magnetic fields
Permanent magnets
Superconducting magnets

Magnetic liquids
UF: Magnetic fluids
BT: Magnetic materials

Magnetic losses
UF: Magnetic core losses
BT: Magnetics
RT: Eddy currents
Loss measurement

Magnetic materials
BT: Magnetics
Materials
RT: Biomagnetics
Boron alloys
Magnetic devices
Magnetoelasticity
Magnetostriction
Permeability
NT: Amorphous magnetic
materials
Antiferromagnetic materials
Diamagnetic materials
Ferrimagnetic films
Ferrimagnetic materials
Ferrite films
Ferrites
Ferrofluid
Ferromagnetic materials
Garnet films
Garnets
Magnetic films
Magnetic liquids
Magnetic semiconductors

Magnetic superlattices
Paramagnetic materials
Soft magnetic materials

Magnetic memory
UF: Magnetic storage
BT: Magnetic devices
       Memory
RT: Magnetic recording
NT: Floppy disks
       Hard disks

Magnetic modulators
BT: Magnetic devices
       Modulation

Magnetic moments
BT: Magnetic anisotropy

Magnetic multilayers
BT: Magnetics
RT: Coatings

Magnetic nanoparticles
BT: Nanoparticles

Magnetic noise
BT: Magnetic recording

Magnetic particle imaging
BT: Tomography
RT: Medical diagnostic imaging

Magnetic particles
BT: Magnetics
RT: Biomagnetics
       Microelectromechanical devices
       Nanomagnetics

Magnetic properties
BT: Magnetics

Magnetic reconnection
BT: Magnetic fields

Magnetic recording
UF: Perpendicular recording
BT: Recording
RT: Magnetic heads
       Magnetic memory
NT: Digital magnetic recording
       Heat-assisted magnetic recording
       Magnetic noise

Magnetooptic recording
Microwave-assisted magnetic recording
Perpendicular magnetic recording
Shingled magnetic recording

Magnetic resonance
BT: Resonance
       Resonant frequency
RT: Ferroresonance
       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
RT: Diagnostic radiography
       Image reconstruction
       Magnetic resonance
NT: Diffusion tensor imaging
       Functional magnetic resonance imaging
       Magnetic resonance elastography
       Magnetic resonance fingerprinting

Magnetic semiconductors
BT: Magnetic materials
       Semiconductor materials

Magnetic sensors
BT: Magnetics
       Sensors
RT: Wearable 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 superlattices
BT: Magnetic materials
            Superlattices

Magnetic susceptibility
BT: Magnetics

Magnetic switching
BT: Magnetics

Magnetic tunneling
UF: Magnetic tunnel junctions
            Magnetic tunnelling
            Spin-dependent tunneling
            Spin-dependent tunnelling
BT: Magnetoelectric effects
            Tunneling
RT: Magnetoelectronics
            Spin polarized transport

Magnetic variables control
BT: Control systems

Magnetic variables measurement
UF: Magnetic measurements
BT: Measurement
NT: Magnetic anomaly detection
            Magnetic field measurement
            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
            Magnetoelectric effects
            Magnetomechanical effects
            Magnetooptic effects
            Magnets
            Magnonics
            Microwave magnetics
            Nanomagnetics
            Nonlinear magnetics
            Remanence
            Spin systems

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 techniques

Magnetoacoustic effects
UF: Acoustomagnetic effects
BT: Magnetics
RT: Acoustics
            Magnetomechanical effects

Magnetoelasticity
BT: Magnetomechanical effects

RT: Magnetic materials
NT: Magnetostriction

Magnetoelectric effects
    BT: Magnetics
    NT: Hall effect
            Magnetic tunneling
            Magnetoelectronics
            Magnetoresistance
            Spintronics

Magnetoelectronics
    UF: Magneto-electronics
            Magnetoelectronic devices
    BT: Magnetoelectric effects
    RT: Magnetic tunneling
            Magnetoresistive devices
    NT: Spin polarized transport

Magnetoencephalography
    BT: Biomagnetics
    RT: Biomedical image processing
            Brain

Magnetohydrodynamic power generation
    BT: Power generation
    RT: Magnetohydrodynamics

Magnetohydrodynamics
    UF: Hydromagnetics
            MHD
            Magnetofluid dynamics
            Magnetofluiddynamics
    BT: Dynamics
            Hydrodynamics
            Mechanical factors
    RT: Electrohydraulics
            Fluid flow
            Magnetohydrodynamic power generation

Magnetomechanical effects
    UF: Piezomagnetic effects
    BT: Magnetics
    RT: Magnetoacoustic effects
            Mechanical factors
            Stress
    NT: Magnetic field induced strain
            Magnetoelasticity
            Magnetostriction

Magnetometers
    UF: Magnetometry

    BT: Magnetic variables measurement
    NT: Magnetic anomaly detectors
            SQUID magnetometers

Magnetooptic devices
    UF: Photomagnetic devices
    BT: Magnetic devices
    RT: Magnetooptic effects

Magnetooptic effects
    UF: Magneto-optical effects
            Photomagnetic effects
    BT: Magnetics
    RT: Kerr effect
            Magnetooptic devices
            Magnetooptic recording
            Optics
            Ultracold atoms
    NT: Faraday effect
            Gyrotropism

Magnetooptic recording
    BT: Laser applications
            Magnetic recording
    RT: Magnetooptic effects

Magnetoresistance
    UF: Magnetoresistivity
    BT: Magnetoelectric effects
    RT: Magnetoresistive devices
            Nanocontacts
            Spin polarized transport
    NT: Anisotropic magnetoresistance
            Colossal magnetoresistance
            Enhanced magnetoresistance
            Extraordinary magnetoresistance
            Giant magnetoresistance
            Ordinary magnetoresistance
            Tunneling magnetoresistance

Magnetoresistive devices
    UF: Magnetoresistors
    BT: Magnetic devices
    RT: Giant magnetoresistance
            Magnetic heads
            Magnetoelectronics
            Magnetoresistance

JULY 2023 IEEE Thesaurus

Tunneling
magnetoresistance

Magnetosphere
UF:	Magnetotail
BT:	Terrestrial atmosphere
RT:	Geomagnetism

Magnetostatic waves
BT:	Waves
RT:	Electromagnetic

propagation

Magnetostatics

Magnetostatics
BT:	Magnetic fields
RT:	Magnetostatic waves

Magnetostriction
BT:	Magnetoelasticity
	Magnetomechanical effects
RT:	Magnetic materials
	Magnetostrictive devices

Magnetostrictive devices
BT:	Magnetic devices
RT:	Magnetostriction
	Sensors

Magnetrons
BT:	Electron tubes
RT:	Relativistic effects
	Sputtering

Magnets
BT:	Magnetics
RT:	Cobalt
	Saturation magnetization
NT:	Electromagnets
	Micromagnetics
	Permanent magnets

Magnonics
BT:	Magnetics

Main-secondary
UF:	main secondary
BT:	Protocols

Mainframes
UF:	Main frames
BT:	Digital computers
RT:	Microcomputers
	Time sharing computer

systems

Maintenance
BT:	Reliability

Maintenance engineering
UF:	Repair
BT:	Engineering - general
RT:	Automatic testing
	Availability
	Configuration management
	Fault diagnosis
	Inspection
	Monitoring
	Remaining life assessment
	Testing
NT:	Maintenance management
	Predictive maintenance
	Preventive maintenance
	Systems support

Maintenance management
BT:	Maintenance engineering
	Technical management

Maldistribution
BT:	Reliability

Malignant tumors
BT:	Tumors

Malware
UF:	Malicious software
BT:	Software
RT:	Anti-virus software
	Cyber espionage
	Phishing
	Privacy
	Security
NT:	Computer viruses
	Computer worms
	Ransomware
	Rootkit
	Trojan horses

Mammary glands
BT:	Glands

Mammography
BT:	Biomedical imaging
RT:	Medical tests

Man-machine systems
UF:	Cyborgs
	Human machine interface
	Human machine systems
	Man machine systems

BT:	Systems, man, and cybernetics
RT:	Androids
	Cybernetics
	Ergonomics
	Human computer interaction
	Human factors
	Persuasive systems
	Tactile Internet
NT:	Digital intelligence
	Extended reality
	Interactive systems

Management

UF:	Reliability management
BT:	Business
RT:	Analytic hierarchy process
	Ethical aspects
	Learning management systems
	Management information systems
	Management training
	Operations research
	Personnel
	Productivity
NT:	Asset management
	Best practices
	Building management systems
	Business continuity
	Business process management
	Business process re-engineering
	Communication system operations and management
	Conference management
	Content management
	Contingency management
	Contract management
	Contracts
	Customer relationship management
	Decision making
	Dependability management
	Distributed management
	Enterprise resource planning
	Facilities management
	Financial management
	Governmental factors
	Human resource management

	Information management
	Interface management
	International collaboration
	Knowledge management
	Marketing management
	Organizational aspects
	Outsourcing
	Process planning
	Production management
	Program management
	Project management
	Public relations
	Quality management
	Requirements management
	Research and development management
	Resource management
	Risk analysis
	Safety management
	Security management
	Storage management
	Supply chain management
	Technical management
	Technology management

Management accounting

BT:	Financial management
NT:	Cost accounting

Management information base

UF:	MIB
BT:	Computer network management
RT:	Information systems
	Telecommunication network management
	Virtual environments

Management information systems

BT:	Information systems
RT:	Customer relationship management
	Knowledge management
	Management
	Supply chain management
NT:	Portals

Management training

BT:	Training
RT:	Continuing education
	Management

Manganese

UF:	Mn
BT:	Metals

NT: Manganese alloys

Manganese alloys
BT: Manganese

Manifold learning
BT: Dimensionality reduction
RT: Learning (artificial intelligence)

Manifolds
UF: Exhaust manifolds
BT: Machine components
RT: Engines
            Exhaust systems
            Valves

Manipulator dynamics
BT: Manipulators

Manipulators
BT: Robots
RT: Assembly
            Assembly systems
            Control equipment
            Control systems
            Industrial control
            Manufacturing automation
            Materials handling
            Mechanical variables control
            Medical robotics
            Motion control
            Nonlinear systems
            Position control
            Service robots
            Servomechanisms
            Servosystems
            Telerobotics
NT: End effectors
            Manipulator dynamics
            Micromanipulators

Manuals
UF: Technical manuals
BT: Professional communication
RT: Documentation
            Training
            Writing

Manufactured products
UF: Counterfeit goods
BT: Manufacturing
RT: Product customization
            Product design
            Product development
NT: Ceramic products
            Chemical products
            Consumer products
            Electrical products
            Food products
            Fuels
            Glass products
            Mechanical products
            Metal products
            Paper products
            Paper pulp
            Plastic products
            Rubber products
            Sports equipment
            Textile products
            Tools
            Windows

Manufacturing
BT: Industry applications
RT: Bonding
            Business
            Discrete-event systems
            Industrial plants
            Machine tools
            Machining
            Materials handling
            Materials processing
            Production control
            Production engineering
            Production facilities
            Production systems
            Productivity
            Soldering
            Stereolithography
            Welding
            Wheels
            Wire drawing
NT: Assembly
            Assembly systems
            Embossing
            Fabrication
            Fourth Industrial Revolution
            Green manufacturing
            Lithography
            Manufactured products
            Manufacturing systems
            Mass customization
            Smart manufacturing
            Tolerance analysis

Manufacturing automation
UF: Factory automation

BT: Automation
Industrial electronics
RT: Assembly
Assembly systems
Automatic optical inspection
Industrial control
Industrial robots
Machine vision
Manipulators
Mobile robots
Process control
Programmable control
Robots
NT: Computer aided manufacturing
Computer integrated manufacturing
Computer numerical control
Flexible manufacturing systems

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 industries
Metal product industries
Plastics industry
Pulp and paper industry
Rubber industry
Shipbuilding industry
Textile industry
Toy manufacturing industry

Manufacturing processes
UF: Compliant mechanisms
Froth flotation
Manufacturing process
BT: Manufacturing systems
RT: Rapid prototyping
NT: Sintering

Manufacturing systems
BT: Manufacturing
Production systems
RT: Bleaching

Industrial facilities
Production engineering
NT: Agile manufacturing
Automobile manufacture
Batch production systems
Blanking
Cellular manufacturing
Flow production systems
Food manufacturing
Forging
Glass manufacturing
Integrated manufacturing systems
Intelligent manufacturing systems
Job production systems
Joining processes
Layered manufacturing
Lean production
Manufacturing processes
Mass production
Melt processing
Pulp manufacturing
Sheet metal processing
Thermoforming
Three-dimensional printing

Manycore processors
UF: Manycore computing
BT: Multicore processing
RT: Program processors
Marine accidents
BT: Accidents
RT: Marine pollution
Marine safety
Marine vehicles

Marine animals
UF: Ocean animals
Sea animals
BT: Animals
RT: Aquaculture
NT: Dolphins
Whales

Marine engineering
BT: Engineering - general

Marine equipment
BT: Marine technology
RT: Marine robots

Marine navigation
BT: Navigation

Oceanic engineering and
marine technology
RT: Marine robots
        Sea state

Marine pollution
BT: Water pollution
RT: Marine accidents
        Oil pollution
        Oils
        Thermal pollution

Marine robots
BT: Marine vehicles
        Robots
        Underwater technology
RT: Autonomous underwater
vehicles
        Boats
        Marine equipment
        Marine navigation
        Military vehicles
        Mobile robots
        Oceanography
        Rescue robots
        Underwater vehicles

Marine safety
BT: Safety
RT: Marine accidents
        Marine technology
        Marine vehicles

Marine technology
UF: Ocean technology
BT: Oceanic engineering and
marine technology
RT: Excavation
        Marine safety
        Military systems
        Oceans
        Underwater vehicles
NT: Marine equipment
        Marine transportation
        Underwater cables
        Underwater communication
        Underwater equipment
        Underwater structures
        Underwater technology

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

Maritime communications
BT: Communication networks

Market opportunities
BT: Marketing management
RT: Consumer behavior
        Customer profiles
        Disruptive innovation
        Disruptive technologies
        Emissions trading
        Neuromarketing

Market research
BT: Customer relationship
management
        Engineering management
RT: Brand management
        Competitive intelligence
        Consumer products
        Customer satisfaction
        Neuromarketing

Marketing management
BT: Management
RT: Electronic commerce
        Public relations
NT: Advertising
        Brand management
        Distribution strategy
        Market opportunities
        Mass customization
        Promotion - marketing

Markov processes
UF: Markov decision processes
BT: Stochastic processes
RT: Belief propagation
        Dynamic programming
        Hidden Markov models

	Infinite horizon
	Multi-armed bandit problem
	Q-learning
NT:	Markov random fields

Markov random fields
UF:	Markov network
BT:	Markov processes

Markup languages
BT:	Computer languages
RT:	Cascading style sheets
	Semantic Web
NT:	HTML
	OWL
	Page description languages
	SGML
	XML

Mars
BT:	Planets

Martensite
BT:	Crystalline materials
	Steel
RT:	Smart materials

Masers
UF:	Microwave lasers
BT:	Microwave devices
	Microwave technology
RT:	Atomic clocks
	Relativistic effects
	Ring oscillators
	Stimulated emission
NT:	Gyrotrons

Mashups
UF:	Mashing
BT:	Web services
	World Wide Web

Masking threshold
BT:	Psychoacoustic models

Mass customization
BT:	Manufacturing
	Marketing management

Mass production
BT:	Manufacturing systems
RT:	Production management

Mass spectroscopy
UF:	Mass spectrometry

BT:	Spectroscopy

Massive machine type communications
UF:	MMTC
	mmtc
BT:	Machine-to-machine communications
RT:	Intelligent systems

Massive MIMO
BT:	MIMO communication

Masticatory muscles
BT:	Stomatognathic system

Matched filters
BT:	Filters
RT:	Filtering theory

Matching pursuit algorithms
BT:	Algorithms

Material properties
BT:	Materials
NT:	Creep
	Elasticity
	Elongation
	Resilience
	Rigidity

Material storage
BT:	Materials, elements, and compounds
RT:	Canning
	Energy storage
NT:	Bulk storage
	Containers
	Fuel storage
	Secure storage
	Stacking
	Storage automation
	Warehousing
	Water storage

Materials
BT:	Materials, elements, and compounds
RT:	Materials handling
	Oxidation
NT:	Acoustic materials
	Additives
	Aggregates
	Amorphous materials
	Auxetic materials
	Bio-inspired materials

Biological materials
Biomedical materials
Building materials
Catalysts
Ceramics
Composite materials
Conducting materials
Corrosion inhibitors
Crystalline materials
Crystals
Dielectric materials
Films
Fluids
Hazardous materials
Inorganic materials
Intelligent materials
Lacquers
Laminates
Magnetic materials
Material properties
Media
Mesoporous materials
Metal foam
Metallic materials
Metamaterials
Nanostructured materials
Oils
Optical materials
Organic inorganic hybrid materials
Organic materials
Paints
Paper pulp
Petrochemicals
Phase change materials
Photoconducting materials
Plastics
Polymer foams
Polymer gels
Polymers
Production materials
Radioactive materials
Raw materials
Resins
Resists
Semiconductor materials
Sheet materials
Smart materials
Solids
Superconducting materials
Surfactants
Terahertz materials
Textiles
Thermoelectric materials
Waste materials

Wire

Materials handling
UF: Materials handling systems
       Scrubbers
BT: Materials science and technology
RT: Canning
       Compaction
       Die casting
       Dispatching
       Lifting equipment
       Manipulators
       Manufacturing
       Materials
       Mobile robots
       Pipelines
       Radioactive waste
       Radioactive waste disposal
       Robots
       Stacking
NT: Cleaning
       Decontamination
       Freight handling
       Materials handling equipment
       Pallets
       Remote handling
       Sieving

Materials handling equipment
BT: Materials handling
RT: Machinery
       Production equipment
       Waste handling equipment
NT: Containers
       Grippers
       Lifting equipment
       Pulleys
       Remote handling equipment
       Winches

Materials preparation
UF: Atmospheric sintering
BT: Materials science and technology
RT: Corrosion inhibitors
       Flame retardants
NT: Doping
       Firing
       Ion implantation
       Laser sintering
       Sputtering

Materials processing
UF:	Mineral processing	
BT:	Production	
RT:	Bonding	
	Canning	
	Corrosion inhibitors	
	Electrochemical deposition	
	Fabrication	
	Finishing	
	Foundries	
	Manufacturing	
	Materials science and technology	
	Metalworking machines	
	Plasma welding	
	Soldering	
	Welding	
NT:	Annealing	
	Bleaching	
	Casting	
	Coatings	
	Curing	
	Etching	
	Heat treatment	
	Joining processes	
	Lamination	
	Laser materials processing	
	Machining	
	Melt processing	
	Plasma materials processing	
	Plating	
	Pressing	
	Punching	
	Refining	
	Shearing	
	Smelting	
	Softening	
	Swaging	
	Vapor deposition	

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
UF:	Materials science
BT:	Materials, elements, and compounds
RT:	Austenite
	Crystals
	Gases
	Liquids
	Materials processing
	Solid-state physics
	Solids
NT:	Absorption
	Aging
	Chemical analysis
	Computational materials science
	Contamination
	Degradation
	Filtration
	Hysteresis
	Impurities
	Materials handling
	Materials preparation
	Materials reliability
	Materials testing
	Metallurgy
	Microstructure
	Periodic structures
	Pigmentation
	Separation processes
	Surface engineering
	Surfaces

Materials testing
BT:	Materials science and technology
	Testing
NT:	Accelerated aging
	Acoustic testing
	Adhesive strength
	Bonding forces
	Delamination
	Elastic recovery
	Nondestructive testing

Materials, elements, and compounds
NT:	Atoms
	Chemical elements
	Compounds
	Material storage
	Materials
	Materials science and technology
	Metals

Mathematical analysis
BT:	Mathematical models	
NT:	Formal concept analysis	
	Fractional calculus	
	Modal analysis	

Mathematical models
BT:	Mathematics	
	Modeling	
RT:	Artificial neural networks	
NT:	Geometric modeling	
	Mathematical analysis	

Mathematical programming
BT:	Mathematics	
	Optimization methods	

Mathematics
RT:	Bio-inspired computing	
	Econometrics	
	Maximum likelihood detection	
	Metaheuristics	
	STEM	
	Viterbi algorithm	
	Waveguide theory	
NT:	Accuracy	
	Algebra	
	Algorithms	
	Arithmetic	
	Azimuth	
	Boundary value problems	
	Calculus	
	Chemical reaction network theory	
	Closed-form solutions	
	Combinatorial mathematics	
	Computational efficiency	
	Conformal mapping	
	Convergence	
	Convex functions	
	Cyclic redundancy check	
	Dynamical systems	
	Eigenvalues and eigenfunctions	
	Equations	
	Estimation	
	Euclidean distance	
	Finite difference methods	
	Finite element analysis	
	Fourier series	
	Functional analysis	
	Geometry	
	Gradient methods	
	Graph theory	

Harmonic analysis
Iterative methods
Kernel
Laplace equations
Lattices
Limit-cycles
Linear matrix inequalities
Linear systems
Linearization techniques
Mathematical models
Mathematical programming
Method of moments
Minimization
Mode matching methods
Network theory (graphs)
Nonlinear equations
Nonlinear systems
Numerical analysis
Optimization
Piecewise linear techniques
Predator prey systems
Probability
Quaternions
Random processes
Root mean square
Sequences
Set theory
Simulated annealing
Smoothing methods
Spirals
Statistics
Stochastic processes
Superposition calculus
Taylor series
Tensors
Topology
Transforms
Transmission line matrix methods
Uncertain systems
Utility theory

Mathematics computing
BT:	Computer applications	
RT:	Graph drawing	
NT:	Matlab	

Matlab
UF:	Matrix laboratory	
BT:	Mathematics computing	
RT:	Computer aided instruction	
	Numerical analysis	
	Simulation	
	Software libraries	

Matrices
UF: Matrix algebra
BT: Linear algebra
RT: Method of moments
    Mode matching methods
NT: Jacobian matrices
    Matrix decomposition
    Singular value decomposition

Matrix converters
UF: Matrix convertors
BT: Power conversion
RT: Power electronics

Matrix decomposition
BT: Matrices
RT: Signal processing
    Statistics

Matter waves
UF: De Broglie methods
    De broglie hypothesis
BT: Waves

Maximum a posteriori estimation
UF: Maximum a posteriori estimator
    Maximum a posteriori framework
    Maximum a posteriori method
    Maximum a posteriori probability
    Maximum a-posteriori
    Maximum aposteriori
BT: Estimation theory

Maximum likelihood decoding
BT: Decoding
RT: Algorithms

Maximum likelihood detection
UF: Additive metric
    Complexity constrained detection
    Linear filtering
BT: Algorithms
RT: Filtering theory
    Mathematics
    Probability
    Statistics

Maximum likelihood estimation
UF: MLE

BT: Estimation
    Statistics
RT: Set theory
    Tracking

Maximum likelihood linear regression
BT: Linear regression

Maximum power point trackers
UF: MPPT
    Maximum power point tracking
BT: Solar power generation
RT: Inverters
    Power conversion
    Solar energy

Maxwell equations
BT: Equations
RT: Electric fields
    Magnetic fields
    Perfectly matched layers

Maxwell-Boltzmann distribution
UF: Maxwell-Boltzmann statistics
BT: Probability distribution

Mean field theory
UF: MFT
    Self-consistent field theory
BT: Statistical analysis
RT: Probability
    Random processes
    Stochastic processes
    Stochastic systems

Mean square error methods
BT: Approximation methods
RT: Error analysis
    Estimation theory
    Least squares approximations
NT: Least mean squares methods

Measurement
UF: Metrics
    Performance measurement
    Performance metrics
BT: Instrumentation and measurement
RT: Containers
    Data acquisition
    Food security

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

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
Geologic measurements
Geophysical measurements
Interferometry
Key performance indicator
Length measurement
Lifetime estimation
Loss measurement
Lumen
Magnetic variables measurement

Measurement by laser beam

Measurement errors
Measurement techniques
Measurement uncertainty
Measurement units
Mechanical variables measurement

Micrometers
Moisture measurement

Noise measurement
Nuclear measurements
Optical variables measurement

Particle beam measurements

Particle measurements
Performance evaluation
Phase measurement
Plasma measurements
Pollution measurement
Pressure measurement
Pulse measurements
Reflectometry
Replicability
Reproducibility of results
Scintillation counters
Sea state
Semiconductor device measurement

Sensitivity
Shape measurement
Size measurement
Software measurement
Soil measurements
Spectral efficiency
Spectroscopy
Thermal variables measurement

Time measurement
UHF measurements
Ultrasonic variables measurement

Viscosity
Wavelength measurement
Wide area measurements
pH measurement

Measurement by laser beam
BT: Measurement
RT: Laser applications
NT: Laser velocimetry

Measurement errors
BT: Measurement
RT: Error analysis
Statistical analysis

Measurement standards
BT: Standards categories
RT: ISO
Measurement
Measurement units

Measurement techniques
BT: Measurement
RT: Measurement uncertainty
NT: Calibration
          Dynamic equilibrium

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
NT: 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
          Precision engineering
          Pressure vessels
NT: Mechanical power transmission
          Mechanical systems

Mechanical factors
UF: Mechanical properties
BT: Physics
RT: Acoustic noise
          Electrostriction
          Magnetomechanical effects
          Mechanical bearings
          Mechanical variables control

          Oils
          Structural engineering
NT: Aerodynamics
          Bending
          Biomechanics
          Damping
          Deformation
          Dynamics
          Fatigue
          Force
          Friction
          Hydrodynamics
          Kinematics
          Lubrication
          Magnetohydrodynamics
          Photoelasticity
          Pressure effects
          Shock (mechanics)
          Strain
          Stress
          Surface cracks
          Surface stress
          Torque
          Vibrations
          Volume relaxation
          Workability

Mechanical guides
UF: Guideways (mechanical)
          Slideways (mechanical)
BT: Mechanical products
RT: Machine tools
          Position control

Mechanical power transmission
UF: Continuously variable transmission
          Powertrain
BT: Mechanical engineering
RT: Cams
          Drives
          Engines
          Gears
          Oils
          Power systems
          Shafts
NT: Torque converters

Mechanical products
UF: Ball screws
BT: Manufactured products
          Production
RT: Escalators
          Mechanical engineering

Structural rings
NT: Automotive components
        Axles
        Bellows
        Blades
        Brakes
        Couplings
        Fasteners
        Flanges
        Gears
        Hoses
        Machine components
        Mechanical guides
        Needles
        Orifices
        Pistons
        Pressure vessels
        Seals
        Springs
        Steering systems
        Structural shapes
        Tires
        Vents
        Wheels

Mechanical sensors
BT: Sensors
NT: Capacitive sensors
Mechanical splines
BT: Machine components
RT: Gears
        Machine tool spindles
        Shafts

Mechanical systems
BT: Mechanical engineering
RT: Gears
        Mechatronics
        Microelectromechanical
devices
        Pneumatic systems
        Turbomachinery
NT: Mechanical energy
        Micromechanical devices
        Suspensions (mechanical
systems)

Mechanical variables control
BT: Control systems
RT: Flexible structures
        Frequency control
        Manipulators
        Mechanical factors
        Mobile robots
        Motor drives

        Robots
NT: Displacement control
        Force control
        Level control
        Motion control
        Pitch control (position)
        Position control
        Shape control
        Size control
        Strain control
        Stress control
        Thickness control
        Torque control
        Velocity control
        Vibration control
        Weight control

Mechanical variables measurement
BT: Measurement
RT: Frequency measurement
        Transducers
NT: Angular velocity
        Displacement
measurement

        Force measurement
        Motion measurement
        Position measurement
        Rotation measurement
        Strain measurement
        Stress measurement
        Thickness measurement
        Torque measurement
        Velocity measurement
        Vibration measurement
        Volume measurement
        Weight measurement

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
        Microelectromechanical
systems

	Robots
	Vehicular automation
NT:	Biomechatronics

Media

BT:	Materials
RT:	Closed captioning
	Design tools
NT:	Fake news
	Nonhomogeneous media
	Photorealism
	Random media

Media Access Protocol

UF:	MAC
	MAC protocol
	Media access control
	Medium access control
BT:	Access protocols
RT:	Local area networks
	Metropolitan area networks

Mediation

BT:	Middleware

Medical conditions

UF:	Medical disorders
BT:	Medical services
RT:	Anxiety disorders
NT:	Addiction
	Aneurysm
	Arrhythmia
	Atrophy
	Autism
	Blindness
	Cataracts
	Chronic kidney disease
	Congestive heart failure
	Cybersickness
	Deafness
	Dementia
	Depression
	Diabetes
	Diseases
	Dyslexia
	Eczema
	Hemorrhaging
	Hypertension
	Hyperthermia
	Injuries
	Kidney stones
	Motion sickness
	Muscular dystrophy
	Obesity
	Paralysis

	Pregnancy
	Scoliosis
	Sepsis
	Sleep apnea
	Stroke (medical condition)
	Thrombosis
	Tumors
	Visual impairment

Medical control systems

BT:	Control systems
RT:	Assistive technologies
	Biomedical equipment
	Orthotics
	Prosthetics

Medical devices

BT:	Biomedical equipment
RT:	Biomedical communication

Medical diagnosis

UF:	Diagnosis (medical)
	Medical diagnostics
	Patient diagnosis
BT:	Medical services
RT:	Biomedical imaging
	Diagnostic radiography
	Diseases
	Electroencephalography
	Electrophoresis
	Medical expert systems
	Occupational medicine
	Radiography
	Translational research
NT:	Autopsy
	Bronchoscopy
	Colonography
	Computer aided diagnosis
	Medical signal detection
	Nanomedicine
	Plethysmography
	Sensitivity and specificity

Medical diagnostic imaging

BT:	Biomedical imaging
RT:	Cancer
	Magnetic particle imaging
	Positron emission tomography
	Solid scintillation detectors
	Tumors
NT:	Anatomical structure
	Radionuclide imaging

Medical expert systems
- BT: Biomedical computing
- Expert systems
- RT: Medical diagnosis
- Medical treatment

Medical information systems
- BT: Biomedical computing
- Computer applications
- Information systems
- NT: Electronic medical records

Medical instruments
- UF: Medical equipment
- BT: Biomedical equipment
- Instruments

Medical robotics
- UF: Medical robots
- Surgical robots
- BT: Robots
- RT: Biomedical equipment
- Biomedical image processing
- Endomicroscopy
- Kinematics
- Manipulators
- Motion control
- Position control
- Soft robotics
- Telerobotics
- Wearable robots
- NT: Assistive robots

Medical services
- UF: Doctor
- Emergency medical services
- Health care
- Healthcare
- Nursing
- Physician
- BT: Engineering in medicine and biology
- RT: Behavioral sciences
- Chemotherapy
- Emergency services
- Translational research
- NT: Assisted living
- Catheterization
- Clinical diagnosis
- Cybercare
- Electronic healthcare
- Health information management

Hospitals
In vitro
In vivo
Internet of Medical Things
Medical conditions
Medical diagnosis
Medical tests
Medical treatment
Occupational medicine
Organ transplantation
Point of care
Prosthetics
Public healthcare
Sensory aids
Smart healthcare
Vaccines
X-rays

Medical signal detection
- BT: Medical diagnosis

Medical simulation
- BT: Simulation

Medical specialties
- BT: Engineering in medicine and biology
- NT: Anesthesiology
- Cardiology
- Dermatology
- Endocrinology
- Gastroenterology
- Gerontology
- Gynecology
- Immunology
- Neonatology
- Nephrology
- Neurology
- Obstetrics
- Oncology
- Ophthalmology
- Pathology
- Pediatrics
- Psychiatry
- Pulmonology
- Radiology

Medical tests
- BT: Medical services
- RT: Mammography
- NT: Amniocentesis
- Biopsy
- Cancer detection
- Colonoscopy
- Pregnancy test

JULY 2023 IEEE Thesaurus

Medical treatment
UF:	Patient identification
	Patient treatment
	Therapy
BT:	Medical services
RT:	Biohazards
	Biomedical applications of radiation
	Internet of Medical Things
	Medical expert systems
	Occupational medicine
	Psychiatry
NT:	Acupuncture
	Anesthesia
	Angioplasty
	Brachytherapy
	Brain stimulation
	Cancer treatment
	Chemotherapy
	Clinical trials
	Cryotherapy
	Defibrillation
	Dentistry
	Electrical stimulation
	Electronic medical prescriptions
	Electroporation
	Embolization
	Fibrillation
	Geriatrics
	Hepatectomy
	Hospitals
	Hyperthermia
	Immunotherapy
	Intubation
	Lithotripsy
	Magnetic stimulation
	Neuromuscular stimulation
	Neutron capture therapy
	Noninvasive treatment
	Orthopedic procedures
	Orthotics
	Patient rehabilitation
	Pharmaceuticals
	Precision medicine
	Proton therapy
	Surgery

Medium voltage
UF:	Medium-voltage
BT:	Voltage measurement

Meeting planning
BT:	Planning

Meetings
UF:	Technical meetings
BT:	Professional communication
RT:	Public speaking
	Teleconferencing
	Video conferencing
NT:	Conferences

Mel frequency cepstral coefficient
UF:	MFCC
	Mel-frequency cepstral coefficient
BT:	Cepstral analysis

Melanoma
BT:	Skin cancer

Melt processing
BT:	Manufacturing systems
	Materials processing
RT:	Die casting
	Smelting
NT:	Vacuum arc remelting

Membrane potentials
UF:	Membrane voltage
	Transmembrane potential
BT:	Cells (biology)
RT:	Action potentials
	Neurons

Memetics
BT:	Evolution (biology)
RT:	Cultural differences
	Genetics

Memory
UF:	Data storage
BT:	Computers and information processing
RT:	CMOS memory circuits
	Cognitive load
	Memory architecture
	Phase change materials
	Recording
NT:	Analog memory
	Associative memory
	Cache memory
	Content addressable storage
	Flash memories
	Magnetic memory
	Memory management

JULY 2023 IEEE Thesaurus

Nonvolatile memory
Phase change memory
Random access memory
Read only memory
Read-write memory
Registers
Scanning probe data storage
Semiconductor memory

Memory architecture
BT: Computer architecture
RT: Memory
Memory management

Memory management
UF: Garbage collection (computers)
BT: Computer architecture
Memory
RT: Memory architecture
Memory modules
Storage management
NT: In-memory computing
Neural network compression

Memory modules
BT: Printed circuits
RT: Integrated circuits
Memory management

Memoryless systems
UF: Memoryless channel
BT: Probability

Memristors
UF: Memory resistors
Memristor circuits
BT: Resistors
RT: Neuromorphic engineering
Resistive RAM

Mental disorders
UF: Mental illness
BT: Psychiatry
NT: Anxiety disorders
Eating disorders

Mental health
BT: Human factors
Psychology
RT: Anxiety disorders
Behavioral sciences

Mentoring
BT: Career development
RT: Training

Mercury (metals)
UF: Hg
BT: Chemical elements
Metals

Mercury (planets)
BT: Planets

Merging
BT: Data handling
RT: Sorting

MERIS
UF: Medium resolution imaging spectrometer
BT: Spectroscopy

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

Mesons
UF: Kaons
Muons
Pions
BT: Elementary particles
RT: Cosmic rays

Mesoporous materials
UF:	Mesoporous
BT:	Materials
RT:	Electrocatalysts

Message authentication
BT:	Data security
RT:	Cryptography
	Digital signatures
	Message systems
	Steganography

Message passing
BT:	Distributed processing
RT:	Belief propagation

Message services
UF:	Messaging service
	WeChat
BT:	Web services

Message systems
BT:	Communications technology
RT:	Cluster computing
	Digital signatures
	Message authentication
NT:	Electronic mail
	Electronic messaging
	Postal services
	Publish subscribe systems
	Voice mail

Message-oriented middleware
BT:	Middleware

Metabolomics
BT:	Molecular biomarkers

Metacognition
UF:	Meta cognition
	Meta-cognition
BT:	Cognition

Metacomputing
BT:	Distributed computing
NT:	Grid computing

Metadata
UF:	Meta data
BT:	Data models
RT:	Image annotation
	Linked data
NT:	Annotations

Metaheuristics
UF:	Meta heuristics
	Meta-heuristics
	Metaheuristic algorithms
BT:	Algorithmic efficiency
	Optimization
RT:	Ant colony optimization
	Evolutionary computation
	Genetic algorithms
	Heuristic algorithms
	Mathematics
	Particle swarm optimization
	Search problems
	Simulated annealing
NT:	Quantum annealing

Metal cutting tools
BT:	Cutting tools

Metal enclosures
BT:	Metal products

Metal foam
BT:	Materials
RT:	Lightweight structures
	Metals
	Polymer foams

Metal product industries
BT:	Manufacturing industries
RT:	Metal products

Metal products
BT:	Manufactured products
RT:	Ball bearings
	Blanking
	Metal product industries
	Metals industry
	Swaging
NT:	Metal enclosures

Metal-insulator structures
BT:	Insulators
RT:	Electrodes
	MIS devices
	MOS integrated circuits
NT:	MIM capacitors
	MIM devices

Metallic materials
BT:	Materials
RT:	Cermet

JULY 2023 IEEE Thesaurus

Metallic superlattices
BT: Superlattices

Metallization
UF: Metallisation
BT: Metals
RT: Wiring
NT: Integrated circuit metallization

Metallurgy
BT: Materials science and technology
RT: Iron alloys
Metals

Metals
UF: Alloys
BT: Materials, elements, and compounds
RT: Blanking
Die casting
Filler metals
Inorganic compounds
Metal foam
Metallurgy
Metalworking machines
NT: Alloying
Aluminum
Barium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Digital alloys
Erbium
Gallium
Germanium
Gold
Hafnium
Indium
Iron
Lanthanum
Lead
Lithium
Magnesium
Manganese
Mercury (metals)
Metallization
Neodymium
Nickel
Niobium

Palladium
Platinum
Rare earth metals
Samarium
Silver
Steel
Strontium
Tin
Titanium
Tungsten
Yttrium
Zinc

Metals industry
UF: Aluminium industry
Aluminum industry
BT: Industries
RT: Metal products
Smelting

Metalworking machines
BT: Machine tools
RT: Cutting tools
Materials processing
Metals

Metamaterials
UF: Acoustic metamaterials
Left handed materials
Left-handed materials
BT: Materials
RT: Metasurfaces
Nanocomposites
Optical materials
Refractive index
Smart materials
Split ring resonators
NT: Electromagnetic metamaterials
Optical cloaking
Optical metamaterials

Metamodeling
UF: Meta-modeling
BT: Modeling

Metasearch
UF: Federated search
Federated searching
Meta search
Meta-search
BT: Search methods
RT: Triples (Data structure)
Web search

JULY 2023 IEEE Thesaurus

Metastasis
UF: Metastatic disease
BT: Cancer
RT: Diseases

Metasurfaces
BT: Surfaces
RT: Metamaterials
Thin films

Metaverse
UF: Meta verse
BT: Virtual environments
RT: Augmented reality
Avatars
Blockchains
Games
Three-dimensional displays
User experience
User interfaces
Virtual reality

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
Barometers
Data assimilation
Environmental factors
Ice
Ionosphere
Pressure effects
Remote sensing
Terrestrial atmosphere
NT: Droughts
Humidity
Lightning
Monsoons
Precipitation
Storms
Weather forecasting
Wind

Meter reading
BT: Power system measurements
NT: Automatic meter reading
Smart meters

Meters
BT: Instruments
NT: Dynamometers
Flowmeters
Goniometers
Potentiometers
Radiometers
Tachometers
Vibrometers
Voltmeters
Wattmeters

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
UF: Galerkin method
Method-of-moments
MoM
Moment methods
BT: Mathematics
Numerical analysis
RT: Boundary-element methods
Integral equations
Matrices

Metrology
BT: Science - general
NT: Optical metrology

Metropolitan area networks
UF: Metro area networks
BT: Communication systems
Computer networks

		Digital systems
RT:		Distributed computing
		IEEE 802.16 Standard
		Internetworking
		LAN interconnection
		Media Access Protocol
		Multiprocessor

interconnection

		Open systems
		Protocols
		Regional area networks
		Token networks

mHEMTs
UF: Metamorphic HEMTs
BT: HEMTs

Mice
UF: Mouse
BT: Animals

Microactuators
BT: Actuators
     Microelectromechanical

devices
RT: Microrelays

Microarchitecture
BT: Software architecture

Microassembly
UF: Die attach
     Die bonding
BT: Assembly
RT: Flip-chip devices
     Integrated circuit

manufacture

     Micromachining
     Semiconductor device

manufacture

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
RT: Ultra-dense networks

Microchannels
BT: Hydraulic diameter

Microchip lasers
BT: Solid lasers

Microcomputers
UF: Laptops
     Micro computers
     Micro-computers
     Minicomputers
     Personal computers
BT: Computers
RT: Consumer electronics
     Home computing
     Mainframes
     Microprocessors
     Office automation
NT: Portable computers
     Workstations

Microcontrollers
BT: Control equipment
     Microprocessors
RT: CMOS technology
     Control systems
     High-speed integrated

circuits

     Neurocontrollers
     System-on-chip

Microdisplays
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
Micro-electromechanical devices
BT: Microelectromechanical systems
RT: Magnetic particles
Mechanical systems
Mechatronics
Micromachining
Microsensors
NT: Microactuators
Micromotors
Micropumps
Microvalves

Microelectromechanical systems
UF: MEMS
Micro-electro-mechanical systems
Micro-electromechanical systems
BT: Electron devices
RT: Mechatronics
Nanoelectromechanical systems
NT: Microelectromechanical devices
Radiofrequency microelectromechanical systems

Microelectronic implants
BT: Implants

Microelectronics
BT: Electronic equipment
RT: Integrated circuits

Microfabrication
BT: Fabrication
Micromechanical devices
RT: Fiducial markers
Nanotechnology

Microfiltration
BT: Filtration
RT: Contamination

Microfluidics
BT: Electron devices
Fluidics
RT: Biochips

Biomedical engineering
Fluidic microsystems
Hydrodynamics

Microgrids
BT: Power grids
RT: Distributed power generation
Power distribution networks
Power generation
Power system management
Power system reliability
Smart grids

Microhydro power
UF: Micro-hydro
BT: Hydroelectric power generation
RT: Appropriate technology

Microinjection
BT: Biology

Micromachining
BT: Electronic equipment manufacture
RT: Electrochemical machining
Embossing
Etching
Integrated circuit manufacture
Microassembly
Microelectromechanical devices
Semiconductor device manufacture

Micromagnetics
BT: Magnets

Micromanipulators
BT: Manipulators

Micromechanical devices
UF: Micromechanical systems
Microsystems
BT: Electron devices
Mechanical systems
RT: Microoptics
Nanogenerators
NT: Biomedical microelectromechanical systems
Fluidic microsystems
Microfabrication

Micrometers
UF:	Micrometres	
	Micrometry	
	Microns	
BT:	Measurement	
RT:	Distance measurement	
	Interferometry	
	Length measurement	
	Strain measurement	
	Thickness measurement	

Micromirrors
UF:	Digital micromirror devices
BT:	Microoptics
	Mirrors
RT:	Optical arrays
	Optical projectors

Micromotors
BT:	Microelectromechanical devices
	Motors
	Rotating machines

Microoptics
UF:	Micro-optical components
	Micro-opticalmechanical devices
	Microoptical components
BT:	Optics
RT:	Integrated optics
	Integrated optoelectronics
	Microcavities
	Microdisplays
	Micromechanical devices
	Microswitches
NT:	Micromirrors

Microorganisms
UF:	Bacteria
	Bacterial content
	Viruses (microorganisms)
BT:	Organisms
RT:	Antibodies
	Biological cells
	Immune system
	Molecular biophysics
NT:	Adenoviruses
	Biofilms
	Fungi
	Viruses (medical)

Micropayments
BT:	Financial services
	Online banking
RT:	Blockchains
	Cryptocurrency

Microphone arrays
BT:	Microphones

Microphones
BT:	Audio systems
NT:	Microphone arrays

Microprocessor chips
BT:	Microprocessors
RT:	Flip-chip devices
	Substrates
	Yield estimation
NT:	AI accelerators

Microprocessors
BT:	Circuits
	Integrated circuits
RT:	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

Microscopy
BT:	Imaging
	Instruments
RT:	Optical imaging
NT:	Atomic force microscopy
	Electron microscopy
	Endomicroscopy

Scanning microwave microscopy

Scanning probe microscopy

Microsensors
BT: Electromechanical sensors
RT: Control systems
Microelectromechanical devices
Wireless sensor networks

Microservice architectures
BT: Service-oriented architecture

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
RT: Aperture coupled antennas
Microstrip antenna arrays
Patch antennas

Microstrip components
BT: Microstrip
RT: Power combiners
Power dividers
Thick film inductors
NT: Microstrip resonators

Microstrip filters
BT: Filters
RT: Microwave communication

Microstrip resonators
BT: Microstrip components
RT: Resonance

Microstructure
BT: Materials science and technology
RT: Crystal microstructure

Microsurgery
BT: Surgery

Microswitches
UF: MEMS switches
BT: Switches
RT: Microoptics

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
Distributed parameter circuits
Microwave devices
Microwave integrated circuits
Microwave photonics

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

Microwave filters
BT: Microwave devices

Microwave frequencies
BT: Microwave measurement

Microwave generation
BT: Microwave technology
NT: High power microwave generation

Microwave imaging
BT: Imaging
RT: Remote sensing

Microwave integrated circuits
UF: MIC
BT: Integrated circuits
RT: Analog integrated circuits
Microwave circuits
NT: MMICs

Microwave magnetics
BT: Magnetics

Microwave measurement
BT: Electromagnetic measurements
RT: Microwave technology
NT: Microwave frequencies

Microwave metamaterials
BT: Electromagnetic metamaterials
RT: Split ring resonators

Microwave oscillators
BT: Oscillators

Microwave ovens
BT: Consumer electronics
Consumer products
Home appliances
Ovens

Microwave photonics
BT: Microwave technology
Photonics
RT: Electro-optic modulators
Elementary particles
Integrated optoelectronics
Microwave circuits
Microwave communication
Microwave devices
Optical modulation

Microwave plasmas
BT: Electromagnetic scattering
Plasmas

Microwave propagation
BT: Electromagnetic propagation
RT: Broadband antennas
Electromagnetic waveguides

Microwave radiometry
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
Millimeter wave 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

Mie scattering
BT: Electromagnetic scattering
RT: Electromagnetic analysis
Electromagnetic fields
Electromagnetic forces
Electromagnetic measurements
Electromagnetic propagation

Migraine
BT: Neurological diseases

Military aircraft
BT: Military equipment
RT: Aircraft
Hyperspectral sensors
Military robotics
NT: Payloads

Military communication
BT: Communication systems
RT: Command and control systems
Cross layer design
Electronic countermeasures
Hyperspectral sensors
Military satellites
Ultra wideband communication
NT: Reconnaissance

Military computing
BT: Computer applications
RT: Military systems
Mobile computing

Military control
BT: Military systems

Military equipment
BT: Aerospace and electronic systems
RT: Defense industry
Explosion protection
Ground support
Landmine detection
Magnetic anomaly detectors
Military systems
Night vision
Open area test sites
Wearable robots
NT: Military aircraft
Military satellites
Military vehicles
Weapons

Military robotics
BT: Military systems
Robots
RT: Autonomous aerial vehicles
Autonomous underwater vehicles
Military aircraft
Military vehicles
Mobile robots
Underwater vehicles
Wearable robots

Military satellites
BT: Artificial satellites
Military equipment
RT: Global Positioning System
Hyperspectral sensors

Military communication

Military standards
UF: Mil standards
BT: Standards categories

Military systems
BT: Systems engineering and theory
RT: Aerospace control
    Autonomous aerial vehicles
    Command and control systems
    Helicopters
    Marine technology
    Military computing
    Military equipment
    Military vehicles
    Weapons
    Wearable robots
NT: Military control
    Military robotics

Military vehicles
BT: Military equipment
    Vehicles
RT: Marine robots
    Military robotics
    Military systems

Millennials
UF: Generation Y
    Millennial generation
BT: Social groups

Millimeter wave circuits
UF: Millimeter-wave circuits
BT: Circuits
    Millimeter wave technology
RT: Analog circuits
    Distributed parameter circuits
    Millimeter wave devices
NT: Millimeter wave integrated circuits

Millimeter wave communication
UF: Millimeter-wave communication
BT: Radio communication
RT: Millimeter wave propagation

Millimeter wave devices
UF: Millimeter-wave devices

BT: Millimeter wave technology
RT: Millimeter wave circuits
    Millimeter wave integrated circuits
NT: Millimeter wave transistors

Millimeter wave integrated circuits
UF: Millimeter-wave integrated circuits
BT: Circuits
    Integrated circuits
    Millimeter wave circuits
    Millimeter wave technology
RT: Analog integrated circuits
    Millimeter wave devices
NT: MIMICs

Millimeter wave measurements
UF: Millimeter-wave measurements
BT: Electromagnetic measurements
RT: Millimeter wave technology

Millimeter wave propagation
UF: Millimeter-wave propagation
BT: Electromagnetic propagation
RT: Millimeter wave communication

Millimeter wave radar
UF: Millimeter-wave radar
BT: Millimeter wave technology
    Radar

Millimeter wave technology
UF: Millimeter-wave technology
BT: Microwave theory and techniques
RT: Millimeter wave measurements
NT: Millimeter wave circuits
    Millimeter wave devices
    Millimeter wave integrated circuits
    Millimeter wave radar

Millimeter wave transistors
UF: Millimeter-wave transistors
BT: Millimeter wave devices
    Transistors

Milling
    BT: Machining
    RT: Boring
             Milling machines

Milling machines
    BT: Machine tools
    RT: Ball milling
             Cutting tools
             Milling

MIM capacitors
    UF: Metal-insulator-metal
capacitors
    BT: Metal-insulator structures

MIM devices
    UF: Metal-insulator-metal
devices
    BT: Metal-insulator structures
    RT: Semiconductor-insulator
interfaces

MIMICs
    UF: Millimeter wave monolithic
integrated circuits
             Millimeter-wave monolithic
integrated circuits
    BT: Millimeter wave integrated
circuits
             Monolithic integrated
circuits
    RT: MMICs
             Radiofrequency integrated
circuits

MIMO communication
    UF: MIMO systems
             Multiple antenna systems
             Multiple input multiple
output
             Multiple input multiple
output systems
             Multiple-input multiple-
output
             Multiple-input multiple-
output systems
             Multiple-input-multiple-
output
             Multivariable systems
    BT: Communication systems
    RT: 3G mobile communication
             Control systems
             IEEE 802.11 Standard
             IEEE 802.11n Standard
             IEEE 802.16 Standard
             MISO communication
             Multipath channels
             NOMA
             OFDM
             Optimization methods
             Radio communication
             SIMO communication
             SISO communication
    NT: Massive MIMO
             Rician channels

MIMO radar
    BT: Multistatic radar

Mineral resources
    BT: Minerals

Mineralization
    BT: Minerals

Minerals
    BT: Geology
    NT: Mineral resources
             Mineralization
             Ores

Minimally invasive surgery
    UF: Laparoscopic surgery
    BT: Surgery
    RT: Laparoscopes

Minimax techniques
    UF: Max-min composition
             Minmax techniques
    BT: Statistics
    RT: Artificial intelligence
             Game theory
             Minimization methods

Minimization
    UF: Minimisation
    BT: Mathematics
    RT: Optimization
    NT: Minimization methods

Minimization methods
    UF: Minimisation methods
    BT: Minimization
    RT: Approximation methods
             Minimax techniques

Mining equipment
    BT: Production equipment
    RT: Mining industry

Mining industry
BT:	Industries
RT:	Excavation
	Fracking
	Fuel processing industries
	Geoengineering
	Hyperspectral sensors
	Mining equipment
	Raw materials
NT:	Coal mining

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
	multiple-input single-output
BT:	Communication systems
RT:	MIMO communication
	SIMO communication
	SISO communication

Missile control
BT:	Control systems

Missile guidance
BT:	Missiles
RT:	Target recognition

Missiles
UF:	Torpedoes
BT:	Weapons
RT:	Aerospace control
	Ground support
	Hypersonic vehicles
NT:	Missile guidance

Mission critical systems
UF:	Mission-critical systems
BT:	Contingency management

Mixed analog-digital integrated circuits
UF:	Mixed analog digital integrated circuits
BT:	Analog-digital integrated circuits
RT:	Analog processing circuits
	System-on-chip

Mixed integer linear programming
UF:	Mixed-integer linear programming
BT:	Integer linear programming

Mixed reality
BT:	Simulation
RT:	Augmented reality
	Multimedia systems
	Virtual reality

Mixers
BT:	Frequency conversion
RT:	Demodulation
	Modulation
	Nonlinear circuits

Mixture models
BT:	Statistics
RT:	Feature extraction
	Image segmentation
	Probabilistic logic

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

JULY 2023 IEEE Thesaurus

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
          Mobile computing
          Software agents

Mobile antennas
BT: Antennas
          Land mobile radio equipment
RT: Land mobile radio

Mobile applications
UF: Mobile apps
BT: Computer applications
RT: Mobile communication
          Mobile handsets
          Wireless communication
NT: Mobility as a service

Mobile communication
BT: Communication systems
          Near field communication
RT: Acoustic communication (telecommunication)
          Block codes
          Film bulk acoustic resonators
          Indoor communication
          Long Term Evolution
          Mobile applications
          Mobile handsets
          Mobility as a service
          Multiuser detection
          Network resource management
          Radio communication
          Routing protocols
          Time-varying channels
          Transceivers
          Vehicular ad hoc networks
NT: 3G mobile communication
          4G mobile communication
          5G mobile communication
          6G mobile communication
          Ambient networks
          Cellular technology

          Dual band
          Land mobile radio
          Location awareness
          Mobile learning
          Mobile nodes
          Mobile security
          Mobile video
          Mobility models
          Software radio
          Ultra-dense networks

Mobile computing
BT: Computers and information processing
RT: Ad hoc networks
          Bring your own device
          Crowdsensing
          Crowdsourcing
          Data dissemination
          Edge computing
          Location awareness
          Military computing
          Mobile agents
          Mobile learning
          Software defined networking
          Telecommunication computing
          User experience
NT: Multi-access edge computing
          Wireless access points

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
NT: Smart phones

Mobile learning
BT: Electronic learning
          Mobile communication
RT: Distance learning
          Hybrid learning
          Mobile computing

Mobile nodes
BT: Mobile communication
        Telecommunication network management

Mobile robots
BT: Robots
RT: Advanced driver assistance systems
        Agricultural robots
        Assembly systems
        Control systems
        Drones
        Humanoid robots
        Industrial control
        Manufacturing automation
        Marine robots
        Materials handling
        Mechanical variables control
        Military robotics
        Motion control
        Motion detection
        Nonlinear systems
        Service robots
        Social robots
        Soft robotics
        Stairs
        Telerobotics
        Vehicles
        Vehicular automation
        Wearable robots
NT: Climbing robots
        Legged locomotion

Mobile security
UF: Mobile device security
BT: Computer security
        Mobile communication
RT: Hardware security

Mobile TV
BT: TV

Mobile video
BT: Mobile communication
        Streaming media
RT: Video recording

Mobility as a service
UF: MaaS
        Mobility on demand
BT: Mobile applications
        Online services
RT: Mobile communication
        Shared transport

Mobility models
BT: Mobile communication
        Modeling

MOCVD
UF: Metalorganic vapor deposition
BT: Chemical vapor deposition
RT: Vapor deposition

Modal analysis
BT: Mathematical analysis
RT: Vibration measurement

Mode matching methods
BT: Mathematics
        Numerical analysis
        Statistical analysis
RT: Antenna theory
        Matrices
        Waveguide theory

Model checking
BT: System testing
RT: Algorithms
        Concurrent computing
        Formal verification
        Static analysis

Model driven engineering
UF: Model-driven engineering
BT: Software design

Model-driven development
BT: Software development management

Modeling
UF: Modelling
        System modeling
BT: Systems engineering and theory
RT: Computer graphics
        Data visualization
        Digital simulation
        Haptic interfaces
        Human in the loop
        Monte Carlo methods
        Numerical simulation
        Petri nets
        Plasma simulation
        Power system analysis computing

Systems Modeling Language

Time series analysis
NT: Analytical models
Atmospheric modeling
Brain modeling
Building information management
Computational modeling
Context modeling
Data models
Data-driven modeling
Deformable models
Digital elevation models
Emulation
Graphical models
Green's function methods
Hidden Markov models
Input variables
Integrated circuit modeling
Inverse problems
Load modeling
Mathematical models
Metamodeling
Mobility models
Numerical models
Object oriented modeling
Power system modeling
Process modeling
Semiconductor device modeling
Semiconductor process modeling
Signal representation
Simulation
Solid modeling
Space mapping
System identification
Systems modeling

Modems
UF: Modulator-demodulators
BT: Communication equipment
Computer peripherals
RT: Data communication
Demodulation
Modulation

MODFET circuits
BT: FET circuits

MODFETs
UF: Heterostructure FETs
SDHTs
Selectively doped heterojunction transistors
TEGFETs
Two-dimensional electron gas FETs
modfet integrated circuits
BT: Field effect transistors
RT: HEMTs

MODIS
UF: Moderate resolution imaging spectroradiometer
Moderate-resolution Imaging Spectroradiometer
BT: Payloads
Spectroradiometers

Modular construction
BT: Construction
RT: Buildings
Prefabricated construction

Modulation
UF: Modulation format
Modulation index
Modulation-coding
Modulators
BT: Communications technology
Signal processing
RT: Direct sequence spread spectrum communication
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
Optical modulators
Phase modulation
Pulse modulation
Pulse width modulation

JULY 2023 IEEE Thesaurus

Modulation coding
- BT: Modulation
- RT: Encoding
       Information theory
- NT: Interleaved codes

Modules (abstract algebra)
- BT: Abstract algebra

Moisture
- BT: Geophysics
- RT: Moisture control
       Moisture measurement
       Trees - insulation

Moisture control
- BT: Control systems
- RT: Humidity effects
       Moisture
- NT: Humidity control

Moisture measurement
- BT: Measurement
- RT: Moisture
       Soil measurements
- NT: Humidity measurement

Molded case circuit breakers
- UF: Molded-case circuit breakers
- BT: Circuit breakers
- RT: Short-circuit currents

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
- BT: Beams
- RT: Epitaxial growth
       Thin films
- NT: Molecular beam applications

Molecular biology
- BT: Biological processes
- NT: Biochips

Molecular biomarkers
- BT: Biomarkers
- RT: Drugs
- NT: Genomics
       Glycomics
       Lipidomics
       Metabolomics
       Proteomics

Molecular biophysics
- UF: Biological macromolecules
       Biomolecules
- BT: Biophysics
- RT: Biochemistry
       Biomedical equipment
       Biomedical imaging
       Biomedical materials
       Cellular biophysics
       DNA
       Genetic engineering
       Genetics
       Microorganisms

Molecular communication
- BT: Biological systems
       Communication systems
- RT: Nanoantennas
       Nanocommunication

Molecular computing
- BT: Computers and information processing
       Nanotechnology
- RT: DNA computing
       Quantum chemistry

Molecular electronics
- UF: Biomolecular electronics
- BT: Nanotechnology
- RT: Graphene devices
       Nanoelectronics
       Organic light emitting diodes

Molecular imaging
- BT: Biomedical imaging

Molecular sieves
- BT: Chemical processes
       Sieving
- RT: Adsorption

Molybdenum
- BT: Chemical elements

Monitoring
- BT: Instrumentation and measurement
- RT: Alarm systems
  - Maintenance engineering
  - Power system management
- NT: Computerized monitoring
  - Environmental monitoring
  - Load monitoring
  - Patient monitoring
  - Process monitoring
  - Radiation monitoring
  - Remote monitoring
  - Surveillance
  - Water monitoring

Monoclonal antibodies
- BT: Antibodies
- RT: Cancer treatment
  - Immunotherapy
  - Proteins

Monolithic integrated circuits
- UF: Monolithic integration
- BT: Circuits
  - Integrated circuits
- NT: MIMICs
  - MMICs

Monopoly
- BT: Economics
- RT: Microeconomics

MONOS devices
- UF: Metal-oxide-nitride-oxide-semiconductors
  - Metal-oxide-nitride-oxide-silicon
- BT: Semiconductor devices

Monsoons
- BT: Meteorology
- RT: Rain
  - Storms

Monte Carlo methods
- UF: Importance sampling
  - Monte Carlo simulations
  - Monte-Carlo methods
  - Monte-Carlo simulations
- BT: Statistical analysis

- RT: Computational electromagnetics
  - Modeling
  - Probability
  - Simulated annealing
  - Simulation

Mood
- BT: Psychology

Moon
- UF: Lunar
- BT: Satellites

Moore's Law
- BT: Integrated circuit technology

Morphological operations
- BT: Image processing
- RT: Image transformation
  - Topology
- NT: Image morphing
  - Image thinning

Morphology
- BT: Natural language processing
- RT: Entomology

Mortar
- BT: Building materials
  - Chemical products
- RT: Construction industry

MOS capacitors
- BT: MOS devices
- RT: Capacitors

MOS devices
- UF: Metal-oxide semiconductors
  - Metal-oxide-semiconductor devices
- BT: MIS devices
- RT: Semiconductor-insulator interfaces
- NT: MOS capacitors
  - MOSFET
  - Negative bias temperature instability

MOS integrated circuits
- BT: MOSFET circuits

RT: Metal-insulator structures

MOSFET
UF: MOS transistors
nMOSFETs
pMOSFETs
BT: Field effect transistors
MOS devices
RT: CMOS technology
CMOSFET logic devices
Gate drivers
TFETs
NT: CMOSFETs
FinFETs
Interface states
Junctionless nanowire
transistors

MOSFET circuits
UF: Metal-oxide semiconductor
field effect transistor
BT: Circuits
FET circuits
RT: Active inductors
Linearization techniques
Operational amplifiers
Power dissipation
Rail to rail amplifiers
Rail to rail operation
Threshold voltage
NT: CMOSFET circuits
MOS integrated circuits
Power MOSFET

MOSHFETs
UF: Metal oxide semiconductor
heterojunction FETs
BT: Field effect transistors

Motion analysis
BT: Robot kinematics
RT: 3-DOF
5-DOF
6-DOF
NT: Active contours
Motion segmentation
Robot localization

Motion artifacts
BT: Biomedical image
processing
Video signal processing

Motion capture
BT: Kinematics

RT: Animation
Biomechanics
Feature extraction
Gait recognition
Image motion analysis
Image sensors
Motion compensation
Motion estimation
Object detection
Object tracking

Motion compensation
BT: Control systems
RT: Image communication
Motion capture

Motion control
BT: Mechanical variables
control
RT: Aerospace control
Legged locomotion
Manipulators
Medical robotics
Mobile robots
Motion detection
Motor coordination
Servosystems
Structure from motion
Trajectory
Trajectory tracking
Velocity control
NT: Collision avoidance
Collision mitigation
Formation control
Kinetic theory
Motion planning
Path planning
Visual servoing

Motion detection
UF: Motion sensors
BT: Signal detection
RT: Alarm systems
Corner detection
Image motion analysis
Image sensors
Infrared detectors
Mobile robots
Motion control
Surveillance
Video signal processing
Video surveillance
NT: Odometry

Motion estimation
BT:	Parameter estimation
RT:	Motion capture
	Object tracking

Motion measurement
BT:	Mechanical variables measurement
RT:	Doppler measurement
	Gaze tracking
	Velocity measurement
NT:	Tracking
	Tribology

Motion pictures
UF:	Cinema
	Films (Motion pictures)
	Movies
	Moving pictures
BT:	Broadcasting
RT:	Cameras
	Cinematography
	Entertainment industry
	Imaging
	Optical projectors

Motion planning
BT:	Motion control
RT:	Navigation
	Robot control

Motion segmentation
BT:	Motion analysis

Motion sickness
BT:	Medical conditions

Motor coordination
BT:	Kinematics
RT:	Motion control
	Paralysis

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

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

Mouth
BT:	Digestive system
	Head
RT:	Stomatognathic system
NT:	Teeth

Moving Pictures Experts Group
BT:	IEC
	ISO

MPEG 1 Standard
BT:	MPEG standards

MPEG 2 Standard
UF:	MPEG-2
BT:	MPEG standards

MPEG 21 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
UF: Moving picture experts
group
BT: IEC Standards
        ISO Standards
RT: Digital multimedia
broadcasting

        Image coding
        Streaming media
        Transform coding
        Video codecs
        Video coding
        Video signal processing
NT: MPEG 1 Standard
        MPEG 2 Standard
        MPEG 21 Standard
        MPEG 4 Standard
        MPEG 7 Standard

Multi-access edge computing
UF: Mobile edge computing
        Multi access edge
computing
BT: Edge computing
        Mobile computing

Multi-agent systems
UF: Multi-agent models
        Multiagent models
        Multiagent systems
BT: Adaptive systems
RT: Agent-based modeling
        Autonomous vehicles
        Formation control
        System analysis and design
        Vehicular automation
NT: Collaborative intelligence

Multi-armed bandit problem
UF: K-armed bandit problem
        N-armed bandit problem

BT: Machine learning
        Probability
RT: Game theory
        Markov processes
        Optimization
        Reinforcement learning
        Resource management
        Statistical distributions
        Stochastic processes

Multi-factor authentication
BT: Access control
        Authentication

Multi-layer neural network
UF: MNN
BT: Neural networks

Multi-party computation
UF: Multi party computation
BT: Cryptography

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

Multiaccess communication
UF: CDMA
        CSMA
        Carrier sense multiaccess
        Code division multiaccess
        Code division multiple
access
        Code-division multiple
access
        Code-division multiple-
access
        Multiaccess systems
        Random 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
Frequency division multiaccess
Multicarrier code division multiple access
Subscriber loops
Time division multiple access
Time division synchronous code division multiple access
Zero correlation zone

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: Mulitcast addressing
Multi-cast addressing
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
RT: Internet
Multicast communication
Routing protocols

Multicast VPN
BT: Multicast communication

Multichip modules
UF: Heterogeneous integration
BT: Integrated circuit packaging
Packaging

Multiconductor transmission lines
BT: Transmission lines
RT: Coupled mode analysis

Multicore processing
UF: Many core processing
Many core systems
Multi-core processing
Multi-core processors
Multicore
BT: Parallel architectures
NT: Embedded multicore processing
Manycore processors

Multidimensional signal processing
BT: Signal processing
RT: Image processing
NT: Video signal processing
Multidimensional systems
BT: Systems engineering and theory

Multifilamentary superconductors
BT: Superconducting materials
Superconducting wires

Multifrequency antennas
BT: Antennas

Multigrid methods
BT: Numerical analysis

Multilayer perceptrons
BT: Feedforward neural networks

Multilevel converters
UF: Modular multi-level converters
Modular multilevel converters
Multi-level converters
BT: Converters

Multilevel inverters
UF: Multi-level inverters

Multi-level invertors
Multilevel invertors
BT: Inverters

Multilevel systems
BT: Hierarchical systems

Multimedia communication
BT: Communication systems
Multimedia systems
RT: B-ISDN
Broadband communication
Diffserv networks
Digital multimedia
broadcasting
Huffman coding
IEEE 802.16 Standard
ISDN
Intserv networks
Journalism
MPEG 7 Standard
Multimedia computing
Streaming media
Transcoding
NT: Hypermedia

Multimedia computing
BT: Multimedia systems
RT: Audio user interfaces
Computer graphics
Computers and information
processing
Content management
Federated learning
Information systems
Multimedia communication
Multimedia databases
Video sequences

Multimedia databases
BT: Database systems
Databases
Multimedia systems
RT: Audio databases
Huffman coding
Multimedia computing

Multimedia systems
BT: Consumer electronics
RT: Authoring systems
Electronic publishing
Huffman coding
MPEG 7 Standard
Mixed reality

NT: Multimedia communication
Multimedia computing
Multimedia databases

Multimodal sensors
UF: Multi-modal sensors
Multimodal sensing
BT: Sensors
RT: Sensor fusion

Multipath channels
BT: Communication channels
RT: Channel estimation
Diversity methods
Fading channels
MIMO communication
Meteorological factors
Multiuser detection
Radio propagation
Terrain factors
Ultra wideband
communication

Multiple access interference
BT: OFDM

Multiple sclerosis
BT: Diseases

Multiple signal classification
UF: MUSIC
BT: Noise measurement

Multiplexing
UF: Multiplexed
BT: Communications
technology
RT: Arrayed waveguide gratings
Multiaccess communication
NT: Code division multiplexing
Demultiplexing
Frequency division
multiplexing
Layered division
multiplexing
Multiplexing equipment
OFDM
Space division multiplexing
Time division multiplexing
Wavelength division
multiplexing

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

Multiprotocol label switching
UF: Label swapping
     MPLS
BT: Communication switching
     Packet switching
     Protocols
RT: Asynchronous transfer mode
     Internet
     Routing protocols

Multiresolution analysis
UF: Multi-resolution
BT: Wavelet analysis

Multisensor systems
BT: Sensor fusion

RT: Robot sensing systems

Multisensory integration
UF: Multi modal integration
     Multi sensory integration
     Multimodal integration
BT: Sense organs
RT: Somatosensory

Multiskilling
UF: Job rotation
BT: Human resource management
RT: Industrial training
     Job specification
     Vocational training

Multispectral imaging
UF: Multi-spectral imaging
BT: Imaging

Multistatic radar
BT: Radar
NT: MIMO radar

Multitasking
UF: Multi-tasking
BT: Computers and information processing
NT: Parametric study

Multithreading
UF: Multi-threaded comput*
     Multithreading comput*
BT: Parallel processing

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

Multivariate regression
    BT: Regression analysis

Multivibrators
    UF: Multi-vibrators
    BT: Electronic circuits

Multiwave mixing
    UF: Multi-wave mixing
    BT: Optical mixing
    RT: Four-wave mixing

Muon colliders
    UF: Muon sources
    BT: Colliding beam devices
    RT: Luminescence
             Luminescent devices
             Storage rings

Muscles
    BT: Musculoskeletal system
    NT: Myocardium
             Neuromuscular

Muscular dystrophy
    BT: Diseases
             Medical conditions
    RT: Musculoskeletal system

Musculoskeletal system
    BT: Anatomy
    RT: Muscular dystrophy
    NT: Cartilage
             Fascia
             Ligaments
             Muscles
             Skeleton
             Tendons

Museums
    BT: Educational institutions
    RT: Art
             Cultural aspects
             Cultural differences
             Humanities
             Research and development
             Technology
    NT: Virtual museums

Music
    UF: Computer music
             Musical
    BT: Humanities
    RT: Audio systems
             White noise

    NT: Acoustics
             Computer generated music
             Electronic music
             Musical instrument digital
interfaces
             Rhythm
             Timbre

Music information retrieval
    BT: Information retrieval
    RT: Cepstral analysis

Musical instrument digital interfaces
    UF: MDDI
    BT: Computer interfaces
             Music
    RT: Digital communication

Must-carry regulations
    UF: Must carry regulations
    BT: Cable TV
             Government policies
    RT: Licenses
             TV

Mutual coupling
    BT: Electromagnetic coupling
    NT: Inductive coupling

Mutual funds
    BT: Financial management

Mutual information
    UF: Transinformation
    BT: Information theory

Myelin
    BT: Nerve fibers
    RT: Axons

Myocardium
    UF: Myocardial
    BT: Muscles

NACE International
    UF: National Association of
Corrosion Engineers
    BT: Standards organizations

NACE Standards
    BT: Standards publications

Nails
    BT: Integumentary system

JULY 2023 IEEE Thesaurus

Naive Bayes methods
UF:	Naive Bayes algorithms
	Naive Bayes classification
	Naive Bayes classifiers
BT:	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

Nanoantennas
BT:	Nanoscale devices
	Optical antennas
RT:	Integrated optics
	Integrated optoelectronics
	Molecular communication
	Nanoelectromechanical systems
	Nanoelectronics
	Nanophotonics
	Nanotubes
	Optical communication equipment
	Optical metamaterials
	Plasmons

Nanobiophotonics
UF:	Nano biophotonics
BT:	Nanobiotechnology
	Photonics
RT:	Biomedical imaging
	Biosensors
	Lasers
	Nanoparticles
	Nanoscale devices

Nanobioscience
BT:	Biology
	Nanotechnology
RT:	Colloidal lithography
	Nanofluidics
NT:	DNA computing
	Nanobiotechnology

Nanobiotechnology
BT:	Nanobioscience
RT:	Nanomedicine

	Nanopores
NT:	Nanobiophotonics

Nanocarriers
BT:	Nanomaterials
RT:	Drug delivery

Nanocommunication
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
	Magnetoresistance
	Nanoelectronics
	Nanowires

Nanocrystals
UF:	Nanocrystal
BT:	Crystalline materials
	Nanoparticles
RT:	Quantum dots
NT:	Colloidal nanocrystals

Nanoelectromechanical systems
UF:	NEMS
BT:	Nanotechnology
RT:	Microelectromechanical systems
	Nanoantennas

Nanoelectronics
UF:	Nanoactuators
BT:	Nanotechnology
RT:	Graphene devices
	Molecular electronics
	Nanoantennas
	Nanocontacts
NT:	Junctionless nanowire transistors

Nanofabrication
BT:	Nanotechnology

Nanofluidics
UF:	Nanofluids	
BT:	Fluidics	
	Nanotechnology	
RT:	Nanobioscience	

Nanogenerators
UF:	Nano generators	
BT:	Energy harvesting	
RT:	Electric generators	
	Low-power electronics	
	Micromechanical devices	
	Nanowires	
	Piezoelectric devices	
	Triboelectricity	
	Vibrations	

Nanolithography
UF:	Nanoimprint lithography	
BT:	Lithography	
	Nanotechnology	
RT:	Nanopatterning	
	Soft lithography	

Nanomagnetics
UF:	Nano-magnetics	
BT:	Magnetics	
	Nanotechnology	
RT:	Magnetic particles	
	Nanostructured materials	

Nanomaterials
BT:	Nanotechnology	
RT:	Nanopackaging	
NT:	Nanocarriers	

Nanomedicine
BT:	Biomedical monitoring	
	Medical diagnosis	
RT:	Cellular biophysics	
	Mechanobiology	
	Nanobiotechnology	
	Nanoparticles	

Nanometers
UF:	Millimicron	
	Nanometres	
BT:	Measurement units	

Nanopackaging
UF:	Nano packaging	
BT:	Nanotechnology	
	Packaging	
RT:	Nanomaterials	

Nanoparticles
UF:	Nanopowders	
BT:	Nanostructures	
RT:	Nanobiophotonics	
	Nanomedicine	
	Nanosensors	
NT:	Magnetic nanoparticles	
	Nanocrystals	

Nanopatterning
BT:	Nanotechnology	
RT:	Nanolithography	
	Nanotopography	
	Soft lithography	
NT:	Colloidal lithography	

Nanophotonics
BT:	Nanotechnology	
	Photonics	
RT:	Nanoantennas	
	Optical antennas	

Nanoplasmonics
BT:	Nanotechnology	
	Plasmons	

Nanopores
BT:	Nanoscale technology	
RT:	Nanobiotechnology	
	Nanoporous materials	
	Nanostructures	

Nanoporous materials
BT:	Nanostructured materials	
RT:	Nanopores	

Nanopositioning
BT:	Nanotechnology	
	Position control	

Nanoribbons
UF:	Nano ribbons	
BT:	Nanostructures	

Nanorods
UF:	Nano-rods	
BT:	Nanostructures	

Nanoscale devices
UF:	Nano devices	
	Nanodevices	
BT:	Nanoscale technology	
RT:	Nanobiophotonics	
	Single electron devices	
NT:	Nanoantennas	

Nanocontacts
Nanotube devices

Nanoscale technology
BT: Nanotechnology
NT: Nanopores
Nanoscale devices

Nanosensors
BT: Nanotechnology
Sensors
RT: Biomedical equipment
Nanoparticles
Nanostructures
Wearable sensors

Nanostructured materials
UF: Core-shelf nanostructures
BT: Materials
Nanotechnology
RT: Nanomagnetics
NT: Nanocomposites
Nanoporous materials

Nanostructures
BT: Nanotechnology
RT: Nanopores
Nanosensors
NT: Nanoparticles
Nanoribbons
Nanorods
Nanotubes
Nanowires
Semiconductor
nanostructures

Nanotechnology
RT: Atomic force microscopy
Bio-inspired materials
Epitaxial growth
Fluidics
Lithography
Microfabrication
Nanotube devices
Power dissipation
Quantum mechanics
Semiconductor device
manufacture
Single electron devices
Very large scale integration
NT: Bionanotechnology
Casimir effect
Molecular computing

Molecular electronics
Nanobioscience
Nanocommunication
Nanoelectromechanical
systems
Nanoelectronics
Nanofabrication
Nanofluidics
Nanolithography
Nanomagnetics
Nanomaterials
Nanopackaging
Nanopatterning
Nanophotonics
Nanoplasmonics
Nanopositioning
Nanoscale technology
Nanosensors
Nanostructured materials
Nanostructures
Self-assembly
Self-replicating machines

Nanotopography
BT: Surface topography
RT: Colloidal lithography
Nanopatterning

Nanotube devices
BT: Nanoscale devices
RT: Nanotechnology

Nanotubes
BT: Nanostructures
RT: Nanoantennas
NT: Carbon nanotubes
Semiconductor nanotubes

Nanowires
BT: Nanostructures
RT: Junctionless nanowire
transistors
Nanocontacts
Nanogenerators
Wires

Narrowband
BT: Bandwidth
Communication systems
RT: Wideband

NASA
UF: National Aeronautics &
Space Administration

National Aeronautics and Space Administration
- BT: US Government agencies
- RT: European Space Agency
  Space exploration
  Space missions
  Space technology

Nash equilibrium
- BT: Game theory

National Electric Code
- UF: National electric safety code
- BT: ANSI Standards

National Institutes of Health
- UF: NIH
- BT: US Department of Health and Human Services

National security
- BT: Terrorism
- RT: Biological weapons
  Chemical weapons
  Control system security
  Cyber warfare
  Nuclear weapons
  Weapons of mass destruction

National Society Agreement awards
- BT: IEEE Awards activities

Natural fibers
- UF: Natural fibres
- BT: Textile fibers
- RT: Cotton
  Wool
- NT: Bamboo

Natural gas
- BT: Fossil fuels
- RT: Air pollution
  Energy resources
  Fracking
  Gases
  Hydrocarbons
  Natural gas industry
- NT: Liquefied natural gas
  Methane

Natural gas industry
- BT: Industries
- RT: Natural gas

Petroleum industry
Pipelines

Natural language processing
- UF: NLP
- BT: Natural languages
- RT: Conditional random fields
  Digital humans
  Personal voice assistants
  Phonetics
  Pragmatics
  Semantic search
  Semantic technology
  Semantics
  Semiotics
  Social robots
  Syntactics
- NT: Chatbots
  Machine translation
  Morphology
  Question answering (information retrieval)
  Sentiment analysis
  Tokenization

Natural languages
- UF: Natural speech
- BT: Humanities
- RT: Artificial intelligence
  Computer languages
- NT: Linguistics
  Natural language processing

Natural resources
- BT: Geoscience

Navier-Stokes equations
- BT: Differential equations
  Fluid dynamics
- RT: Finite volume methods
  Viscosity

Navigation
- UF: Direction-finding
  Geomagnetic navigation
- BT: 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

Near field communication
UF:	NFC
	Nearfield communication
BT:	Communication standards
	Radio communication
RT:	Magnetic communication
NT:	Mobile communication

Near-field radiation pattern
UF:	Near field radiation pattern
BT:	Antenna radiation patterns

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

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 loops
BT:	Feedback loop

NEMA
BT:	Standards organizations

Neodymium
UF:	Nd
BT:	Metals
NT:	Neodymium alloys
	Neodymium compounds

Neodymium alloys
BT:	Neodymium
RT:	Alloying

Neodymium compounds
UF:	Nd2O3
	Neodymium oxide
BT:	Neodymium

Neon
BT:	Chemical elements

Neonatology
BT:	Medical specialties
RT:	Pediatrics

Neoplasms
UF:	Neoplasia
BT:	Biological tissues
NT:	Breast neoplasms
	Liver neoplasms
	Lung neoplasms
	Skin neoplasms

Nephrology
BT:	Medical specialties
RT:	Kidney
	Kidney stones

Neptunium
BT:	Chemical elements

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
Spine
Synapses

Network address translation
BT: Computer network management

Network analyzers
UF: Network analysis
BT: Instruments

Network architecture
BT: Network topology
Telecommunication network management
NT: Active networking
Information-centric networking
Network function virtualization
Network slicing

Network coding
BT: Information theory
RT: Network security

Network function virtualization
UF: NFV
BT: Computer networks
Network architecture
RT: Application virtualization
Cloud computing
Computer network management
Intrusion detection
Routing
Servers
Software defined networking
Virtual machining
Virtualization
NT: Cloud radio access networks
Virtual LAN

Network interfaces
BT: Interface phenomena
RT: Interface management

Network intrusion
BT: Data breach
RT: Data security
Network security
Privacy
NT: Network intrusion detection

Network intrusion detection
BT: Intrusion detection
Network intrusion

Network location awareness
BT: Location awareness

Network neutrality
UF: Internet neutrality
Net neutrality
BT: Telecommunication network management

Network operating systems
BT: Operating systems
RT: Software defined networking
NT: Autonomic systems

Network reconnaissance
UF: Footprinting
BT: Network security

Network resource management
UF: Dynamic service delivery

| | BT: | Resource management |
| | | Telecommunication |

network management

	RT:	Cellular radio
		Mobile communication
	NT:	Intercell interference

Network security

	BT:	Security
	RT:	Communication networks
		Computer networks
		Hardware security
		Network coding
		Network intrusion
	NT:	Network reconnaissance

Network servers

| | BT: | Computer networks |

Network slicing

| | BT: | Network architecture |
| | RT: | Augmented reality |

Network synthesis

| | BT: | Computer network |

management

Network systems

| | BT: | Systems engineering and |

theory

| | NT: | Autonomous networks |
| | | DC distribution systems |

Network theory (graphs)

	BT:	Computer science
		Mathematics
		Physics
	RT:	Social sciences

Network topology

| | BT: | Communications |

technology

| | RT: | Overlay networks |
| | | Telecommunication |

network topology

	NT:	Complex networks
		Computer network reliability
		Network architecture

Network-on-chip

| | UF: | Network-on-a-chip |
| | BT: | System-on-chip |

Networked control systems

| | UF: | Network control systems |
| | BT: | Control systems |

| | RT: | Real-time systems |
| | | System of systems |

Neural activity

| | UF: | Neural oscillation |
| | BT: | Brain |

Neural circuits

	BT:	Circuits
		Neural engineering
	RT:	Neurons

Neural engineering

	UF:	Neuro engineering
		Neuroengineering
	BT:	Biomedical engineering
	RT:	Brain-computer interfaces
		Intracranial pressure

sensors

	NT:	Neural circuits
		Neural microtechnology
		Neural nanotechnology
		Neural prosthesis

Neural implants

	UF:	Brain implants
	BT:	Brain
		Implants
	RT:	Deep brain stimulation

Neural microtechnology

| | BT: | Neural engineering |

Neural nanotechnology

| | BT: | Neural engineering |

Neural network compression

	BT:	Data compression
		Memory management
		Neural networks

Neural network hardware

	UF:	Neural chips
	BT:	Neural networks
	RT:	AI accelerators
		Analog integrated circuits
		Integrated circuits
		Neurocontrollers

Neural networks

| | UF: | Neural nets |
| | | Wavelet neural networks |

Page 300

BT: Computational and artificial intelligence
RT: AI accelerators
Adaptive systems
Artificial intelligence
Associative memory
Backpropagation
Bio-inspired computing
Cybernetics
Deep architecture
Dynamic programming
Fish schools
Fuzzy cognitive maps
Generative adversarial networks
Nervous system
Neurophysiology
Nonlinear dynamical systems
Pattern classification
Reinforcement learning
Semisupervised learning
Soft sensors
Systems neuroscience
NT: Artificial neural networks
Biological neural networks
Cellular neural networks
Feedforward neural networks
Graph neural networks
Multi-layer neural network
Neural network compression
Neural network hardware
Perception evolution networks
Radial basis function networks
Recurrent neural networks

Neural pathways
BT: Nervous system

Neural prosthesis
BT: Neural engineering

Neurites
UF: Neuronal process
BT: Neurons

Neuroanatomy
BT: Anatomy
Nervous system

Neurocontrollers
BT: Intelligent control
RT: Artificial intelligence
Microcontrollers
Neural network hardware

Neurodynamics
BT: Brain
RT: Neurophysiology

Neurofeedback
UF: Neuro-feedback
BT: Feedback

Neuroimaging
UF: Brain imaging
Neuro imaging
Neuro-imaging
BT: Biomedical image processing
Brain mapping
RT: Functional near-infrared spectroscopy
Neuroradiology
NT: Functional neuroimaging

Neuroinformatics
BT: Bioinformatics
Informatics
Neuroscience
RT: Analytical models
Big Data
Computational modeling
Data science
Synapses

Neurological diseases
UF: Neurological disorders
BT: Diseases
RT: Nervous system
Spinal cord injury
NT: Migraine

Neurology
BT: Medical specialties
RT: Nervous system
NT: Dyslexia
Neurorehabilitation

Neuromarketing
UF: Neuro marketing
BT: Consumer behavior
Neuroscience
RT: Electronic commerce
Ethics

Market opportunities
Market research

Neuromodulation
  BT: Neurons
         Physiology
  RT: Control systems
  NT: Neurostimulation
         Optogenetics

Neuromorphic engineering
  UF: Neuromorphic computing
  BT: Neuromorphics
  RT: AI accelerators
         Artificial neural networks
         CMOS integrated circuits
         Memristors
         Neurophysiology
         Synapses

Neuromorphics
  BT: Very large scale integration
  RT: Analog circuits
         Biological system modeling
  NT: Neuromorphic engineering

Neuromuscular
  BT: Muscles

Neuromuscular stimulation
  UF: Functional electrical
stimulation
  BT: Medical treatment
  RT: Nervous system

Neurons
  UF: Nerve cells
         Neurone
  BT: Nervous system
  RT: Action potentials
         Membrane potentials
         Neural circuits
         Synapses
  NT: Dendrites (neurons)
         Nerve fibers
         Neurites
         Neuromodulation
         Photoreceptors
         Soma

Neuropathic pain
  BT: Pain

Neuropathology
  BT: Pathology

  RT: Nervous system

Neurophysiology
  BT: Brain
  RT: Biomedical signal
processing
         Microelectrodes
         Neural networks
         Neurodynamics
         Neuromorphic engineering
         Science - general
  NT: Biological neural networks
         Neuroplasticity

Neuroplasticity
  UF: Brain plasticity
         Cortical plasticity
  BT: Neurophysiology

Neuroprostheses
  UF: Neural prosthetics
         Neuroprosthetics
  BT: Brain
         Neuroscience
         Prosthetics
  RT: Brain-computer interfaces

Neuropsychology
  BT: Brain
         Psychology

Neuroradiology
  BT: Nervous system
         Radiology
  RT: Electromagnetics
         Neuroimaging

Neurorehabilitation
  UF: Neuro-rehabilitation
  BT: Neurology
         Patient rehabilitation

Neuroscience
  BT: Nervous system
         Science - general
  RT: Fish schools
  NT: Clinical neuroscience
         Cognitive neuroscience
         Computational
neuroscience
         Neuroinformatics
         Neuromarketing
         Neuroprostheses
         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

Neurosurgery
- BT: Surgery
- NT: Deep brain stimulation

Neurotechnology
- BT: Brain
  Technology

Neurotransmitters
- UF: Neuro transmitters
  Neuro-transmitters
  Neurotransmission
  Synaptic transmission
- BT: Transmitters
- RT: Synapses

Neutrino sources
- UF: Neutrino
  Neutrinos
- BT: Elementary particles
- RT: Radioactive materials

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 spin echo
- UF: Neutron scattering
- BT: Spectroscopy

Neutron stars
- BT: Stars

Neutrons
- BT: Elementary particles
- RT: Cosmic rays

New Radio
- BT: 5G mobile communication
  Radio access technologies
- RT: 3GPP

Newton method
- UF: Newton Fourier method
  Newton Raphson method
  Newton's method
  Newton-Fourier method
  Newton-Raphson method
  Newtons method
- BT: Numerical analysis
- RT: Optimization methods
  Poles and zeros

Next generation networking
- UF: 21CN
  21st century networks
  NGN
  NGNA
  Next generation network architecture
  Next generation networks
  Next-generation networks
- BT: Computer networks
- RT: 3G mobile communication
  4G mobile communication
  5G mobile communication
  IP networks
  Internet
  Packet switching
  Pervasive computing
  Quality of service
  Telecommunications

NFPA
- UF: National Fire Protection Agency
  National Fire Protection Association
- BT: Standards organizations

Nickel
- UF: Ni
- BT: Metals
- NT: Nickel alloys
  Nickel compounds

Nickel alloys
- BT: Nickel

	RT:	Alloying

Nickel cadmium batteries
	UF:	Nickel-cadmium batteries
	BT:	Batteries

Nickel compounds
	BT:	Nickel

Night vision
	BT:	Infrared imaging
	RT:	Image sensors
		Military equipment

Niobium
	UF:	Nb
	BT:	Metals
	RT:	Type II superconductors
	NT:	Niobium alloys
		Niobium compounds

Niobium alloys
	BT:	Niobium
	RT:	Alloying
	NT:	Niobium-tin

Niobium compounds
	BT:	Niobium

Niobium-tin
	UF:	Nb3Sn
	BT:	Niobium alloys
		Superconducting materials
		Tin alloys

NISO Standards
	BT:	Standards publications

NIST
	UF:	NBS
		National Bureau of Standards
		National Institute of Standards & Technology
		National Institute of Standards and Technology
	BT:	Standards organizations
		US Department of Commerce

NIST Standards
	BT:	Standards publications

Nitrogen
	BT:	Chemical elements
		Gases

	NT:	Nitrogen compounds
		Silicon nitride

Nitrogen compounds
	UF:	Potassium nitrate
		Sodium nitrate
	BT:	Nitrogen
	NT:	Ammonia
		Nitrous oxide

Nitrous oxide
	BT:	Nitrogen compounds

Nobel Prize
	BT:	Awards

Noise
	BT:	Signal processing
	RT:	Autoregressive processes
		Cyclic redundancy check
		Distortion
		Electromagnetic interference
		Interference
		Noise generators
		Noise measurement
		Roundoff errors
	NT:	1/f noise
		Additive noise
		Colored noise
		Gaussian noise
		Laser noise
		Low-frequency noise
		Noise cancellation
		Phase noise
		Signal to noise ratio
		Superconducting device noise
		White noise

Noise cancellation
	UF:	Noise cancellers
	BT:	Acoustic noise
		Noise
	RT:	Filtering

Noise figure
	BT:	Noise measurement
	RT:	Signal to noise ratio

Noise generators
	BT:	Signal generators
	RT:	Noise

Noise level
BT:	Acoustic noise

Noise measurement
UF:	Noisy
BT:	Measurement
RT:	Distortion measurement
	Electric variables measurement
	Noise
	Packet loss
NT:	Multiple signal classification
	Noise figure
	Noise shaping

Noise reduction
UF:	Audio enhancement
	De-noising
	Denoising
	Noise abatement
	Noise suppression
BT:	Acoustic noise
NT:	Active noise reduction
	Noise robustness
	Wiener filters

Noise robustness
UF:	Noise robust
BT:	Noise reduction

Noise shaping
UF:	Noise-shaping
BT:	Noise measurement
NT:	Multi-stage noise shaping

NOMA
UF:	Nonorthogonal multiple access
	non-orthogonal multiple access
BT:	Access protocols
	Communication systems
RT:	Cellular radio
	Free-space optical communication
	MIMO communication
	OFDM
	Radio communication
	Radiofrequency interference

Non-repudiation
UF:	Non repudiation
BT:	Access control
	Data integrity
RT:	Digital forensics

Nonconductive adhesives
BT:	Adhesives

Nondestructive testing
BT:	Materials testing
RT:	Acoustic emission
	Ultrasonic transducers
NT:	Magnetic flux leakage

Nonfungible tokens
UF:	NFT
	Non fungible tokens
	Non-fungible tokens
BT:	Authentication
	Blockchains
RT:	Bitcoin
	Cryptocurrency
	Distributed ledger

Nonhomogeneous media
UF:	Composite media
	Inhomogeneous media
	Layered media
	Multilayers
	Periodic media
	Stratified media
BT:	Media
RT:	Random media

Noninvasive treatment
UF:	Noninvasive diagnosis
	Noninvasive measurement
	Noninvasive surgery
	Noninvasive technique
	Noninvasive therapy
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 equations
BT:	Equations
	Mathematics
RT:	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:	Cross-phase modulation
	Electo-optic effects
	Pattern formation
	Photonic crystals
	Thermal lensing
NT:	Fiber nonlinear optics
	Nonlinear optical devices
	Optical mixing
	Optical saturation
	Photorefractive effect
	Raman scattering
	Supercontinuum generation

Nonlinear systems
UF:	Bilinear systems
	Multilinear systems
BT:	Mathematics
RT:	Control systems
	Linear approximation
	Manipulators
	Mobile robots
	Nonlinear equations
	Robots
NT:	Chaos
	Nonlinear dynamical systems

Nonlinear wave propagation
BT:	Propagation
RT:	Nonlinear acoustics

Nonparametric statistics
UF:	Non-parametric statistics
BT:	Statistics
NT:	Nearest neighbor methods

Nonuniform electric fields
BT:	Electric fields

Nonuniform sampling
BT:	Sampling methods

Nonvolatile memory
UF:	Non-volatile memory
	Nonvolatile memories
BT:	Memory

North America
BT:	Continents

North Pole
BT:	Arctic

Nose
>BT: Head
>Sense organs
>NT: Olfactory

NoSQL databases
>UF: Non relational databases
>Nonrelational databases
>BT: Database systems
>RT: Big Data
>Data structures
>Data warehouses
>Distributed databases
>Linked data
>Query processing

Notch filters
>UF: Band-stop filters
>BT: Filters

Notice of Violation
>BT: IEEE publications
>RT: Intellectual property
>Plagiarism

NP-complete problem
>UF: NP-C
>BT: Complexity theory

NP-hard problem
>UF: NP hard problem
>Nondeterministic polynomial-time hard
>BT: Complexity theory
>NT: Traveling salesman problems

NTIA
>UF: National Telecommunications and Information Administration
>BT: US Department of Commerce

Nuclear and plasma sciences
>NT: Biomedical applications of radiation
>Colliding beam devices
>Electron emission
>Elementary particles
>Fusion power generation
>Fusion reactors
>Gamma-rays
>Gas discharge devices
>High energy physics instrumentation computing
>Ion beam applications
>Nuclear electronics
>Nuclear imaging
>Nuclear medicine
>Nuclear physics
>Particle accelerators
>Particle beam handling
>Particle beam injection
>Plasmas
>Radiation effects
>Radiation hardening (electronics)
>Radiation monitoring
>Radiation safety
>Reactor instrumentation
>Scintillation counters
>Thermionic emission

Nuclear electronics
>BT: Nuclear and plasma sciences
>RT: FET circuits
>High energy physics instrumentation computing

Nuclear facility regulation
>UF: Licensing (nuclear facilities)
>Nuclear facility licensing
>BT: Power industry
>RT: Radioactive waste

Nuclear fuels
>BT: Energy resources
>Fuels
>Radioactive materials
>RT: Nuclear power generation
>Radioactive waste

Nuclear imaging
>UF: Gamma-ray imaging
>BT: Imaging
>Nuclear and plasma sciences
>RT: Nuclear medicine
>Radiography
>NT: Energy resolution
>Ion emission

Nuclear magnetic resonance
>UF: NMR
>BT: Magnetic resonance

JULY 2023 IEEE Thesaurus

Nuclear measurements
BT:	Measurement
RT:	Atomic measurements
	CAMAC
	Position sensitive particle detectors
	Radiation detectors
	Spectroscopy
NT:	Particle tracking

Nuclear medicine
BT:	Engineering in medicine and biology
	Nuclear and plasma sciences
RT:	Energy resolution
	Gamma-rays
	Nuclear imaging
	Positron emission tomography

Nuclear phase transformations
UF:	Nuclear phase transitions
	Phase transformations, nuclear
	Phase transitions, nuclear
BT:	Nuclear physics
RT:	Nuclear thermodynamics

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 generation
UF:	Atomic energy
	Nuclear Power Generating Stations
	Nuclear energy
BT:	Power generation
RT:	Nuclear fuels
NT:	Atomic batteries
	Fission reactors
	Fusion power generation

Nuclear thermodynamics
BT:	Nuclear physics
RT:	Elementary particles
	Entropy
	Nuclear phase transformations
	Phase change materials

Nuclear weapons
UF:	A-bomb
	Atom bomb
	Atomic warfare
	Atomic weapons
	Nuclear bombs
	Nuclear warfare
	Nuclear warheads
	Nuke
BT:	Weapons
RT:	Biological weapons
	Chemical weapons
	National security
	Terrorism
	US Department of Homeland Security

Null space
BT:	Kernel

Null value
UF:	Nullvalue
BT:	Data structures
RT:	Programming

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
NT:	Adaptive mesh refinement
	Approximation methods

Convergence of numerical methods
Finite difference methods
Finite element analysis
Finite volume methods
Gradient methods
Independent component analysis
Iterative methods
Least squares approximations
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 methods

Numerical models
BT: Modeling
RT: Numerical analysis

Numerical simulation
BT: Numerical analysis
RT: Modeling
Plasma simulation
Simulation

Numerical stability
BT: Numerical analysis
RT: Algorithms

NVIS
UF: Near vertical incidence skywave
BT: Broadcasting
Radiowave propagation

Obesity
BT: Medical conditions

Obituaries
BT: IEEE indexing

Object detection
UF: Image object detection

Target detection
BT: Image analysis
RT: Advanced driver assistance systems
Image matching
Internet of Things
Magnetic anomaly detection
Magnetic anomaly detectors
Motion capture
Robot vision systems
NT: Buried object detection
Time difference of arrival

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
> Image segmentation
> Motion capture
> Motion estimation
> Object recognition
> Trajectory
> Video signal processing

Observability
> BT: Control theory

Observatories
> BT: Astronomy
> RT: Telescopes

Observers
> BT: State estimation
> RT: Machine vision
> NT: Disturbance observers
> Earth Observing System

Obstetrics
> BT: Medical specialties
> RT: Pregnancy

Occipital 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 medicine
> BT: Medical services
> RT: Medical diagnosis
> Medical treatment
> Occupational health

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

Ocean circulation
> BT: Ocean dynamics
> Oceanography
> RT: Ocean waves
> Sea level
> Tides

Ocean dynamics
> BT: Oceanography
> RT: Ocean temperature
> Ocean waves
> Tides
> NT: Ocean circulation

Ocean salinity
> BT: Oceans
> RT: Salinity (geophysical)
> NT: SMOS mission

Ocean temperature
> UF: Sea surface temperature
> BT: Oceanic engineering and marine technology
> Oceans

JULY 2023 IEEE Thesaurus

RT: Global warming
Land surface temperature
Ocean dynamics

Ocean waves
BT: Hydrology
RT: Ocean circulation
Ocean dynamics
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
RT: Marine robots
Oceans
NT: Ocean circulation
Ocean dynamics

Oceans
UF: Ocean composition
Planetary oceans
BT: Geoscience
RT: Geophysics
Marine technology
Oceanography
Sea ice
Sea measurements
Water
NT: Ocean salinity
Ocean temperature
Sea coast
Sea floor
Sea level
Sea surface
Tides

Octrees
BT: Data structures

Odometers
BT: Distance measurement
Instruments

Odometry
BT: Motion detection
Position measurement
RT: Calibration
Location awareness
Robot control
Sensors

OFDM
UF: Orthogonal frequency division multiple access
Orthogonal frequency division multiplexing
BT: Multiplexing
RT: 3G mobile communication
Acoustic communication (telecommunication)
Communication channels
Digital signal processing
MIMO communication
Modulation
Multiaccess communication
Multicarrier code division multiple access
NOMA
NT: Multiple access interference
OFDM modulation
Partial transmit sequences
Peak to average power ratio

OFDM modulation
BT: OFDM

OFETs
UF: Organic FETS
Organic field effect transistors
Organic field-effect 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
	NT:	Workflow management software

Offshore installations
	UF:	Gas platforms
		Offshore distribution systems
		Offshore platforms
		Offshore power plants
		Oil platforms
	BT:	Structural engineering
	RT:	Oil drilling
		Petroleum industry
		Power industry

Ohmic contacts
| | BT: | Contacts |
| | RT: | Linear circuits |

Oil drilling
	UF:	Drilling oil
	BT:	Petroleum industry
	RT:	Drilling
		Fuel processing industries
		Offshore installations
		Technology
		Well logging

Oil filled cables
| | BT: | Oil insulation |
| | RT: | Cable insulation |

Oil insulation
	UF:	Transformer oil
	BT:	Insulation
	RT:	Oils
	NT:	Oil filled cables

Oil pollution
	BT:	Pollution
	RT:	Accidents
		Land pollution
		Marine pollution
		Oils
		Petroleum
		Petroleum industry

Oil refineries
| | BT: | Petroleum industry |

Oils
	BT:	Materials
	RT:	Engines
		Fats
		Fluids
		Fractionation
		Fuel processing industries
		Insulation
		Marine pollution
		Mechanical factors
		Mechanical power transmission
		Oil insulation
		Oil pollution
		Petroleum
		Petroleum industry
		Pipelines
		Water pollution
	NT:	Lubricating oils
		Vegetable oils

Older adults
	UF:	Elderly
		Senior citizens
	BT:	Social groups
	RT:	Aging
		Alzheimer's disease
		Assisted living
		Assistive robots
		Geriatrics
		Gerontology

Olfactory
| | BT: | Nose |

Olfactory bulb
| | BT: | Forebrain |
| | | 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 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

Oncological surgery
UF: Otologic surgery
Surgery oncology
BT: Surgery
RT: Cancer
Oncology

Oncology
BT: Medical specialties
RT: Cancer
Cell therapy
Chemotherapy
Oncological surgery
Tumors
NT: Radiation therapy

Online banking
UF: Digital currency
E-banking
E-currency
E-wallets
Electronic banking
Electronic currency
Electronic wallets
Internet banking
Mobile payment
Virtual currency
BT: Banking
Online services
RT: Bitcoin
Cryptocurrency
Electronic commerce
Open banking
NT: Distributed ledger
Micropayments

Online services
UF: Inverted classroom
On-line services
Reverse teaching
BT: Information retrieval
RT: Cloud gaming

Electronic learning
Internet
NT: Mobility as a service
Online banking

Ontologies
UF: Ontology
BT: Knowledge representation
RT: Linked data
Open data
Ranking (statistics)
Semantic Web
Semantic search
Thesauri
NT: Description logic

Open Access
BT: Open systems
Publishing
NT: Public domain software

Open area test sites
UF: OATS
BT: Test facilities
RT: Electromagnetic compatibility and interference
Electromagnetic interference
Immunity testing
Military equipment

Open banking
BT: Banking
Open source software
RT: Finance
Investment
Online banking
Open systems

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 systems
UF:	Open loop control	
BT:	Control systems	
RT:	Feedforward systems	
	Operational amplifiers	

Open source hardware
UF:	Open-source hardware	
BT:	Hardware	

Open source software
UF:	Open-source software	
BT:	Software	
RT:	Public domain software	
NT:	Open banking	

Open systems
UF:	OSI	
BT:	Computers and information processing	
	System analysis and design	
RT:	Common Information Model (electricity)	
	Computer networks	
	Internetworking	
	Interoperability	
	Local area networks	
	Metropolitan area networks	
	Open banking	
	Open data	
	Standards	
	Wide area networks	
NT:	Open Access	
	Open Educational Resources	
	Physical layer	

Open wireless architecture
UF:	OWA	
BT:	Wireless communication	

Operating systems
UF:	Android (operating system)	
	Computer operating systems	
	Executive programs	
	Microsoft Windows	
	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	

Opportunistic software systems development
BT:	Programming	

Optical add-drop multiplexers
UF:	ROADMS	
BT:	Add-drop multiplexers	

Optical amplifiers
BT:	Optics	
RT:	Erbium	
NT:	Doped fiber amplifiers	

Erbium-doped fiber
amplifiers

Semiconductor optical
amplifiers

Optical antennas
- BT: Antennas
  - Optics
- RT: Nanophotonics
  - Optical communication
equipment
  - Optical metamaterials
  - Optoelectronic devices
  - Plasmons
  - Receivers
  - Terahertz materials
  - Transceivers
  - Transmitters
- NT: Nanoantennas

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: Electo-optic effects
- RT: Electro-optic devices
  - Optical switches

Optical buffering
- BT: Optical fiber communication

Optical burst switching
- BT: Burst switching

Optical character recognition
- UF: OCR
- BT: Software
- NT: License plate recognition

Optical cloaking
- UF: Metamaterial cloaking
- BT: Metamaterials
  - Optical materials

Optical coherence tomography
- BT: Tomography
- RT: Eyes

Optical collimators
- BT: Optical devices

Optical communication equipment
- BT: Communication equipment
- RT: Biomedical optical imaging
  - Nanoantennas
  - Optical antennas
  - Optical attenuators
  - Optical switches
- NT: Optical transmitters

Optical computing
- BT: Computers and information
processing
Optical control
- BT: Control systems
- RT: Optical switches
- NT: Lighting control
  - Optical variables control
  - Optogenetics

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
- BT: Optical design
- RT: Design methodology
- NT: High-speed optical
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 devices
UF:	Optical components
BT:	Optics
RT:	Biomedical optical imaging
	Endomicroscopy
	Gratings
	Optical materials
NT:	Bragg gratings
	Collimators
	Displays
	Holographic optical components
	Lenses
	Light deflectors
	Lighting
	Luminescent devices
	Mirrors
	Optical arrays
	Optical attenuators
	Optical collimators
	Optical device fabrication
	Optical filters
	Optical modulators
	Optical resonators
	Optical sensors
	Retroreflectors
	Thermooptical devices

Optical diffraction
BT:	Electromagnetic diffraction
RT:	Photonic band gap
NT:	Diffraction gratings

Optical distortion
BT:	Optics
RT:	Lasers
	Optical noise
	Thermal lensing

Optical engineering
BT:	Engineering - general
	Optics
RT:	Optical materials

Optical feedback
BT:	Image processing
RT:	Distributed feedback devices

Optical fiber amplifiers
UF:	Optical fibre amplifiers
BT:	Optical fibers
RT:	Amplifiers

Optical fiber applications
UF:	Optical fibre applications
BT:	Optics
RT:	Channel spacing
	Code division multiplexing
	Optical fiber cables
	Optical fiber communication
	Optical fibers
NT:	Optical fiber devices

Optical fiber cables
UF:	Communication cables (optical)
	Optical fibre cables
BT:	Cables
RT:	Optical fiber applications
	Splicing
NT:	Claddings

Optical fiber communication
UF:	Infrared communication
	Optical communication
	Optical fibre communication
	Optical links
BT:	Communication systems
RT:	Avalanche photodiodes
	Broadband communication
	Indoor communication
	Optical crosstalk
	Optical fiber applications
	Optical transmitters
	Quantum communication
	Silicon photonics
	Synchronous digital hierarchy
NT:	FDDI
	Free-space optical communication
	Optical buffering
	Optical fiber networks
	Optical fiber subscriber loops
	Optical interconnections
	Optical packet switching
	Optical wavelength conversion

JULY 2023 IEEE Thesaurus

SONET
Scheduling algorithms
Visible light communication

Optical fiber couplers
UF: Optical fibre couplers
BT: Optical fibers
RT: Optical coupling

Optical fiber devices
UF: Optical fibre devices
BT: Optical fiber applications
RT: Optical fibers
NT: Optical fiber sensors

Optical fiber dispersion
UF: Optical fibre dispersion
BT: Dispersion

Optical fiber filters
BT: Optical filters

Optical fiber LAN
UF: Optical fiber local area network
Optical fibre LAN
Optical fibre local area network
BT: Optical fiber networks

Optical fiber losses
UF: Optical fiber loss
Optical fibre losses
BT: Optical fibers

Optical fiber networks
UF: Optical fibre networks
Optical networks
Optical-fiber networks
Optical-fibre networks
BT: Optical fiber communication
RT: Light fidelity
NT: All-optical networks
LAN emulation
Optical fiber LAN
Optical network units
Passive optical networks
Protection switching
Wavelength assignment

Optical fiber polarization
UF: Optical fibre polarisation
Polarization-maintaining optical fibers
BT: Optical fibers

RT: Optical fiber sensors
Optical interferometry
NT: Polarization mode dispersion

Optical fiber sensors
UF: Fiber optic sensors
Fibre optic sensors
Optical fibre sensors
BT: Optical fiber devices
Optical sensors
RT: Optical fiber polarization
Partial discharge measurement

Optical fiber subscriber loops
UF: FTTH
Fiber-in-the-loop
Optical fibre subscriber loops
BT: Optical fiber communication

Optical fiber testing
UF: Optical fibre testing
BT: Testing
RT: Optical fibers

Optical fiber theory
UF: Optical fibre theory
BT: Optical fibers
RT: Electromagnetic field theory

Optical fibers
UF: Optical fibres
BT: Fiber optics
Optical waveguides
RT: Electromagnetic waveguides
Optical fiber applications
Optical fiber devices
Optical fiber testing
Optical materials
Optical propagation
Optical waveguide theory
Optical wavelength conversion
Supercontinuum generation
Temperature sensors
NT: Optical fiber amplifiers
Optical fiber couplers
Optical fiber losses
Optical fiber polarization
Optical fiber theory
Plastic optical fiber

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0). Created by The Institute of Electrical and Electronics Engineers (IEEE) for the benefit of humanity.

Page 317

Wavelength conversion

Optical films
BT:	Films	
RT:	Integrated optics	
	Optical materials	

Optical filters
BT:	Optical devices	
RT:	Photography	
NT:	Optical fiber filters	

Optical flow
UF:	Optic flow	
BT:	Optical imaging	
	Relativistic effects	

Optical frequency conversion
BT:	Frequency conversion

Optical harmonic generation
UF:	Optical frequency combs
BT:	Optics

Optical imaging
BT:	Imaging
RT:	Infrared imaging
	Microscopy
	Remote sensing
NT:	Optical flow
	Optical projectors
	Talbot effect
	Thermoreflectance imaging

Optical interconnections
UF:	Optical interconnects
BT:	Optical fiber communication

Optical interferometry
UF:	Light interferometry
BT:	Interferometry
RT:	Optical fiber polarization
	Speckle
	Talbot effect

Optical losses
BT:	Optics
RT:	Loss measurement
	Optical attenuators
	Optical scattering

Optical materials
BT:	Materials
RT:	Glass
	Indium tin oxide

Lenses
Magnesium oxide
Metamaterials
Mirrors
Optical devices
Optical engineering
Optical fibers
Optical films
Optics
Organic inorganic hybrid materials

Phase change materials
Photonic crystals
SIMO communication

NT:	Colloidal nanocrystals
	Optical cloaking
	Optical polymers
	Optical retarders
	Optical superlattices
	Photorefractive materials

Optical metamaterials
UF:	Photonic metamaterials
BT:	Metamaterials
RT:	Electromagnetic metamaterials
	Nanoantennas
	Optical antennas

Optical metrology
BT:	Metrology

Optical microscopy
BT:	Optics

Optical mixing
UF:	Optical heterodyning
BT:	Nonlinear optics
	Optics
RT:	Photorefractive materials
NT:	Multiwave mixing

Optical modulation
BT:	Modulation
RT:	Indoor communication
	Microwave photonics
	Optical transmitters
NT:	Cross-phase modulation
	Intensity modulation

Optical modulators
BT:	Modulation
	Optical devices
NT:	Electro-absorption modulators
	Electro-optic modulators

Optical network units
UF: ONU
BT: Optical fiber networks

Optical noise
BT: Integrated circuit noise
RT: Optical distortion
NT: Speckle

Optical packet switching
BT: Optical fiber communication

Optical planar waveguides
BT: Optical waveguides

Optical polarization
UF: Light polarisation
    Light polarization
    Optical polarisation
BT: Optics
RT: Photoelasticity
NT: Polarization shift keying
    Stokes parameters

Optical polymers
BT: Optical materials
    Polymers

Optical projectors
UF: projectors (optical)
BT: Optical imaging
    Video equipment
RT: Image processing
    Micromirrors
    Motion pictures

Optical propagation
UF: Infrared propagation
BT: Electromagnetic propagation
RT: Optical fibers
    Thermooptic effects
NT: Optical surface waves
    Optical waveguides

Optical pulse compression
BT: Pulse compression methods

Optical pulse generation
BT: Pulse generation
RT: Optical pulse shaping

Optical pulse shaping
BT: Pulse shaping methods
RT: Optical pulse generation

Optical pulses
BT: Optics

Optical pumping
BT: Laser excitation

Optical receivers
BT: Receivers

Optical recording
BT: Recording
RT: Laser applications
NT: CD recording

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 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 scattering
BT: Electromagnetic scattering
RT: Laser radar
  Light scattering
  Optical losses
  Optical reflection
  Speckle

Optical sensors
BT: Optical devices
  Sensors
RT: Image sensors
  Wearable 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
  Solitons
RT: Optical vortices

Optical squeezing
UF: Squeezed light
  Squuezed states
BT: Quantum optics

Optical superlattices
UF: Optical multilayers
BT: Optical materials
  Superlattices

Optical surface waves
BT: Optical propagation

Optical switches
UF: Optical switch
BT: Switches
RT: Optical bistability
  Optical communication equipment
  Optical control
  Photothyristors
  Smart pixels
  Thermooptical devices

Optical transmitters
BT: Optical communication equipment
  Transmitters
RT: Bragg gratings
  Diodes
  Optical fiber communication
  Optical modulation
  Photodiodes
  Semiconductor lasers
  Semiconductor optical amplifiers

Optical tuning
BT: Optics
  Tuning
RT: Laser tuning

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 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: Electro-optic modulators
  Integrated optics
  Photonic crystals

NT:	Arrayed waveguide gratings	
	Electro-optical waveguides	
	Optical fibers	
	Optical planar waveguides	
	Optical waveguide components	
	Optical waveguide theory	

Optical wavelength conversion
BT:	Optical fiber communication	
	Signal processing	
RT:	Multicast communication	
	Optical fibers	
	Telecommunications	

Optics
BT:	Lasers and electrooptics
RT:	Erbium
	Fourier transforms
	Laser theory
	Magnetooptic effects
	Optical materials
NT:	Adaptive optics
	Aspherical optics
	Birefringence
	Brightness
	Color
	Electron optics
	Extinction coefficients
	Fiber optics
	Fluorescence
	Four-wave mixing
	Geometrical optics
	Integrated optics
	Light fields
	Light sources
	Luminescence
	Microoptics
	Nonlinear optics
	Optical amplifiers
	Optical antennas
	Optical crosstalk
	Optical design
	Optical devices
	Optical distortion
	Optical engineering
	Optical fiber applications
	Optical harmonic generation
	Optical losses
	Optical microscopy
	Optical mixing
	Optical polarization
	Optical pulses
	Optical retarders

Optical saturation
Optical solitons
Optical tuning
Optogenetics
Particle beam optics
Photoluminescence
Physical optics
Ray tracing
Stray light
Ultrafast optics
Whispering gallery modes

Optimal control
BT:	Control systems
RT:	Game theory
	H infinity control
NT:	Bang-bang control
	Infinite horizon

Optimal matching
BT:	Graph theory

Optimal scheduling
BT:	Optimization

Optimization
UF:	Optimisation
	Performance optimisation
	Performance optimization
BT:	Mathematics
RT:	Artificial bee colony algorithm
	Doping profiles
	Least squares approximations
	Minimization
	Multi-armed bandit problem
	Parametric study
	Performance analysis
	TOPSIS
NT:	Cost function
	Metaheuristics
	Optimal scheduling
	Optimization methods
	Trajectory optimization

Optimization methods
UF:	Optimisation methods
BT:	Optimization
RT:	Infinite horizon
	Linear programming
	MIMO communication
	Newton method
	Operations research

Processor scheduling
Response surface methodology

Search methods
Single machine scheduling
Traveling salesman problems
- NT: Affordances
Circuit optimization
Concave programming
Design optimization
Fireworks algorithm
Gradient methods
H infinity control
Lagrangian functions
Mathematical programming
Optimized production technology
Pareto optimization
Quadratic programming
Simulated annealing

Optimized production technology
- UF: Optimised production technology
- BT: Optimization methods
Production control
- RT: Production planning
Production systems

Optimizing compilers
- UF: Optimising compilers
- BT: Program processors

Optoelectronic and photonic sensors
- BT: Sensors

Optoelectronic devices
- UF: Opto-electronic devices
- BT: Lasers and electrooptics
- RT: Electro-optic devices
Optical antennas
Phototransistors
- NT: Charge-coupled image sensors
Integrated optoelectronics
Light emitting diodes
Photoconducting devices
Photodetectors
Superluminescent diodes

Optogenetics
- BT: Genetics
Neuromodulation
Optical control

Optics

Oral communication
- UF: Speech communication
- BT: Professional communication
- NT: Public speaking
Speech

Orbital calculations
- BT: Energy states

Orbital robotics
- BT: Robots

Orbits
- BT: Astrophysics
- RT: Geostationary satellites
- NT: Orbits (stellar)
Planetary orbits

Orbits (stellar)
- BT: Orbits

Ordinary differential equations
- BT: Differential equations

Ordinary magnetoresistance
- BT: Magnetoresistance

Ores
- BT: Minerals

Organ transplantation
- UF: Transplants
- BT: Medical services

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 inorganic hybrid materials
- UF: Inorganic organic hybrid materials

		Inorganic-organic hybrid materials
		Organic-inorganic hybrid materials
		Organically modified silicates
		Ormosils
	BT:	Materials
	RT:	Bio-inspired materials
		Inorganic compounds
		Optical materials

Organic light emitting diodes

	UF:	OLED
		Organic light-emitting diodes
		Polymer led
	BT:	Diodes
		Light emitting diodes
	RT:	Electroluminescence
		Molecular electronics
	NT:	Active matrix organic light emitting diodes

Organic materials

	BT:	Materials

Organic semiconductors

	BT:	Organic compounds
		Semiconductor materials
	NT:	Pentacene

Organic thin film transistors

	UF:	OTFT
		Organic thin-film transistors
	BT:	Thin film transistors

Organisms

	BT:	Biological systems
	NT:	Algae
		Animals
		Archaea
		Fish
		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
		Industrial communication
		Teamwork
	NT:	Business communication
		Corporate acquisitions
		Data governance
		Facilities management
		Role transfer
		Scheduling
		Stakeholders

Organizations

	BT:	Business
	RT:	Leadership
	NT:	BNSC
		Companies
		Decentralized autonomous organization
		European Space Agency
		Government
		Sociotechnical systems
		United Kingdom Space Agency

Orifices

	BT:	Mechanical products

Orthopedic procedures

	BT:	Medical treatment

Orthopedic surgery

	BT:	Surgery

Orthotics

	BT:	Medical treatment
	RT:	Assistive technologies
		Biomedical engineering
		Biomedical equipment
		Medical control systems
		Prosthetics
		Sensory aids
		Wearable robots

Oscillators

	UF:	Oscillations
	BT:	Circuits and systems
	RT:	Circuits
		Damping
		Klystrons
		Lasers
		Resonant frequency
		Vibrations
	NT:	Digital-controlled oscillators
		Injection-locked oscillators
		Local oscillators

		Microwave oscillators
		Phase noise
		Ring oscillators
		Voltage-controlled oscillators

Oscilloscopes
UF:	Cathode-ray oscilloscopes
BT:	Instruments
RT:	Electric variables measurement
	Test equipment

Osmium
BT:	Chemical elements

Osmosis
BT:	Chemical processes
NT:	Electro-osmosis

Osteoarthritis
BT:	Bone diseases

Osteoporosis
BT:	Bone diseases
RT:	Cancellous bone

Out of order
UF:	OOO
BT:	Instruction sets

Output feedback
BT:	Feedback circuits

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

Overlay networks
BT:	Computer networks
RT:	Network topology
	Transport protocols
NT:	Dark Web

OWL
UF:	Web ontology language
BT:	Markup languages
	Semantic Web
RT:	Knowledge representation

Oxidation
BT:	Chemical processes
RT:	Materials
NT:	Combustion
	Redox

Oxygen
BT:	Chemical elements
	Gases
RT:	Pulse oximetry

Ozonation
UF:	Ozone treatment
BT:	Wastewater treatment
RT:	Environmental factors
	Pollution control

P-i-n diodes
BT:	Diodes
	Semiconductor devices
	Semiconductor diodes
RT:	CMOSFET logic devices
	Electro-optic modulators
	Vertical cavity surface emitting lasers

P-n junctions
BT:	Junctions
RT:	Light emitting diodes
	Photodiodes
	Semiconductor diodes

Pacemakers
BT:	Biomedical equipment
RT:	Cardiology

Packaging
BT:	Industry applications
RT:	Filling
	Leak detection
	Packaging machines
	Seals
NT:	Bagging
	Bottling
	Canning
	Encapsulation
	Food packaging
	Labeling
	Multichip modules

Nanopackaging
Plastic packaging
Wrapping

Packaging machines
BT: Production equipment
RT: Bagging
Bottling
Labeling
Packaging
Wrapping

Packet loss
BT: Loss measurement
Packet switching
RT: Data communication
Noise measurement

Packet radio networks
UF: Packet radio
BT: Radio communication

Packet switching
BT: Communication switching
RT: ARPANET
Data transfer
IEEE 802.3 Standard
Next generation networking
NT: Burst switching
Frame relay
Multiprotocol label
switching
Packet loss

Page description languages
UF: Postscript
BT: Markup languages
RT: Desktop publishing
High level languages

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

Pairwise error probability
UF: Pair-wise error probability
Pairwise correlations
BT: Probability

Palladium
BT: Metals

Pallets
UF: Palletising
Palletizing
BT: Materials handling
RT: Containers
Load management

Palmprint recognition
UF: Palm print recognition
Palmprint identification
BT: Biometrics (access control)
RT: Identification of persons

Pancreas
BT: Digestive system
RT: Pancreatic cancer

Pancreatic cancer
BT: Cancer
RT: Pancreas

Pandemics
BT: Epidemics
RT: COVID-19
Coronaviruses
Diseases
Influenza

Pansharpening
UF: Pansharpened
BT: Image processing
RT: Image quality

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
    Pulp and paper industry
RT: Paper making
    Paper products
    Paper pulp
    Paper technology
    Pulp manufacturing
    Spinning machines

Paper mills
BT: Production facilities
    Pulp and paper industry
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
    Materials
RT: Cellulose
    Paper making
    Paper making machines
    Paper mills
    Paper products
    Pulp and paper industry
    Pulp manufacturing

Paper technology
BT: Industry applications
RT: Paper making
    Paper making machines
    Paper products
    Pulp and paper industry

Parallel algorithms
BT: Algorithms
    Parallel processing

Parallel architectures
BT: Computer architecture
RT: Parallel machines
    Parallel processing
NT: Multicore processing

Parallel languages
BT: High level languages
RT: Multiprocessing systems
    Parallel processing
    Parallel programming

Parallel machines
BT: Computers
RT: Parallel architectures
    Parallel processing

Parallel processing
UF: Array processing
    Parallel computing
    Parallelism
BT: Computers and information processing
RT: Cluster computing
    Concurrency control
    Digital computers
    Parallel architectures
    Parallel languages
    Parallel machines
    Parallel programming
NT: Multiprocessing systems
    Multithreading
    Parallel algorithms
    Pipeline processing

Parallel programming
BT: Programming
RT: Multiprocessing systems
    Parallel languages
    Parallel processing
    VHDL

Parallel robots
BT: Robots

Paralysis
BT: Medical conditions
RT: Motor coordination

Paramagnetic materials
BT: Magnetic materials
RT: Paramagnetic resonance
NT: Superparamagnetic iron oxide nanoparticles

Paramagnetic resonance
- BT: Magnetic resonance
- RT: Paramagnetic materials

Parameter estimation
- UF: Parameter identification
- BT: Signal analysis
  Statistical analysis
- RT: Control systems
  Power system analysis computing
  Spectral analysis
- NT: Amplitude estimation
  Direction-of-arrival estimation
  Frequency estimation
  Motion estimation
  Phase estimation
  Time of arrival estimation

Parameter extraction
- BT: Electromagnetic measurements
- RT: Bipolar transistor circuits
  Very large scale integration

Parametric statistics
- UF: Parametric model
- BT: Statistics

Parametric study
- BT: Multitasking
- RT: Optimization

Parasitic capacitance
- BT: Capacitance

Parasitic diseases
- BT: Diseases

Parasympathetic nervous system
- BT: Autonomic nervous system

Pareto analysis
- BT: Statistical analysis
- RT: Cause effect analysis
  Quality management
- NT: Pareto optimization

Pareto optimization
- UF: Multi-attribute optimization
  Multi-objective programming
  Multiobjective programming
  Pareto optimisation

Vector optimization
- BT: Optimization methods
  Pareto analysis
- RT: Genetic algorithms

Parietal lobe
- BT: Brain

Parity check codes
- UF: LDPC
  Ldpc codes
  Low density parity check codes
  Parity-check codes
- BT: Codes
- RT: Decoding
- NT: Iterative decoding

Parkinson's disease
- BT: Diseases

Partial differential equations
- BT: Differential equations
- RT: Boundary value problems
  Fourier transforms
- NT: Boundary-element methods
  Poisson equations

Partial discharge measurement
- BT: Electric variables measurement
- RT: Electrical safety
  Insulation life
  Insulation testing
  Optical fiber sensors

Partial discharges
- BT: Dielectric breakdown
- RT: Corona

Partial response channels
- BT: Communication channels

Partial response signaling
- BT: Digital modulation

Partial transmit sequences
- BT: OFDM

Particle accelerators
- BT: Nuclear and plasma sciences
- RT: Colliding beam devices
  Large Hadron Collider
  Particle beams

	Voltage multipliers
NT:	Accelerator magnets
	Colliding beam accelerators
	Cyclotrons
	Electron accelerators
	Ion accelerators
	Linear accelerators
	Photon collider
	Plasma accelerators
	Proton accelerators
	Storage rings
	Synchrocyclotrons
	Synchrotrons

Particle beam handling
BT: Nuclear and plasma sciences
RT: Particle beams

Particle beam injection
UF: Injected beams
BT: Nuclear and plasma sciences
RT: Particle beams

Particle beam measurements
BT: Measurement
RT: Particle beams

Particle beam optics
UF: Ion optics
BT: Optics
RT: Electrodynamics
Particle beams
NT: Atom optics
Electron optics
Stimulated emission

Particle beams
UF: Accelerator beams
Neutron beams
Proton beams
BT: Beams
Elementary particles
RT: Colliding beam accelerators
Laser theory
Particle accelerators
Particle beam handling
Particle beam injection
Particle beam measurements
Particle beam optics
Storage rings
Synchrotrons

NT: Atomic beams
Electron beams
Ion beams

Particle charging
BT: Electrostatic processes
RT: Semiconductor detectors

Particle collisions
BT: Elementary particles

Particle filters
BT: Filters

Particle measurements
UF: Particulate measurements
BT: Measurement
RT: Current density
High energy physics instrumentation computing
Position sensitive particle detectors

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 optimization
UF: Particle swarm
Particle-swarm optimization
Swarm intelligence
Swarm optimization
BT: Evolutionary computation
RT: Artificial bee colony algorithm
Fireworks algorithm
Fish schools
Metaheuristics
Stochastic processes

Particle tracking
BT: Nuclear measurements
RT: High energy physics instrumentation computing

Tracking

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
Passive-optical-network
BT: Optical fiber networks
RT: EPON

Passive radar
BT: Radar
RT: Radar detection
Radar imaging

Passive RFID tags
BT: RFID tags

Passwords
BT: Access control
Computer security
RT: Authentication

Patch antennas
BT: Antennas
RT: Microstrip antennas

Patent law
BT: Law

Patents
BT: Legal factors
RT: Intellectual property
US Government agencies

Path planning
UF: piano mover's problem
BT: Motion control
RT: Course correction
Indoor navigation
Vehicle routing
NT: Trajectory
Trajectory planning
Trajectory tracking

Pathogens
UF: Germs
BT: Diseases
RT: Epidemics

Pathological processes
BT: Pathology
NT: Cadaver
Death

Pathology
UF: Pathological
BT: Medical specialties
RT: Autopsy
Diseases
NT: Histopathology
Neuropathology
Pathological processes

Patient monitoring
BT: Monitoring
RT: Assistive robots
Chemotherapy
Electronic medical records
Fall detection
Point of care

Patient rehabilitation
BT: Medical treatment
RT: Assistive robots
NT: Neurorehabilitation

Pattern analysis
BT: Machine intelligence
RT: Surface reconstruction

JULY 2023 IEEE Thesaurus

Pattern classification
UF:	Signal classification
BT:	Decision making
RT:	Feature extraction
	Graph neural networks
	Logistic regression
	Nearest neighbor methods
	Neural networks
	Pattern recognition
	Reinforcement learning
	Semisupervised learning
	Support vector machines
NT:	Naive Bayes methods

Pattern clustering
BT:	Clustering methods
RT:	Image reconstruction
	Nearest neighbor methods
	Pattern matching
	Signal analysis
	Signal detection
	Signal processing

Pattern formation
BT:	Process design
RT:	Chaos
	Nonlinear dynamical systems
	Nonlinear optics
	Spatiotemporal phenomena

Pattern matching
BT:	Pattern recognition
RT:	Pattern clustering
	Spatiotemporal phenomena
NT:	Image matching

Pattern recognition
UF:	Image pattern recognition
BT:	Computers and information processing
RT:	Automatic optical inspection
	Computer vision
	Feature extraction
	Feedforward neural networks
	Hidden Markov models
	Human activity recognition
	Learning systems
	Machine vision
	Pattern classification
	Principal component analysis
	Publish subscribe systems
	Random forests

	Robot vision systems
	Shape
	Spatiotemporal phenomena
	Statistical learning
	Symbols
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
	Sound recognition
	Speech recognition
	Text recognition

Payloads
BT:	Military aircraft
	Space technology
NT:	MODIS

PD control
UF:	PID control
	Proportional + derivative control
	Proportional derivative control
	Proportional plus derivative control
	Proportional-derivative control
	Proportional-integral-derivative
BT:	Control systems

Peace technology
BT:	Social implications of technology

Peak to average power ratio
UF:	PAPR
	Peak-to-average power ratio
	Peak-to-average ratio
BT:	OFDM

Pedestrians
BT:	Human factors
	Road traffic
RT:	Legged locomotion
	Road safety

Road traffic control
Vehicle safety

Pediatrics
UF: Babies
Baby
Child
Children
Infant
Infants
Newborns
Paediatrics
Toddler
BT: Medical specialties
RT: Neonatology

Peer-to-peer computing
UF: File sharing
P2P
Peer to peer communications
Peer to peer computing
Peer to peer exchange
Peer to peer network
Peer-to-peer communications
Peer-to-peer exchange
Peer-to-peer network
BT: Computer networks
Distributed computing
RT: Border Gateway Protocol
Cluster computing
Decentralized applications
Distributed ledger
Workstations
NT: InterPlanetary File System

Peltier effect
BT: Thermoelectricity

Pelvic bones
BT: Bones

Pelvis
BT: Body regions

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

Perception evolution networks
BT: Neural networks
RT: Unsupervised learning

Perfectly matched layers
BT: Propagation
RT: Finite difference methods
Finite element analysis
Maxwell equations

Performance analysis
UF: Dynamic program analysis
Performance index
BT: Programming
RT: Optimization
NT: Performance gain

Performance evaluation
BT: Measurement
RT: Benchmark testing
NT: Key performance indicator

Performance gain
BT: Performance analysis

Performance loss
BT: Computer performance

Perineum
BT: Body regions

Periodic structures
BT: Materials science and technology
NT: Gratings
Photonic crystals

Peripheral nervous system
BT: Nervous system

Permanent magnet generators
BT: Permanent magnet machines

Permanent magnet machines
UF: Permanent magnet synchronous machines
BT: Electric machines
Rotating machines
RT: Permanent magnet motors
Permanent magnets
NT: Permanent magnet generators

Permanent magnet motors
UF: Permanent magnet synchronous motors
Permanent-magnet generators
Permanent-magnet motors
BT: Motors
RT: Permanent magnet machines

Permanent magnets
BT: Magnets
RT: Magnetic gears
Magnetic levitation vehicles
Permanent magnet machines
Remanence

Permeability
UF: Magnetic permeability
BT: Electromagnetic analysis
RT: Magnetic materials
Permeability measurement

Permeability measurement
BT: Magnetic variables measurement
RT: Permeability

Permission
UF: Access rights
File system permissions
BT: Computer security
RT: Zero Trust

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
RT: Disk drives

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 digital devices
UF: Blackberry
Digital devices

	Hand held computers
	Handheld computers
	PD
	PDA
	Palmtop computers
	Personal digital assistants
	Wireless digital devices
BT:	Portable computers

Personal protective equipment
BT:	Health and safety
RT:	Protective clothing

Personal voice assistants
UF:	PVA
BT:	Speech recognition
	Virtual assistants
RT:	Natural language processing
	Smart devices
	Speech synthesis
	Voice activity detection

Personnel
BT:	Human resource management
RT:	Appraisal
	Bring your own device
	Education
	Employment
	Equal opportunities
	Management
	Productivity
	Training
NT:	Labor resources

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

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
	Pesticides

Pesticides
BT:	Agrochemicals
RT:	Agricultural products
	Chemical industry
	Chemical products
	Land pollution
	Pest control
	Plant diseases
	Soil pollution
	Water pollution

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
RT:	Chemical industry
	Chemistry
	Fuels
	Petroleum
	Petroleum industry
	Plastic products
	Plastics

Petroleum
UF:	Gasoline
	Petrol
BT:	Chemical products
	Fuels

RT: Fuel processing industries
Oil pollution
Oils
Petrochemicals
Petroleum industry
NT: Hydrocarbons

Petroleum industry
UF: Oil industry
BT: Industries
RT: Chemical industry
Fractionation
Fuel processing industries
Gas industry
Natural gas industry
Offshore installations
Oil pollution
Oils
Petrochemicals
Petroleum
Pipelines
NT: Oil drilling
Oil refineries
Well logging

pH measurement
BT: Chemical analysis
Measurement

Phantoms
BT: Biomedical imaging
RT: Dosimetry
Positron emission tomography
Single photon emission computed tomography
X-ray applications
X-ray detection
X-ray imaging

Pharmaceutical technology
BT: Chemical technology
RT: Biochemistry
Chemistry
Pharmaceuticals

Pharmaceuticals
BT: Chemical products
Medical treatment
RT: Biochemistry
Chemistry
Pharmaceutical technology
NT: Drugs

Pharynx
BT: Digestive system
RT: Stomatognathic system

Phase change materials
UF: PCM
BT: Materials
RT: Memory
Nuclear thermodynamics
Optical materials
Phase change memory
Solar heating

Phase change memory
BT: Memory
RT: Phase change materials
Resistive RAM
NT: Phase change random access memory

Phase change random access memory
UF: PCRAM
Phase change RAM
Phase-change RAM
Phase-change random access memory
BT: Phase change memory
Random access memory

Phase control
UF: Phase-control
BT: Power electronics
RT: Electric variables control
Optical variables control
Phase transformers

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
Voltage control

Phase locked loops
UF: PLL
        Phase locked-loops
        Phase-locked loops
        Phase-locked-loops
BT: Linear feedback control systems
        Signal processing
RT: Frequency locked loops
        Modulation
        Nonlinear filters
        Ring oscillators

Phase measurement
BT: Measurement
RT: Acoustic measurements
        Electric variables measurement
        Optical variables measurement

Phase modulation
BT: Modulation
RT: Demodulation
        Electro-optic modulators
NT: Continuous phase modulation
        Cross-phase modulation
        Differential phase shift keying
        Phase shift keying

Phase noise
BT: Noise
        Oscillators
RT: Time-domain analysis

Phase shift keying
UF: PSK
        Phase-shift keying
        Phase-shift-keying
        QPSK
BT: Phase modulation
NT: Binary phase shift keying
        Quadrature phase shift keying

Phase shifters
BT: Circuits
RT: Butler matrices
NT: Phase transformers

Phase shifting interferometry
BT: Interferometry

Phase transformers
BT: Phase shifters
        Transformers
RT: Circuits
        Phase control

Phased arrays
UF: Antenna phased arrays
BT: Antenna arrays
RT: Optical arrays
NT: Steerable antennas

Phasor measurement units
UF: PMU
        PMUs
        Synchrophasors
BT: Electric variables measurement

PHEMTs
UF: Pseudomorphic HEMTs
BT: HEMTs

Philosophical considerations
BT: Social implications of technology
RT: Econophysics
        Ethical aspects
        Humanities
        Machine ethics
        Quantum mechanics
        Social factors
        Technology
        Technology social factors

Phishing
BT: Computer security
        Information security
RT: Malware

Phonetics
BT: Linguistics
RT: Natural language processing
        Semiotics
        Speech processing
NT: Acoustic phonetics

Phonocardiography
UF: PCG
        Phonocardiogram
BT: Cardiography
RT: Biomedical monitoring
        Cardiology
        Heart rate measurement

JULY 2023 IEEE Thesaurus

Phonons
- BT: Elementary particles
- RT: Acoustics
  - Crystals
  - Electrons
  - Indium phosphide

Phosphorescence
- BT: Luminescence
- RT: Phosphors

Phosphors
- BT: Light sources
- RT: Phosphorescence

Phosphorus
- BT: Chemical elements

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
- RT: Photocatalysts

Photocatalysts
- BT: Catalysts
- RT: Photocatalysis

Photocathodes
- UF: Photo-cathodes
- BT: Cathodes
- RT: Photomultipliers

Photochemistry
- BT: Chemistry
- RT: Water splitting
- NT: Photobleaching
  - Photocatalysis

Photochromism
- UF: Photodarkening
- BT: Photonics
- RT: Color

Photoconducting devices
- BT: Optoelectronic devices
- RT: Photoconducting materials
  - Photoconductivity
  - Photodetectors
  - Semiconductor devices
- NT: Electrophotography

Photoconducting materials
- UF: Photoconductors
- BT: Materials
- RT: Photoconducting devices
  - Photoconductivity
  - Photodetectors
  - Semiconductor materials

Photoconductivity
- UF: Photocurrent
- BT: Conductivity
- RT: Photoconducting devices
  - Photoconducting materials

Photodetectors
- UF: Photodetector
- BT: Optoelectronic devices
  - Radiation detectors
- RT: Image sensors
  - Infrared detectors
  - Optical signal detection
  - Photoconducting devices
  - Photoconducting materials
  - Photoelectricity
- NT: Photodiodes
  - Phototransistors
  - Superconducting photodetectors

Photodiodes
- BT: Photodetectors
- RT: Optical transmitters
  - P-n junctions
- NT: Avalanche photodiodes
  - PIN photodiodes

Photoelasticity
- BT: Mechanical factors
- RT: Optical polarization
  - Piezooptic effects
  - Stress

JULY 2023 IEEE Thesaurus

Photoelectricity
- UF: Photoemission
  Phototubes
- BT: Electricity
  Electron devices
- RT: Electron emission
  Photodetectors
  Photomultipliers
  Photovoltaic cells
- NT: Photovoltaic effects

Photoelectron microscopy
- UF: Photoemission electron microscopy
- BT: Electron microscopy

Photography
- BT: Imaging
- RT: Cameras
  Electrophotography
  High dynamic range
  Image capture
  Image storage
  Optical filters
- NT: Cinematography
  Digital photography
  Image forensics
  Photomicrography
  Photorealism

Photoluminescence
- UF: Electrophotoluminescence
- BT: Luminescence
  Optics
- RT: Judd-Ofelt theory
  Microcavities

Photometry
- BT: Geoscience and remote sensing
  Optical variables measurement
- RT: Light sources
  Lighting
  Radiometry

Photomicrography
- UF: Micrographs
  Microphotographs
  Microphotography
  Photomicrographs
- BT: Photography

Photomultipliers
- BT: Vacuum technology
- RT: Avalanche photodiodes
  Electron multipliers
  Photocathodes
  Photoelectricity

Photon collider
- BT: Particle accelerators

Photonic band gap
- UF: Band gap
  Band-gap
  Bandgap
  Photonic bandgap
- BT: Photonic crystals
- RT: Electromagnetic wave polarization
  Optical diffraction

Photonic bandgap fibers
- UF: Photonic bandgap fibres
- BT: Photonic crystal fibers

Photonic crystal fibers
- UF: Microstructured fibers
  Microstructured fibres
  Photon crystal fibers
  Photon crystal fibres
  Photonic crystal fibres
  Photonic-crystal fibers
  Photonic-crystal fibres
- BT: Photonic crystals
- NT: Holey fibers
  Photonic bandgap fibers

Photonic crystals
- UF: 2-D photonic crystals
  2D photonic crystals
  Photonic cyrstal fibers
  Two dimensional photonic crystals
  Two-dimensional photonic crystals
- BT: Periodic structures
- RT: Microwave devices
  Nonlinear optics
  Optical materials
  Optical waveguides
  Spontaneous emission
- NT: Photonic band gap
  Photonic crystal fibers

Photonic integrated circuits
- BT: Integrated circuits

Photonics
BT:	Lasers and electrooptics
RT:	Electromagnetic metamaterials
	Epitaxial growth
	Silicon devices
	Synapses
NT:	Biophotonics
	Microwave photonics
	Nanobiophotonics
	Nanophotonics
	Photochromism
	Photothermal effects
	Silicon photonics
	Spontaneous emission

Photoplethysmography
BT:	Biomedical measurement
	Plethysmography

Photorealism
BT:	Media
	Photography
RT:	Art
	Cameras
	Deepfakes
	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

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

Photovoltaic cells
UF:	Solar cells
BT:	Electron devices
	Energy conversion
RT:	Photoelectricity
	Photovoltaic effects
	Photovoltaic systems
	Solar panels
NT:	Light trapping

Photovoltaic effects
UF:	Photogalvanic effects
BT:	Photoelectricity
RT:	Photovoltaic cells
	Photovoltaic systems
NT:	Shunts (electrical)

Photovoltaic systems
UF:	Photovoltaic power systems
BT:	Solar power generation
RT:	Hybrid power systems
	Photovoltaic cells
	Photovoltaic effects
	Water pumps
NT:	Building integrated photovoltaics
	Fill factor (solar cell)
	Solar panels

Phylogeny
UF:	Cladistics
	Phylogenetic tree
	Phylogenetics
BT:	Evolution (biology)

Physical chemistry
BT:	Chemistry

Physical design
BT:	System analysis and design
	Systems engineering and theory
RT:	Integrated circuit layout

Physical layer
BT:	Open systems
NT:	Physical layer security

Physical layer security
BT: Physical layer
RT: Hardware security

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: Ionized jet deposition
        Physical vapor transport
        Physical vapour deposition
        Physical vapour transport
BT: Plasma materials processing
RT: Sputtering

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
        Somatosensory

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

Pickling
BT: Surface treatment
RT: Chemistry

Picohydro power
UF: Pico-hydro
BT: Hydroelectric power generation
RT: Appropriate technology

Picture archiving and communication systems
UF: Pacs
BT: Image communication
RT: Biomedical communication
        Biomedical computing
        Biomedical imaging

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

Piezoelectric actuators

BT:	Actuators

Piezoelectric devices

BT:	Dielectric devices
RT:	Acoustic devices
	Acoustoelectric devices
	Nanogenerators
	Piezoelectric films
	Piezoelectric materials
	Piezoelectricity
	Piezoresistive devices
	Surface acoustic wave devices

Piezoelectric effect

BT:	Piezoelectricity

Piezoelectric films

BT:	Dielectric films
	Films
	Piezoelectric materials
RT:	Piezoelectric devices
	Piezoelectricity

Piezoelectric materials

UF:	Piezoceramics
BT:	Dielectric materials
RT:	Acoustic materials
	Crystals
	Piezoelectric devices
	Piezoelectricity
NT:	Piezoelectric films

Piezoelectric polarization

BT:	Piezoelectricity

Piezoelectric transducers

BT:	Transducers

Piezoelectricity

UF:	Piezoelectric effects
BT:	Electricity
	Ultrasonics, ferroelectrics, and frequency control
RT:	Electrostriction
	Piezoelectric devices
	Piezoelectric films
	Piezoelectric materials

	Piezoresistance
	Pyroelectricity
	Stress
	Ultrasonic transducers
NT:	Piezoelectric effect
	Piezoelectric polarization

Piezooptic effects

BT:	Acoustooptic effects
RT:	Photoelasticity
	Pressure effects
	Stress

Piezoresistance

UF:	Piezoresistive
BT:	Electric variables
	Resistance
RT:	Piezoelectricity
	Piezoresistive devices
	Pressure effects
	Stress

Piezoresistive devices

UF:	Piezoresistors
BT:	Semiconductor devices
RT:	Piezoelectric devices
	Piezoresistance
	Pressure measurement

Pigmentation

BT:	Color
	Materials science and technology
NT:	Pigments

Pigments

BT:	Pigmentation

PIN photodiodes

UF:	P-I-N
	PIN diodes
BT:	Photodiodes

Pins

BT:	Plugs

Pipeline processing

UF:	Computer pipeline processing
	Pipelining
BT:	Parallel processing
RT:	Multiprocessing systems
	Systolic arrays

Pipelines
- BT: Fluid flow
- RT: Chemical industry
  Magnetic flux leakage
  Materials handling
  Natural gas industry
  Oils
  Petroleum industry

Pistons
- BT: Machine components
  Mechanical products
- RT: Bellows
  Engine cylinders
  Engines
  Gaskets
  Shafts
  Structural rings

Pitch control (audio)
- BT: Audio systems
  Variable speed drives

Pitch control (position)
- BT: Mechanical variables control

Pituitary gland
- BT: Glands
  Nervous system

Pixel
- BT: Digital images

Plagiarism
- BT: Professional communication
- RT: Copyright protection
  Notice of Violation
  Publishing

Planar arrays
- UF: Planar antennas
  Planar array
- BT: Antenna arrays

Planar motors
- BT: Electric motors

Planar transmission lines
- BT: Transmission lines
- RT: Spurline
- NT: Coplanar transmission lines
  Finline
  Microstrip
  Slot lines
  Stripline

Planar waveguides
- BT: Electromagnetic waveguides
- RT: Rectangular waveguides

Planarization
- UF: Chemical mechanical planarisation
  Chemical mechanical planarization
  Planarisation
- BT: Surface treatment
- RT: Dielectric films
  Integrated circuits

Planetary orbits
- BT: Orbits

Planets
- UF: Planetary composition
  Planetary oceans
- BT: Solar system
- RT: Extraterrestrial phenomena
- NT: Asteroids
  Comets
  Earth
  Jupiter
  Mars
  Mercury (planets)
  Pluto
  Saturn
  Venus

Planing
- BT: Machining
- RT: Finishing
  Surface roughness
  Surface treatment

Planning
- UF: System planning
- BT: Engineering management
- RT: Decision making
  Economics
- NT: Meeting planning
  Schedules
  Strategic planning
  Technical planning
  Technology planning

Plant diseases
      BT: Diseases
      RT: Pesticides

Plants (biology)
      BT: Organisms
      RT: Life sciences
      NT: Bamboo

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 immersion ion implantation
      BT: Ion implantation
               Plasma applications
      RT: Semiconductor impurities

Plasma jets
      BT: Plasma devices
      RT: Propulsion

Plasma materials processing
      BT: Materials processing
      RT: Plasma applications
      NT: Chemical vapor deposition
               Ignition
               Physical vapor deposition
               Spark Plasma sintering

Plasma measurements
      BT: Measurement
      RT: Plasma diagnostics
               Plasmas

Plasma properties
      BT: Plasmas
      RT: Electron mobility
               Stability analysis
      NT: Dusty plasmas
               Plasma chemistry
               Plasma density
               Plasma sheaths
               Plasma stability
               Plasma temperature
               Plasmons

Plasma sheaths
      BT: Plasma properties

Plasma simulation
      BT: Plasmas
      RT: Modeling
               Numerical simulation
               Tokamaks

Plasma sources
      BT: Plasmas
      RT: Ion implantation
               Ion sources

Plasma stability
      BT: Plasma properties

Plasma temperature
      BT: Plasma properties

Plasma transport processes
      BT: Plasmas

Plasma waves
      BT: Waves
      RT: Plasmas

Plasma welding
      BT: Plasma applications
      RT: Joining processes

Materials processing
Plasmas

Plasma x-ray sources
BT: X-ray imaging
RT: X-ray lasers

Plasma-assisted combustion
BT: Combustion
Plasmas

Plasmas
BT: Nuclear and plasma sciences
RT: Arc discharges
Discharges (electric)
Ionization
Ionosphere
Plasma devices
Plasma measurements
Plasma waves
Plasma welding
Relativistic effects
NT: Atmospheric-pressure plasmas
Low-temperature plasmas
Microwave plasmas
Plasma applications
Plasma confinement
Plasma diagnostics
Plasma properties
Plasma simulation
Plasma sources
Plasma transport processes
Plasma-assisted combustion

Plasmons
UF: Plasmon
Plasmonics
BT: Plasma properties
RT: Nanoantennas
Optical antennas
NT: Nanoplasmonics
Surface plasmons

Plastic films
BT: Films
Plastics
RT: Plastic insulation
Plastic insulators

Plastic insulation
BT: Insulation
RT: Dielectric materials

Plastic films
Plastic insulators

Plastic insulators
BT: Insulators
RT: Fiber reinforced plastics
Plastic films
Plastic insulation
Plastic packaging

Plastic integrated circuit packaging
UF: Plastic IC packaging
BT: Integrated circuit packaging

Plastic optical fiber
BT: Optical fibers
Plastics

Plastic packaging
BT: Packaging
RT: Bagging
Electronics packaging
Encapsulation
Integrated circuit packaging
Plastic insulators
Plastics

Plastic products
UF: Plastic bottles
Plastic containers
BT: Manufactured products
RT: Bottling
Chemical industry
Chemical products
Chemistry
Consumer products
Petrochemicals
Plastics
Plastics industry

Plastics
BT: Chemical products
Materials
RT: Petrochemicals
Plastic packaging
Plastic products
Plastics industry
Polymers
Resins
NT: Epoxy resins
Fiber reinforced plastics
Plastic films
Plastic optical fiber

JULY 2023 IEEE Thesaurus

Plastics industry
BT: Manufacturing industries
RT: Chemical industry
Plastic products
Plastics

Platform as a service
UF: PAAS
BT: Cloud computing

Platform virtualization
BT: Computers and information processing
RT: Virtual machine monitors

Plating
BT: Materials processing
NT: Chrome plating

Platinum
BT: Metals
NT: Platinum alloys

Platinum alloys
BT: Platinum
RT: Alloying

Plethysmography
BT: Biomedical measurement
Medical diagnosis
NT: Photoplethysmography

Plug-in electric vehicles
BT: Electric vehicles

Plug-in hybrid electric vehicles
BT: Hybrid electric vehicles
RT: Charging stations

Plugs
BT: Connectors
NT: Keyways
Pins

Pluto
BT: Planets

Plutonium
BT: Chemical elements

Pneumatic actuators
BT: Actuators

Pneumatic systems
BT: Control systems
RT: Bellows
Fluidics
Mechanical systems

Pneumonia
BT: Pulmonary diseases
RT: Asthma
Chronic obstructive pulmonary disease
Emphysema

Poincare invariance
UF: Poincare group
BT: Transforms

Point cloud compression
UF: PCC
BT: Data compression
Visual databases
RT: Three-dimensional displays

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
RT: Internet
Internet telephony

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

Polarimetric synthetic aperture radar
BT: Synthetic aperture radar

Polarimetry
UF: Solar polarimetry
BT: Electromagnetic measurements
RT: Ellipsometry
        Optical retarders

Polaritons
BT: Energy states
NT: Surface plasmon polaritons

Polarization
UF: Circular polarisation
        Circular polarization
        Polarisation
BT: Electromagnetic scattering

Polarization mode dispersion
UF: Polarization-mode dispersion
BT: Optical fiber polarization

Polarization shift keying
BT: Optical polarization

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

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

Pollution measurement
BT: Measurement
RT: Environmental monitoring
        Pollution
        Pollution control

Polonium
BT: Chemical elements

Polycaprolactone
BT: Polymers
RT: Smart materials

Polyethylene
BT: Polymers
NT: Thermoplastic polyethylene

Polyimides
BT: Polymers

Polymer fibers
BT: Polymers
RT: Cellulose

Polymer films
UF:	Polymer coatings
BT:	Films
RT:	Dielectric thin films

Polymer foams
BT:	Materials
RT:	Insulation
	Insulators
	Metal foam
	Resins

Polymer gels
BT:	Materials
RT:	Intelligent materials

Polymers
UF:	Electroactive polymers
BT:	Materials
RT:	Colloidal lithography
	Plastics
NT:	Azobenzene
	Biopolymers
	Cellulose
	Elastomers
	Hydrogels
	Liquid crystal polymers
	Optical polymers
	Polycaprolactone
	Polyethylene
	Polyimides
	Polymer fibers

Polynomials
BT:	Equations
RT:	Poles and zeros

Porcelain
BT:	Ceramics
RT:	Ceramic products
	Ceramics industry

Porous silicon
BT:	Silicon

Portable computers
UF:	Laptops
	Portable PCs
BT:	Microcomputers
NT:	Personal digital devices

Portable document format
UF:	PDF
BT:	Document handling
RT:	Document image processing

Portable media players
UF:	MP3
	Portable Multimedia players
	Portable video players
	iPOD
BT:	Audio systems
	Digital communication
	Home automation
RT:	Digital audio broadcasting
	Tablet computers

Portals
BT:	Management information systems
RT:	Information retrieval
	Web sites

Portfolios
UF:	Electronic portfolios
BT:	Professional communication

Ports (computers)
UF:	Computer ports
BT:	Computer interfaces
RT:	Computer networks
	Hardware
	Information exchange

Pose estimation
BT:	Estimation
RT:	Computer vision

Position control
UF:	Orientation control
BT:	Mechanical variables control
RT:	Admittance control
	Attitude control
	Capacitive transducers
	Manipulators
	Mechanical guides
	Medical robotics
	Servosystems
NT:	Nanopositioning

Position measurement
UF:	Attitude determination
	Orientation determination
	Orientation measurement
	Source location

BT: Mechanical variables measurement
RT: Direction-of-arrival estimation
Distance measurement
Gaze tracking
Geodesy
Location awareness
Navigation
Tracking
NT: Odometry

Position sensitive particle detectors
BT: Ionizing radiation sensors
RT: High energy physics instrumentation computing
Nuclear measurements
Particle measurements
Semiconductor counters

Positive train control
BT: Control systems
Rail transportation
RT: Feedback
Railway accidents
Railway safety

Positron emission tomography
UF: PET
BT: Tomography
RT: Biomedical applications of radiation
Medical diagnostic imaging
Nuclear medicine
Phantoms
Tumors
NT: Whole-body PET

Positrons
BT: Elementary particles

Possibility theory
BT: Probability
RT: Fuzzy logic
Nonlinear dynamical systems

Postal services
UF: Mail
BT: Message systems
RT: Electronic mail

Posthuman
UF: Post human
Post-human

BT: Systems, man, and cybernetics
RT: Artificial intelligence
Transhuman

Potassium
BT: Chemical elements

Potential energy
BT: Energy conservation
RT: Kinetic energy
Mechanical energy

Potential well
UF: Potential wells
Quantum confinement
BT: Energy conversion

Potentiometers
BT: Meters
RT: Resistors
Voltage measurement

Powders
BT: Coatings
RT: Ceramics
Spark Plasma sintering

Power amplifiers
UF: Radio frequency power amplifiers
Radiofrequency power amplifiers
BT: Amplifiers
NT: High power amplifiers
Predistortion

Power and energy standards
UF: IEEE Arc Flash Standards
IEEE Electric Machinery Standards
IEEE Power Substations Standards
IEEE Surge Protective Devices 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: Power smoothing

Power control
BT: Electric variables control
RT: Electric current control
Power factor correction
Pulse width modulation
converters

Power conversion
BT: Converters
RT: Choppers (circuits)
Maximum power point
trackers
Nonlinear circuits
Power conditioning
Power electronics
Power semiconductor
devices
Power supplies
Pulse width modulation
converters
Regulators
Switched systems
NT: AC-AC converters
AC-DC power converters
DC-AC power converters
DC-DC power converters
Matrix converters
Power conversion
harmonics
Voltage-source converters

Power conversion harmonics
BT: Power conversion
RT: Harmonic distortion

Power demand
UF: Power consumption
BT: Power supplies
Power system planning
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 distribution
UF: Distribution of electric
power
BT: Power systems
RT: Electricity supply industry
Energy Internet
Industrial power systems
Load shedding
Power demand
Transactive energy
NT: DC distribution systems
Power distribution control
Power distribution faults
Power distribution lines
Power distribution networks
Power distribution planning
Power distribution reliability
Simultaneous wireless
information and power transfer

Power distribution control
BT: Power distribution
RT: Voltage control

Power distribution faults
BT: Power distribution

Power distribution lines
UF: Overhead distribution lines
BT: Power distribution
RT: Conductors
Poles and towers
Power cables

JULY 2023 IEEE Thesaurus

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 dividers
- BT: Waveguide components
- RT: Microstrip components
  - Power combiners
  - Stripline components

Power electronics
- UF: Electric power
- RT: High-voltage techniques
  - Matrix converters
  - Power conversion
  - Power filters
  - Pulse width modulation converters
  - Rectifiers
  - Resonant inverters
  - Switching converters
  - Voltage-source converters
- NT: Converters
  - Current limiters
  - Gate drivers
  - Inverters
  - Phase control
  - Power conditioning
  - Power semiconductor devices
  - Power semiconductor switches
  - Snubbers
  - Three-phase electric power

Power engineering
- BT: Power engineering and energy
- RT: Power engineering education
- NT: Ferroresonance
  - High-voltage techniques
  - Power engineering computing

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
  - Power engineering
- RT: Energy Internet
  - Power system analysis computing
  - Virtual power plants

Power engineering education
- BT: Engineering education
- RT: Power engineering

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 generation
- UF: Generation of electric power
  - Output power
  - Power plants
  - Power stations
- BT: Power engineering and energy
- RT: Batteries
  - Energy Internet
  - Fuel cells
  - Generators
  - Microgrids
  - Power generation economics
  - Power supplies
  - Pulsed power systems
  - Space power stations
- NT: Automatic generation control

Cogeneration
Distributed power generation
Geothermal power generation
Hydroelectric power generation
Magnetohydrodynamic power generation
Nuclear power generation
Power generation control
Power generation dispatch
Power generation planning
Power generation reliability
Solar power generation
Trigeneration
Turbomachinery
Wind energy generation
Wind power generation

Power generation control
　　BT:　　Automatic control
　　　　　Power generation

Power generation dispatch
　　BT:　　Power generation

Power generation economics
　　BT:　　Economics
　　RT:　　Power generation
　　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:　　Energy Internet
　　　　　Power distribution networks
　　　　　Wind energy integration
　　NT:　　Microgrids
　　　　　Smart grids

Power harmonic filters
　　BT:　　Power system harmonics

Power industry
　　UF:　　Electric utilities
　　BT:　　Industries
　　RT:　　Offshore installations
　　　　　Power system faults

Telecontrol equipment
　　NT:　　Electrical equipment industry
　　　　　Electricity supply industry
　　　　　Nuclear facility regulation
　　　　　Power system interconnection

Power integrated circuits
　　BT:　　Circuits
　　　　　Integrated circuits
　　RT:　　Power semiconductor devices

Power lasers
　　BT:　　Lasers
　　RT:　　Power semiconductor devices

Power line communications
　　BT:　　Transmission lines

Power markets
　　UF:　　Electricity markets
　　　　　Electricity trading
　　　　　Power exchange
　　　　　Power pools
　　　　　Power trading
　　　　　Power wheeling
　　BT:　　Electricity supply industry deregulation
　　RT:　　Emissions trading
　　　　　Power transmission
　　　　　Transactive energy

Power measurement
　　BT:　　Electric variables measurement
　　RT:　　Wattmeters
　　NT:　　Dynamometers

Power MOSFET
　　BT:　　MOSFET circuits
　　RT:　　Power semiconductor devices

Power overhead lines
　　BT:　　Power transmission lines
　　RT:　　Railway electrification

Power quality
　　UF:　　Power supply quality
　　　　　Voltage sags
　　BT:　　Power supplies
　　RT:　　Electricity supply industry

Power system harmonics
Power system transients

Power semiconductor devices
- BT: Power electronics
  Semiconductor devices
- RT: Power MOSFET
  Power conversion
  Power integrated circuits
  Power lasers
- NT: Power transistors

Power semiconductor switches
- BT: Power electronics
  Semiconductor devices
- NT: Bipolar transistors
  Thyristors

Power smoothing
- BT: Power conditioning

Power steering
- BT: Automotive engineering

Power supplies
- BT: Power systems
- RT: Power conversion
  Power generation
  Pulsed power systems
  Uninterruptible power systems
- NT: Battery chargers
  Charging stations
  Current supplies
  Emergency power supplies
  Inductive charging
  Islanding
  Power demand
  Power quality
  Power system restoration
  Switched mode power supplies
  Traction power supplies
  Umbilical cable

Power system analysis computing
- BT: Computer applications
  Power systems
- RT: Digital simulation
  Modeling
  Parameter estimation
  Power engineering computing
  Software packages

Power system control
- BT: Electric variables control
- RT: Control system security
  Energy Internet
  Load monitoring
  Power systems
  Virtual power plants
- NT: Bidirectional power flow
  Load flow control
  SCADA systems

Power system dynamics
- BT: Power systems

Power system economics
- BT: Power systems
- RT: Electricity supply industry deregulation
  Transactive energy
- NT: Low-carbon economy

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: Energy Internet
  Power systems
  Power transmission

Power system management
- UF: Power management
  Telecommunication power management
- BT: Power systems
- RT: Energy Internet
  Microgrids
  Monitoring
  Preventive maintenance
  Virtual power plants
- NT: Load flow

Power system measurements
- BT: Power systems
- RT: Load monitoring
- 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
- RT: Arresters
  - Circuit breakers
  - Fuses
  - Grounding
  - Power system faults
  - Power system transients
  - 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: Hardware security
  - 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
- RT: Arresters
  - Power quality
  - Power system protection
- NT: Transient analysis

Power systems
- UF: Electric power
- BT: Power engineering and energy
- RT: Civil engineering
  - Mechanical power transmission
  - Power system control
  - Power system interconnection
  - Power system modeling
  - Power system relaying
  - Power system restoration
  - Power system security
  - Power system simulation
  - Skin effect
  - Telecontrol equipment
  - Time-frequency analysis
  - Voltage fluctuations
- NT: Data center power
  - Energy Internet
  - Hybrid power systems
  - Industrial power systems
  - PSCAD
  - Power distribution
  - Power grids
  - Power supplies
  - Power system analysis computing
  - Power system dynamics
  - Power system economics
  - Power system faults
  - Power system harmonics
  - Power system management
  - Power system measurements
  - Power system planning
  - Power system protection

Power system reliability
Power system stability
Power transmission
Pulsed power systems
Reactive power
Substations
Transformers
Uninterruptible power systems

Wind energy integration

Power transformer insulation
BT: Power transformers
RT: Insulation

Power transformers
UF: Power distribution transformers
BT: Transformers
RT: Transformer cores
        Windings
NT: On load tap changers
        Power transformer insulation

Power transistors
BT: Power semiconductor devices
RT: Driver circuits

Power transmission
UF: Transmission of electric power
BT: Power systems
RT: Electric current control
        Energy Internet
        Load flow analysis
        Magnetic gears
        Power dissipation
        Power factor correction
        Power markets
        Power system interconnection
        Power transmission lines
NT: Common Information Model (electricity)
        DC power transmission
        Flexible AC transmission systems
        HVDC transmission
        Inductive power transmission
        Static VAr compensators

Transmission lines
Wireless power transmission

Power transmission lines
UF: Overhead transmission lines
BT: Transmission lines
RT: Conductors
        DC distribution systems
        Poles and towers
        Power transmission
        Superconducting transmission lines
NT: Gas insulated transmission lines
        Power cables
        Power overhead lines

Pragmatics
BT: Linguistics
        Semiotics
RT: Communication symbols
        Context
        Natural language processing
        Professional communication

Praseodymium
UF: Praeseodymium
BT: Chemical elements
Pre-college engineering
UF: Elementary school engineering
        High school engineering
        Precollege engineering
BT: Educational programs

Preamplifiers
BT: Amplifiers

Precipitation
BT: Meteorology
NT: Rain
        Snow

Precision engineering
BT: Engineering - general
RT: Industrial engineering
        Mechanical engineering

Precision medicine
UF:	Personalized medicine
BT:	Medical treatment

Precoding
BT:	Encoding

Predator prey systems
UF:	Predator-prey models
	Predator-prey systems
BT:	Biology
	Mathematics
RT:	Chaos
	Differential equations
	Game theory
	Nonlinear dynamical systems
	Stability

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 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
BT:	Maintenance engineering

Predictive models
BT:	Prediction methods
RT:	Ensemble learning
	Fish schools
	Predictive analytics

Predistortion
UF:	Inverse distortion
BT:	Power amplifiers
RT:	Nonlinear distortion

Prefabricated construction
UF:	Prefabricated buildings
BT:	Construction
	Construction industry
RT:	Building materials
	Buildings
	Modular construction

Prefetching
BT:	Instruction sets

Preforms
BT:	Assembly

Pregnancy
UF:	Pregnant
BT:	Medical conditions
RT:	Obstetrics

Pregnancy test
BT:	Medical tests

Presence network agents
UF:	PNAs
BT:	Communications technology

Presses
BT:	Machine tools
RT:	Dies
	Pressing

Pressing
BT: Materials processing
RT: Presses

Pressure control
BT: Control systems

Pressure effects
BT: Mechanical factors
RT: Meteorology
Piezooptic effects
Piezoresistance

Pressure gauges
BT: Instruments
RT: Atmospheric measurements
Density measurement
Fluid flow measurement
Force measurement
Geophysical measurements
Pressure measurement
Pressure sensors
Torque measurement

Pressure measurement
BT: Measurement
RT: Piezoresistive devices
Pressure gauges
Pressure sensors
Tactile sensors
NT: Altimetry
Tire pressure

Pressure sensors
BT: Sensors
RT: Pressure gauges
Pressure measurement
Wearable sensors

Pressure vessels
BT: Mechanical products
RT: Concrete
Fission reactors
Mechanical engineering
Steel

Preventive maintenance
BT: Maintenance engineering
RT: Accident prevention
Power system management
Reliability
Safety
NT: Condition monitoring

Pricing
BT: Financial management
RT: Emissions trading

Primary motor cortex
BT: Brain

Principal component analysis
UF: PCA
BT: Statistical analysis
RT: Feature extraction
Independent component analysis
Linear systems
Operations research
Pattern recognition
Transform coding

Printed circuits
UF: Circuit boards
Printed circuit boards
BT: Circuits
RT: Electronics packaging
Integrated circuit layout
Substrates
Wiring
NT: Flexible printed circuits
Memory modules
Surface mount technology

Printers
BT: Computer peripherals
RT: Printing
NT: Laser printers

Printing
BT: Information technology
RT: Character generation
Color gamut
Ink
Lithography
Printers
Printing machinery
Publishing
Typesetting
NT: Digital printing
Ink jet printing
Teleprinting
Three-dimensional printing

Printing machinery
UF: Printing presses
BT: Machinery
RT: Printing

Privacy
- BT: Technology social factors
- RT: Authorization
  - Communication system security
  - Computer security
  - Cryptography
  - Cyberbullying
  - Cyberethics
  - Data privacy
  - Data protection
  - Data security
  - Differential privacy
  - General Data Protection Regulation
  - Homomorphic encryption
  - Malware
  - Network intrusion
  - Trust management
- NT: Eavesdropping
  - Internet privacy
  - Privacy breach

Privacy breach
- BT: Information security
  - Privacy
- RT: Data breach
  - Data security

Privacy-invasive software
- UF: Invasive software
- BT: Software
- RT: Computer crime
  - Computer security
  - Unsolicited e-mail
- NT: Spyware

Privatization
- UF: Privatisation
- BT: Macroeconomics
- RT: Industrial economics

Probabilistic computing
- BT: Computers and information processing

Probabilistic logic
- BT: Logic
- RT: Mixture models

Probability
- BT: Mathematics
- RT: Belief propagation
  - Distribution functions
  - Fourier transforms
  - Gamma distribution
  - Information geometry
  - Maximum likelihood detection
  - Mean field theory
  - Monte Carlo methods
  - Naive Bayes methods
  - Random processes
  - Statistical analysis
  - Statistics
  - Stochastic processes
  - Stochastic systems
  - Viterbi algorithm
  - Weibull distribution
- NT: Ant colony optimization
  - Bayes methods
  - Error probability
  - Forecasting
  - Memoryless systems
  - Multi-armed bandit problem
  - Pairwise error probability
  - Possibility theory
  - Probability distribution
  - Random variables
  - Statistical distributions
  - Uncertainty

Probability computing
- BT: Computers and information processing

Probability density function
- BT: Integral equations
- RT: Distribution functions

Probability distribution
- BT: Probability
- NT: Exponential distribution
  - Heavily-tailed distribution
  - Lightly-tailed distribution
  - Log-normal distribution
  - Maxwell-Boltzmann distribution
  - Nakagami distribution

Probes
- BT: Instruments

Problem-solving
- BT: Cognitive science
- RT: Human factors

JULY 2023 IEEE Thesaurus

Process control
  BT: Industrial control
  RT: Bleaching
        Chemical reactions
        Continuous production
        Manufacturing automation
        Process design
        Process modeling
        Process planning
        Production control
        Soft sensors
  NT: Predictive control
        Three-term control
        Two-term control

Process design
  BT: Design methodology
  RT: Chemical engineering
        Design for disassembly
        Design for quality
        Process control
        Process planning
        Product design
        Service computing
  NT: Pattern formation
        Process modeling

Process modeling
  BT: Modeling
        Process design
  RT: Process control

Process monitoring
  BT: Monitoring
  RT: Soft sensors

Process planning
  BT: Management
        Production
        Production management
        Production planning
  RT: Process control
        Process design
  NT: 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

Procurement
  BT: Supply chain management
  RT: Contracts
        Logistics
        Proposals
        Supply chains

Product codes
  BT: Codes
  RT: Decoding
        Error correction
        QR codes
        Radiofrequency
identification
  NT: Bar codes

Product customization
  UF: Product customisation
  BT: Product development
  RT: Customer satisfaction
        Manufactured products
        Product design

Product delivery
  UF: Delivery of goods
        Package delivery
  BT: Commerce and trade
  RT: Electronic commerce

Product design
  BT: Design methodology
  RT: Concurrent engineering
        Design for disassembly
        Design for quality
        Design tools
        Digital twins
        Group technology
        Manufactured products
        Process design
        Product customization
        Product development
        Prototypes
        Requirements engineering

Product development
  BT: Crowdsourcing
        Engineering management
  RT: Brand management

Manufactured products
Product design
Quality function deployment
Rapid prototyping
Reverse engineering
Virtual prototyping
NT: Graphical user interfaces
Product customization
Product lifecycle
management

Software product lines
Time to market

Product liability
BT: Legal factors
RT: Consumer products
Product safety
Quality assurance
Quality management
NT: Warranties

Product lifecycle management
UF: Product life cycle
management

System lifecycle
management
BT: Product development
RT: Release engineering
NT: Prognostics and health
management

Product safety
BT: Safety
RT: Accidents
Consumer products
Product liability

Product safety engineering
RT: Software safety
NT: Consumer protection
Power system protection
Safety
Vehicle crash testing

Production
BT: Industry applications
RT: Containers
Wheels
Wire drawing
NT: Ball milling
Compression molding
Embossing
Food products
Group technology
Injection molding
Materials processing

Mechanical products
Process planning
Production control
Production engineering
Production equipment
Production facilities
Production management
Production materials
Production systems
Productivity
Shafts
Springs
Transfer molding

Production control
BT: Industrial control
Production
RT: Adaptive scheduling
Cellular manufacturing
Group technology
Inventory control
Manufacturing
Process control
Production systems
Supply chain management
NT: Continuous production
Lot sizing
Optimized production
technology
Scheduling

Production engineering
BT: Engineering - general
Production
RT: Industrial engineering
Inventory management
Manufacturing
Manufacturing systems
Production equipment
Production management
Production materials
NT: Production planning

Production equipment
BT: Production
RT: Gears
Machinery
Materials handling
equipment
Production engineering
NT: Applicators
Clamps
Cutting tools
Fixtures
Machine tools
Mining equipment

Molding equipment
Packaging machines
Paper making machines
Polishing machines
Soldering equipment

Production facilities
UF: Factories
        Manufacturing facilities
BT: Production
RT: Manufacturing
        Warehousing
NT: Foundries
        Greenhouses
        Industrial facilities
        Industrial plants
        Machine shops
        Paper mills

Production management
UF: Manufacturing management
BT: Management
        Production
RT: Continuous improvement
        Continuous production
        Industrial engineering
        Inventory control
        Lean production
        Mass production
        Production engineering
        Productivity
        Research and development management
        Technology management
        Waste management
NT: Control charts
        Inventory management
        Lead time reduction
        Logistics
        Process planning
        Production planning

Production materials
BT: Materials
        Production
RT: Additives
        Cast iron
        Chemical products
        Hydraulic fluids
        Production engineering
NT: Abrasives
        Aerospace materials
        Automotive materials
        Inhibitors

Ink
Joining materials
Lubricants
Retardants

Production planning
BT: Production engineering
        Production management
RT: Demand forecasting
        Lead time reduction
        Optimized production technology
NT: Capacity planning
        Materials requirements planning
        Process planning

Production systems
BT: Production
RT: Discrete-event systems
        Industrial plants
        Manufacturing
        Optimized production technology
        Production control
NT: Assembly systems
        Exhaust systems
        Intelligent manufacturing systems
        Lean production
        Manufacturing systems
        Steering systems

Productivity
UF: Labor productivity
        Labour productivity
BT: Production
RT: Business
        Human factors
        Incentive schemes
        Industrial psychology
        Management
        Manufacturing
        Personnel
        Production management
        Profitability

Professional aspects
BT: Engineering profession

Professional communication
UF: Technical communication
RT: Cooperative communication
        Federated learning
        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

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
Multithreading 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

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
RT: Programmable logic devices

Programmable logic devices
UF: Programmable logic controllers
BT: Circuits
Logic devices
Programmable circuits
RT: High level synthesis
Programmable logic arrays

Programming
UF: Program profiling
BT: Computer science

RT:	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 programming	
	Opportunistic software systems development	
	Parallel programming	
	Performance analysis	
	Programming profession	
	Robot programming	

Programming environments
BT: Software engineering
RT: Computer aided software engineering
        Programming
        Software debugging
        Software tools

Programming profession
UF: Computer programming profession
BT: Programming
RT: Employment
        Engineering profession

Project engineering
BT: Engineering management
NT: Scheduling
        Turnkey project

Project management
BT: Management
RT: Building information management
        Concurrent engineering

Lead time reduction
Program management
Requirements engineering
Requirements management
Research and development management

Scrum (Software development)

System integration
Technology management
NT: Agile project management
        Proposals
        Turnkey project

Projectiles
BT: Weapons

Projection algorithms
BT: Algorithms

Projective geometry
BT: Geometry

PROM
UF: Programmable read only memory
BT: Read only memory
NT: EPROM

Promethium
BT: Chemical elements

Promotion - marketing
UF: Sales promotion
BT: Marketing management
RT: Public relations

Proof of Work
UF: proof-of-work
BT: Computer security
        Protocols
RT: Blockchains
        Denial-of-service attack

Propagation
UF: Wave equations
        Wave propagation
BT: Waves
RT: Damping
        Electromagnetic waveguides
NT: Attenuation
        Electromagnetic propagation

	Insertion loss	
	Nonlinear wave propagation	
	Perfectly matched layers	
	Reflection	
	Scattering	
	Transient response	

Propagation constant
- BT: Electromagnetic propagation

Propagation delay
- BT: Delay effects

Propagation losses
- UF: Propagation loss
- BT: Electromagnetic propagation

Propellants
- BT: Chemical products

Propellers
- BT: Aircraft propulsion
- RT: Aircraft
  - Blades
  - Engines
  - Impellers
  - Marine vehicles
  - Shafts

Propioception
- UF: proprioceptive
- BT: Robot sensing systems
- RT: Robot kinematics

Proportional control
- BT: Control systems

Proposals
- UF: Technical proposals
- BT: Project management
- RT: Contracts
  - Procurement
  - Technical requirements
  - Writing

Propulsion
- BT: Vehicular and wireless technologies
- RT: Engines
  - Plasma jets
  - Traction motors
  - Vehicle-to-grid
- NT: Aerospace propulsion
  - Aircraft propulsion
  - Electromagnetic launching
  - Electrothermal launching
  - Rockets

Prostate cancer
- BT: Cancer

Prosthetic hand
- BT: Prosthetics

Prosthetic limbs
- BT: Prosthetics

Prosthetics
- UF: Hip joint replacements
  - Knee joint replacements
  - Neural prostheses
  - Prosthesis
- BT: Medical services
- RT: Assistive technologies
  - Bioceramics
  - Biological control systems
  - Biomedical equipment
  - Medical control systems
  - Orthotics
  - Sensory aids
  - Wearable robots
- NT: Artificial biological organs
  - Artificial limbs
  - Knee replacement
  - Neuroprostheses
  - Prosthetic hand
  - Prosthetic limbs
  - Visual prosthesis

Protactinium
- BT: Chemical elements

Protection
- BT: Safety
- RT: Circuit breakers
  - Fuses
  - Galvanizing
  - Grounding
  - Hazardous areas
  - Occupational safety

JULY 2023 IEEE Thesaurus

		Security
		Uninterruptible power systems
	NT:	Electrostatic discharge protection
		Explosion protection
		Lightning protection
		Radiation protection

Protection switching
| | UF: | Automatic protection switching |
| | BT: | Optical fiber networks |

Protective clothing
	BT:	Clothing
		Safety devices
	RT:	Clothing industry
		Eye protection
		Occupational health
		Occupational safety
		Personal protective equipment
		Safety

Protective relaying
	UF:	Distance relays
		Protective relays
	BT:	Relays
	RT:	Instrument transformers
		Power system protection
		Power system relaying

Protein engineering
| | BT: | Biomedical engineering |

Protein sequence
| | BT: | Proteins |

Proteins
	BT:	Biochemistry
	RT:	Monoclonal antibodies
	NT:	Enzymes
		Protein sequence

Proteomics
| | BT: | Molecular biomarkers |

Protocols
	UF:	Communication protocols
	BT:	Communication systems
	RT:	Ad hoc networks
		Bluetooth
		Concurrency control
		Frame relay

		IEEE 802.11 Standard
		IEEE 802.11e Standard
		IEEE 802.11g Standard
		IEEE 802.11n Standard
		IPTV
		Internet of Things
		Local area networks
		Metropolitan area networks
		Multicarrier code division multiple access
		Software defined networking
		TCPIP
		Wide area networks
	NT:	Access protocols
		Asynchronous transfer mode
		Border Gateway Protocol
		Consensus protocol
		Cryptographic protocols
		InterPlanetary File System
		Main-secondary
		Multicast protocols
		Multiprotocol label switching
		Proof of Work
		Routing protocols
		Smart contracts
		Transport protocols
		Wireless application protocol
		Zero knowledge proof

Proton accelerators
	BT:	Particle accelerators
	RT:	Ion accelerators
		Protons

Proton effects
	UF:	Biological effects of protons
		Proton beam effects
	BT:	Electrothermal effects
		Quantum mechanics
	RT:	Elementary particle exchange interactions
		Elementary particles
		High energy physics instrumentation computing
		Protons
		Radiation effects
		Space vehicles
		Thermal factors
	NT:	Proton radiation effects
		Single event latchup

Proton radiation effects
- BT: Proton effects
- RT: Bipolar transistors
  Ion radiation effects
  Protons
  Radiation effects
  Semiconductor devices
  Silicon-on-insulator

Proton therapy
- BT: Medical treatment
- RT: Biological effects of radiation

Protons
- BT: Elementary particles
- RT: Cosmic rays
  Ions
  Proton accelerators
  Proton effects
  Proton radiation effects

Prototypes
- BT: Design methodology
- RT: Laser sintering
  Product design
  Stereolithography
  Virtual prototyping
- NT: Breadboard
  Rapid prototyping

Proximity effects
- UF: Current crowding
- BT: Electromagnetics
- RT: Conductors
  Lithography

PSCAD
- UF: Power Systems Computer Aided Design
- BT: Design automation
  Power systems
  Software packages
- RT: EMTDC

PSNR
- UF: Peak signal to noise ratio
  Peak signal-to-noise ratio
- BT: Signal to noise ratio

Psychiatry
- BT: Behavioral sciences
  Medical specialties
- RT: Depression
  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
  Mental health
  Mood
  Neuropsychology
  Psychometric testing

Psychometric testing
- BT: Psychology
- RT: Industrial psychology

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
- RT: Financial management
  Government
  Macroeconomics

Public healthcare
- UF: Public health
- BT: Medical services
- RT: Epidemiology

Public infrastructure
- BT: Asset management
- RT: Electricity supply industry
  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
- UF: Public key cryptosystems
- BT: Public key
- RT: Homomorphic encryption
- NT: Elliptic curve cryptography
  Identity-based encryption

Public policy
- BT: Government policies
- RT: Public infrastructure

Public relations
- BT: Management
- RT: Customer relationship management
  Marketing management
  Promotion - marketing

Public speaking
- UF: Speechmaking
- BT: Oral communication
  Professional communication
- RT: Meetings

Public transportation
- UF: Subways
  Taxi
  Trolley cars
  Uber
- BT: Transportation
- RT: Light rail systems
  Rail transportation
  Urban areas

Publish subscribe systems
- UF: Publish-subscribe systems
  Publish/subscrbe systems
- BT: Message systems
- RT: Content management
  Middleware
  Pattern recognition
  Queueing analysis

Publish-subscribe
- BT: Distributed information systems

Publishing
- BT: Computer applications
- RT: Bibliographies
  Copyright protection
  Digital printing
  Document handling
  Guidelines
  Plagiarism
  Printing
  Text processing
- NT: Bibliometrics
  Desktop publishing
  Electronic publishing
  Journalism
  Open Access
  Scientific publishing

Pulleys
- BT: Materials handling equipment
- RT: Freight handling
  Lifting equipment
  Loading

Pulmonary diseases
- UF: Lung diseases
  Respiratory diseases
- BT: Diseases
- RT: Lung
  Respiratory system
  Spirometry
- NT: Asthma
  Chronic obstructive pulmonary disease
  Emphysema
  Pneumonia

Pulmonology
- UF: Chest medicine
  Pneumology
  Respiratory medicine
  Respirology
- BT: Medical specialties
- RT: Lung

JULY 2023 IEEE Thesaurus

| | Respiratory system |
| NT: | Spirometry |

Pulp and paper industry
UF:	Paper industry
BT:	Manufacturing industries
RT:	Forestry
	Paper products
	Paper pulp
	Paper technology
	Pulp manufacturing
	Spinning machines
	Wood industry
NT:	Paper making
	Paper making machines
	Paper mills

Pulp manufacturing
BT:	Manufacturing systems
RT:	Paper making
	Paper making machines
	Paper mills
	Paper pulp
	Pulp and paper industry
	Wood industry

Pulse amplifiers
| BT: | Amplifiers |

Pulse circuits
UF:	Bistable multivibrator
BT:	Circuits
RT:	Digital circuits
NT:	Flip-flops

Pulse compression methods
| BT: | Signal processing |
| NT: | Optical pulse compression |

Pulse generation
UF:	Impulse generation
	Pulse generators
BT:	Signal generators
NT:	Optical pulse generation

Pulse inverters
UF:	Logic inverters
BT:	Inverters
RT:	Logic circuits

Pulse measurements
| UF: | Impulse measurements |
| BT: | Measurement |

| RT: | Electric variables measurement |

Pulse modulation
| BT: | Modulation |
| RT: | Demodulation |

Pulse oximeter
BT:	Biomedical equipment
	Biomedical measurement
RT:	Noninvasive treatment
	Pulse oximetry

Pulse oximetry
BT:	Instrumentation and measurement
	Noninvasive treatment
RT:	Biomedical measurement
	Oxygen
	Pulse oximeter
	Remote sensing

Pulse shaping methods
UF:	Pulse shaping
BT:	Signal processing
NT:	Optical pulse shaping

Pulse transformers
| BT: | Transformers |

Pulse width modulation
UF:	PWM
	Pulsewidth modulation
	Pulsewidth-modulation
BT:	Modulation
RT:	AC generators
	AC machines
	AC motors
	Converters
	DC generators
	DC machines
	DC motors
	Pulse width modulation converters
NT:	Pulse width modulation inverters
	Space vector pulse width modulation

Pulse width modulation converters
UF:	PWM converters
	PWM convertors
	Pulse width modulated power converters

Pulse width modulation convertors

Pulsewidth modulation converters

Pulsewidth modulation convertors
- BT: Converters
- RT: Power conditioning
  Power control
  Power conversion
  Power electronics
  Pulse width modulation
  Voltage-source converters

Pulse width modulation inverters
- UF: PWM inverters
  PWM invertors
  Pulse width modulation invertors
- BT: Pulse width modulation
- RT: AC motors
  AC-DC power converters
  Converters
  DC motors
  DC-DC power converters

Pulsed electroacoustic methods
- BT: Acoustoelectric effects
- RT: Acoustoelectric devices
  Charge measurement
  Insulation testing
  Space charge

Pulsed laser deposition
- UF: Laser deposition
- BT: Chemical vapor deposition
- RT: Laser cladding
  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

Pump lasers
- BT: Lasers

Pumps
- BT: Machinery
- RT: Bellows
  Compressors
  Impellers
  Turbomachinery
- NT: Fuel pumps
  Heat pumps
  Insulin pumps
  Micropumps
  Water pumps

Punching
- BT: Materials processing
- RT: Sheet metal processing

Pupils
- BT: Eyes
- RT: Ophthalmology

Purification
- BT: Cleaning
- RT: Air cleaners
  Decontamination
  Refining
  Sugar refining

Pursuit algorithms
- BT: Algorithms

Pyroelectric devices
- BT: Dielectric devices
- RT: Pyroelectricity

Pyroelectricity
- BT: Electricity
  Ultrasonics, ferroelectrics, and frequency control
- RT: Ferroelectric materials
  Piezoelectricity
  Pyroelectric devices
  Thermal factors

Python
- BT: Computer languages
  Public domain software
- RT: Functional programming
  Object oriented programming
  Software libraries

Q measurement
- BT: Electric variables measurement

RT: Q-factor

Q-factor
UF: Q factor
       Quality factor
BT: Electric variables
RT: Capacitors
       Q measurement

Q-learning
UF: Q learning
BT: Reinforcement learning
RT: Markov processes
       Stochastic processes

QR codes
UF: Quick response codes
BT: Bar codes
RT: Product codes

Quadratic programming
BT: Optimization methods

Quadrature amplitude modulation
UF: QAM
BT: Amplitude modulation

Quadrature phase shift keying
BT: Phase shift keying
NT: Differential quadrature
phase shift keying

Quadrotors
UF: Quadcopters
BT: Helicopters
RT: Autonomous aerial vehicles
       Drones

Quadrupedal robots
UF: Quadrupeds
BT: Robots

Qualifications
BT: Training
RT: Continuing professional
development
       Standards

Quality assessment
BT: Quality management

Quality assurance
BT: Quality management
RT: Consumer protection

       Data integrity
       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
machines
       Data integrity
       Design for quality
       Failure analysis
       IEEE 802.11e Standard
       Quality assurance
       Quality function deployment
       Reliability
       Six sigma
       Total quality management

Quality function deployment
UF: QFD
BT: Quality management
RT: Concurrent engineering
       Product development
       Quality assurance
       Quality awards
       Quality control

Quality management
UF: ISO 9000
BT: Management
RT: Control charts
       Customer relationship
management
       Customer satisfaction
       Data governance
       Design for quality
       ISO Standards
       Pareto analysis
       Product liability
       Reliability

System improvement
NT: Quality assessment
Quality assurance
Quality awards
Quality control
Quality function deployment
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
Quality-of-service
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

Quantization (signal)
UF: Quantisation
Quantization effects
Quantization errors
Signal quantisation
Signal quantization
BT: Signal processing
RT: Analog-digital conversion
Data compression
Digital representation
Encoding
Finite wordlength effects
Granular computing
Signal sampling
NT: Vector quantization

Quantum algorithm
BT: Quantum computing

Quantum annealing
BT: Metaheuristics
Quantum computing
RT: Annealing

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 channels
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
Trapped ions
NT: Quantum algorithm
Quantum annealing
Quantum cellular automata
Quantum chemistry
Quantum circuit
Quantum networks
Quantum simulation
Qubit

Quantum cryptography
    BT: Cryptography
            Quantum mechanics

Quantum decoherence
    BT: Quantum mechanics
    RT: Coherence

Quantum dot lasers
    UF: Quantum-dot lasers
    BT: Semiconductor lasers
    RT: Quantum dots
            Quantum mechanics
            Quantum well lasers

Quantum dots
    UF: Quantum dash
            Quantum-dot
            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 channels
            Quantum circuit

Quantum key distribution
    BT: Communication system
security
            Quantum mechanics
    RT: Cryptography

Quantum mechanics
    UF: Quantum theory
    BT: Physics
    RT: Lagrangian functions
            Laser theory
            Nanotechnology
            Philosophical
considerations
            Quantum cascade lasers
            Quantum dot lasers
            Quantum dots
            Quantum well devices

            Quantum well lasers
            Resonant frequency
            Solid-state physics
            String theory
    NT: Coherence time
            Density functional theory
            Proton effects
            Quantum capacitance
            Quantum cryptography
            Quantum decoherence
            Quantum entanglement
            Quantum information
science
            Quantum key distribution
            Quantum optics
            Quantum sensing
            Quantum simulation
            Quantum state
            Quantum system
            Relativistic quantum
mechanics
            Schrodinger equation
            Stationary state
            Teleportation
            Tunneling

Quantum networks
    BT: Quantum communication
            Quantum computing

Quantum optics
    BT: Quantum mechanics
    NT: Optical squeezing

Quantum radar
    BT: Radar
            Remote sensing
    RT: Lighting
            Quantum entanglement

Quantum sensing
    BT: Quantum mechanics
            Sensors

Quantum simulation
    BT: Quantum computing
            Quantum mechanics
            Simulation

Quantum state
    BT: Quantum mechanics
    RT: Quantum entanglement

JULY 2023 IEEE Thesaurus

Quantum system
- BT: Quantum mechanics

Quantum well devices
- UF: Quantum-well devices
  Quantumwell devices
- BT: Electron devices
- RT: Electro-optic modulators
  Quantum mechanics
  Resonant tunneling devices
  Tunneling
- NT: Quantum well lasers
  Quantum wells
  Two dimensional hole gas

Quantum well lasers
- UF: Quantum-well lasers
- BT: Lasers
  Quantum well devices
  Semiconductor devices
  Semiconductor lasers
  Solid lasers
- RT: Quantum dot lasers
  Quantum mechanics
  Quantum wells
  Semiconductor optical amplifiers
  Surface emitting lasers
  Two dimensional hole gas
- NT: Quantum cascade lasers

Quantum wells
- UF: Semiconductor quantum wells
- BT: Electrons
  Quantum well devices
- RT: Quantum well lasers
  Surface emitting lasers
  Two dimensional hole gas

Quartz crystals
- BT: Crystals

Quasi-Fermi level
- UF: Fermi energy
  Imref
  Quasi Fermi level
- BT: Energy states
  Thermodynamics
- RT: Fermi level

Quaternions
- BT: Mathematics

Qubit
- UF: qbit
- BT: Quantum computing
- RT: Coherence time
  Quantum channels

Query processing
- UF: Query evaluation
  Query optimisation
  Query optimization
  Query pipeline
  Query process
  Query routing
- BT: Database systems
- RT: Linked data
  NoSQL databases
  Semantic search

Question answering (information retrieval)
- BT: Natural language processing
- RT: Chatbots

Queueing analysis
- UF: Queueing theory
- BT: Traffic control
- RT: Publish subscribe systems
  Scheduling

R language
- BT: Computer languages
  Public domain software
- RT: Data analysis
  Data mining
  Data visualization
  Statistical analysis

Rabbits
- BT: Animals

Radar
- UF: Microwave radar
- BT: Electromagnetic compatibility and interference
- 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 cross-sections
UF: Radar cross section
Radar cross sections
Radar cross-section
BT: Radar
Radar measurements
Reflection

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 polarimetry
UF: SAR imaging
Synthetic aperture radar
imaging
BT: Radar applications

Radar remote sensing
BT: Radar applications
RT: Spaceborne radar

Radar scattering
BT: Electromagnetic scattering
RT: Radar

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 detector circuits
BT: Circuits
RT: Counting circuits
        Radiation detectors

Radiation detectors
UF: Counters
        Particle detectors
        Radiation counters
        Radiation detection
        Ratemeters
BT: Ionizing radiation sensors
RT: Atomic measurements
        Dosimetry
        Nuclear measurements
        Phototransistors
        Radiation detector circuits
        Radiation monitoring
        Radiofrequency exposure
        Spectroscopy
        X-ray detectors
NT: Bolometers
        Gamma-ray detectors
        Infrared detectors
        Photodetectors
        Semiconductor radiation detectors
        Silicon radiation detectors

Radiation dosage
BT: Radiation monitoring

Radiation effects
UF: Irradiation
BT: Nuclear and plasma sciences
RT: Biomedical applications of radiation
        Brachytherapy
        High energy physics instrumentation computing
        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
        Rad-hard
BT: Electronic equipment manufacture
        Nuclear and plasma sciences
RT: Ionizing radiation
        Satellite communication
        Total ionizing dose

Radiation imaging
BT: Imaging
RT: Biomedical imaging
NT: Radionuclide imaging

Radiation monitoring
UF: Health physics
BT: Monitoring
        Nuclear and plasma sciences
RT: Dosimetry
        Radiation detectors
        Radiation effects
        Radiation protection
        Radioactive pollution
        Reactor instrumentation
NT: Radiation dosage

Radiation protection
UF: Radiation shielding
        Radiological protection
BT: Protection
        Radiation safety
RT: Biological effects of radiation
        Contamination
        Dosimetry
        Fission reactors
        Radiation effects
        Radiation monitoring
        Radioactive pollution

Radiation safety
BT: Nuclear and plasma sciences
        Safety
NT: Radiation protection
        Radiofrequency safety

Radiation therapy
UF: Radiotherapy
BT: Biomedical applications of radiation
Oncology
RT: Cancer treatment

Radiative recombination
BT: Spontaneous emission
RT: Semiconductor materials

Radio access networks
UF: RAN
BT: Telecommunications
RT: 3G mobile communication
4G mobile communication
Land mobile radio
Radio communication
Telecommunication services
NT: Cloud radio access networks

Radio access technologies
UF: RATS
BT: Communication networks
NT: New Radio

Radio astronomy
UF: Radio telescopes
BT: Antennas and propagation
Astronomy
RT: Reflector antennas
Telescopes

Radio broadcasting
BT: Broadcasting
Radio communication
RT: Digital multimedia broadcasting
Journalism
NT: Frequency modulation
Radio networks

Radio communication
BT: Communication systems
RT: Bandwidth
Convolutional codes
Cross layer design
Diversity methods
Film bulk acoustic resonators
IEEE 802.11 Standard
IEEE 802.11g Standard
IEEE 802.11n Standard
IEEE 802.15 Standard
Intercell interference
MIMO communication
Mobile communication
NOMA
Radio access networks
Radio communication equipment
Radio propagation
SIMO communication
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 communication

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
BT: Radio communication
RT: Light fidelity
Wireless fidelity
NT: High frequency
Radiofrequency exposure
Radiofrequency safety

Radio interferometry
UF: Radiowave interferometry
BT: Interferometry

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 spectrum management
UF: Frequency allocation
Spectrum management
BT: Radio communication
RT: Communication standards
NT: Direct sequence spread spectrum communication
White spaces

Radio transceivers
BT: Radio communication equipment
Transceivers
NT: Dynamic spectrum access

Radio transmitters
BT: Transmitters

Radioactive decay
BT: Radioactive materials

Radioactive materials
UF: Alphavoltaic power sources
Betavoltaic power sources
Radioisotopes
BT: Materials
RT: Isotopes
Neutrino sources
Occupational health
Occupational safety
Radioactive pollution
Safety
NT: Nuclear fuels
Radioactive decay
Radioactive waste

Radioactive pollution
UF: Nuclear wastes
BT: Pollution
RT: Hazardous areas
Incineration
Industrial pollution
Land pollution
Radiation monitoring
Radiation protection
Radioactive materials
Radioactive waste
Radioactive waste disposal
Safety
Waste materials

Radioactive waste
BT: Radioactive materials
Waste materials
RT: Hazardous areas
Hazardous materials
Incineration
Materials handling
Nuclear facility regulation
Nuclear fuels
Radioactive pollution
Waste disposal

Waste management
NT: Radioactive waste disposal

Radioactive waste disposal
BT: Radioactive waste
Waste disposal
RT: Incineration
Materials handling
Radioactive pollution
Vitrification
Waste handling

Radiofrequency amplifiers
UF: Radiofrequency power amplifiers
BT: Amplifiers

Radiofrequency exposure
UF: RF exposure
Radio frequency exposure
BT: Radio frequency
RT: Electromagnetic radiation
Radiation detectors

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 identification

Radiofrequency interference
UF: Radio frequency interference
Radio-frequency interference
BT: Electromagnetic interference

RT: NOMA
Superconducting filters
NT: Intercell interference

Radiofrequency microelectromechanical systems
UF: RF micro-electro-mechanical systems
RF microelectromechanical systems
Radiofrequency micro-electro-mechanical systems
Radiofrequency micro-electromechanical systems
BT: Microelectromechanical systems

Radiofrequency safety
UF: RF safety
Radio frequency safety
Radio-frequency safety
BT: Radiation safety
Radio frequency
RT: Electromagnetic radiation

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: Generators

Radiology
BT: Biomedical image processing
Medical specialties
NT: Neuroradiology

Radiometers
BT: Meters
Radiometry
NT: Spectroradiometers

Radiometry
BT: Electromagnetic measurements

Geoscience and remote sensing
- RT: Imaging
  Photometry
  Remote sensing
  Temperature measurement
- NT: Microwave radiometry
  Radiometers

Radiomics
- BT: Biomedical image processing
- RT: Machine learning

Radionuclide imaging
- UF: Radionuclide scanning
  Radionuclide scans
- BT: Medical diagnostic imaging
  Radiation imaging

Radiotracer
- UF: Radioactive label
  Radioactive tracer
- BT: Chemical compounds

Radiowave propagation
- BT: Electromagnetic propagation
- RT: Radio propagation
- NT: NVIS

Radium
- BT: Chemical elements

Radomes
- BT: Antenna accessories

Radon
- BT: Chemical elements

Rail to rail amplifiers
- BT: Rail to rail operation
- RT: Amplifiers
  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
  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 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

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 communication
- BT: Rail transportation
  Telecommunications
- NT: Block signalling
  GSM-R

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: Precipitation
  RT: Floods
        Monsoons
        Stormwater

Rain fading
  UF: Rain fades
  BT: Interference

RAKE receivers
  BT: Receivers
  RT: Signal to noise ratio

Raman scattering
  UF: Raman effect
        Raman spectroscopy
  BT: Electromagnetic scattering
        Nonlinear optics

Random access memory
  UF: RAM
        Random access storage
  BT: Memory
  RT: Buffer storage
  NT: DRAM chips
        Phase change random

access memory

        Resistive RAM
        SDRAM
        SRAM cells
        SRAM chips

Random forests
  BT: Machine learning
        Random processes
  RT: Decision trees
        Fish schools
        Pattern recognition
        Regression analysis

Random media
  UF: Turbulent media
  BT: Media
  RT: Chaos
        Nonhomogeneous media

Random number generation
  BT: Cryptography
  RT: Random sequences
        Stochastic processes
        White noise

Random processes
  BT: Mathematics
  RT: Algorithms
        Mean field theory
        Probability
        Signal processing
        Statistical analysis
        Time series analysis
  NT: Brownian motion
        Conditional random fields
        Random forests

Random sequences
  UF: Pseudorandom sequences
  BT: Sequences
  RT: Cryptography
        Random number

generation

Random variables
  BT: Probability
  RT: Stochastic processes
        Stochastic systems

Ranking (statistics)
  BT: Statistics
  RT: Information retrieval
        Ontologies
        Search methods
        Semantic Web
        Vocabulary

Ransomware
  BT: Malware

Rapid eye movement sleep
  UF: REM sleep
  BT: Sleep

Rapid prototyping
  BT: Prototypes
  RT: CADCAM
        Design methodology

Manufacturing processes
Product development
Software engineering
Three-dimensional printing
Virtual prototyping

Rapid thermal annealing
    BT: Annealing
    RT: Semiconductor devices

Rapid thermal processing
    BT: High-temperature techniques
    RT: Heating systems

Rare earth metals
    UF: Rare-earth metals
    BT: Metals

Rate distortion theory
    BT: Information theory
    RT: Audio coding
            Channel coding
            Channel spacing
            Distortion
            Image coding
            Signal analysis
            Signal processing
            Source coding
            Speech coding
            Video coding
    NT: Channel rate control

Rate-distortion
    UF: Rate distortion
    BT: Information theory
    RT: Data compression

Rats
    BT: Animals

Raw materials
    BT: Materials
    RT: Mining industry

Ray tracing
    UF: Ray-tracing
    BT: Geometrical optics
            Optics
    RT: Computer graphics
            Stray light

Rayleigh channels
    UF: Raleigh fading
            Raleigh fading channels

Rayleigh-fading
    BT: Fading channels
    RT: Radio propagation

Rayleigh scattering
    BT: Electromagnetic scattering

Reachability analysis
    BT: Graph theory

Reactive power
    UF: Power factor
            VAR
    BT: Power systems
    RT: Reactive power control
            Static VAr compensators

Reactive power control
    BT: Electric variables control
    RT: Power system security
            Reactive power
            Voltage control

Reactor instrumentation
    BT: Nuclear and plasma sciences
    RT: Radiation monitoring

Read only memory
    UF: ROM
    BT: Memory
    RT: Read-write memory
    NT: PROM

Read-write memory
    BT: Memory
    RT: Read only memory

Readability metrics
    UF: Readability formulas
            Readability tests
    BT: Writing

Readout electronics
    BT: Displays
    RT: Detectors
            SQUIDs

Real-time systems
    UF: Real time
            Real time control
            Real time monitoring
            Real time processing
            Real time systems
            Real-time control

Real-time monitoring
Real-time processing
BT: Computers and information processing
RT: Control systems
Endomicroscopy
Hardware-in-the-loop simulation
High energy physics instrumentation computing
Networked control systems
NT: Telexistence
WebRTC

Rebreathing equipment
UF: Rebreathers
BT: Underwater equipment

Received signal strength indicator
UF: RSSI
BT: Communication system signaling
Signal processing

Receivers
UF: Radio receivers
BT: Communication equipment
RT: Demodulation
Optical antennas
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
Recommendation systems
BT: Information filtering
RT: Collaborative filtering
Graph neural networks

Reconfigurable architectures
BT: Computer architecture

Reconfigurable devices
UF: Re-configurable devices
BT: Hardware
RT: Field programmable gate arrays

Reconfigurable logic
BT: Logic design

Reconnaissance
BT: Military communication
Security
RT: Remote sensing
Surveillance

Reconstruction algorithms
UF: Reconstruction algorithm
Reconstruction methods
BT: Tomography
RT: Image processing
Three-dimensional displays

Recording
BT: Signal processing
RT: Memory
NT: Audio recording
Digital recording
Disk recording
Flight 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 networks
- UF: RNN
  - Recurrent neural nets
- BT: Neural networks
- RT: Deep learning
- NT: Hopfield neural networks

Recursive estimation
- BT: Bayes methods
- RT: Least squares approximations

Recycling
- UF: Recycle
- BT: Environmental management
- RT: Food waste

Red blood cells
- BT: Blood

Redox
- UF: Reduction-oxidation
- BT: Chemical reduction
  - Oxidation

Reduced instruction set computing
- UF: RISC
- BT: Instruction sets

Reduced order systems
- UF: Model reduction
  - Reduced order model
  - Reduced-order model
  - Reduced-order systems
- BT: Systems engineering and theory
- RT: Estimation
  - Simulation

Redundancy
- BT: Fault tolerance
- RT: Codes
  - Reliability

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

Reflection
- BT: Propagation
- RT: Mirrors
  - Scattering
- NT: Acoustic reflection
  - Backscatter
  - Electromagnetic reflection
  - Fresnel reflection
  - Radar cross-sections

Reflection coefficient
- BT: Optical variables measurement
  - Waveguide discontinuities
- RT: Amplitude estimation

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
- NT: Diffuse reflectance spectroscopy

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
Cross-phase modulation
Dispersion
Gain measurement
Laser beams
Metamaterials
Optical refraction
Photorefractive effect
Semiconductor device measurement
Semiconductor lasers

Refrigerants
BT: Coolants
RT: Heat pumps
Space cooling
NT: Liquid nitrogen

Refrigeration
BT: Cooling

Refrigerators
BT: Home appliances
Home automation

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

NT: Random forests
Linear regression
Logistic 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

Reinforcement learning
BT: Machine learning
RT: Artificial intelligence
Bayes methods
Deep learning
Multi-armed bandit problem
Neural networks
Pattern classification
Semisupervised learning
Support vector machines
Unsupervised learning
NT: Q-learning

Relational databases
BT: Databases
RT: Structured Query Language
Triples (Data structure)

Relativistic effects
BT: Nuclear physics
RT: Electron beams
Free electron lasers
Klystrons
Magnetrons
Masers
Plasmas
NT: Optical flow

Relativistic quantum mechanics
BT: Quantum mechanics

Relaxation methods
BT: Numerical analysis
RT: Simulated annealing

JULY 2023 IEEE Thesaurus

Relaxor ferroelectrics
BT: Ferroelectric materials

Relay networks
BT: Communication networks
        Relays

Relays
BT: Switchgear
RT: Switching circuits
NT: Digital relays
        Microrelays
        Power system relaying
        Protective relaying
        Relay networks
        Road side unit

Release engineering
UF: Releng
BT: Software engineering
RT: Product lifecycle management
        Software development management
        Source coding

Relevance vector machines
BT: Classification algorithms
        Machine learning
RT: Bayes methods
        Support vector machines

Reliability
UF: Reliability management
        System reliability
RT: Aging
        Dependability management
        Electron traps
        Failure analysis
        Life testing
        Power system reliability
        Preventive maintenance
        Quality control
        Quality management
        Redundancy
        Risk analysis
        System improvement
        System recovery
        Thermal management
NT: Availability
        Fault diagnosis
        Fault tolerance
        Fluctuations
        Integrated circuit reliability
        Maintenance
        Maldistribution

Materials reliability
Reliability engineering
Reliability theory
Robustness
Semiconductor device reliability
Software reliability
Stability
Telecommunication network reliability

Reliability engineering
BT: Reliability
RT: Weibull distribution

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

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 equipment
        Telecontrol equipment

JULY 2023 IEEE Thesaurus

Remote handling equipment
BT: Materials handling equipment
RT: Remote handling
Telerobotics
Waste handling equipment

Remote laboratories
BT: Laboratories

Remote monitoring
BT: Monitoring
Remote sensing
RT: Internet of Medical Things
Machine-to-machine communications

Remote sensing
BT: Geoscience and remote sensing
RT: Atmospheric measurements

Earth
Geologic measurements
Geophysical measurement techniques

Geophysical measurements
Imaging
Infrared imaging
Land surface temperature
Landmine detection
Meteorology
Microwave imaging
Oceanographic techniques
Optical imaging
Pulse oximetry
Radar imaging
Radar measurements
Radiometry
Reconnaissance
Sea measurements
Soil measurements
Sonar measurements
Surveillance
Terrain mapping
Vegetation mapping
Water resources
NT: Hyperspectral sensors
Passive microwave remote sensing

Quantum radar
Remote monitoring

Remote working
UF: Distance work

Hybrid office
Hybrid working
Mobile office
Telecommuting
Teleworking
Virtual office
BT: Systems, man, and cybernetics

Remotely guided underwater vehicles
BT: Remotely guided vehicles
Underwater vehicles

Remotely guided vehicles
UF: Automated guided vehicles
Remotely controlled vehicles
Remotely operated automobiles
Remotely operated cars
Remotely operated vehicles
BT: Vehicles
NT: Drones
Remotely guided underwater vehicles
Remotely piloted aircraft

Remotely piloted aircraft
UF: RPA
Remote piloted aircraft
Remotely controlled aerial vehicles
Unmanned air vehicles
BT: Remotely guided vehicles

Remuneration
BT: Human resource management
RT: Employee welfare
NT: Incentive schemes
Pensions

Rendering (computer graphics)
BT: Computer graphics
RT: Image synthesis

Renewable energy sources
UF: Renewable energy
Renewable energy resources
Renewable-energy
Renewables
BT: Energy conservation
Environmental management

RT:	Low-carbon economy	
	Solar panels	
	Wave power	
NT:	Biomass	

Repeaters
UF:	Optical regenerators
BT:	Communication equipment

Replicability
BT:	Measurement

Representation learning
UF:	Feature learning
BT:	Machine learning

Representational state transfer
BT:	Software architecture

Reproducibility of results
UF:	Reproductible research
BT:	Measurement

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

Rescue robots
BT:	Robots
RT:	Emergency services
	Hazards
	Marine robots

Research and development
UF:	Research & development
BT:	Engineering - general
RT:	Electrical engineering
	Engineering profession
	Industrial engineering
	International collaboration
	Laboratories
	Museums

	Research and development management	
	Reverse engineering	
	Science - general	
	Technology	
	Virtual enterprises	
	Virtual manufacturing	
	Virtual prototyping	
NT:	Translational research	

Research and development management
UF:	R & D management
BT:	Engineering management
	Management
RT:	Concurrent engineering
	Engineering profession
	Production management
	Project management
	Research and development
	Technology management
	Venture capital
NT:	Innovation management

Research initiatives
BT:	Engineering management

Reservoirs
BT:	Water resources
	Water storage
RT:	Dams
	Lakes
	Land use planning
	Water

Residual neural networks
UF:	Residual networks
BT:	Artificial neural networks

Residual stresses
UF:	Residual stress
BT:	Stress

Resilience
UF:	Resiliency
	Resilient systems
BT:	Material properties

Resins
BT:	Materials
RT:	Plastics
	Polymer foams
NT:	Epoxy resins

Resistance
BT:	Electric variables

RT:	Electrical resistance measurement	
	Resistance heating	
	Skin effect	
NT:	Electric resistance	
	Piezoresistance	
	Surface resistance	
	Thermal resistance	
	Viscosity	

Resistance heating
UF:	Electric heating
BT:	Heating systems
RT:	Electrothermal actuators
	Resistance

Resistive RAM
UF:	RRAM
	ReRAM
BT:	Random access memory
RT:	Memristors
	Phase change memory

Resistive transducers
BT:	Transducers

Resistors
BT:	Electronic components
RT:	Electrical ballasts
	Potentiometers
NT:	Memristors
	Switched capacitor networks
	Varistors

Resists
UF:	Photoresists
BT:	Materials

Resonance
RT:	Cavity resonators
	Dielectric resonator antennas
	Film bulk acoustic resonators
	Microstrip resonators
	Optical resonators
	Resonant inverters
	Resonant tunneling devices
	Resonator filters
	Resonators
	Vibrations
NT:	Ferroresonance
	Magnetic resonance
	Resonance light scattering
	Stochastic resonance

Resonance light scattering
BT:	Resonance
	Spectroscopy
RT:	Light scattering

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
BT:	Inverters
RT:	Power electronics
	Resonance

Resonant tunneling devices
UF:	Resonant tunnelling devices
	Resonant-tunneling devices
	Resonant-tunnelling devices
BT:	Tunneling
RT:	Quantum well devices
	Resonance
	Single electron devices

Resonator filters
BT:	Filters
RT:	Resonance

Resonators
BT:	Amplifiers
RT:	Acoustics
	Resonance
	Ring oscillators
	Tuners
NT:	Cavity resonators
	Split ring resonators

Resource description framework
UF:	RDF
BT:	Semantic Web

Resource management
UF:	Allocation
	Radio resource management
	Resource allocation

Resource distribution
Resource sharing
Resource utilisation
Resource utilization
Resources management
BT: Management
RT: Business process integration

Business process management

Cluster computing
Edge computing
Environmental engineering
Forestry
Multi-armed bandit problem
Operations research
System integration
NT: Elastic computing
Network resource management

Resource virtualization
Serverless computing

Resource virtualization
BT: Resource management

Respiratory system
UF: Bronchi
BT: Anatomy
RT: Intubation
Pulmonary diseases
Pulmonology
Ventilators
NT: Larynx
Lung

Response surface methodology
BT: Surface fitting
RT: Optimization methods

Restful API
BT: Application programming interfaces

Software architecture

Resumes
BT: Writing

Retardants
BT: Production materials
RT: Inhibitors
NT: Flame retardants

Retina
UF: Retinal

BT: Eyes
RT: Ophthalmology
NT: Retinal vessels

Retinal vessels
BT: Retina
RT: Diabetic retinopathy

Retinopathy
BT: Eye diseases
NT: Diabetic retinopathy

Retirement
BT: Human resource management

Retroreflectors
UF: Corner cube prisms
Corner-cube prisms
BT: Optical devices
RT: Road safety

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

Reversible computing
BT: Computational modeling
Time complexity

Reviews
BT: Writing

RF signals
BT: Signal processing

RFID tags
BT: Radiofrequency identification
NT: Active RFID tags
Passive RFID tags

Rhenium
    BT: Chemical elements

Rheology
    BT: Fluid dynamics
    RT: Viscosity

Rhetoric
    BT: Professional communication

Rhodium
    BT: Chemical elements

Rhythm
    BT: Music

Ribs
    BT: Thorax

Riccati equations
    BT: Equations

Rician channels
    UF: Rician fading
              Rician fading channels
    BT: MIMO communication

Rigidity
    BT: Material properties

Ring generators
    BT: Automatic testing
              Testing

Ring lasers
    BT: Lasers
    RT: Gyroscopes
    NT: Fiber lasers

Ring oscillators
    BT: Oscillators
    RT: Frequency control
              Jitter
              Klystrons
              Logic gates
              Masers
              Phase locked loops
              Resonators
              Tuning
              Voltage-controlled oscillators

Risk analysis
    BT: Management
    RT: Accident prevention
              Accidents
              Decision making
              Occupational health
              Occupational safety
              Reliability
              Safety
              Technology social factors
              Venture capital
    NT: Fault trees
              Risk management
              Threat assessment

Risk management
    UF: Risk assessment
              Risk handling
              Risk minimization
              Risk mitigation
              Risk reduction
    BT: Risk analysis
    RT: Contract management

Rivers
    BT: Geoscience
    RT: Excavation
              Floods
              Lakes
              Sediments
              Stormwater
              Water
              Water pollution
              Water resources
              Watersheds
              Wetlands

RLC circuits
    UF: Resonant circuits
    BT: Circuits
              Tunable circuits and devices

RNA
    UF: Ribonucleic acid
    BT: Biological cells

Road accidents
    BT: Accidents
    RT: Road safety
              Road vehicles

Road safety
    BT: Roads
    RT: Automated highways

Automotive engineering
Lane detection
Pedestrians
Retroreflectors
Road accidents
Vehicle-to-everything
NT: Lane departure warning systems

Road side unit
BT: Relays
Vehicular ad hoc networks

Road traffic
BT: Road traffic control
NT: Pedestrians

Road traffic control
BT: Road transportation
Traffic control
RT: Automotive control
Pedestrians
NT: Road traffic

Road transportation
UF: Highways
BT: Land transportation
RT: Civil engineering
Global Positioning System
NT: Road traffic control
Roads
Traffic congestion

Road vehicles
BT: Land vehicles
RT: Automotive control
Road accidents
Roads
NT: Automobiles
Motorcycles

Roadmaps (technology planning)
BT: Strategic planning
Technology forecasting

Roads
BT: Road transportation
RT: Civil engineering
Excavation
Road vehicles
NT: Road safety

Roaming
BT: Wireless communication
RT: Dual band

GSM

Robot control
UF: Robotic control
BT: Control systems
Robots
RT: Force control
Formation control
Motion planning
Odometry
Trajectory tracking
NT: Robot motion

Robot kinematics
BT: Robots
RT: Propioception
NT: Motion analysis

Robot learning
BT: Machine learning
Robots
RT: Artificial intelligence

Robot localization
BT: Motion analysis
RT: Robot sensing systems

Robot motion
UF: Robotic motion
BT: Robot control
NT: 3-DOF
5-DOF
6-DOF

Robot programming
UF: Robotic programming
BT: Programming
Robots

Robot sensing systems
UF: Manipulator sensing systems
Mobile robot sensing systems
Robot sensor networks
BT: Robots
Sensor systems and applications
RT: Multisensor systems
Robot localization
NT: Propioception
Robot vision systems
Simultaneous localization and mapping
Stereognosis
Tactile sensors

Robot vision systems
UF: Manipulator vision systems
  Mobile robot vision systems
BT: Robot sensing systems
RT: Image sensors
  Imaging
  Intelligent robots
  Object detection
  Object recognition
  Pattern recognition
  Stereo vision
NT: Visual servoing

Robotic assembly
UF: Assembly robots
  Robot-based assembly
BT: Assembly systems
RT: Robotics and automation

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
  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

  Industrial robots
  Intelligent robots
  Manipulators
  Marine robots
  Medical robotics
  Military robotics
  Mobile robots
  Orbital robotics
  Parallel robots
  Quadrupedal robots
  Rescue robots
  Robot control
  Robot kinematics
  Robot learning
  Robot programming
  Robot sensing systems
  Service robots
  Snake robots
  Social robots
  Soft robotics
  Telerobotics
  Visual odometry
  Wearable robots

Robust control
UF: Active disturbance rejection
control
BT: System analysis and design
RT: Disturbance observers

Robust stability
BT: Stability

Robustness
BT: Reliability
RT: Control systems
  Sensitivity
  Stability
  Uncertain systems

Rockets
BT: Propulsion
RT: Engines
  Ground support

Rocks
BT: Geology

Rodents
BT: Animals

Roentgenium
BT: Chemical elements

Role transfer
BT: Organizational aspects

Rolling bearings
UF:	Roller bearings
	Rolling contact bearings
	Rolling element bearings
BT:	Mechanical bearings
RT:	Ball bearings

Rollover
BT:	Vehicle dynamics

Root cause analysis
BT:	Process planning
RT:	Failure analysis

Root mean square
UF:	Root mean square error
	Root mean square value
BT:	Mathematics
	Statistics

Rootkit
UF:	Root kit
BT:	Malware

Rotating machines
BT:	Electric machines
RT:	Brushes
	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 measurement

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
	Noise

Routing
BT:	Communication systems
RT:	Multicast communication
	Network function virtualization
	Routing protocols
	Soft switching
	Virtual links
NT:	Wavelength routing

Routing protocols
BT:	Protocols
RT:	Border Gateway Protocol
	Internet
	Land mobile radio
	Mobile communication
	Multicast protocols
	Multiprotocol label switching
	Routing
	Wireless access points
NT:	Virtual links

Rubber
BT:	Insulators
RT:	Rubber industry
	Rubber products

Rubber industry
BT:	Manufacturing industries
RT:	Chemical industry
	Rubber
	Rubber products

Rubber products
BT:	Manufactured products
RT:	Hoses
	Rubber
	Rubber industry
	Wastewater treatment

NT: Tires

Rubidium
     BT: Chemical elements

Runtime
     BT: Software engineering
     RT: Programming
     NT: Dynamic compiler
             Runtime environment

Runtime environment
     BT: Runtime

Runtime library
     BT: Formal languages

Rural areas
     BT: Geography
     RT: Macrocell networks
             Public infrastructure

Ruthenium
     BT: Chemical elements

Rydberg atoms
     UF: Rydberg sensors
     BT: Electric variables measurement
             Physics

Safety
     BT: Industry applications
             Product safety engineering
     RT: Alarm systems
             Control system security
             Electric shock
             Environmental factors
             Explosions
             Eye protection
             Fires
             Hazardous areas
             Occupational health
             Preventive maintenance
             Protective clothing
             Radiation effects
             Radioactive materials
             Radioactive pollution
             Risk analysis
     NT: Aerospace safety
             Domestic safety
             Emergency services
             Explosion protection
             Fire safety

             Hazards
             Health and safety
             Marine safety
             Product safety
             Protection
             Radiation safety
             Safety devices
             Safety management
             Vehicle safety

Safety devices
     BT: Safety
     RT: Accident prevention
             Alarm systems
             Railway safety
             Smoke detectors
     NT: Eye protection
             Fire extinguishers
             Protective clothing

Safety management
     BT: Management
             Safety
     RT: Dependability management

Sagnac interferometers
     BT: Interferometry

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 compounds

Samarium alloys
     UF: Samarium cobalt
     BT: Samarium

JULY 2023 IEEE Thesaurus

Samarium compounds
BT: Samarium

Sampled data circuits
UF: Sampled-data circuits
BT: Circuits

Sampled data systems
BT: Discrete-time systems

Sampling methods
BT: Statistics
RT: Signal sampling
Surveys
NT: Compressed sensing
Nonuniform sampling
Synthetic data

Sandblasting
BT: Surface treatment
RT: Surface roughness

Sandwich structures
BT: Structural shapes
RT: Honeycomb structures
Lightweight structures
Sheet materials
Structural panels
Thin wall structures

Sanitary engineering
BT: Engineering - general
RT: Environmental management
Sewage treatment
Waste disposal
Waste management
Waste materials
Wastewater
Wastewater treatment
Water pollution

Satellite antennas
BT: Antennas

Satellite broadcasting
UF: DBS
Direct broadcast satellites
Satellite broadcasts
BT: Broadcasting
Satellite communication
RT: Global Positioning System

Satellite communication
UF: Communication satellites
BT: Communication systems
Radio communication
RT: Artificial satellites
Convolutional codes
Global Positioning System
Handover
Radiation hardening (electronics)
Space-air-ground integrated networks
Transponders
NT: Downlink
Satellite broadcasting
Satellite ground stations
Uplink

Satellite constellations
BT: Satellite navigation systems

Satellite ground stations
BT: Communication systems
Radio communication
Satellite communication
RT: Communication equipment

Satellite navigation systems
BT: Navigation
RT: Radio navigation
Time dissemination
NT: Global Positioning System
Global navigation satellite system
Satellite constellations

Satellites
BT: Solar system
RT: Artificial satellites
NT: Geostationary satellites
Moon
Small satellites

Saturation magnetization
UF: Saturation magnetisation
BT: Magnetization processes
RT: Magnetic fields
Magnets

Saturn
BT: Planets

SAW filters
BT: Electromechanical devices

JULY 2023 IEEE Thesaurus

Sawing
      BT: Machining
      RT: Sawing machines

Sawing machines
      BT: Machine tools
      RT: Sawing

SCADA systems
      UF: Supervisory control and data acquisition systems
                     Supervisory control and data-acquisition systems
      BT: Control systems
                     Power system control
                     Supervisory control
      RT: Load monitoring
                     Substation automation

Scalability
      BT: System analysis and design
      RT: Extensibility

Scalp
      BT: Head

Scandium
      BT: Chemical elements

Scanning electron microscopy
      UF: SEM
      BT: Electron microscopy
      RT: Electron backscatter diffraction
                     Electron beam applications
                     Particle scattering

Scanning microwave microscopy
      BT: Microscopy
      RT: Atomic force microscopy

Scanning probe data storage
      BT: Memory

Scanning probe microscopy
      BT: Microscopy
      NT: Scanning thermal microscopy

Scanning thermal microscopy
      BT: Scanning probe microscopy

Scattering
      UF: Backscattering
                     Wave scattering
      BT: Propagation
      RT: Reflection
                     Scattering parameters
      NT: Acoustic scattering
                     Brillouin scattering
                     Electromagnetic scattering
                     Light scattering
                     Particle scattering

Scattering parameters
      UF: S parameters
                     S-parameters
      BT: System analysis and design
      RT: Circuits
                     Scattering

Scene classification
      BT: Image classification

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

Schottky barriers
      UF: Schottky contacts
      BT: Semiconductor-metal interfaces
      RT: MESFETs
                     Schottky diodes

Schottky diodes
UF:	Schottky diode	
BT:	Diodes	
	Semiconductor devices	
	Semiconductor diodes	
RT:	Schottky barriers	
	Semiconductor-metal interfaces	

Schottky gate field effect transistors
UF:	Schottky gate FET	
BT:	Field effect transistors	

Schrodinger equation
BT:	Quantum mechanics	
RT:	Electrons	

Science - general
RT:	Econophysics	
	Neurophysiology	
	Research and development	
	STEM	
NT:	Astronomy	
	Biology	
	Chemistry	
	Electricity	
	Epidemiology	
	Geoscience	
	Life sciences	
	Metrology	
	Neuroscience	
	Physics	
	Social sciences	
	Thermodynamics	

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	

Scoliosis
BT:	Medical conditions	
	Spine	

Scrum (Software development)
BT:	Agile software development	
RT:	Agile project management	
	Feedback	
	Project management	
	Software development management	

SDRAM
UF:	Synchronous DRAM	
	Synchronous dynamic random access memory	
BT:	Random access memory	

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 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

Sea surface salinity
- BT: Sea surface
- RT: Salinity (geophysical)

Sealing materials
- UF: Sealants
- BT: Joining materials
- RT: Seals

Seals
- BT: Mechanical products
- RT: Packaging
- Sealing materials
- Structural rings
- NT: Gaskets
- Hermetic seals

Seaports
- UF: Sea ports
- BT: Industrial facilities
- Transportation
- RT: Freeports
- Marine transportation
- Marine vehicles

Search engines
- UF: Google
- BT: Information retrieval

Search methods
- BT: Information retrieval
- RT: Genetic algorithms
- Gradient methods
- Nearest neighbor methods
- Optimization methods
- Ranking (statistics)
- NT: Keyword search
- Metasearch
- Search problems
- Semantic search
- Web search

Search problems
- BT: Search methods
- RT: Artificial bee colony algorithm
- Metaheuristics

Sebaceous glands
- UF: Sebaceious glands

- BT: Glands
- Skin

Second Life
- BT: Social networking (online)

Secondary generated hot electron injection
- UF: Secondary generated hot-electron injection
- BT: Hot carrier injection

Secure storage
- BT: Material storage
- RT: Security

Security
- BT: Industry applications
- RT: Anti-virus software
- Biometrics (access control)
- Bring your own device
- Business continuity
- Identification of persons
- Malware
- Physical unclonable function
- Protection
- Secure storage
- Surveillance
- NT: Access control
- Alarm systems
- Capability-based security
- Computer security
- Control system security
- Cryptography
- Data security
- Digital signatures
- Food security
- Hardware security
- Information security
- Network security
- Power system security
- Reconnaissance
- Security management
- Terrorism
- Watermarking
- Zero Trust

Security management
- BT: Management
- Security
- RT: Hardware security

Sediments
- UF: Mud
- BT: Geoscience

RT: Lakes
Rivers
Sea floor
Soil

Seeds (agriculture)
BT: Crops
RT: Agriculture
Botany
Ecology
Food products
Genetic engineering
Soil

Seismic measurements
UF: Seismic visualization
BT: Geophysical measurements
RT: Acoustic measurements
Seismology

Seismic waves
BT: Waves
RT: Acoustic waves
Earthquakes
Elastodynamics
Explosions
Seismology
Shock waves

Seismology
BT: Geophysics
RT: Earthquake engineering
Earthquakes
Seismic measurements
Seismic waves
Well logging

Selenium
BT: Chemical elements

Self-assembly
BT: Bio-inspired materials
Nanotechnology
RT: Biological cells
Programming
Semiconductor device manufacture
Thin films
NT: Electrostatic self-assembly

Self-aware
BT: Cognition

Self-organizing feature maps
UF: Kohonen maps
SOM
Self organising feature maps
Self organizing feature maps
Self organizing maps
Self-organizing maps
BT: Artificial neural networks
RT: Feedforward neural networks
Knowledge acquisition

Self-organizing networks
UF: Self organizing networks
BT: Wireless networks

Self-replicating machines
UF: Self replicating machines
BT: Nanotechnology

Self-service
UF: Self service
BT: Consumer behavior
Customer services

Self-study courses
BT: Educational programs

Self-supervised learning
UF: Self supervised learning
BT: Learning systems
RT: Supervised learning
Unsupervised learning

Semantic search
BT: Search methods
Semantics
RT: Context awareness
Natural language processing
Ontologies
Query processing
Semantic Web

Semantic segmentation
BT: Image segmentation
RT: Deep learning

Semantic technology
BT: Information technology
Semantics
RT: Data models

Encoding
Natural language processing

Semantic Web

Semantic Web
UF: Web 3.0
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

Semiconductivity
BT: Conductivity
        Electron devices
RT: Charge carriers

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
        Semiconductor device testing
        Tolerance analysis

Semiconductor device doping
UF: Semiconductor doping
BT: Semiconductor device manufacture
RT: Doping
        Semiconductor materials

Semiconductor device manufacture
UF: Semiconductor manufacturing
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 unclonable function
        Semiconductor device doping
        Semiconductor epitaxial layers
        Semiconductor growth
        Silicidation
        Wafer bonding

Semiconductor device measurement
BT: Measurement
RT: Refractive index
        Semiconductor device noise
        Semiconductor device reliability
        Semiconductor device testing

Semiconductor device modeling
UF: Semiconductor device models
BT: Modeling

Semiconductor devices
RT: Semiconductor device noise

Semiconductor device noise
BT: Semiconductor devices
RT: Integrated circuit noise
        Semiconductor device measurement
        Semiconductor device modeling

Semiconductor device packaging
BT: Components, packaging, and manufacturing technology
RT: Integrated circuit packaging
        Semiconductor devices

Semiconductor device reliability
BT: Reliability
RT: Electrostatic discharge protection
        Semiconductor device breakdown
        Semiconductor device measurement

Semiconductor device testing
BT: Testing
RT: Semiconductor device breakdown
        Semiconductor device measurement

Semiconductor devices
UF: SIS devices (semiconductor)
        Semiconductor-insulator-semiconductor devices
BT: Electron devices
RT: Contacts
        Epitaxial growth
        Field effect transistors
        Heterojunction bipolar transistors
        Hot carriers
        Integrated circuits
        Molecular beam applications
        Photoconducting devices
        Physical unclonable function
        Proton radiation effects
        Rapid thermal annealing
        Semiconductor device manufacture
        Semiconductor device packaging
        Silicon-on-insulator
        Varistors
NT: Flip-chip devices
        Gunn devices
        Hall effect devices
        Junctions
        MIS devices
        MONOS devices
        P-i-n diodes
        Piezoresistive devices
        Power semiconductor devices
        Power semiconductor switches
        Quantum dots
        Quantum well lasers
        SONOS devices
        Schottky diodes
        Semiconductor counters
        Semiconductor detectors
        Semiconductor device modeling
        Semiconductor device noise
        Semiconductor diodes
        Semiconductor lasers
        Semiconductor waveguides
        Semiconductor-insulator interfaces
        Silicon devices
        Superluminescent diodes
        Surface emitting lasers
        Thermistors
        Transistors

Semiconductor diodes
BT: Semiconductor devices
RT: Diodes
        Magnetic field induced strain
        P-n junctions
NT: P-i-n diodes
        Schottky diodes
        Semiconductor-metal interfaces
        Superluminescent diodes
        Varactors

Semiconductor epitaxial layers
UF: Silicon epitaxial layers

BT: Semiconductor device manufacture
RT: Bipolar transistors

Semiconductor films
BT: Films
RT: Buffer layers
        Dielectric thin films
        Magnetic field induced strain
        Semiconductor growth
        Semiconductor materials
        Thick films
        Thin films

Semiconductor growth
BT: Semiconductor device manufacture
RT: Buffer layers
        Crystal growth
        Epitaxial layers
        Semiconductor films
        Semiconductor materials

Semiconductor impurities
BT: Impurities
RT: Charge carrier processes
        Plasma immersion ion implantation
        Semiconductor materials

Semiconductor laser arrays
BT: Semiconductor lasers

Semiconductor lasers
UF: Injection lasers
        Junction lasers
        Laser diodes
BT: Diodes
        Lasers
        Semiconductor devices
        Solid lasers
RT: Molecular beam applications
        Optical transmitters
        Refractive index
NT: Laser tuning
        Quantum dot lasers
        Quantum well lasers
        Semiconductor laser arrays
        Semiconductor optical amplifiers
        Surface emitting lasers

Semiconductor materials
UF: Pseudobinary semiconductors
        Semi-insulating materials
        Semiconductor alloys
BT: Materials
RT: Acoustoelectric effects
        Charge carriers
        Conducting materials
        Crystals
        Excitons
        High-k dielectric materials
        Photoconducting materials
        Radiative recombination
        Semiconductor device doping
        Semiconductor films
        Semiconductor growth
        Semiconductor impurities
        Semiconductor thin films
        Silicon compounds
        Tunneling
NT: Amorphous semiconductors
        Deep level transient spectroscopy
        Elemental semiconductors
        Gallium
        Gallium arsenide
        Germanium
        II-VI semiconductor materials
        III-V semiconductor materials
        Indium gallium arsenide
        Indium phosphide
        Magnetic semiconductors
        Organic semiconductors
        Semiconductor superlattices
        Silicon
        Silicon germanium
        Substrates
        Transition metal dichalcogenides
        Wide band gap semiconductors

Semiconductor memory
UF: Semiconductor storage
BT: Memory
RT: Integrated circuits
NT: Integrated memory circuits

Semiconductor nanostructures
BT: Nanostructures

JULY 2023 IEEE Thesaurus

Semiconductor nanotubes
    BT: Nanotubes

Semiconductor optical amplifiers
    UF: SOA
    BT: Optical amplifiers
              Semiconductor lasers
    RT: Optical transmitters
              Quantum well lasers

Semiconductor process modeling
    BT: Modeling
    RT: Circuit simulation

Semiconductor radiation detectors
    BT: Radiation detectors

Semiconductor superlattices
    BT: Semiconductor materials
              Superlattices

Semiconductor thin films
    BT: Thin films
    RT: Epitaxial growth
              Gallium
              Germanium
              Semiconductor materials
              Silicon
              Transition metal
dichalcogenides

Semiconductor waveguides
    BT: Semiconductor devices

Semiconductor-insulator interfaces
    BT: Semiconductor devices
    RT: CMOSFETs
              MIM devices
              MIS devices
              MOS devices
              Silicon-on-insulator

Semiconductor-metal interfaces
    UF: Metal-semiconductor
interfaces
    BT: Semiconductor diodes
    RT: Magnetic field induced
strain
              Schottky diodes
    NT: Schottky barriers

Semidefinite programming
    BT: Convex functions
    RT: Array signal processing
              Computational complexity

Seminars
    BT: Educational programs
    NT: Webinars

Semiotics
    UF: Semiology
              Semiosis
              Semiotic studies
    BT: Communication symbols
    RT: Linguistics
              Natural language
processing
              Phonetics
              Professional
communication
    NT: Pragmatics
              Semantics
              Syntactics

Semisupervised learning
    UF: Semi-supervised learning
    BT: Learning systems
    RT: Artificial intelligence
              Bayes methods
              Neural networks
              Pattern classification
              Reinforcement learning
              Supervised learning
              Unsupervised learning

Sense organs
    BT: Anatomy
    RT: Somatosensory
    NT: Ear
              Eyes
              Multisensory integration
              Nose
              Olfactory bulb
              Taste buds
              Visual systems

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
RT: Wearable sensors
NT: Sensor fusion

Sensor fusion
BT: Sensor arrays
RT: Active perception
Kalman filters
Multimodal sensors
Wearable sensors
NT: Multisensor systems

Sensor phenomena and characterization
BT: Sensors

Sensor placement
BT: Sensors

Sensor systems
BT: Aerospace and electronic systems
Sensor systems and applications
RT: Navigation
NT: Activity recognition
Gunshot detection systems

Sensor systems and applications
BT: Sensors
NT: Detectors
Electric sensing devices
Leak detection
Radiofrequency identification
Robot sensing systems
Sensor arrays
Sensor systems

Sensorless control
BT: Control systems
RT: AC machines
DC machines
Drives
Induction motors
Inductive power transmission
Motor drives
Motors

Sensors
UF: Sun sensors
RT: Capacitive transducers
Magnetostrictive devices
Odometry
Wireless sensor networks
NT: Acoustic sensors
Chemical and biological sensors
Electromechanical sensors
Force sensors
Glucose sensors
Inertial sensors
Infrared sensors
Intelligent sensors
Intracranial pressure sensors
Ionizing radiation sensors
Magnetic sensors
Mechanical sensors
Multimodal sensors
Nanosensors
Optical sensors
Optoelectronic and photonic sensors
Pressure sensors
Quantum sensing
Sensor phenomena and characterization
Sensor placement
Sensor systems and applications
Soft sensors
Thermal sensors
Thick film sensors
Thin film sensors
Vision sensors
Wearable sensors

Sensory aids
BT: Medical services
RT: Assistive technologies
Biomedical equipment
Orthotics
Prosthetics
NT: Hearing aids

Sentiment analysis
UF: Opinion mining
BT: Computational linguistics
Natural language processing
RT: Anxiety disorders
Emotion recognition
Information analysis

Separation processes
BT: Materials science and technology

NT: Electrophoresis
   Fractionation
   Particle separators

Sepsis
 BT: Medical conditions
 RT: Immune system

Sequences
 UF: Digital sequences
   Sequence analysis
 BT: Mathematics
 RT: Codes
 NT: Binary sequences
   Random sequences

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

Serious games
 BT: Games
   Simulation

Serverless computing
 BT: Cloud computing
   Resource management
   Servers

Servers
 BT: Client-server systems
 RT: Network function virtualization
 NT: Serverless computing
   Web servers

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 level agreements
 UF: SLA
 BT: Contracts
   Service computing
 RT: Internet
   Quality of service

Service robots
 BT: Robots
 RT: Home automation
   Manipulators
   Mobile robots
   Wearable robots
 NT: Assistive robots

Service-oriented architecture
 UF: SOA
   Service oriented architecture
   Service-oriented architectures
 BT: Web services
 RT: Service computing
   Service-oriented systems engineering
 NT: Microservice architectures

Service-oriented systems engineering
 UF: SOSE
 BT: Systems engineering and theory
 RT: Formal specifications
   Service computing
   Service-oriented architecture
   Software engineering

Servomechanisms
 BT: Servomotors
 RT: Actuators
   Manipulators

Servomotors
 UF: Servos
 BT: Motors
   Rotating machines
   Servosystems
 NT: Servomechanisms

Servosystems
UF:	Servo control
	Servo-control
BT:	Control equipment
RT:	Actuators
	Manipulators
	Motion control
	Motor drives
	Position control
	Robots
	Velocity control
NT:	Servomotors

Set theory
BT:	Algebra
	Mathematics
RT:	Boolean algebra
	Maximum likelihood estimation
NT:	Fuzzy set theory
	Fuzzy sets
	Rough sets

Sewage treatment
BT:	Waste handling
RT:	Pollution
	Pollution control
	Sanitary engineering
	Sludge treatment
	Water pollution

SGML
UF:	Standard Generalized Markup Language
BT:	Markup languages

Shadow mapping
UF:	Projective shadowing
	Shadowing
BT:	Computer graphics
RT:	Three-dimensional displays

Shafts
BT:	Machine components
	Production
RT:	Couplings
	Gears
	Machine tool spindles
	Mechanical power transmission
	Mechanical splines
	Pistons
	Propellers
	Torque converters
NT:	Camshafts

Shape
BT:	Graphics
RT:	Geometry
	Pattern recognition
	Shape control
	Shape measurement

Shape control
BT:	Mechanical variables control
RT:	Shape

Shape measurement
BT:	Measurement
RT:	Shape

Shape memory alloys
BT:	Alloying
RT:	Actuators

Sharding
BT:	Database systems
	Distributed processing

Share prices
BT:	Economic indicators

Shared transport
UF:	Bicycle sharing
	Bike sharing
	Car pools
	Car sharing
	Carpools
	Cycle sharing
	Microtransit
	Ridesharing
	Shared mobility
	Vanpools
BT:	Sharing economy
	Transportation
RT:	Mobility as a service

Sharing economy
BT:	Economics
NT:	Shared transport

Shear testing
BT:	Stress
	Testing
RT:	Failure analysis
	Shearing

Shearing
BT:	Materials processing

RT: Shear testing
Sheet metal processing

Sheet materials
BT: Materials
Structural shapes
RT: Sandwich structures
Sheet metal processing
Structural panels
Thin wall structures

Sheet metal processing
BT: Manufacturing systems
RT: Blanking
Embossing
Punching
Shearing
Sheet materials

Shift registers
BT: Registers
RT: Logic circuits
NT: Linear feedback shift registers

Shingled magnetic recording
BT: Magnetic recording

Shipbuilding industry
UF: Boat building industry
BT: Manufacturing industries
RT: Construction industry

Shock (mechanics)
BT: Mechanical factors
NT: Thermal shock

Shock absorbers
UF: Dampers
BT: Suspensions (mechanical systems)
RT: Automotive components
Damping
Springs
Vibration control

Shock waves
BT: Waves
RT: Aerodynamics
Seismic waves

Short-circuit currents
UF: Short circuit currents
BT: Current

RT: Molded case circuit breakers

Shortest path problem
UF: Shortest-path-problem
BT: Graph theory
RT: Traveling salesman problems

Shoulder
BT: Extremities
NT: Axilla

Shunts (electrical)
BT: Electric current control
Photovoltaic effects

Side-channel attacks
UF: Side channel attacks
BT: Cryptography

Sieving
BT: Materials handling
RT: Filtration
NT: Molecular sieves

Sigma-delta modulation
UF: Delta sigma
Sigma delta
BT: Delta modulation

Sign language
BT: Gesture recognition
RT: Assistive technologies
Deafness
Semantics

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
NT: Discrete-event systems
Harmonic analysis
Parameter estimation
Signal mapping

JULY 2023 IEEE Thesaurus

	Sound recognition		Correlators
	Spectral analysis		Data processing
			Decoding
Signal denoising			Deconvolution
UF:	Signal de-noising		Digital signal processors
BT:	Signal reconstruction		Discrete Fourier transforms
RT:	Signal resolution		Empirical mode
	Signal restoration	decomposition	
	Signal to noise ratio		Encoding
			Estimation
Signal design			Estimation theory
BT:	Signal processing		Feature extraction
			Fourier series
Signal detection			Gaussian noise
UF:	Detection (signal)		Independent component
BT:	Signal processing	analysis	
RT:	Blind source separation		Matrix decomposition
	Channel estimation		Pattern clustering
	Correlators		Prediction methods
	Decision making		Random processes
	Demodulation		Rate distortion theory
	Pattern clustering		Stability analysis
	Receivers		Structure from motion
	Signal resolution		Synapses
	Source separation		System-on-chip
	Time of arrival estimation		Transforms
NT:	Acoustic signal detection		Transversal filters
	Motion detection		Vectors
	Multiuser detection		Wavelet transforms
	Optical signal detection	NT:	Acoustic signal processing
	Phase detection		Adaptive signal processing
	Radar detection		Amplifiers
			Array signal processing
Signal generators			Attenuators
UF:	Function generators		Chirp
	Waveform generators		Convolution
BT:	Signal processing		Decorrelation
NT:	Noise generators		Digital signal processing
	Pulse generation		Dispersion
			Distortion
Signal integrity			Error correction
BT:	Signal processing		Fading channels
			Filters
Signal mapping			Frequency locked loops
BT:	Signal analysis		Geophysical signal
		processing	
Signal processing			Limiting
UF:	Vibrational signal		Local field potentials
processing			Modulation
RT:	Analog processing circuits		Multidimensional signal
	Antennas and propagation	processing	
	Band-pass filters		Noise
	Bandwidth		Optical signal processing
	Biomedical computing		Optical wavelength
	Bit rate	conversion	

JULY 2023 IEEE Thesaurus

Phase locked loops
Pulse compression

methods

Pulse shaping methods
Quantization (signal)
RF signals
Radar signal processing
Received signal strength

indicator

Recording
Signal analysis
Signal design
Signal detection
Signal generators
Signal integrity
Signal reconstruction
Signal resolution
Signal restoration
Signal sampling
Signal synthesis
Source separation
Spectrogram
Tracking loops

Signal processing algorithms
BT: Algorithms

Signal reconstruction
BT: Signal processing
RT: Inverse problems
    Signal sampling
    Signal to noise ratio
NT: Signal denoising

Signal representation
BT: Modeling
RT: Approximation methods
    Wavelet transforms

Signal resolution
UF: Signal decomposition
BT: Signal processing
RT: Array signal processing
    Signal analysis
    Signal denoising
    Signal detection
    Spectral analysis
NT: Diversity reception

Signal restoration
BT: Signal processing
RT: Deconvolution
    Distortion
    Signal denoising

Signal sampling
BT: Signal processing
RT: Quantization (signal)
    Sampling methods
    Signal reconstruction

Signal synthesis
BT: Signal processing
RT: Speech synthesis

Signal to noise ratio
UF: S/N
    SNR
    Signal-to-noise ratio
    Signal-to-noise-ratio
BT: Noise
RT: Filters
    Noise figure
    RAKE receivers
    Signal denoising
    Signal reconstruction
NT: PSNR

Silicidation
BT: Semiconductor device manufacture

Silicides
BT: Silicon compounds

Silicon
UF: Si
    Silicon materials
    Siliconization
BT: Semiconductor materials
RT: Amorphous semiconductors
    Elemental semiconductors
    Epitaxial growth
    Semiconductor thin films
    Silicon devices
    Silicon germanium
    Silicon-on-insulator
NT: Amorphous silicon
    Porous silicon
    Silicon alloys
    Silicon photonics

Silicon alloys
BT: Silicon
RT: Alloying
NT: Germanium silicon alloys

Silicon carbide
UF: SiC
BT: Silicon compounds

Silicon compiler
> BT: Computer aided manufacturing
> RT: Integrated circuit manufacture

Silicon compounds
> UF: Silica
> Silicon dioxide
> BT: Compounds
> RT: Semiconductor materials
> NT: Silicides
> Silicon carbide
> Silicon nitride

Silicon devices
> BT: Semiconductor devices
> RT: Doping
> Photonics
> Silicon

Silicon germanium
> UF: SiGe
> BT: Semiconductor materials
> RT: Germanium
> Silicon
> Silicon-on-insulator
> Substrates
> Transistors

Silicon nitride
> BT: Nitrogen
> Silicon compounds

Silicon on sapphire
> UF: Silicon-on-sapphire
> BT: CMOS technology
> Silicon-on-insulator
> RT: Substrates

Silicon photonics
> BT: Photonics
> Silicon
> RT: Optical fiber communication

Silicon radiation detectors
> BT: Radiation detectors
> RT: Ionizing radiation

Silicon-on-insulator
> UF: SOI
> SOS (silicon on sapphire)
> Silicon on insulator
> Silicon on insulator technology

Silicon-on-insulator technology
> BT: Circuits
> RT: Double-gate FETs
> Integrated circuits
> Interface states
> Junctionless nanowire transistors
> Proton radiation effects
> Semiconductor devices
> Semiconductor-insulator interfaces
> Silicon
> Silicon germanium
> Thin film circuits
> NT: Silicon on sapphire

Silver
> UF: Ag
> BT: Metals

SIMO communication
> UF: Single input multiple output systems
> BT: Communication systems
> RT: Antenna arrays
> Diversity reception
> Feedback
> MIMO communication
> MISO communication
> Optical materials
> Radio communication
> SISO communication

Simple object access protocol
> UF: SOAP
> BT: Web services

Simulated annealing
> BT: Mathematics
> Optimization methods
> RT: Annealing
> Metaheuristics
> Monte Carlo methods
> Relaxation methods

Simulation
> UF: Simulation results
> BT: Modeling
> 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

Simultaneous localization and mapping
UF: SLAM
BT: Robot sensing systems

Simultaneous wireless information and power transfer
UF: SWIPT
BT: Data transfer
Power distribution
Wireless power transfer
RT: Internet of Things
Low-power electronics

Single electron devices
BT: Circuits and systems
Electron devices
RT: Nanoscale devices
Nanotechnology
Resonant tunneling devices
NT: Single electron memory
Single electron transistors

Single electron memory
BT: Single electron devices
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 machine scheduling
BT: Scheduling
RT: Optimization methods

Single photon emission computed tomography
UF: SPECT
BT: Computed tomography
RT: Cancer
Collimators
Phantoms
Tumors

Single-photon avalanche diodes
UF: SPAD
single photon avalanche diodes
BT: Avalanche photodiodes

Singular value decomposition
BT: Matrices

Sintering
UF: Frittage
BT: Manufacturing processes
NT: Spark Plasma sintering

SISO communication
UF: Single input single output systems
BT: Communication systems
RT: Antenna arrays
Diversity reception
MIMO communication
MISO communication
Radio communication
SIMO communication
Transmitters

Six sigma
BT: Total quality management
RT: Quality assurance
Quality control

Size control
BT: Mechanical variables control
RT: Thickness control

Size measurement
BT: Measurement
RT: Area measurement
Length measurement
Thickness measurement
Volume measurement

NT: Functional point analysis

Skeleton
BT: Musculoskeletal system
NT: Bones
Joints
Spine
Thorax

Skin
BT: Integumentary system
NT: Dermis
Epidermis
Sebaceous glands
Sweat glands

Skin cancer
BT: Cancer
NT: Basal cell carcinoma
Melanoma
Squamous cell carcinoma

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

Slabs
BT: Structural shapes

Slag
BT: Industrial waste
RT: Fly ash
Waste disposal
Waste management

Sleep
BT: Brain
NT: Rapid eye movement sleep
Sleep apnea

Sleep apnea
UF: Sleep apnoea

Snore activity
Snore signals
Snoring
BT: Medical conditions
Sleep

Sliding mode control
UF: Sliding-mode control
BT: Control systems

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

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 satellites
UF: Microsatellites
Miniaturized satellites
Nanosatellites
Smallsats
BT: Satellites
NT: CubeSat

SMAP mission
UF: Soil Moisture Active Passive mission
BT: Soil moisture

JULY 2023 IEEE Thesaurus

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

Smart buildings
BT: Buildings

Smart cameras
BT: Cameras
        Computer vision

Smart cards
BT: User interfaces
RT: Access control
        Data processing

Smart charging
BT: Electric vehicle charging
        Smart devices

Smart cities
BT: Intelligent structures
        Urban areas
RT: Buildings
        Construction industry
        Cyber-physical systems
        Energy informatics

Smart contracts
BT: Contracts
        Protocols
RT: Decentralized applications

Smart devices
BT: Electronic equipment
        Wireless communication
RT: Fourth Industrial Revolution
        Personal voice assistants
        Physical unclonable
function
        Smart healthcare
        Smart manufacturing
        Tactile Internet
        Virtual assistants
        Wearable Health Monitoring
Systems
NT: Smart charging
        Smart glasses

Smart lighting

Smart glasses
UF: Smartglasses
BT: Smart devices
        Wearable computers

Smart grids
UF: Smart microgrids
        Smart power grids
BT: Power grids
RT: Cyber-physical systems
        Energy Internet
        Energy informatics
        Microgrids
        Power distribution networks
        Smart meters
        Transactive energy
NT: Vehicle-to-grid

Smart healthcare
UF: Smart health
        Smart medical services
BT: Medical services
RT: Electronic healthcare
        Internet of Medical Things
        Point of care
        Smart devices
NT: Wearable Health Monitoring
Systems

Smart homes
BT: Buildings
        Home automation

Smart lighting
BT: Lighting
        Smart devices

Smart manufacturing
UF: Smart factories
BT: Manufacturing
RT: Fourth Industrial Revolution
        Intelligent manufacturing
systems
        Smart devices
        Smart materials

Smart materials
UF: Shape memory material
        Shape memory technology
BT: Materials
RT: Austenite
        Azobenzene
        Dielectric elastomers

	Intelligent materials	
	Martensite	
	Metamaterials	
	Polycaprolactone	
	Smart manufacturing	
	Smart transportation	
	Thermomechanical processes	
	NT:	Biomimetic materials
		Smart textiles

Smart meters
- BT: Meter reading
- RT: Automatic meter reading
- 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 textiles
- UF: Electronic textiles
- Smart clothing
- Smart fabrics
- Smart garments
- BT: Smart materials
- RT: Wearable computers
- NT: Textile antennas

Smart transportation
- BT: Transportation
- RT: Automated highways
- Intelligent transportation systems
- Intelligent vehicles
- Smart materials

Smart TV
- BT: TV
- RT: Internet

Smelting
- BT: Materials processing
- RT: Blast furnaces

Heat treatment
Melt processing
Metals industry
Refining

Smoke detectors
- BT: Alarm systems
- RT: Domestic safety
- Fires
- Ionization chambers
- Safety devices
- Zigbee

Smoothing methods
- BT: Mathematics

SMOS mission
- UF: Soil moisture and ocean salinity
- Soil moisture and ocean salinity mission
- BT: Ocean salinity
- Soil moisture

SMPTE
- UF: Society of Motion Picture and Television Engineers
- BT: Standards organizations

SMPTE Standards
- BT: Standards publications

Snake robots
- UF: Snake bots
- Snakebots
- BT: Robots

Snow
- BT: Precipitation
- RT: Ice

Snubbers
- BT: Power electronics

Social computing
- BT: Federated learning
- Internet
- RT: Behavioral sciences
- Community networks
- Crowdsourcing
- Social computing
- Social networking (online)
- NT: Cyberbullying
- Persuasive systems
- Social Internet of Things

Social intelligence

Social engineering (security)
- BT: Information security
- RT: Human factors
  - Psychology
  - Social factors

Social factors
- BT: Social implications of technology
- RT: Bio-inspired computing
  - Digital divide
  - Digital humans
  - Food security
  - Governmental factors
  - International collaboration
  - International relations
  - Philosophical considerations
  - Social Internet of Things
  - Social engineering (security)
  - Social intelligence
  - Technology planning
- NT: Demography
  - Developing countries
  - Technology social factors

Social groups
- BT: Sociology
- NT: Millennials
  - Older adults

Social implications of technology
- UF: Orange technology
- RT: Cyberbullying
  - Cyberethics
  - Digital divide
  - Social robots
  - Technology acceptance model
- NT: Cultural aspects
  - Cultural differences
  - Environmental factors
  - Ethical aspects
  - Ethics
  - Globalization
  - International relations
  - Peace technology
  - Philosophical considerations
  - Social factors
  - Sustainable development
  - Technology

Social intelligence
- BT: Behavioral sciences
  - Social computing
  - Sociology
- RT: Cultural differences
  - Digital intelligence
  - Social factors

Social Internet of Things
- UF: SocialNet of Things
  - siot
- BT: Internet of Things
  - Social computing
- RT: Behavioral sciences
  - Collaboration
  - Social factors
  - Social networking (online)

Social network theory
- BT: Sociotechnical systems
- RT: Complex networks
  - Social networking (online)

Social networking (online)
- UF: Facebook
  - Linkedin
  - Myspace
  - Online social networks
  - Reddit
  - Social media
  - Social networking
  - Social networking services
  - Social networks
  - Social-networks
  - Twitter
  - WeChat
- BT: Information retrieval
- RT: Blogs
  - Crowdsourcing
  - Electronic mail
  - Internet
  - Journalism
  - Social Internet of Things
  - Social computing
  - Social network theory
  - Web sites
- NT: Community networks
  - Computer mediated communication
  - Cyberbullying
  - Second Life

Social robots
- BT: Human-robot interaction
  - Robots

RT:	Assistive robots
	Assistive technologies
	Educational robots
	Emotion recognition
	Humanoid robots
	Mobile robots
	Natural language processing
	Social implications of technology

Social sciences
BT:	Humanities
	Science - general
RT:	Complex networks
	Graph drawing
	Network theory (graphs)
NT:	Anthropology
	Behavioral sciences
	Psychology
	Sociology

Sociology
BT:	Social sciences
RT:	Collective intelligence
NT:	Digital divide
	Social groups
	Social intelligence

Sociotechnical systems
UF:	Socio-technical systems
BT:	Organizations
NT:	Smart spaces
	Social network theory

Sockets
BT:	Connectors

Sodium
BT:	Chemical elements

Soft electronics
BT:	Electronic equipment
RT:	Flexible electronics
	Inorganic materials
	Wearable computers

Soft lithography
UF:	Microcontact printing
	Replica molding
	Replica moulding
BT:	Lithography
RT:	Nanolithography
	Nanopatterning

Soft magnetic materials
BT:	Magnetic materials

Soft robotics
UF:	Soft robots
BT:	Robots
RT:	Assistive robots
	Biomimetics
	Flexible structures
	Grippers
	Medical robotics
	Mobile robots
	Wearable robots

Soft sensors
UF:	Data sources
	Soft sensing
	Software sensors
	Virtual sensing
	Virtual sensors
BT:	Sensors
	Software
RT:	Fuzzy systems
	Intelligent sensors
	Kalman filters
	Learning (artificial intelligence)
	Neural networks
	Process control
	Process monitoring

Soft switching
UF:	Soft switch
	Softswitch
BT:	Telecommunication computing
RT:	Routing

Softening
UF:	Softening (metallurgical)
BT:	Materials processing
RT:	Annealing

Software
UF:	Computer software
	On-demand software
BT:	Computers and information processing
RT:	Algorithms
	Computer languages
	Computer science
	Courseware
	Documentation
	Enterprise resource planning

Firewalls (computing)
Geospatial analysis
Microprogramming
Programming
Software engineering
Software protection
Software standards
NT: Anti-virus software
Application software
Closed box
Embedded software
Freeware
Glass box
Malware
Middleware
Open source software
Optical character
recognition
Privacy-invasive software
Public domain software
Soft sensors
Software agents
Software as a service
Software debugging
Software maintenance
Software packages
Software performance
Software quality
Software reusability
Software safety
Software systems
Software tools
System software

Software agents
BT: Software
RT: Artificial intelligence
Computer applications
Distributed computing
Intelligent systems
Knowledge based systems
Learning systems
Mobile agents
NT: Agent-based modeling
Autonomous agents
Botnet
Intelligent agents

Software algorithms
BT: Algorithms

Software architecture
BT: Software engineering
RT: Distributed computing
NT: Client-server systems

Deep architecture
Dew computing
Microarchitecture
Representational state
transfer
Restful API

Software as a service
UF: On demand software
On-demand software
SaaS
Software-as-a-service
BT: Software
RT: Cloud computing
Information processing

Software debugging
BT: Software
RT: Programming
Programming environments
NT: Software design

Software defined networking
UF: SDN
Software defined networks
Software-defined
networking
BT: Computer networks
RT: Application programming
interfaces
Cloud computing
Computer network
management
Distributed processing
Intelligent networks
Mobile computing
Network function
virtualization
Network operating systems
Operating systems
Protocols
Virtual machining
Virtualization
NT: Service function chaining
Virtual LAN

Software design
BT: Software debugging
RT: Web design
NT: Model driven engineering
Usability

Software development management
UF: Github
BT: Engineering management

       RT: Release engineering
               Scrum (Software development)
               Software product lines
       NT: Agile project management
               Agile software development
               Model-driven development

Software engineering
       BT: Computers and information processing
       RT: Code refractoring
               Functional point analysis
               Rapid prototyping
               Requirements engineering
               Service-oriented systems engineering
               Software
               Static analysis
               Systems Modeling Language
               Visual BASIC
       NT: Capability maturity model
               Computer aided software engineering
               Formal verification
               Full stack
               Programming environments
               Release engineering
               Runtime
               Software architecture
               Software libraries
               Software product lines

Software libraries
       BT: Libraries
               Software engineering
       RT: Algorithms
               Matlab
               Object oriented programming
               Python
               Software reusability

Software maintenance
       BT: Software
       RT: Software product lines

Software measurement
       BT: Measurement

Software packages
       BT: Software
       RT: Computer applications

               Power system analysis computing
       NT: EMTDC
               PSCAD
               SPICE

Software performance
       BT: Software
       RT: Algorithmic efficiency
               Capability maturity model

Software product lines
       BT: Product development
               Software engineering
       RT: Software development management
               Software maintenance

Software protection
       BT: Copyright protection
               Legal factors
       RT: Digital rights management
               Intellectual property
               Software

Software prototyping
       BT: System analysis and design

Software quality
       BT: Software
       RT: Algorithmic efficiency

Software radio
       UF: Reconfigurable radio
               Software defined radio
               Software-defined radio
       BT: Mobile communication
               Radio communication
       RT: Cellular radio
               Code division multiplexing
               Land mobile radio
               Telecommunication computing
               Transceivers

Software reliability
       BT: Reliability

Software reusability
       UF: Software reuse
       BT: Software
       RT: Capability maturity model
               Object oriented programming

Software libraries

Software reviews
BT: IEEE indexing

Software safety
BT: Software
RT: Product safety engineering

Software standards
BT: Standards categories
RT: ISO
ISO Standards
Software

Software systems
BT: Software

Software testing
BT: Testing
RT: Closed box
Glass box
NT: Combinatorial testing
Fuzzing

Software tools
BT: Software
RT: Computer aided software engineering
Programming
Programming environments
Visual BASIC
NT: Authoring systems

Soil
BT: Geoscience
RT: Earth
Excavation
Sediments
Seeds (agriculture)
Soil measurements
Soil pollution
NT: Soil moisture
Soil properties
Soil texture

Soil measurements
BT: Measurement
RT: Geophysical measurements
Moisture measurement
Remote sensing
Soil
NT: Salinity (geophysical)

Soil moisture
BT: Soil
NT: SMAP mission
SMOS mission

Soil pollution
BT: Land pollution
RT: Agriculture
Pesticides
Soil

Soil properties
BT: Soil

Soil texture
BT: Soil

Solar cooling
BT: Cooling

Solar eclipses
BT: Sun

Solar energy
BT: Energy resources
RT: Maximum power point trackers
Solar heating
Solar power generation
Solar radiation

Solar heating
BT: Energy conversion
Heating systems
RT: Phase change materials
Solar energy
Space heating

Solar panels
BT: Photovoltaic systems
Solar power generation
RT: Building materials
Building services
Photovoltaic cells
Renewable energy sources

Solar power generation
UF: Solar generation
BT: Power generation
RT: Building integrated photovoltaics
Solar energy
Solar powered vehicles
NT: Maximum power point trackers

Photovoltaic systems
Solar panels

Solar powered vehicles
BT: Electric vehicles
RT: Battery powered vehicles
Energy storage
Solar power generation
Traction motors
Vehicle-to-grid

Solar radiation
BT: Extraterrestrial phenomena
RT: Solar energy
Space radiation

Solar system
BT: Astronomy
NT: Kuiper belt
Planets
Satellites
Sun

Soldering
UF: Solder joints
BT: Assembly
Fabrication
Joining processes
RT: Bonding processes
Manufacturing
Materials processing
Soldering equipment
NT: Brazing
Flip chip solder joints
Reflow soldering

Soldering equipment
UF: Soldering irons
BT: Production equipment
RT: Joining materials
Joining processes
Soldering

Solenoids
BT: Magnetic devices
RT: Switches
Transducers

Solid lasers
UF: Color center lasers
Solid state lasers
Solid-state lasers
BT: Lasers

RT: Thermal lensing
Thermooptical devices
NT: Microchip lasers
Quantum well lasers
Semiconductor lasers
Surface emitting lasers

Solid modeling
BT: Modeling
RT: Digital twins
Solid-state physics
Virtual reality

Solid scintillation detectors
BT: Scintillation counters
RT: Energy resolution
Medical diagnostic imaging
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

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
UF: Solid-state drives
BT: Digital storage
RT: DRAM chips
Flash memories
Integrated memory circuits
Solid state circuits

Solid state lighting
UF: Solid-state lighting
BT: Lighting

Solid-state physics
BT: Physics
RT: Materials science and
technology

Quantum mechanics
Solid modeling

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

Solvation
BT: Chemical reactions
RT: Hydrolysis

Solvents
BT: Chemical processes
RT: Methanol

Soma
UF: Somata
BT: Neurons
RT: Brain

Somatosensory
BT: Physiology
RT: Multisensory integration
           Sense organs

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

Sonar detection
BT: Acoustic signal detection
           Sonar applications
RT: Reflectivity

Sonar equipment
UF: Hydrophones
BT: Sonar

Sonar measurements
BT: Sonar applications
RT: Remote sensing
           Sea measurements

Sonar navigation
BT: Navigation
RT: Sonar applications

SONET
UF: Synchronous optical
network
BT: Communication standards
           Digital communication
           ETSI Standards
           Optical fiber communication
RT: Asynchronous transfer
mode
           Synchronous digital
hierarchy
           Transport protocols

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

Sound recognition
BT: Pattern recognition
           Signal analysis

Source coding
BT: Data compression
           Encoding

		Information theory
RT:		Rate distortion theory
		Release engineering

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 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

Space division multiplexing
UF:	Space-division multiplexing
	Spatial division multiplexing
	Spatial multiplexing
BT:	Multiplexing

Space exploration
UF:	Space travel
BT:	Space technology
RT:	NASA
NT:	Interplanetary exploration
	Space missions

Space heating
BT:	Heating systems
RT:	Building services
	District heating
	Gas appliances
	Solar heating
	Temperature control
	Vents

Space mapping
| BT: | Design optimization |
| | Modeling |

Space missions
BT:	Space exploration
RT:	Interplanetary exploration
	NASA

Space power stations
UF:	Power stations (space)
BT:	Space stations
RT:	Power generation

Space radiation
BT:	Radiation effects
RT:	Ionization
	Solar radiation

Space shuttles
| BT: | Space vehicles |
| RT: | Aerospace safety |

Space stations
BT:	Artificial satellites
NT:	International Space Station
	Space power stations

Space technology
UF:	Space habitats
BT:	Aerospace engineering
RT:	Artificial satellites
	Extraterrestrial phenomena
	Field programmable analog arrays
	NASA
	Space vehicles
NT:	Payloads
	Space debris
	Space exploration

Space vector pulse width modulation
| UF: | SVPWM |
| BT: | Pulse width modulation |

Page 420

RT: AC motors
Converters
DC motors

Space vehicles
UF: Planetary landers
Space vehicle navigation
BT: Vehicles
RT: Aerospace accidents
Aerospace control
Aerospace electronics
Aerospace materials
Aerospace safety
Artificial satellites
Ground support
Hypersonic vehicles
Proton effects
Space technology
NT: Space shuttles

Space-air-ground integrated networks
UF: SAGIN
BT: 6G mobile communication
RT: Satellite communication

Space-time codes
BT: Codes
RT: Channel coding
Decoding

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

Spark gaps
BT: Electromagnetic analysis
RT: Air gaps
Electrodes
Insulation
Sparks
Switches

Spark Plasma sintering
UF: Field assisted sintering
Plasma pressure compaction
Pulsed electric current sintering

BT: Plasma materials processing
Sintering
RT: Powders

Sparks
BT: Electric breakdown
RT: Spark gaps

Sparse matrices
UF: Sparse matrix
BT: Numerical analysis

Spatial audio
UF: Surround sound
BT: Audio systems

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

Spatial temporal resolution
UF: Spatial-temporal resolution
Spatio temporal resolution
BT: Spatiotemporal phenomena

Spatiotemporal phenomena
UF: Spatio-temporal phenomena
BT: Chaos

RT:	Nonlinear dynamical systems	
	Pattern formation	
	Pattern matching	
	Pattern recognition	
NT:	Spatial temporal resolution	

Speaker recognition
BT: Identification of persons
RT: Biometrics (access control)
Speech
Speech recognition
Viterbi algorithm

Special issues and sections
UF: Special issues
Special sections
BT: IEEE indexing

Specific absorption rate
UF: SAR
BT: Electromagnetic interference

Specification languages
BT: Computer languages
NT: Domain specific languages
Unified modeling language

Speckle
BT: Optical noise
RT: Optical interferometry
Optical scattering

Spectral analysis
UF: Power spectra
Spectral domain
Spectral-domain
Spectrum analysis
Spectrum estimation
BT: Signal analysis
RT: Direction-of-arrival estimation
Estimation
Frequency estimation
Harmonic analysis
Parameter estimation
Prediction methods
Signal resolution
Spectroscopy
Speech analysis
Time series analysis
Transforms
NT: Infrared spectra
Judd-Ofelt theory

Spectroradiometers

Spectral efficiency
UF: Bandwidth efficiency
BT: Channel allocation
Measurement
RT: Bandwidth
Information processing

Spectral shape
BT: Acoustics

Spectrogram
UF: Spectral waterfall
Voice print
Voicegram
Voiceprint
BT: Signal processing
RT: Sonogram

Spectroradiometers
BT: Radiometers
Spectral analysis
NT: MODIS

Spectroscopy
UF: Spectrometry
BT: Measurement
RT: Atomic measurements
Bandwidth
Fourier series
Infrared spectra
Nuclear measurements
Radiation detectors
Solid scintillation detectors
Spectral analysis
Thermoreflectance imaging
NT: Deep level transient spectroscopy
Diffuse reflectance spectroscopy
Electrochemical impedance spectroscopy
Electron paramagnetic resonance
Fourier transform infrared spectroscopy
Functional near-infrared spectroscopy
Kirchhoff's Law
MERIS
Mass spectroscopy
Neutron spin echo
Photoacoustic effects

Resonance light scattering

Speech
- BT: Oral communication
- RT: Speaker recognition
- NT: Hate speech

Speech analysis
- BT: Speech recognition
- RT: Cepstral analysis
  Frequency estimation
  Signal analysis
  Spectral analysis
  Speech coding
  Speech synthesis

Speech codecs
- BT: Codecs
  Communication equipment
- RT: Decoding
  Speech coding
  Vocoders

Speech coding
- BT: Encoding
  Information theory
- RT: Audio coding
  Rate distortion theory
  Speech analysis
  Speech codecs
  Vector quantization
  Vocoders
  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
- UF: Voice recognition
- BT: Identification of persons

Pattern recognition
- RT: Cepstral analysis
  Emotion recognition
  Feature extraction
  Speaker recognition
  Speech enhancement
  Voice activity detection
- NT: Automatic speech recognition
  Personal voice assistants
  Speech analysis

Speech synthesis
- UF: Synthetic speech
  Voice response systems
- BT: Speech processing
- RT: Biomedical equipment
  Personal voice assistants
  Signal synthesis
  Speech analysis
  Voice activity detection
- NT: Chatbots

SPICE
- UF: Simulation Program with Integrated Circuit Emphasis
  pSPICE
- BT: Software packages
- RT: Circuit analysis
  Design automation
  Integrated circuits

Spin polarized transport
- UF: Spin injection
  Spin polarised transport
- BT: Magnetoelectronics
- RT: Magnetic tunneling
  Magnetoresistance

Spin systems
- BT: Magnetics

Spin valves
- BT: Magnetic sensors
- RT: Hysteresis

Spinal cord
- BT: Nervous system
- NT: Cerebrospinal fluid
  Spinal cord injury

Spinal cord injury
- UF: Spinal cord injuries
- BT: Spinal cord
- RT: Neurological diseases

Spine
BT:	Nervous system	
	Skeleton	
NT:	Scoliosis	

Spinning
BT:	Textile technology	
RT:	Spinning machines	
	Textile fibers	

Spinning machines
BT:	Textile machinery	
RT:	Paper making	
	Paper making machines	
	Paper mills	
	Pulp and paper industry	
	Spinning	
	Textile industry	
	Textiles	

Spintronics
UF:	Fluxtronics	
	Spin electronics	
	Spinelectronics	
BT:	Magnetoelectric effects	

Spirals
BT:	Mathematics	

Spirometry
BT:	Biomedical measurement	
	Pulmonology	
RT:	Lung	
	Pulmonary diseases	

Splicing
UF:	Cable splicing	
	Fusion splicing	
BT:	Joining processes	
RT:	Optical fiber cables	
	Transmission lines	

Splines (mathematics)
UF:	B-Spline	
	Spline functions	
BT:	Numerical analysis	
RT:	Curve fitting	

Split gate flash memory cells
UF:	Split-gate flash memory cells	
BT:	Flash memory cells	

Split ring resonators
BT:	Resonators	

RT:	Electromagnetic metamaterials	
	Metamaterials	
	Microwave metamaterials	
	Optical resonators	
	Terahertz metamaterials	

Spontaneous emission
UF:	Superradiance	
BT:	Photonics	
RT:	Microcavities	
	Photonic crystals	
NT:	Radiative recombination	

Sports
UF:	Baseball	
	Football	
	Hockey	
	Soccer	
	Swimming	
	Tennis	
BT:	Entertainment industry	
RT:	Games	
	Sports equipment	

Sports equipment
BT:	Manufactured products	
RT:	Bicycles	
	Sports	

Spot welding
BT:	Welding	

Spraying
BT:	Surface finishing	
RT:	Aerosols	
	Coatings	
	Liquids	
	Particle production	
	Surface charging	
NT:	Thermal spraying	

Spread spectrum communication
UF:	Frequency hop communication	
	Frequency-hop communication	
	Multi-hop	
	Multihop	
	Pseudonoise coded communication	
BT:	Digital communication	
RT:	3G mobile communication	
	4G mobile communication	

Bluetooth
Channel estimation
Chirp modulation
Code division multiplexing
Electronic countermeasures
Electronic warfare
Multicarrier code division
multiple access
Multiuser detection
Radio communication
countermeasures
Time division synchronous
code division multiple access
Ultra wideband
communication

Spread spectrum radar
UF: Frequency hop radar
        Pseudonoise coded radar
BT: Radar
RT: Chirp modulation
        Electronic countermeasures
        Electronic warfare
        Radar countermeasures

Spreadsheet programs
UF: Microsoft Excel
BT: Data processing

Springs
BT: Mechanical products
        Production
RT: Shock absorbers
        Suspensions (mechanical
systems)
        Wires

Sprites (computer)
BT: Computer graphics
RT: Three-dimensional displays
        Two dimensional displays

Spurline
BT: Power filters
RT: Planar transmission lines
NT: Spurline components

Spurline components
BT: Spurline

Sputter etching
BT: Sputtering
RT: Cardiography

Sputtering
UF: Sputter deposition
        Thin film deposition
BT: Materials preparation
RT: Coatings
        Films
        Magnetrons
        Physical vapor deposition
NT: Sputter etching

Spyware
BT: Privacy-invasive software

SQL injection
BT: Computer crime
        Information security

Squamous cell carcinoma
BT: Skin cancer

SQUID magnetometers
BT: Magnetometers
RT: Magnetic fields

SQUIDs
UF: Superconducting quantum
interference devices
BT: Superconducting devices
RT: Readout electronics

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
        Time invariant systems
NT: Circuit stability
        Robust stability
        Stability analysis
        Thermal stability

JULY 2023 IEEE Thesaurus

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

Stakeholders
  BT: Customer relationship management
    Organizational aspects
  RT: Decision making
    Requirements engineering
    Strategic planning

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

Standards categories
  BT: Standards
  NT: Communication standards
    International Atomic Time
    Measurement standards
    Military standards
    Power and energy standards
    Software standards

Standards organizations
  BT: Standards
  NT: 3GPP
    ANSI
    ASA
    CSA Group
    ETSI
    IEC
    IEEE Standards Association
    ISO
    ITU
    NACE International
    NEMA
    NFPA
    NIST
    Open Geospatial Consortium
    SMPTE
    W3C

Standards publications
  BT: Standards
  NT: 3GPP Standards
    ANSI Standards
    ASA Standards
    CSA Group Standards
    ETSI Standards
    IEC Standards
    IEEE Standards
    ISO Standards
    ITU Standards
    NACE Standards
    NISO Standards
    NIST Standards
    SMPTE Standards
    W3C Standards

Standby generators
  UF: Emergency power generators
  BT: Generators
    Rotating machines
  RT: Emergency power supplies

Stark effect
- BT: Electo-optic effects

Stars
- BT: Astronomy
- NT: Neutron stars

STATCOM
- UF: Static compensator
- BT: Static VAr compensators

State estimation
- BT: Estimation
- RT: Control systems
- NT: Observers

State feedback
- BT: Linear feedback control systems

State of charge
- BT: Battery chargers

State-space methods
- UF: State space theory
  - State-space model
- BT: Control system analysis
- RT: Time-domain analysis

Static analysis
- UF: Static projection
  - Statis scoring
- BT: Statistical analysis
  - System analysis and design
- RT: Model checking
  - Software engineering

Static induction transistors
- BT: Transistors

Static power converters
- UF: Static converters
- BT: Converters

Static VAr compensators
- UF: SVC
- BT: Power transmission
- RT: Reactive power
- NT: STATCOM

Stationary state
- UF: Ground state
- BT: Quantum mechanics

Statistical analysis
- UF: Statistical testing
- BT: Statistics
- RT: Measurement errors
  - Nearest neighbor methods
  - Probability
  - R language
  - Random processes
  - Technology acceptance model
  - Time series analysis
- NT: Analysis of variance
  - Conditional random fields
  - Mean field theory
  - Mode matching methods
  - Monte Carlo methods
  - Parameter estimation
  - Pareto analysis
  - Predictive analytics
  - Principal component analysis
  - Regression analysis
  - Static analysis

Statistical distributions
- BT: Probability
- RT: Multi-armed bandit problem
- NT: Distribution functions
  - Gaussian distribution
  - Weibull distribution

Statistical learning
- BT: Machine learning
- RT: Decision theory
  - Pattern recognition

Statistics
- BT: Mathematics
- RT: Econometrics
  - Estimation theory
  - Extrapolation
  - Fourier transforms
  - Information theory
  - Interpolation
  - Matrix decomposition
  - Maximum likelihood detection
  - Operations research
  - Probability
  - Scheduling
  - Weibull distribution
- NT: Adaptive estimation
  - Autoregressive processes
  - Boltzmann distribution
  - Correlation

Correlation coefficient
Covariance matrices
Differential privacy
Dimensionality reduction
Ensemble learning
Gamma distribution
Gaussian mixture model
Higher order statistics
Histograms
Linear discriminant analysis
Maximum likelihood estimation

Minimax techniques
Mixture models
Nonparametric statistics
Parametric statistics
Prediction theory
Ranking (statistics)
Root mean square
Sampling methods
Statistical analysis
Surveys
Time series analysis

Stator bars
    BT: Stators

Stator cores
    BT: Stators

Stator windings
    BT: Stators

Stators
    BT: Electric machines
    NT: Stator bars
            Stator cores
            Stator windings

Steady-state
    UF: Steady state
    BT: Dynamic equilibrium
    RT: Transient analysis

Steam engines
    BT: Heat engines
    RT: Boilers
            Water

Steel
    BT: Metals
    RT: Pressure vessels
    NT: Martensite

Steel industry
    BT: Industries

Steerable antennas
    BT: Antennas
            Beam steering
            Phased arrays

Steering systems
    BT: Mechanical products
            Production systems
    RT: Advanced driver assistance systems
            Automotive components
            Wheels

Steganography
    BT: Cryptography
    RT: Image coding
            Message authentication

Steiner trees
    UF: Steiner points
            Steiner vertices
    BT: Combinatorial mathematics

Stellar dynamics
    BT: Astrophysics
    NT: Stellar motion

Stellar motion
    BT: Stellar dynamics

STEM
    UF: Science technology engineering mathematics
            science technology engineering and math
            science, technology, engineering, and math
    BT: Educational programs
    RT: Curriculum development
            Educational courses
            Engineering - general
            Mathematics
            Science - general
            Technology

Stem cells
    UF: Stem cell research
    BT: Biological cells
    RT: Cloning
            Progenitor cells

Stereo image processing
UF: Stereoscopic
BT: Stereo vision

Stereo vision
UF: Stereovision
          Three-dimensional vision
BT: Imaging
RT: Image matching
          Machine vision
          Robot vision systems
NT: Stereo image processing

Stereognosis
BT: Robot sensing systems

Stereolithography
BT: Lithography
RT: Laser applications
          Laser sintering
          Lasers
          Layered manufacturing
          Manufacturing
          Prototypes

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 processes
UF: Stochastic distribution
          Stochastic prediction
          Stochastic theory
BT: Mathematics
RT: Computational electromagnetics
          Diffusion processes
          Mean field theory
          Multi-armed bandit problem
          Particle swarm optimization
          Probability
          Q-learning
          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
          Mean field theory
          Probability
          Random variables

Stock markets
UF: Stock exchanges
BT: Economics

Stokes parameters
BT: Optical polarization

Stomach
BT: Digestive system

Stomatognathic system
UF: stomognathic system
BT: Anatomy
RT: Faces
          Lips
          Mouth
          Pharynx
          Tongue
NT: Masticatory muscles
          Salivary glands

Storage area networks
UF: SAN
BT: Computer networks
RT: Buffer storage
          Local area networks

Storage automation
UF: Automated storage and retrieval systems
BT: Automation
          Material storage
RT: Warehousing

Storage management
BT: Capacity planning
          Management
RT: Memory management

NT:	Digital storage	

Storage rings
BT: Particle accelerators
RT: Ions
Muon colliders
Particle beams

Storms
BT: Meteorology
RT: Lightning
Monsoons
Stormwater
NT: Geomagnetic storms

Stormwater
UF: Storm water
BT: Hydrology
Water resources
RT: Disaster management
Emergency services
Floods
Rain
Rivers
Storms

Strain
BT: Mechanical factors
RT: Elasticity
Elongation
Strain control
Strain measurement
NT: Tensile strain
Uniaxial strain

Strain control
UF: Friction stir processing
BT: Mechanical variables control
RT: Strain

Strain measurement
UF: Strain gauges
BT: Mechanical variables measurement
RT: Micrometers
Strain

Strategic planning
BT: Planning
RT: Analytic hierarchy process
Business intelligence
Decision making
Information systems

Stakeholders
NT: Roadmaps (technology planning)

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 communication
Unicast
Video coding
Video signal processing
NT: Mobile video
Over-the-top media services
Video on demand

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
Shear testing
Tensile stress
Wind stress

Stress control
BT: Mechanical variables control
RT: Stress
Surface stress

Stress measurement
BT: Mechanical variables measurement

RT: Stress

String theory
    BT: Physics
    RT: Quantum mechanics

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
    RT: Architecture
             Bridges
             Building information
management
             Construction

             Flexible structures
             Floods
             Intelligent structures
             Mechanical factors
    NT: Offshore installations

Structural panels
    UF: Railway bridges
             Road bridges
             Suspension bridges
    BT: Structural shapes
    RT: Honeycomb structures
             Sandwich structures
             Sheet materials
             Structural plates
             Thin wall structures

Structural plates
    BT: Electronic components
             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
             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

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 experiments
- BT: Engineering education
- RT: Laboratories

Style sheet languages
- BT: Computer languages
- NT: Cascading style sheets

Subcontracting
- BT: Contracts

Submillimeter wave circuits
- BT: Circuits
  Submillimeter wave technology
- RT: Analog circuits
  Submillimeter wave devices
  Submillimeter wave filters
- 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
  Terahertz wave absorption

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 technology
- BT: Microwave theory and techniques
- RT: Submillimeter wave measurements
- NT: Submillimeter wave circuits
  Submillimeter wave communication
  Submillimeter wave devices
  Submillimeter wave integrated circuits

Subscriber loops
- BT: Communication systems
  Multiaccess communication

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
UF: Power stations
(substations)
BT: Power systems
NT: Substation automation
           Substation protection

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
           Vapor deposition

Subthreshold current
UF: Subthreshold conduction
           Subthreshold drain current
           Subthreshold leakage
BT: Threshold voltage

Subtraction techniques
BT: Image analysis
RT: Biomedical image
processing

Sufficient conditions
BT: Logic

Sugar
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
RT: 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

Sum product algorithm
UF: Sum-product algorithm
BT: Iterative algorithms

Summing circuits
BT: Circuits
RT: Analog computers

Sun
BT: Solar system
NT: Solar eclipses

Supercapacitors
UF: Electrical double layer
capacitors
           Super capacitors
           Ultracapacitors
BT: Electrochemical devices
           Energy storage
           Power capacitors
RT: Capacitance
           Capacitance measurement
           Electrolytes

Supercomputers
BT: Computers
RT: Petascale computing
NT: Exascale computing

Superconducting cables
BT: Superconducting
transmission lines
RT: Superconducting coils

JULY 2023 IEEE Thesaurus

Superconducting magnets

Superconducting coils
- BT: Coils
- Superconducting devices
- RT: Superconducting cables
- Superconducting magnets
- Superconducting wires

Superconducting device noise
- BT: Noise
- RT: Superconducting devices

Superconducting devices
- UF: Josephson devices
- SIS devices (superconductor)
- SNS devices
- 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 photodetectors

Superconducting epitaxial layers
- BT: Epitaxial layers
- RT: Superconducting materials

Superconducting filaments
- BT: Superconducting materials

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 integrated circuits
- BT: Integrated circuits
- Superconductivity

Superconducting logic circuits
- BT: Logic circuits

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
- BT: Materials
- Superconductivity
- RT: Critical current density
- Cryogenic electronics
- Superconducting epitaxial layers
- Thermal factors
- NT: Granular superconductors
- High-temperature superconductors
- Multifilamentary superconductors
- Niobium-tin
- Superconducting filaments
- Superconducting wires
- 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 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 wires
BT: Superconducting materials
RT: Superconducting coils
NT: Multifilamentary superconductors

Superconductive tunneling
UF: Superconductive tunnelling
BT: Superconductivity
          Tunneling

Superconductivity
NT: Bean model
          Critical current density
          Flux pinning
          Superconducting devices
          Superconducting films
          Superconducting integrated circuits
          Superconducting magnetic energy storage
          Superconducting materials
          Superconducting transition temperature
          Superconductive tunneling

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: Diodes
          Light emitting diodes
          Light sources
          Optoelectronic devices
          Semiconductor devices
          Semiconductor diodes
RT: Lasers

Superparamagnetic iron oxide nanoparticles
UF: SPIONs
BT: Paramagnetic materials
RT: Targeted drug delivery

Superposition calculus
BT: Mathematics

Superresolution
UF: Super resolution
          Super-resolution
BT: Image resolution

Supersonic flow
BT: Fluid flow

Supervised learning
BT: Learning systems
RT: Deep learning
          Graph neural networks
          Naive Bayes methods
          Self-supervised learning
          Semisupervised learning
NT: Boosting

Supervisory control
BT: Control systems
NT: SCADA systems

Supply and demand
BT: Economics
RT: Microeconomics
          Utility theory

Supply chain management
UF:	SCM supply chains
BT:	Management
RT:	Business process integration
	Business process management
	Capacity planning
	Customer relationship management
	Electronic commerce
	Food security
	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
	Support vector regression
BT:	Computation theory
RT:	Artificial intelligence
	Feedforward neural networks
	Logistic regression
	Naive Bayes methods
	Pattern classification
	Reinforcement learning
	Relevance vector machines
NT:	Support vector machine classification

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

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
	Quantum wells
NT:	Vertical cavity surface emitting lasers

Surface engineering
BT:	Materials science and technology
RT:	Surface treatment

Surface finishing
BT:	Finishing
RT:	Lapping
	Polishing machines
NT:	Burnishing
	Deburring
	Painting
	Spraying

JULY 2023 IEEE Thesaurus

Surface fitting
  BT: Numerical analysis
  RT: Computational geometry
         Computer graphics
         Curve fitting
         Interpolation
  NT: Response surface
methodology

Surface impedance
  BT: Surfaces
  RT: High-temperature
superconductors
         Superconducting films

Surface morphology
  BT: Surfaces
  RT: Surface roughness
  NT: Adsorption

Surface mount technology
  UF: Surface-mount technology
  BT: Integrated circuit
manufacture
         Printed circuits
  NT: Ball grid arrays

Surface plasmon polaritons
  BT: Polaritons
         Surface plasmons
Surface plasmons
  BT: Plasmons
  NT: Surface plasmon polaritons

Surface reconstruction
  BT: Visualization
  RT: Pattern analysis

Surface resistance
  BT: Resistance
         Surfaces
  RT: High-temperature
superconductors
         Superconducting films

Surface roughness
  BT: Surfaces
  RT: Planing
         Polishing machines
         Rough surfaces
         Sandblasting
         Surface morphology

Surface soil
  BT: Surfaces

Surface states
  BT: Energy states
         Surface structures
  NT: Surfactants

Surface stress
  BT: Mechanical factors
         Surfaces
  RT: Internal stresses
         Stress control

Surface structures
  BT: Surfaces
  NT: Surface states

Surface tension
  BT: Surfaces
  RT: Surfactants

Surface texture
  BT: Surfaces

Surface topography
  BT: Geometry
         Surfaces
  NT: Nanotopography

Surface treatment
  BT: Surfaces
  RT: Colloidal lithography
         Planing
         Surface contamination
         Surface engineering
  NT: Electrochemical deposition
         Etching
         Finishing
         Galvanizing
         Painting
         Passivation
         Pickling
         Planarization
         Sandblasting
         Surface cleaning
         Surfactants
         Vapor deposition

Surface waves
  BT: Geophysics
  RT: Sea surface
  NT: Surface acoustic waves

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
RT:	Biomedical equipment
	Catheters
	Endoscopes
NT:	Ambulatory surgery
	Hepatectomy
	Laser surgery
	Microsurgery
	Minimally invasive surgery
	Neurosurgery
	Oncological surgery
	Orthopedic surgery

Surges
BT:	Electromagnetic transients
RT:	Surge protection
NT:	Inrush current

Surgical instruments
BT:	Biomedical equipment
NT:	Laparoscopes

Surveillance
BT:	Monitoring

RT:	Conformance testing
	Hazardous areas
	Motion detection
	Reconnaissance
	Remote sensing
	Security
	Terrorism
NT:	Infrared surveillance
	Video surveillance

Surveys
BT:	Statistics
RT:	Sampling methods

Suspensions (mechanical systems)
BT:	Mechanical systems
RT:	Automotive components
	Springs
NT:	Shock absorbers

Sustainable development
UF:	Sustainability
BT:	Environmental management
	Social implications of technology
RT:	Food security
	Green computing

Swaging
BT:	Materials processing
RT:	Metal products

Swarm robotics
UF:	Swarm robots
BT:	Multi-robot systems
RT:	Consensus control

Sweat glands
BT:	Glands
	Skin

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
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

Switches
BT: Control equipment
        Electronic components
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
NT: Circuit breakers
        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

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 systems
BT: Communication systems
RT: Communication switching
NT: Electronic switching systems
        Switching frequency
        Switching loss
        Telecommunication switching

Symbiosis
UF: Symbiotic relationships
BT: Biological processes

Symbols
BT: Graphics
RT: Huffman coding
        Information retrieval
        Pattern recognition
NT: CAPTCHAs
        Communication symbols
        Emojis

Symmetric matrices
UF: Symmetric matrix
BT: Numerical analysis

Sympathetic nervous system
UF: Sympathetic outflow
BT: Autonomic nervous system

Synapses
BT: Nervous system
RT: Artificial intelligence
        Artificial neural networks
        Brain
        Communication channels
        Computational intelligence
        Electrochemical devices
        Integrated optics
        Local field potentials
        Neuroinformatics
        Neuromorphic engineering
        Neurons
        Neurotransmitters
        Organic electronics
        Photonics
        Signal processing

Synaptic communication

Synaptic communication
- BT: Biological processes
- RT: Synapses

Synchrocyclotrons
- BT: Particle accelerators

Synchronization
- UF: Clock synchronization
  - Sync
  - Synchronisation
- BT: Timing
- RT: Chaotic communication
  - Concurrency control
  - Frequency locked loops
  - Scheduling
  - Synchronous digital hierarchy
  - Time dissemination
  - Tracking loops

Synchronous digital hierarchy
- UF: SDH
- BT: Communication standards
  - Communication systems
  - ETSI Standards
- RT: Digital communication
  - Optical fiber communication
  - SONET
  - Synchronization
  - Transport protocols

Synchronous generators
- BT: AC generators
  - Synchronous machines
- RT: Alternators
- NT: Reluctance generators

Synchronous machines
- BT: AC machines
- NT: Hysteresis motors
  - Reluctance machines
  - Synchronous generators
  - Synchronous motors

Synchronous motors
- BT: Synchronous machines
- RT: Rotating machines
- NT: Hysteresis motors
  - Reluctance motors

Synchrotron radiation
- BT: Synchrotrons

- RT: Biomedical applications of radiation
  - Light sources
  - X-rays

Synchrotrons
- BT: Particle accelerators
- RT: Colliding beam accelerators
  - Electric fields
  - High energy physics instrumentation computing
  - Magnetic fields
  - Particle beams
- NT: Synchrotron radiation
  - Undulators

Syngas
- UF: Synthesis gas
  - Synthetic gas
- BT: Gases

Syntactics
- UF: Syntax
- BT: Semiotics
- RT: Communication symbols
  - Grammar
  - Natural language processing
  - Professional communication
  - Programming

Synthesizers
- UF: Synthesisers
- BT: Electronic music

Synthetic aperture radar
- UF: SAR
- BT: Radar
- RT: Airborne radar
  - Ground penetrating radar
  - Radar imaging
  - Spaceborne radar
  - Synthetic aperture sonar
  - Ultra wideband radar
- NT: Inverse synthetic aperture radar
  - Polarimetric synthetic aperture radar

Synthetic aperture radar interferometry
- BT: Radar interferometry

Synthetic aperture sonar
- UF: SAS

BT: Sonar
RT: Synthetic aperture radar

Synthetic biology
UF: Synthetic life research
BT: Biology
Engineering in medicine and biology
RT: Biological system modeling
Computational biology

Synthetic data
BT: Computer simulation
Sampling methods
RT: Data augmentation
Data privacy
Information integrity

Synthetic fibers
UF: Artificial fibers
Artificial fibres
Nylon fiber
Synthetic fibres
BT: Textile fibers

System analysis and design
UF: Logical decomposition
System analysis
System design
System metrics
BT: Systems engineering and theory
RT: Configuration management
Design methodology
Flowcharts
Multi-agent systems
Skin effect
Stability analysis
System improvement
System validation
System verification
Systems simulation
Threat modeling
NT: Asymptotic stability
Closed box
Control system analysis
Diakoptics
Distributed processing
Distributed vision networks
Fault detection
Fault tolerant systems
Glass box

Interconnected systems
Large-scale systems
Lyapunov methods
Open systems
Petri nets
Physical design
Robust control
Scalability
Scattering parameters
Sequential analysis
Sequential diagnosis
Software prototyping
Static analysis
System dynamics
System performance
System-level design
Systems Modeling Language
Systems modeling
Task analysis
Time factors

System buses
BT: Computer interfaces

System dynamics
BT: System analysis and design
RT: Behavioral sciences
Complex networks
Feedback
Flow production systems
Timing

System identification
BT: Modeling

System implementation
BT: Systems engineering and theory

System improvement
BT: Systems engineering and theory
RT: Quality management
Reliability
System analysis and design
System testing

System integration
BT: Systems engineering and theory
RT: Enterprise resource planning
Integrated manufacturing systems

JULY 2023 IEEE Thesaurus

Project management
Resource management

System kernels
BT: Kernel
        Operating systems

System of systems
BT: Systems engineering and
theory
RT: Complex networks
        Emergent phenomena
        Networked control systems
NT: Cyber-physical systems

System performance
UF: Cooperative cache
BT: System analysis and design
NT: Cooperative caching

System realization
BT: Systems engineering and
theory

System recovery
UF: Deadlocks (computers)
        Error recovery (computers)
BT: Computers and information
processing
RT: Business continuity
        Operating systems
        Reliability
NT: Checkpointing
        Core dumps
        Debugging

System software
BT: Software
RT: Visual BASIC
NT: File systems
        Operating systems
        Program processors
        Utility programs

System testing
BT: System validation
        System verification
        Testing
RT: Closed box
        Glass box
        System improvement
NT: Model checking

System validation
BT: Systems engineering and
theory
RT: System analysis and design
NT: System testing

System verification
BT: Systems engineering and
theory
RT: System analysis and design
NT: System testing

System-in-package
UF: System in package
BT: Chip scale packaging
        System-on-chip
NT: Antenna-in-package

System-level design
UF: System level design
BT: System analysis and design

System-on-chip
UF: On-chip
        SOC
        System on chip
        System-on-a-chip
BT: Application specific
integrated circuits
RT: AI accelerators
        Microcontrollers
        Microprocessors
        Mixed analog-digital
integrated circuits
        Power dissipation
        Signal processing
NT: Lab-on-a-chip
        Network-on-chip
        System-in-package

Systematics
UF: Biological systematics
BT: Biology

Systems architecture
BT: Systems engineering and
theory
NT: Deep architecture

Systems biology
BT: Biology

JULY 2023 IEEE Thesaurus

Systems engineering and theory
UF: Systems engineering
RT: Aerospace and electronic systems
        Business process integration
        Business process management
        Digital twins
NT: Adaptive systems
        Capability engineering
        Complex systems
        Configuration management
        Failure state
        Hierarchical systems
        Integrated design
        Interface management
        Military systems
        Modeling
        Multidimensional systems
        Network systems
        Physical design
        Reduced order systems
        Requirements engineering
        Requirements management
        Service-oriented systems engineering
        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 education
        Systems operation
        Systems simulation
        Systems support
        Systems thinking
        Task analysis
        Technical management

Systems engineering education
BT: Engineering education
        Systems engineering and theory

Systems modeling
BT: Modeling
        System analysis and design

NT: Threat modeling

Systems Modeling Language
UF: SYSML
BT: Computer languages
        System analysis and design
RT: Modeling
        Software engineering

Systems neuroscience
BT: Neuroscience
RT: Neural networks

Systems operation
BT: Systems engineering and theory

Systems simulation
BT: Simulation
        Systems engineering and theory
RT: 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
        Pervasive computing
        Posthuman
        Remote working
        Transhuman
        User interfaces

Systolic arrays
BT: Multiprocessing systems
RT: Pipeline processing

JULY 2023 IEEE Thesaurus

Table lookup
UF: LUT
Look-up table
Lookup table
BT: Data structures
Image processing

Tablet computers
UF: Tablet PC
BT: Computers
RT: Mobile handsets
Portable media players

Tachometers
BT: Meters

Tactile Internet
BT: Haptic interfaces
Internet of Things
RT: 5G mobile communication
Human-robot interaction
Information exchange
Machine-to-machine communications
Man-machine systems
Smart devices
Tactile sensors

Tactile sensors
UF: Tactile feedback
Touch sensors
BT: Robot sensing systems
RT: Braille
Pressure measurement
Tactile Internet
Touch sensitive screens
Wearable sensors

Tag clouds
UF: Word cloud
BT: Tagging

Tagging
UF: Hashtag
BT: Information retrieval
RT: Indexing
Internet of Things
NT: Tag clouds

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

Tantalum
BT: Chemical elements

Tap changers
BT: Transformers
NT: On load tap changers

Tape casting
BT: Casting
RT: Ceramics

Target recognition
BT: Object recognition
RT: Missile guidance

Target tracking
BT: Tracking
RT: Control systems
Radar tracking

Targeted drug delivery
BT: Drug delivery
RT: Superparamagnetic iron oxide nanoparticles

Tariffs
BT: Regulation
RT: Free economic zones
Trade agreements

Task analysis
BT: Business process management
System analysis and design
Systems engineering and theory

Taste buds
BT: Sense organs

Taxonomy
BT: Information retrieval

JULY 2023 IEEE Thesaurus

Taylor series
- UF: Taylor expansion
- BT: Mathematics

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

Teamwork
- UF: Team work
  Team working
- BT: Collaboration
- RT: Organizational aspects

Technetium
- BT: Chemical elements

Technical drawing
- BT: Design methodology
- RT: Engineering drawings
  Graphics

Technical management
- UF: System life cycle management
  Technical assessment
  Technical data management
  Technical risk management
- BT: Management
  Systems engineering and theory
- RT: Program management
  Systems simulation
- NT: Maintenance management
  Technical planning

Technical planning
- BT: Planning
  Technical management

Technical requirements
- BT: Requirements engineering
- RT: Proposals

Technological innovation
- UF: Innovation
  Invention
- BT: Technology
- RT: Disruptive innovation
  Disruptive technologies
  Technology social factors

Technology
- BT: Social implications of technology
- RT: Engineering - general
  Museums
  Oil drilling
  Philosophical considerations
  Research and development
  STEM
  Technology forecasting
  Technology planning
- NT: Appropriate technology
  Disruptive technologies
  Machine ethics
  Neurotechnology
  Technological innovation
  Technology social factors
  Technology transfer
  Telepresence
  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 forecasting
- UF: Futurism
  Technological forecasting
- BT: Forecasting
- RT: Technology
  Technology social factors
- NT: Roadmaps (technology planning)

JULY 2023 IEEE Thesaurus

Technology management
BT: Management
RT: Data processing
Innovation management
Production management
Project management
Research and development management
Technology transfer

Technology planning
BT: Planning
RT: Social factors
Technology

Technology social factors
BT: Social factors
Technology
RT: Philosophical considerations
Risk analysis
Technological innovation
Technology forecasting
NT: Privacy

Technology transfer
BT: Technology
RT: Technology acceptance model
Technology management
NT: Small business technology transfer

Teeth
UF: Tooth
BT: Mouth

Telecommunication buffers
BT: Data communication

Telecommunication computing
UF: Communications computing
Telecom computing
BT: Computer applications
Telecommunications
RT: 3G mobile communication
4G mobile communication
Information-centric networking
Mobile computing
Quality of service
Software radio
TV
Telecommunication control
Telecommunication network management

Telegraphy
Telephony
NT: Internetworking
Soft switching

Telecommunication congestion control
UF: Telecom congestion control
BT: Telecommunication network topology
NT: Call admission control

Telecommunication control
UF: Telecom control
BT: Communication system control
RT: Telecommunication computing
NT: Virtual links

Telecommunication network management
UF: Telecom network management
BT: Telecommunication network topology
RT: Border Gateway Protocol
Management information base
Telecommunication computing
Telecommunication network performance
NT: Mobile nodes
Network architecture
Network neutrality
Network resource management

Telecommunication network performance
BT: Communication networks
RT: Telecommunication network management
Telecommunication network reliability
Telecommunication network topology
Telecommunication services
Telecommunication traffic

Telecommunication network reliability
UF: Communication network reliability
Telecom network reliability
BT: Reliability

Telecommunication network topology
RT: Telecommunication network performance
NT: Diversity schemes

Telecommunication network topology
UF: Telecom network topology
BT: Telecommunications
RT: Dynamic spectrum access
Network topology
Telecommunication network performance
NT: Backhaul networks
Intelligent networks
Link aggregation
Passive networks
Telecommunication congestion control
Telecommunication network management
Telecommunication network reliability
Telecommunication traffic

Telecommunication services
UF: Telecom services
BT: Telecommunications
RT: Radio access networks
Telecommunication network performance
NT: Acoustic communication (telecommunication)
Number portability

Telecommunication switching
UF: Telecom switching
BT: Switching systems

Telecommunication traffic
UF: Network traffic
Telecom traffic
Traffic load
BT: Telecommunication network topology
RT: Border Gateway Protocol
Communication system traffic
Telecommunication network performance

Telecommunications
UF: Telecom
BT: Communication systems
RT: Convolutional codes

Diversity reception
Film bulk acoustic resonators
Global Positioning System
Helical antennas
Multiaccess communication
Multicarrier code division multiple access
Multicast communication
Next generation networking
Optical wavelength conversion
Reflectivity
Switched circuits
Telecontrol equipment
NT: Ambient intelligence
Feedback communications
IP networks
Radio access networks
Railway communication
Space communications
Telecommunication computing
Telecommunication network topology
Telecommunication services
Telematics

Teleconferencing
BT: Communication systems
RT: Image communication
Meetings
Office automation

Telecontrol equipment
BT: Control equipment
RT: Communication systems
Data communication
Power industry
Power systems
Remote handling
Telecommunications

Telegraphy
BT: Communication systems
RT: Telecommunication computing

Telematics
BT: Information technology
Telecommunications
RT: Cyberspace

JULY 2023 IEEE Thesaurus

Telemedicine
	UF:	Telehealth
		Telehealthcare
	BT:	Biomedical communication
	RT:	Telepresence

Telemetry
	BT:	Aerospace and electronic systems
		Data communication
	RT:	Deep-space communications
		Measurement
	NT:	Biomedical telemetry

Teleoperators
	BT:	Telerobotics

Telephone equipment
	BT:	Communication equipment
	RT:	Land mobile radio equipment
		Radio communication equipment
		Telephony
	NT:	Cellular phones
		Landline
		Telephone sets
		Vocoders

Telephone poles
	BT:	Poles and towers

Telephone sets
	UF:	Handsets
		Subscriber sets
	BT:	Telephone equipment
	RT:	Telephony
	NT:	Mobile handsets

Telephony
	BT:	Communication systems
	RT:	Telecommunication computing
		Telephone equipment
		Telephone sets
		Videophone systems

Teleportation
	UF:	Quantum teleportation
	BT:	Quantum mechanics
	RT:	Information theory
		Quantum communication
		Quantum entanglement

Telepresence
	BT:	Human computer interaction
		Technology
	RT:	Telemedicine

Teleprinting
	UF:	Teletype
	BT:	Communication systems
		Data communication
		Printing
	RT:	Digital communication

Telerobotics
	UF:	Telesurgical robotics
	BT:	Robots
	RT:	Delay systems
		Human factors
		Manipulators
		Medical robotics
		Mobile robots
		Remote handling equipment
	NT:	Teleoperators

Telescopes
	BT:	Instruments
	RT:	Astronomy
		Observatories
		Radio astronomy
	NT:	Gamma-ray telescopes
		X-ray telescopes

Teletext
	BT:	Communication systems
		Information services
	RT:	Data communication
		Videotex

Telexistence
	BT:	Human computer interaction
		Real-time systems
		Technology

Tellurium
	BT:	Chemical elements

TEM cells
	UF:	GHZ transverse electromagnetic cells
		GTEM cells
		Transverse electromagnetic cells
	BT:	Test facilities

RT: Anechoic chambers
Electromagnetic compatibility and interference
Electromagnetic interference
Electronic equipment testing

Temperature
BT: Thermal factors
RT: Temperature control
Temperature measurement
NT: Color temperature
Temperature distribution

Temperature control
BT: Thermal variables control
RT: Space heating
Temperature
Thermal factors
Ventilation
NT: Cooling
Heating systems

Temperature dependence
BT: Thermal factors

Temperature distribution
BT: Temperature
RT: Insulators

Temperature measurement
BT: Thermal variables measurement
RT: Bolometers
Radiometry
Temperature
Temperature sensors
Thermistors
Thermoresistivity
NT: Cryobiology
Cryogenics
Cryotherapy
Global warming
Kelvin
Thomson effect

Temperature sensors
BT: Thermal sensors
RT: Bragg gratings
Optical fibers
Temperature measurement
Transducers

NT: Thermocouples
Thermometers

Temporal lobe
BT: Brain
NT: Hippocampus

Tendons
BT: Musculoskeletal system

Tensile strain
BT: Strain
RT: Tensile stress

Tensile stress
BT: Stress
RT: Tensile strain

Tensors
BT: Mathematics

Terahertz communications
BT: Communication systems

Terahertz materials
BT: Materials
RT: Optical antennas
Terahertz wave absorption
NT: Terahertz metamaterials

Terahertz metamaterials
BT: Electromagnetic metamaterials
Terahertz materials
RT: Split ring resonators

Terahertz radiation
BT: Electromagnetic radiation
Radiation effects
RT: Terahertz wave absorption

Terahertz wave absorption
BT: Electromagnetic wave absorption
RT: Submillimeter wave filters
Terahertz materials
Terahertz radiation

Terahertz wave imaging
BT: Imaging

Terbium
BT: Chemical elements

Termination of employment
UF:	Dismissal
	Redundancy (employment)
BT:	Employment
	Human resource management
RT:	Pensions

Terminology
UF:	Definitions
	Glossaries
BT:	Information retrieval
NT:	Dictionaries

Terrain factors
BT:	Interference
RT:	Earth
	Multipath channels
	Rough surfaces

Terrain mapping
UF:	Topography (earth)
BT:	Geoscience and remote sensing
RT:	Earth
	Geologic measurements
	Geophysical measurements
	Global Positioning System
	Remote sensing
	Vegetation mapping
NT:	Digital elevation models

Terrestrial atmosphere
UF:	Earth atmosphere
	Stratosphere
	Troposphere
BT:	Geoscience and remote sensing
RT:	Atmospheric measurements
	Geophysics
	Meteorology
NT:	Clouds
	Global warming
	Ionosphere
	Magnetosphere

Terrorism
UF:	9/11
	9/11 attack
	911 attack
	September 11
	Terrorist

BT:	Security
RT:	Biohazards
	Chemical weapons
	Nuclear weapons
	Surveillance
	Threat assessment
	US Department of Homeland Security
	Weapons
	Weapons of mass destruction
NT:	Bioterrorism
	Cyber terrorism
	National security

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 pattern generators
UF:	Test generation
BT:	Automatic test pattern generation

Testing
BT:	Industrial electronics
	Instrumentation and measurement
RT:	Cause effect analysis
	Fault diagnosis
	Hardware-in-the-loop simulation
	Inspection
	Leak detection
	Maintenance engineering
	Measurement
NT:	Aerospace testing
	Automatic testing
	Benchmark testing
	Built-in self-test

	Circuit testing
	Conformance testing
	Electronic equipment
testing	
	Error analysis
	Error-free operations
	Failure analysis
	Frequency response
	Impulse testing
	Insulator testing
	Integrated circuit testing
	Life testing
	Materials testing
	Optical fiber testing
	Remaining life assessment
	Ring generators
	Semiconductor device
testing	
	Shear testing
	Software testing
	System testing
	Test equipment
	Test facilities

Text analysis
BT:	Data mining
RT:	Annotations
	Conditional random fields
	Naive Bayes methods
NT:	Text categorization

Text categorization
UF:	Text classification
BT:	Text analysis
RT:	Data analysis

Text detection
BT:	Image processing
	Text processing
	Video signal processing
RT:	Discrete Fourier transforms
	Discrete wavelet transforms
	Image segmentation
	Machine learning

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:	Text detection
	Typesetting

Text recognition
BT:	Pattern recognition
RT:	Character recognition
	Text processing

Textile antennas
BT:	Antennas
	Smart textiles
RT:	Wearable antennas

Textile fibers
UF:	Fibers
	Textile fibres
BT:	Textiles
RT:	Cotton
	Spinning
	Textile products
	Textile technology
	Weaving
	Wool
NT:	Natural fibers
	Synthetic fibers
	Yarn

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

Thalamus

BT:	Brain

Thallium

BT:	Chemical elements

Theodolites

BT:	Instruments
RT:	Geodesy
	Geologic measurements
	Geophysical measurement techniques

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 measurement

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
Thermoresistivity

Thermal force
BT: Thermal expansion

Thermal lensing
BT: Thermooptic effects
RT: Laser beams
        Nonlinear optics
        Optical distortion
        Solid lasers

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 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
BT: Stability
RT: Integrated circuit reliability
        Thermal factors

Thermal stresses
BT: Thermal factors
NT: Thermal loading
        Thermal shock

Thermal variables control
BT: Control systems
RT: Thermal engineering
        Thermal factors
NT: HVAC
        Temperature control
        Thermal analysis

Thermal variables measurement
BT: Measurement
RT: Calorimetry
        Thermal engineering
        Thermal factors
        Transducers
NT: Temperature measurement

Thermionic emission
BT: Nuclear and plasma sciences
RT: Electron emission
        Ion emission
        Transmission electron microscopy
        Vacuum arcs

Thermistors
BT: Semiconductor devices
RT: Temperature measurement

Thermoresistivity

Thermochromism
BT: Thermooptic effects

Thermocouples
BT: Temperature sensors

Thermodynamics
BT: Science - general
NT: Adiabatic processes
Enthalpy
Fermi level
Isobaric processes
Isothermal processes
Quasi-Fermi level

Thermoelasticity
BT: Thermal factors

Thermoelectric devices
BT: Thermoelectricity

Thermoelectric materials
BT: Materials
Thermoelectricity

Thermoelectricity
UF: Seebeck effect
Thermoelectric effect
BT: Electricity
Energy conversion
Thermal factors
NT: Electrothermal effects
Peltier effect
Thermoelectric devices
Thermoelectric materials

Thermoforming
BT: Manufacturing systems

Thermoluminescence
BT: Luminescence

Thermolysis
BT: Chemical processes
Thermal factors
NT: Thermal decomposition
Thermal degradation

Thermomechanical processes
UF: Thermo-mechanics
Thermomechanical effects
Thermomechanics
BT: Thermal analysis

RT: Heat treatment
Smart materials

Thermometers
BT: Temperature sensors

Thermooptic effects
UF: Thermo-optic effects
BT: Thermal factors
RT: Birefringence
Optical propagation
Optical reflection
Optical refraction
Thermooptical devices
NT: Thermal lensing
Thermochromism
Thermoreflectance

Thermooptical devices
UF: Thermo-optical devices
BT: Optical devices
RT: Integrated optics
Optical switches
Solid lasers
Thermooptic effects

Thermoplastic polyethylene
BT: Polyethylene
NT: UHMWPE

Thermoreflectance
BT: Thermooptic effects

Thermoreflectance 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

Thick film circuits
BT: Circuits
Integrated circuits
RT: Hybrid integrated circuits

Thick film devices
Thick film inductors

Thick film devices
 BT: Electron devices
 RT: Thick film circuits
   Thick films
 NT: Thick film inductors

Thick film inductors
 BT: Inductors
   Thick film devices
 RT: 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

Thickness control
 BT: Mechanical variables control
 RT: Size control

Thickness measurement
 BT: Mechanical variables measurement
 RT: Micrometers
   Size measurement

Thigh
 BT: Extremities

Thin film circuits
 BT: Circuits
   Integrated circuits
 RT: Hybrid integrated circuits
   Silicon-on-insulator
   Thin film devices
   Thin film inductors

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
   Vapor deposition
 NT: Buffer layers
   Epitaxial growth
   Semiconductor thin films

Thin wall structures
 BT: Structural shapes
 RT: Honeycomb structures
   Lightweight structures
   Sandwich structures
   Sheet materials

Structural panels
Structural shells

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
NT: Threat modeling

Threat modeling
UF: Threat modelling
BT: Systems modeling
Threat assessment
RT: Computer crime
Computer security
Cyber threat intelligence
Cyberattack
Data privacy
Data security
System analysis and design

Three-dimensional displays
UF: 3-D displays
3-D modeling
3-D modelling
3-D reconstruction
3D displays
3D modeling
3D modelling
3D reconstruction
Three dimensional displays
BT: Displays
RT: Metaverse
Point cloud compression
Reconstruction algorithms
Shadow mapping
Sprites (computer)
Structure from motion
NT: Bundle adjustment
X3D

Three-dimensional integrated circuits
UF: 3D integrated circuits
3D integration
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
NT: Bioprinting

Three-dimensional television
BT: TV

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
RT: Integrated circuit noise
MOSFET circuits
Transistors
NT: Subthreshold current

Thresholding (Imaging)
BT: Image processing
RT: Image edge detection

Thrombosis
BT: Medical conditions

Through-silicon vias
UF: TSV
BT: Integrated circuits

Throughput
UF: Network throughput
BT: Communication channels

Page 456

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
	RT:	Endocrinology
		Thyroid cancer

Thyroid cancer
| | BT: | Cancer |
| | RT: | Thyroid |

Tides
	BT:	Oceans
	RT:	Ocean circulation
		Ocean dynamics

Tiles
	BT:	Building materials
	RT:	Ceramic products
		Ceramics
		Floors

Timbre
| | BT: | Music |

Time complexity
	BT:	Computational complexity
	RT:	Computational modeling
	NT:	Reversible computing

Time difference of arrival
| | UF: | Time-difference-of-arrival |
| | BT: | Object detection |

Time dissemination
	BT:	Time measurement
	RT:	Satellite navigation systems
		Synchronization

Time division multiple access
| | UF: | Time division multiaccess |
| | BT: | Multiaccess communication |

Time division multiplexing
	UF:	TDM
		Time division multiplexed
	BT:	Multiplexing

Time division synchronous code division multiple access
	UF:	TDSCDMA
	BT:	Multiaccess communication
	RT:	3G mobile communication
		4G mobile communication
		Cellular radio
		Multicarrier code division multiple access
		Spread spectrum communication

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 invariant systems
	BT:	Time factors
	RT:	Differential equations
		Discrete-time systems
		Feedback
		Linear systems
		Stability
		Time-varying systems

Time measurement
	BT:	Measurement
	RT:	Time-frequency analysis
		Watches
	NT:	Clocks
		Time dissemination
		Timing

Time of arrival estimation
- UF: TOA estimation
- Time-of-arrival 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
- Time-sharing systems
- BT: Computers and information processing
- RT: Mainframes

Time to market
- BT: Design methodology
- Product development
- RT: Concurrent engineering

Time varying circuits
- BT: Circuits

Time warp simulation
- BT: Discrete event simulation

Time-domain analysis
- UF: FDTD
- Time domain analysis
- 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-varying channels
- BT: Communication channels
- RT: Mobile communication
- Wireless LAN

Time-varying systems
- UF: Time varying systems
- BT: Time factors
- RT: Control systems
- Time invariant 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

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
          Bioprinting
          Colloidal lithography
          Diamond-like carbon
          Genetic engineering
          Hydrogels
NT: Regeneration engineering

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

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: Federated identity
          Local area networks
          Metropolitan area networks
          Wide area networks

Tokenization
BT: Data security
          Natural language processing
RT: Federated identity

Tolerance analysis
UF: Circuit tolerance analysis
          Tolerating problems
BT: Manufacturing
RT: Circuit analysis
          Circuit optimization
          Semiconductor device breakdown
          Sensitivity

Tomography
UF: Tomographic
BT: Imaging
RT: Biomedical imaging
          Geophysical measurement techniques
          Image reconstruction
NT: Computed tomography
          Electrical capacitance tomography
          Electrical impedance tomography
          Magnetic particle imaging
          Optical coherence tomography
          Positron emission tomography
          Reconstruction algorithms

Tongue
BT: Digestive system
RT: Stomatognathic system

Tools
BT: Manufactured products
NT: Hand tools

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

Tornadoes
UF:	Tornado
	Tornados
BT:	Geoscience

Toroidal magnetic fields
BT:	Magnetic fields
RT:	Tokamak devices

Torque
BT:	Mechanical factors
RT:	Torque control
	Torque converters
	Torque measurement

Torque control
BT:	Mechanical variables control
RT:	Admittance control
	Motor drives
	Torque

Torque converters
UF:	Torque convertors
BT:	Mechanical power transmission
RT:	Automotive components
	Drives
	Engines
	Gears
	Shafts
	Torque

Torque measurement
UF:	Torque ripple
BT:	Mechanical variables measurement
RT:	Pressure gauges
	Torque
NT:	Dynamometers

Torso
BT:	Body regions

Total harmonic distortion
BT:	Distortion measurement
	Harmonic distortion
RT:	Signal analysis

Total ionizing dose
BT:	Radiation effects
RT:	Aerospace electronics
	Radiation hardening (electronics)

Total quality management
UF:	TQM
BT:	Quality management
RT:	Business process re-engineering
	Design for quality
	Quality assurance
	Quality awards
	Quality control
NT:	Continuous improvement
	Six sigma

Touch sensitive screens
UF:	Touch screens
	touchscreens
BT:	Computer displays
RT:	Haptic interfaces
	Tactile sensors

Tourism industry
BT:	Industries

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

JULY 2023 IEEE Thesaurus

RT: Electronics industry

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
- RT: 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

Trade agreements
- UF: Free trade
  GATT
  General agreement on tariffs and trade
- BT: Economics
- RT: Free economic zones
  Freeports
  Globalization
  International collaboration
  International trade
  Tariffs

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 management
  Traffic congestion
- NT: Advanced driver assistance systems
  Queueing analysis
  Road traffic control
  Vehicle routing

Training
- UF: Technician training
- BT: Education
- RT: Accreditation
  Continuing education
  Continuing professional development
  Electronic learning
  Learning management systems
  Manuals
  Mentoring
  Personnel
- NT: Certification
  Industrial training
  Management training
  On the job training
  Qualifications
  Vocational training

Training data
- BT: Data analysis
- RT: Fish schools

Trajectory
- BT: Path planning
- RT: Motion control
  Object tracking
- NT: Trajectory optimization

Trajectory optimization
- BT: Optimization
  Trajectory

Trajectory planning
- BT: Path planning

JULY 2023 IEEE Thesaurus

Trajectory tracking
BT:	Path planning
	Tracking
RT:	Motion control
	Robot control

Transaction databases
BT:	Databases
RT:	Automated teller machine
NT:	Itemsets

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 equipment
	Mobile communication
	Mobile handsets
	Optical antennas
	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

Transcranial magnetic stimulation
BT:	Neuroscience
	Neurostimulation

Transducers
BT:	Electronic components
RT:	Electric variables measurement
	Measurement
	Mechanical variables measurement
	Solenoids
	Temperature sensors
	Thermal variables measurement
NT:	Acoustic transducers
	Biomedical transducers
	Capacitive transducers
	Chemical transducers
	Inductive transducers
	Piezoelectric transducers
	Resistive transducers
	Ultrasonic transducer arrays

Transfer functions
UF:	Transfer function
BT:	Differential equations
RT:	Control systems
	Damping
	Linear systems
NT:	Poles and zeros

Transfer learning
BT:	Machine learning

Transfer molding
UF:	Resin transfer molding
	Resin transfer moulding
	Transfer moulding
BT:	Production

Transform coding
UF:	JPEG
	JPEG2000
	MPEG
BT:	Data compression
RT:	Digital photography
	MPEG standards
	Principal component analysis
	Vector quantization

Transformer cores
BT:	Magnetic cores
	Magnetic devices
RT:	Power transformers
	Transformers

JULY 2023 IEEE Thesaurus

Transformers
BT:	Power systems
RT:	Coils
	Core loss
	Inductive power transmission
	Transformer cores
	Voltage multipliers
	Windings
NT:	Baluns
	Current transformers
	Flyback transformers
	High-frequency transformers
	Instrument transformers
	Phase transformers
	Power transformers
	Pulse transformers
	Tap changers

Transforms
BT:	Mathematics
RT:	Numerical analysis
	Signal processing
	Spectral analysis
NT:	Discrete transforms
	Empirical mode decomposition
	Fourier transforms
	Karhunen-Loeve transforms
	Poincare invariance
	Wavelet transforms

Transgender issues
BT:	Gender issues
RT:	Gender equity

Transhuman
UF:	Trans human
	Trans-human
	Transhumanism
BT:	Systems, man, and cybernetics
RT:	Posthuman

Transient analysis
UF:	Transients
BT:	Power system transients
RT:	Electromagnetic transients
	Signal analysis
	Steady-state

Transient response
UF:	Natural response
BT:	Propagation
RT:	Damping

Transistors
BT:	Semiconductor devices
	Solid state circuits
RT:	Aluminum gallium nitride
	Bipolar transistors
	CMOS technology
	Silicon germanium
	Threshold voltage
NT:	Field effect transistors
	Heterojunction bipolar transistors
	Millimeter wave transistors
	Phototransistors
	Static induction transistors

Transition metal compounds
BT:	Inorganic compounds
NT:	Transition metal dichalcogenides

Transition metal dichalcogenides
BT:	Semiconductor materials
	Transition metal compounds
RT:	Semiconductor thin films

Translational research
UF:	Bench to bedside
	Translational medicine
	Translational science
BT:	Biomedical engineering
	Research and development
RT:	Medical diagnosis
	Medical services

Transmission electron microscopy
UF:	TEM
BT:	Electron microscopy
RT:	Electron beams
	Thermionic emission
NT:	High-resolution transmission electron microscopy

Transmission line antennas
BT:	Antennas
RT:	Transmission lines

Transmission line discontinuities
BT:	Transmission lines
RT:	Freight handling
NT:	Waveguide discontinuities

Transmission line matrix methods
- BT: Mathematics
- Numerical analysis

Transmission line measurements
- BT: Electric variables measurement
- RT: Impedance measurement
- Transmission lines

Transmission line theory
- BT: Transmission lines
- RT: Capacitance
- Conductivity
- Crosstalk
- Frequency
- Inductance

Transmission lines
- UF: Transmission-line
- BT: Power transmission
- RT: Baluns
- Circuit noise
- Civil engineering
- Coaxial cables
- Distributed parameter circuits
- Helical antennas
- Splicing
- Transmission line antennas
- Transmission line measurements
- NT: Cables
- Electromagnetic waveguides
- Multiconductor transmission lines
- Planar transmission lines
- Poles and towers
- Power line communications
- Power transmission lines
- Stripline
- Superconducting transmission lines
- Transmission line discontinuities
- Transmission line theory

Transmitters
- BT: Communication equipment
- RT: Linearization techniques
- Modulation
- Optical antennas
- SISO communication
- NT: Auxiliary transmitters

Diversity methods
Neurotransmitters
Optical transmitters
Radio transmitters
Transmitting antennas

Transmitting antennas
- UF: Transmit antennas
- BT: Antennas
- Transmitters
- RT: Receiving antennas

Transponders
- BT: Communication equipment
- Radio communication equipment
- RT: Radio navigation
- Satellite communication

Transport protocols
- BT: Protocols
- RT: IP networks
- Overlay networks
- Radio links
- SONET
- Synchronous digital hierarchy
- TCPIP

Transportation
- BT: Intelligent transportation systems
- RT: Bridges
- Freight containers
- NT: Air transportation
- Escalators
- Green transportation
- Land transportation
- Public transportation
- Seaports
- Shared transport
- Smart transportation
- Vehicles

Transportation industry
- BT: Industries

Transversal filters
- BT: Filters
- RT: Digital filters
- Filtering theory
- Signal processing

Trapped ions
- UF: Ion trapping

BT: Ions
RT: Laser cooling
    Quantum computing

Traveling salesman problems
UF: Traveling salesman
    Travelling salesman problem
BT: NP-hard problem
RT: Optimization methods
    Shortest path problem

Traveling wave tubes
UF: Travelling wave tubes
BT: Electron tubes

Tree data structures
BT: Data structures
NT: Binary trees

Tree graphs
BT: Graph theory
RT: Circuit topology

Trees - insulation
UF: Water trees
BT: Insulators
RT: Humidity
    Insulation life
    Moisture

Triboelectricity
BT: Electricity
    Electrostatic processes
    Surface charging
RT: Electrostatic discharge protection
    Nanogenerators

Tribology
BT: Motion measurement

Trigeneration
UF: CHCP
    Combined heat, cooling and power
    Combined heat, cooling, and power
    Trigen
BT: Cooling
    Heating systems
    Power generation
RT: Cogeneration

Trigger circuits
BT: Circuits

Trions
BT: Electrons

Triples (Data structure)
UF: SPO
    Semantic triple
    Subject predicate object
    Triplestore
BT: Buffer storage
RT: Database systems
    Information retrieval
    Metasearch
    Relational databases
    Text mining

Trojan horses
UF: Trojans
BT: Malware
RT: Cyber espionage

Tropical cyclones
UF: Cyclonic storms
    Storm systems
    Tropical depressions
    Tropical storms
BT: Cyclones

Trust management
BT: Decision making
    Information security
RT: Access control
    Computer security
    Cryptography
    Privacy
NT: Trusted computing
    Trustless services

Trusted computing
BT: Computer security
    Trust management

Trustless services
UF: Trustless applications
BT: Trust management
RT: Blockchains

Tsunami
BT: Geoscience

Tuberculosis
BT: Diseases

Tumors
UF: Tumor

		Tumor cells
		Tumor detection
		Tumours
	BT:	Medical conditions
	RT:	Cancer
		Medical diagnostic imaging
		Oncology
		Positron emission tomography
		Single photon emission computed tomography
	NT:	Benign tumors
		Breast tumors
		Colonic polyps
		Lesions
		Malignant tumors

Tunable circuits and devices

	BT:	Circuits and systems
		Frequency control
	RT:	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
		Tunable circuits and devices

Tungsten

	UF:	Wolfram
	BT:	Metals

Tuning

	BT:	Frequency control
	RT:	Ring oscillators
		Tunable circuits and devices
	NT:	Laser tuning
		Optical tuning
		Tuners

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
		Superconductive tunneling
		Tunneling magnetoresistance

Tunneling magnetoresistance

	UF:	TMR
		Tunnelling magnetoresistance
	BT:	Magnetoresistance
		Tunneling
	RT:	Magnetoresistive devices

Turbines

	BT:	Turbomachinery
	RT:	Aircraft propulsion
		Boilers
		Compressors
		Turbogenerators
		Wind energy
	NT:	Hydraulic turbines
		Wind turbines

Turbo codes

	BT:	Channel coding
	RT:	Error correction
		Viterbi algorithm

Turbogenerators

	UF:	Turbo generators
	BT:	Turbomachinery
	RT:	Turbines
		Wind power generation

Turbomachinery

	UF:	Turbomachine blades
	BT:	Power generation
	RT:	Blades
		Compressors
		Engines
		Machine components
		Mechanical systems
		Pumps
	NT:	Turbines
		Turbogenerators

Turing completeness

	BT:	Computation theory
		Data handling
	RT:	Instruction sets

JULY 2023 IEEE Thesaurus

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 regulations
	TV equipment
	Telecommunication computing
	UHDTV
	Visual communication
NT:	Analog TV
	Cable TV
	Color TV
	Digital TV
	Mobile TV
	Smart TV
	Three-dimensional television
	Web TV

TV equipment
BT:	Communication equipment
RT:	TV
	Video equipment
NT:	Large screen displays
	TV receivers

TV interference
BT:	Interference
RT:	Echo interference

Gaussian noise

TV receivers
BT:	TV equipment

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-term control
BT:	Process control

Type II superconductors
BT:	Superconducting materials
RT:	Flux pinning
	Niobium

Typesetting
BT:	Text processing
RT:	Printing

Ubiquitous computing
UF:	Ubiquitous wireless*
BT:	Pervasive computing
RT:	Ambient intelligence
NT:	Context-aware services

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

RT: UHF devices

UHF circuits
UF: Ultra-high-frequency circuits
BT: Circuits
              UHF technology
RT: Analog circuits
NT: UHF integrated circuits

UHF communication
UF: Ultra-high-frequency communication
BT: Communication systems
              UHF technology
RT: Mobile handsets

UHF devices
UF: Ultra-high-frequency devices
BT: UHF technology
RT: UHF antennas
              UHF integrated circuits

UHF integrated circuits
UF: Ultra-high-frequency integrated circuits
BT: Circuits
              Integrated circuits
              UHF circuits
              UHF technology
RT: Analog integrated circuits
              UHF devices

UHF measurements
UF: Ultra-high-frequency measurements
BT: Measurement
RT: UHF technology

UHF propagation
UF: UHF radio propagation
              Ultra-high-frequency propagation
BT: Electromagnetic propagation
RT: Broadband antennas

UHF technology
UF: Ultra-high-frequency technology

BT: Communications technology
RT: UHF measurements
NT: UHF antennas
              UHF circuits
              UHF communication
              UHF devices
              UHF integrated circuits

UHMWPE
UF: Ultra high molecular weight polyethylene
BT: Thermoplastic polyethylene

Ultra large scale integration
UF: ULSI
BT: Circuits
              Integrated circuits
              Large scale integration

Ultra reliable low latency communication
UF: URLLC
              Ultra-reliable low latency communication
              Ultra-reliable low-latency communication
BT: Low latency communication

Ultra wideband antennas
UF: UWB antennas
              Ultrawideband antennas
BT: Broadband antennas
              Ultra wideband technology
RT: Ultra wideband radar

Ultra wideband communication
UF: UWB communication
              Ultrawideband communication
BT: Ultra wideband technology
RT: Broadband communication
              Military communication
              Multipath channels
              Spread spectrum communication

Ultra wideband radar
UF: UWB radar
              Ultrawideband radar
BT: Radar
              Ultra wideband technology
RT: Ground penetrating radar
              Radar detection
              Radar imaging
              Synthetic aperture radar

Ultra wideband antennas

Ultra wideband technology
UF: UWB technology
Ultra wide-band
Ultra wideband
Ultra-wide-band
Ultra-wideband
Ultrawideband
Ultrawideband technology
BT: Communications technology
NT: Ultra wideband antennas
Ultra wideband communication
Ultra wideband radar

Ultra-dense networks
UF: UDN
BT: Cellular networks
Mobile communication
RT: 5G mobile communication
Microcell networks

Ultra-high definition video
BT: High definition video

Ultracold atoms
BT: Atoms
Cooling
RT: Laser cooling
Magnetooptic effects

Ultrafast electronics
BT: High-speed electronics

Ultrafast optics
BT: Optics

Ultrasonic imaging
UF: Ultrasonic techniques
Ultrasound
BT: Ultrasonics, ferroelectrics, and frequency control
RT: Amniocentesis
Biomedical imaging
NT: Ultrasonography

Ultrasonic transducer arrays
BT: Transducers

Ultrasonic transducers
BT: Ultrasonics, ferroelectrics, and frequency control

RT: Nondestructive testing
Piezoelectricity
Sonar

Ultrasonic variables measurement
BT: Measurement

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

Ultraviolet sources
UF: UV sources
Ultra violet
Ultra-violet
BT: Light sources
RT: Lamps
Lasers

Umbilical cable
UF: Power supplies to apparatus
BT: Power supplies

Uncertain systems
UF: Parameter uncertainty
BT: Mathematics
RT: Control systems
Linear matrix inequalities
Robustness
Uncertainty

Uncertainty
BT: Probability
RT: Cognitive science
Fuzzy sets
Nonlinear dynamical systems
Uncertain systems
NT: Evidence theory
Forecast uncertainty

Underground power cables
BT: Power cables

Underwater acoustics
    BT: Acoustics

Underwater cables
    UF: Marine cables
            Sub-sea cables
            Submarine cables
            Submersible 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 structures
    BT: Marine technology
            Underwater technology

Underwater technology
    UF: Submarine technology
    BT: Marine technology
    RT: Underwater vehicles
    NT: Marine robots
            Underwater communication
            Underwater equipment
            Underwater structures

Underwater tracking
    BT: Tracking

Underwater vehicles
    UF: Aquatic vehicles
            Submarines
            Submersibles
    BT: Marine vehicles
    RT: Marine robots
            Marine technology
            Military robotics
            Underwater equipment
            Underwater technology
    NT: Autonomous underwater vehicles
            Remotely guided underwater vehicles

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 locators
    UF: URL
            Uniform Resource Identifier
            Uniform resource name
    BT: Web sites

Uninterruptible power systems
    BT: Power systems
    RT: Batteries
            Emergency power supplies
            Power supplies
            Protection

United Kingdom Space Agency
    UF: UK Space Agency
            UKSA
    BT: Organizations

Universal motors
    BT: Motors

Universal Serial Bus
    UF: USB
    BT: Communication standards

Information technology

Unsolicited e-mail
UF: Junk e-mail
Junk email
Spam
Spamming
Unsolicited electronic e-mail

Unsolicited electronic email
Unsolicited email
BT: Electronic mail
RT: Computer crime
Cyberbullying
Office automation
Privacy-invasive software

Unsupervised learning
BT: Learning systems
RT: Deep learning
Formal concept analysis
Generative adversarial
networks
Perception evolution
networks
Reinforcement learning
Self-supervised learning
Semisupervised learning
NT: Competitive 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 planning
UF: City planning
Urban modeling
BT: Urban areas

RT: Public infrastructure
NT: Urban policy

Urban policy
BT: Urban planning

Urban pollution
BT: Pollution

Urogenital system
BT: Anatomy
NT: Bladder
Kidney

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: Biological weapons
Chemical weapons
Cyberattack
Nuclear weapons
Terrorism
Weapons of mass
destruction

US Department of Transportation
UF: DOT
BT: US Government

US Government
BT: Government
NT: US Department of
Agriculture
US Department of
Commerce

US Department of Defense
US Department of Energy
US Department of
Homeland Security
US Department of
Transportation
US Government agencies
US local government

US Government agencies
BT: US Government
RT: Patents
NT: FAA
   FCC
   FDA
   NASA
   US Department of Health
and Human Services

US local government
BT: US Government

Usability
BT: Software design

User centered design
UF: User-centered design
   User-centred design
BT: Design methodology
RT: Technology acceptance
model

User experience
BT: Ergonomics
RT: Affective computing
   Human computer
interaction
   Human factors
   Metaverse
   Mobile computing
   Quality of experience
   Technology acceptance
model
   User interfaces
NT: Cyberbullying

User interfaces
UF: Man-machine interfaces
   User computer interfaces
   User-computer interfaces
BT: Systems, man, and
cybernetics
RT: Adaptive learning
   Affordances
   Ambient intelligence

Browsers
Computer interfaces
Computer peripherals
Displays
Gaze tracking
Metaverse
User experience
Web design
NT: 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

Vaccines
BT: Medical services

Vacuum arc remelting
BT: Melt processing

Vacuum arcs
BT: Vacuum breakdown
RT: Electron emission
   Thermionic emission
   Vacuum systems

Vacuum breakdown
BT: Dielectric breakdown
RT: Electron emission
   Vacuum systems
NT: Vacuum arcs

Vacuum electronics
BT: Vacuum technology

JULY 2023 IEEE Thesaurus

Vacuum systems
BT: Vacuum technology
RT: Bellows
Casimir effect
Leak detection
Vacuum arcs
Vacuum breakdown
NT: Gettering

Vacuum technology
BT: Electron devices
RT: Field emitter arrays
Gettering
Space charge
NT: Photomultipliers
Vacuum electronics
Vacuum systems

Valves
BT: Fluid flow
Hydraulic equipment
Machine components
RT: Fluid flow control
Manifolds
NT: Microvalves

Vanadium
BT: Chemical elements

Vapor deposition
UF: Vacuum plating
Vapour deposition
BT: Materials processing
Surface treatment
RT: Coatings
Electrochemical deposition
MOCVD
Pulsed laser deposition
Substrates
Thin films

Varactors
BT: Capacitors
Semiconductor diodes

Variable speed drives
UF: Variable frequency drives
BT: Drives
RT: Magnetic gears
Motor drives
NT: Pitch control (audio)

Variable structure systems
BT: Adaptive systems

Varistors
BT: Resistors
RT: Arresters
Semiconductor devices

Vector processors
BT: Microprocessors

Vector quantization
UF: Vector quantisation
BT: Quantization (signal)
RT: Codes
Encoding
Image coding
MPEG 4 Standard
Speech coding
Transform coding
Video coding

Vectors
BT: Linear algebra
RT: Eigenvalues and eigenfunctions
Signal processing

Vegetable oils
BT: Oils
RT: Food products

Vegetation
UF: Trees (botanical)
BT: Biology
RT: Forestry
Vegetation mapping
NT: Crops
Marine vegetation

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: Collision avoidance
Vehicles

Vehicle detection
> BT: Automotive engineering
> NT: License plate recognition

Vehicle driving
> BT: Automotive engineering
> NT: Autonomous driving

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
> UF: Automobile safety
>   Automotive safety
> BT: Automotive engineering
>   Safety
> RT: Pedestrians
>   Vehicle-to-everything
> NT: Advanced driver assistance systems
>   Lane departure warning systems
>   Lane detection

Vehicle-to-everything
> UF: V2X
> BT: Communication systems
>   Intelligent vehicles
> RT: Advanced driver assistance systems
>   On board unit
>   Road safety
>   Vehicle safety
>   Vehicular ad hoc networks
> NT: Vehicle-to-infrastructure

Vehicle-to-grid
> UF: V2G
> BT: Electric vehicles
>   Smart grids
> RT: Battery powered vehicles
>   Demand side management
>   Distributed power generation
>   Fuel cell vehicles
>   Hybrid electric vehicles

Load management
Propulsion
Solar powered vehicles

Vehicle-to-infrastructure
> UF: V2I
> BT: Vehicle-to-everything

Vehicles
> BT: Transportation
>   Vehicular and wireless technologies
> RT: Mobile robots
>   Tires
>   Vehicle crash testing
>   Vehicle dynamics
>   Vehicular ad hoc networks
> NT: Connected vehicles
>   Hydrogen powered vehicles
>   Hypersonic vehicles
>   Intelligent vehicles
>   Internet of Vehicles
>   Land vehicles
>   Military vehicles
>   Remotely guided vehicles
>   Space vehicles

Vehicular ad hoc networks
> UF: V2V
>   VANET
>   Vehicle to vehicle communication
>   Vehicle-to-vehicle
> BT: Ad hoc networks
> RT: Dedicated short range communication
>   Internet of Vehicles
>   Mobile communication
>   Vehicle-to-everything
>   Vehicles
>   Vehicular automation
> NT: Road side unit

Vehicular and wireless technologies
> UF: Vehicular technologies
> NT: Automotive engineering
>   Land mobile radio equipment
>   Navigation
>   Propulsion
>   Vehicles
>   Wireless sensor networks

Vehicular automation
> BT: Automation

RT:	Autonomous vehicles	
	Intelligent vehicles	
	Mechatronics	
	Mobile robots	
	Multi-agent systems	
	Vehicular ad hoc networks	

Veins
BT:	Blood vessels

Velocity control
UF:	Rotational measurement
	Rotational speed
	Speed control
BT:	Mechanical variables control
RT:	Aerospace control
	Angular velocity
	Cruise control
	Motion control
	Motor drives
	Servosystems
NT:	Angular velocity control

Velocity measurement
UF:	Speed measurement
BT:	Mechanical variables measurement
RT:	Angular velocity
	Doppler measurement
	Flowmeters
	Motion measurement
	Slow light
	Tracking

Ventilation
BT:	Cooling
RT:	Air conditioning
	HVAC
	Temperature control
	Vents
NT:	Fans

Ventilators
UF:	Vented
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
	Entrepreneurship
	Research and development management
	Risk analysis

Venus
BT:	Planets

Vertical cavity surface emitting lasers
UF:	VCSEL
	Vertical cavity surface-emitting lasers
	Vertical-cavity surface-emitting lasers
BT:	Surface emitting lasers
RT:	Distributed Bragg reflectors
	P-i-n diodes

Very high speed integrated circuits
UF:	VHSIC
BT:	Integrated circuits

Very large scale integration
UF:	VLSI
	Very-large-scale-integration
BT:	Circuits
	Integrated circuits
	Large scale integration
RT:	Damascene integration
	Nanotechnology
	Parameter extraction
NT:	Neuromorphics

VHDL
UF:	VHSIC Hardware Description Language
BT:	Hardware design languages
RT:	Electronic design automation and methodology

	Field programmable gate arrays	
	Integrated circuits	
	Parallel programming	

VHF circuits

UF:	Very-high-frequency circuits	
BT:	Circuits	
RT:	Analog circuits	
	Helical antennas	
	VHF devices	

VHF devices

UF:	Very-high-frequency devices	
BT:	Communications technology	
RT:	VHF circuits	

Vibration control

BT:	Mechanical variables control	
RT:	Damping	
	Isolation technology	
	Shock absorbers	
	Vibration measurement	
	Vibrations	

Vibration measurement

BT:	Mechanical variables measurement	
RT:	Modal analysis	
	Vibration control	
	Vibrations	
	Vibrometers	

Vibrations

UF:	Mechanical vibrations	
	Tuning forks	
	Vibrating bodies	
BT:	Mechanical factors	
RT:	Acoustic noise	
	Acoustics	
	Damping	
	Dynamics	
	Elastodynamics	
	Nanogenerators	
	Oscillators	
	Resonance	
	Vibration control	
	Vibration measurement	

Vibrometers

BT:	Meters	
RT:	Vibration measurement	

Video codecs

BT:	Codecs	
	Communication equipment	
	Video equipment	
RT:	Decoding	
	Image coding	
	MPEG 4 Standard	
	MPEG standards	
	Video coding	

Video coding

UF:	Advanced video coding	
	Videocoding	
BT:	Video signal processing	
RT:	Image coding	
	MPEG 4 Standard	
	MPEG standards	
	Rate distortion theory	
	Streaming media	
	Transcoding	
	Vector quantization	
	Video codecs	
NT:	DVD	
	High efficiency video coding	

Video compression

BT:	Video signal processing	
RT:	Data compression	

Video conferencing

UF:	Videoconferencing	
BT:	Communication systems	
RT:	Meetings	

Video description

BT:	Assistive technologies	
	Audio systems	
	Videos	

Video equipment

UF:	Camcorders	
BT:	Communication equipment	
RT:	Consumer electronics	
	TV equipment	
	Video recording	
NT:	Optical projectors	
	Video codecs	
	Videos	

Video games
UF:	Computer games	
	Video-games	
	Videogames	
BT:	Videos	

Video on demand
BT:	Streaming media	
RT:	Broadband communication	
	Digital multimedia broadcasting	

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 sequences
UF:	Video sequence	
BT:	Computer graphics	
RT:	Image databases	
	Image processing	
	Multimedia computing	

Video signal processing
BT:	Multidimensional signal processing	
RT:	Authentication	
	Fall detection	
	Firewire	
	Gaze tracking	
	IEEE 1394 Standard	
	Image annotation	
	Image recognition	
	MPEG 4 Standard	
	MPEG standards	
	Motion detection	
	Object tracking	
	Streaming media	
	Time-frequency analysis	
NT:	Motion artifacts	
	Text detection	
	Video coding	
	Video compression	

Video surveillance
BT:	Surveillance	
RT:	Motion detection	

Video tracking
BT:	Image motion analysis	
	Tracking	

Videoconferences
BT:	Collaborative tools	

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:	Deepfakes	
	Video description	
	Video games	

Videotex
UF:	Viewdata	
BT:	Communication systems	
	Information services	
RT:	Data communication	
	Teletext	

Virology
BT:	Microbiology	
RT:	Epidemics	
	Viruses (medical)	

Virtual artifact
BT:	Artificial intelligence	
	Brain	
	Digital systems	
	Virtual reality	

Virtual assistants
UF:	Alexa	
	Bixby	
	Cortana	
	Siri	
BT:	Computer applications	
RT:	Digital humans	
	Smart devices	
NT:	Personal voice assistants	

JULY 2023 IEEE Thesaurus

Virtual colonoscopy
BT: Colonoscopy

Virtual enterprises
BT: Computer applications
        Data processing
        Economics
        Operations research
RT: Electronic commerce
        Internet
        Research and development
        Virtual manufacturing
        Virtual reality

Virtual environments
BT: Virtual reality
RT: Internet of Things
        Management information
base
NT: Metaverse
        Virtual links
        Virtualization

Virtual groups
UF: Virtual teams
BT: Collaboration

Virtual LAN
UF: VLAN
        Virtual local area network
BT: Local area networks
        Network function
virtualization
        Software defined
networking
RT: Virtual private networks

Virtual links
BT: Communication networks
        Routing protocols
        Telecommunication control
        Virtual environments
RT: Ethernet
        Routing

Virtual machine monitors
UF: Hypervisors
        VMMs
BT: Computers and information
processing
RT: Platform virtualization

Virtual machining
UF: Virtual machines
BT: Machining

        Virtual manufacturing
RT: Network function
virtualization
        Software defined
networking
        Virtual prototyping
        Virtual reality

Virtual manufacturing
UF: Digital factories
        Virtual factories
BT: Computer applications
RT: CADCAM
        Computer integrated
manufacturing
        Concurrent engineering
        Research and development
        Virtual enterprises
        Virtual prototyping
        Virtual reality
NT: Virtual machining

Virtual museums
BT: Digital images
        Museums
RT: Augmented reality
        Cultural differences
        Digital art
        Digital photography
        Digital preservation
        Digital recording
        Digital representation
        Virtual reality

Virtual power plants
BT: Distributed power
generation
RT: Cloud computing
        Power engineering
computing
        Power system control
        Power system management

Virtual private networks
UF: VPN
BT: Computer networks
RT: Data security
        Internet
        Local area networks
        Virtual LAN
        Wide area networks
NT: Extranets

Virtual prototyping
BT: Design methodology

RT: Product development
Prototypes
Rapid prototyping
Research and development
Virtual machining
Virtual manufacturing
Virtual reality

Virtual reality
BT: Computer graphics
Graphics
RT: 3D audio
Affordances
Cyberspace
Digital humans
Digital representation
Digital transformation
Digital twins
Immersive audio
Metaverse
Mixed reality
Solid modeling
Virtual enterprises
Virtual machining
Virtual manufacturing
Virtual museums
Virtual prototyping
Virtualization
NT: Augmented reality
Augmented virtuality
Avatars
Cybersickness
Extended reality
Immersive experience
Virtual artifact
Virtual environments
X reality

Virtualization
BT: Virtual environments
RT: Network function
virtualization
Software defined
networking
Virtual reality

Viruses (medical)
BT: Microorganisms
RT: COVID-19
Virology
NT: Bacteriophages
Coronaviruses
Influenza

Viscera
BT: Body regions

Viscosity
BT: Fluids
Measurement
Resistance
RT: Navier-Stokes equations
Rheology

Visible light communication
UF: VLC
BT: Data communication
Optical fiber communication
RT: Light emitting diodes
Light fidelity
Lighting

Vision defects
UF: Amblyopia
Color blindness
Myopia
BT: Visual systems
RT: Eye diseases
Visual impairment

Vision sensors
BT: Sensors
RT: Image processing

Visual analytics
UF: Video analytics
BT: Visualization
RT: Information representation

Visual BASIC
BT: Computer languages
RT: Software engineering
Software tools
System software

Visual communication
BT: Communication systems
RT: Image communication
Image resolution
TV
Videophone systems

Visual databases
UF: Moving object databases
BT: Databases
NT: Point cloud compression

Visual effects
BT: Visualization
RT: Animation
           Computer graphics

Visual impairment
UF: Vision impairment
BT: Medical conditions
RT: Blindness
           Cataracts
           Eye diseases
           Vision defects
NT: Macular degeneration

Visual information retrieval
BT: Information retrieval
RT: Image matching

Visual odometry
BT: Computer vision
           Robots

Visual perception
BT: Visual systems

Visual prosthesis
UF: Electronic visual prosthesis
           Visual prostheses
BT: Prosthetics
RT: Blindness

Visual servoing
UF: Vision Based Robot Control
BT: Motion control
           Robot vision systems

Visual systems
UF: Vision (biological)
BT: Sense organs
RT: Head
           Machine vision
           Saliency detection
NT: Vision defects
           Visual perception

Visualization
UF: Visual
           Visualisation
BT: Computer graphics
           Graphics
RT: Animation
           Design tools
           Educational technology
           Image forensics
NT: Curve fitting

           Surface reconstruction
           Visual analytics
           Visual effects

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

VLIW
UF: Very long instruction word
           Very-long-instruction-word
BT: Central Processing Unit

Vocabulary
BT: Information retrieval
RT: Ranking (statistics)

Vocational training
UF: NVQ
           National vocational
qualification
BT: Training
RT: Industrial training
           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
RT: Personal voice assistants
           Speech coding
           Speech recognition
           Speech synthesis

Voice mail
- BT: Message systems
- RT: Electronic mail
  - Office automation

Volatile organic compounds
- BT: Organic compounds

Volcanic activity
- BT: Volcanoes

Volcanic ash
- BT: Volcanoes
- RT: Ash

Volcanoes
- UF: Volcano
- BT: Geoscience
- NT: Volcanic activity
  - Volcanic ash

Voltage
- BT: Electric variables
- RT: Automatic voltage control
  - Capacitance-voltage characteristics
  - Electrophysiology
  - Phase frequency detectors
  - Voltage control
  - Voltage measurement
- NT: Breakdown voltage
  - Dynamic voltage scaling
  - Threshold voltage
  - Voltage fluctuations

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 fluctuations
- BT: Voltage
- RT: Power systems

Voltage measurement
- BT: Electric variables measurement
- RT: Automatic voltage control
  - Potentiometers
  - Voltage
  - Voltage transformers
  - Voltmeters
- NT: Low voltage
  - Medium voltage

Voltage multipliers
- BT: Circuits
- RT: AC-DC power converters
  - Charge pumps
  - Particle accelerators
  - Rectifiers
  - Transformers
  - Voltage control
- NT: Capacitors
  - Diodes

Voltage source inverters
- BT: Inverters

Voltage transformers
- UF: Potential transformers
- BT: Instrument transformers
- RT: Voltage measurement

Voltage-controlled oscillators
- UF: VCO
  - Voltage controlled oscillators
- BT: Oscillators
- RT: Ring oscillators

Voltage-source converters
- UF: Modular multi-level converters
  - VSC
  - Voltage-source convertors
- BT: Converters
  - Power conversion
- RT: AC-DC power converters
  - HVDC transmission
  - Power electronics
  - Pulse width modulation converters

Voltmeters
 BT: Meters
 RT: Voltage measurement

Volume measurement
 UF: Volume estimation
 BT: Mechanical variables measurement
 RT: Size measurement

Volume relaxation
 BT: Mechanical factors

Voting
 BT: Government
 NT: Electronic voting

W3C
 UF: World Wide Web Consortium
 BT: Standards organizations

W3C Standards
 BT: Standards publications

Wafer bonding
 BT: Bonding processes
  Semiconductor device manufacture

Wafer scale integration
 UF: Wafer level packaging
  Wafer-level packaging
 BT: Circuits
  Integrated circuits
  Large scale integration

Warehousing
 BT: Material storage
 RT: Production facilities
  Stacking
  Storage automation

Warranties
 UF: Product warranties
  Product warranty
 BT: Product liability

Washing machines
 BT: Electric machines
  Electrical products
  Home appliances
  Home automation

Waste disposal
 BT: Waste management

 RT: Effluents
  Pollution
  Radioactive waste
  Sanitary engineering
  Slag
 NT: Incineration
  Radioactive waste disposal

Waste handling
 BT: Waste management
 RT: Radioactive waste disposal
  Waste reduction
 NT: Sewage treatment
  Sludge treatment
  Waste handling equipment
  Wastewater treatment

Waste handling equipment
 BT: Waste handling
 RT: Materials handling equipment
  Remote handling equipment

Waste heat
 BT: Energy conversion
 RT: Boilers
  Cogeneration
  Energy conservation
  Industrial waste
  Thermal pollution

Waste management
 BT: Environmental management
 RT: Biodegradation
  Effluents
  Production management
  Radioactive waste
  Sanitary engineering
  Slag
  Waste materials
  Wastewater treatment
 NT: Waste disposal
  Waste handling
  Waste recovery
  Waste reduction

Waste materials
 UF: Refuse
  Solid waste
 BT: Materials
 RT: Fuels
  Radioactive pollution
  Sanitary engineering

		Waste management
		Waste recovery
		Water pollution
	NT:	Effluents
		Electronic waste
		Food waste
		Industrial waste
		Radioactive waste
		Slurries
		Wastewater

Waste recovery
	BT:	Waste management
	RT:	Waste materials
		Waste reduction

Waste reduction
	UF:	Waste compaction
	BT:	Waste management
	RT:	Design for disassembly
		Waste handling
		Waste recovery
	NT:	Compaction

Wastewater
	BT:	Waste materials
	RT:	Industrial waste
		Sanitary engineering
		Sludge treatment
		Wastewater treatment
		Water
		Water pollution
		Water pumps

Wastewater treatment
	UF:	Dissolved air flotation
	BT:	Waste handling
	RT:	Rubber products
		Sanitary engineering
		Sludge treatment
		Waste management
		Wastewater
		Water conservation
		Water pollution
	NT:	Ozonation

Watches
	BT:	Clocks
	RT:	Consumer products
		Time measurement

Water
	UF:	H2O
	BT:	Liquids
	RT:	Hydrodynamics

		Hydrologic measurements
		Hydrology
		Lakes
		Oceans
		Reservoirs
		Rivers
		Steam engines
		Wastewater
		Water heating
		Water pollution
		Water resources
		Water splitting
		Water storage
		Wetlands
	NT:	Water quality

Water conservation
	UF:	Water recycling
	BT:	Environmental management
	RT:	Wastewater treatment
		Water resources
		Water storage
	NT:	Desalination

Water heating
	BT:	Heating systems
	RT:	District heating
		Water

Water jet cutting
| | UF: | Abrasive water jet cutting |
| | BT: | Cutting tools |

Water monitoring
| | BT: | Monitoring |
| | | Water resources |

Water pollution
	BT:	Oceanic engineering and marine technology
		Pollution
	RT:	Effluents
		Industrial pollution
		Lakes
		Oils
		Pesticides
		Rivers
		Sanitary engineering
		Sewage treatment
		Thermal pollution
		Waste materials
		Wastewater
		Wastewater treatment
		Water

Water quality
Water resources
NT: Marine pollution

Water pumps
BT: Pumps
RT: Automotive components
Cooling
Hydraulic equipment
Irrigation
Photovoltaic systems
Wastewater

Water quality
BT: Water
RT: Water pollution

Water resources
BT: Environmental management
RT: Lakes
Remote sensing
Rivers
Water
Water conservation
Water pollution
Watersheds
NT: Desalination
Reservoirs
Stormwater
Water monitoring

Water splitting
BT: Chemical processes
RT: Chemical reactions
Hydrogen
Photochemistry
Water

Water storage
UF: Water-storage
BT: Material storage
RT: Crops
Lakes
Land use planning
Water
Water conservation
NT: Dams
Reservoirs

Watermarking
UF: Audio watermarking
Digital watermarking
Image watermarking
Watermark
BT: Security
RT: Copyright protection
Embossing
Internet of Things

Watersheds
BT: Hydrology
Land surface
RT: Rivers
Water resources

Watthour meters
UF: Watt hour meters
Watt-hour meters
BT: Wattmeters
RT: Energy measurement

Wattmeters
BT: Meters
RT: Power measurement
NT: Watthour meters

Wave energy conversion
UF: Wave energy converters
BT: Energy conversion
Hydroelectric power generation

Wave functions
BT: Waves
RT: Conformal mapping
Elementary particle exchange interactions
Functional analysis
NT: Wavelet analysis
Wavelet domain

Wave power
BT: Energy resources
Ocean waves
RT: Renewable energy sources

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 waveguides
RT: Lasers
NT: Substrate integrated waveguides

Waveguide theory
UF: Guided electromagnetic wave propagation
BT: Electromagnetic waveguides
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 division multiplexing
UF: WDM
       Wavelength division multiplexed
       Wavelength-division multiplexing
BT: Multiplexing
RT: Bragg gratings
       Multicast communication
NT: WDM networks

Wavelength measurement
BT: Measurement
RT: Acoustic measurements
       Electromagnetic measurements
       Frequency measurement
       Hyperspectral sensors
       Optical variables measurement

Wavelength routing
BT: Routing

Wavelet analysis
BT: Wave functions
RT: Wavelet transforms
NT: Multiresolution analysis

Wavelet coefficients
BT: Wavelet transforms

Wavelet domain
BT: Wave functions

Wavelet packets
BT: Wavelet transforms

Wavelet transforms
BT: Transforms
RT: Harmonic analysis
       Signal analysis
       Signal processing
       Signal representation
       Wavelet analysis
NT: Biorthogonal modulation
       Continuous wavelet transforms
       Discrete wavelet transforms

Wavelet coefficients
Wavelet packets

Waves
    BT: Physics
    RT: Acoustic propagation
           Acoustic scattering
           Electromagnetic propagation
           Electromagnetic radiation
           Electromagnetic scattering
           Time-domain analysis
    NT: Atmospheric waves
           Berry phase
           Doppler effect
           Electrodynamics
           Magnetostatic waves
           Matter waves
           Plasma waves
           Propagation
           Reflectivity
           Seismic waves
           Shock waves
           Solitons
           Surface acoustic waves
           Wave functions

WDM networks
    BT: Wavelength division multiplexing

Weapons
    UF: Bomb
           Munitions
           Ordinance
    BT: Military equipment
    RT: Defense industry
           Electronic countermeasures
           Military systems
           Terrorism
    NT: Biological weapons
           Chemical weapons
           Guns
           Missiles
           Nuclear weapons
           Projectiles
           Weapons of mass destruction

Weapons of mass destruction
    UF: WMD
    BT: Weapons
    RT: Biological weapons
           Chemical weapons
           National security

           Terrorism
           US Department of Homeland Security

Wearable antennas
    BT: Antennas
           Wearable computers
    RT: Body area networks
           Textile antennas
           Wearable sensors

Wearable computers
    UF: Body borne computers
           Wearable computing
           Wearable devices
           Wearable electronics
           Wearables
    BT: Computers
           Pervasive computing
    RT: Fall detection
           Internet of Medical Things
           Smart textiles
           Soft electronics
    NT: Smart glasses
           Wearable Health Monitoring Systems
           Wearable antennas

Wearable Health Monitoring Systems
    UF: Apple watch
           Fitbit
           Smartwatch
           WHMS
    BT: Smart healthcare
           Wearable computers
    RT: Electronic healthcare
           Smart devices

Wearable robots
    UF: Hardsuit
           Powered armor
           Powered exoskeleton
    BT: Robots
    RT: Assistive technologies
           Biomechanics
           Human-robot interaction
           Medical robotics
           Military equipment
           Military robotics
           Military systems
           Mobile robots
           Orthotics
           Prosthetics
           Service robots
           Soft robotics

Wearable sensors

Wearable sensors
- BT: Sensors
- RT: Biosensors
  - Body sensor networks
  - Image sensors
  - Infrared detectors
  - Magnetic sensors
  - Nanosensors
  - Optical sensors
  - Pressure sensors
  - Sensor arrays
  - Sensor fusion
  - Tactile sensors
  - Wearable antennas
  - Wearable robots
  - Wireless sensor networks

Weather forecasting
- UF: Weather prediction
- BT: Meteorology
- NT: Wind 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 design
- UF: Web site design
- BT: Web sites
- RT: Authoring systems
  - Content management
  - Software design
  - User interfaces
- NT: Web page design
  - Web pages

Web mining
- BT: Data mining

Web page design
- BT: Web design

Web pages
- BT: Web design

Web search
- BT: Search methods
- RT: Metasearch
- NT: Crawlers

Web servers
- BT: Servers
  - Web services

Web services
- BT: Internet
  - Middleware
- RT: Asynchronous communication
  - Cloud computing
  - Dark Web
  - Service computing
  - Webcams
- NT: Business Process Execution Language
  - Mashups
  - Message services
  - Service-oriented architecture
  - Simple object access protocol
  - Web TV
  - Web and internet services
  - Web servers
  - WebRTC

Web sites
- UF: Reddit
- BT: Computer applications
  - Information retrieval
- RT: Computer networks
  - Content management
  - Electronic commerce
  - Extranets
  - Internet
  - Portals
  - Social networking (online)
  - World Wide Web
- NT: Uniform resource locators
  - Web design

Web TV
- UF: Web television
- BT: Broadcasting
  - TV

Web services

Webcams
UF:	Web cams
BT:	Cameras
	Video recording
RT:	Web services

Webinars
BT:	Seminars

WebRTC
UF:	Web real-time communications
BT:	Application programming interfaces
	Real-time systems
	Web services

Weibull distribution
BT:	Statistical distributions
RT:	Failure analysis
	Probability
	Reliability engineering
	Statistics

Weibull fading channels
BT:	Fading channels

Weight control
BT:	Mechanical variables control

Weight measurement
BT:	Mechanical variables measurement

Welding
BT:	Fabrication
	Joining processes
RT:	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

Wheelchairs
BT:	Assistive technologies

Wheels
BT:	Mechanical products
RT:	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 blood cells
BT:	Blood

White matter
BT:	Central nervous system
RT:	Action potentials
	Axons
	Brain
	Learning systems

White noise
BT:	Noise
RT:	AWGN channels
	Music
	Random number generation
NT:	AWGN

JULY 2023 IEEE Thesaurus

White spaces
BT: Radio spectrum management

Whole body imaging
BT: Biomedical image processing

Whole-body PET
BT: Positron emission tomography

Wide area measurements
UF: WAMS
Wide area measurement systems
Wide-area measurement systems
Wide-area measurements
BT: Measurement

Wide area networks
UF: WAN
WANs
BT: Communication systems
Computer networks
RT: Electronic learning
Frame relay
IEEE 802.3 Standard
Internetworking
LAN interconnection
Multiprocessor interconnection
Open systems
Protocols
Token networks
Virtual private networks
NT: Low-power wide area networks

Wide band gap semiconductors
BT: Semiconductor materials
RT: Gallium alloys

Wideband
BT: Bandwidth
Communication systems
RT: Narrowband

Wiener filters
BT: Noise reduction

Wildlife
BT: Animals

WiMAX
UF: Wi-Max
WiMax
Wimax
Worldwide Interoperability for Microwave Access
BT: Wireless communication
RT: IEEE 802.16 Standard

Winches
BT: Materials handling equipment
RT: Cables
Lifting equipment

Wind
BT: Meteorology
RT: Sea surface
Wind energy
Wind power generation
NT: Wind forecasting
Wind speed
Wind stress

Wind energy
UF: Wind-energy
BT: Energy resources
RT: Turbines
Wind
Wind forecasting
Wind power generation
Wind turbines
NT: Wind energy conversion

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 farms
UF: Wind farm
BT: Energy resources

Wind forecasting
BT: Weather forecasting
Wind
RT: Wind energy
Wind energy generation
Wind turbines

Wind power generation
UF: Wind power
BT: Power generation
RT: Turbogenerators
Wind
Wind energy
NT: Wind energy conversion

Wind speed
BT: Wind
RT: Wind stress

Wind stress
BT: Stress
Wind
RT: Wind speed

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

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

Windup
BT: Feedback control

Wine industry
BT: Industry applications
NT: Wineries

Wineries
BT: Wine industry

Wire
BT: Materials
RT: Communication cables
Conductors
Wiring

Wire drawing
BT: Wires
RT: Manufacturing
Production

Wireless Access in Vehicular Environments
UF: WAVE
BT: Wireless networks
RT: IEEE 802.11p Standard
Intelligent vehicles

Wireless access points
UF: WAP
BT: Computer networks
Hardware
Mobile computing
Wireless communication
RT: IEEE 802.11 Standard
Routing protocols
Wireless LAN
Wireless fidelity

Wireless application protocol
UF: WAP
BT: Protocols
Wireless communication

Wireless cellular systems
BT: Wireless networks

Wireless communication
UF: Wireless systems
BT: Communication systems
RT: Bluetooth
Dynamic spectrum access
IEEE 802.11 Standard
IEEE 802.11p Standard
IEEE 802.22 Standard
Inductive charging

	Light fidelity
	Location awareness
	Long Term Evolution
	Machine-to-machine communications
	Mobile applications
	Paging systems
	Regional area networks
	Wireless LAN
	Wireless fidelity
NT:	Cognitive radio
	Cooperative communication
	Dedicated short range communication
	GSM
	Open wireless architecture
	Point-to-multipoint communications
	Roaming
	Smart devices
	Spatial diversity
	WRAN
	WiMAX
	Wireless access points
	Wireless application protocol
	Wireless networks

Wireless fidelity

UF:	wi-fi
	wifi
BT:	Wireless LAN
RT:	IEEE 802.11 Standard
	Light fidelity
	Radio frequency
	Wireless access points
	Wireless communication

Wireless LAN

UF:	Radio LAN
	WLAN
	Wireless Metropolitan Area Networks
	Wireless local area networks
BT:	Local area networks
RT:	Ad hoc networks
	Bluetooth
	Butler matrices
	IEEE 802.11 Standard
	IEEE 802.11e Standard
	IEEE 802.11g Standard
	IEEE 802.11n Standard
	IEEE 802.15 Standard
	LAN interconnection

	Personal area networks
	Radio communication
	Time-varying channels
	Wireless access points
	Wireless communication
	Wireless sensor networks
NT:	Light fidelity
	Wireless fidelity

Wireless mesh networks

BT:	Communication systems
RT:	Wireless sensor networks

Wireless networks

UF:	Wireless access networks
BT:	Wireless communication
RT:	Acoustic communication (telecommunication)
	IEEE 802.11p Standard
	IEEE 802.22 Standard
	Nanocommunication
	WRAN
	Wireless power transmission
NT:	AODV
	Self-organizing networks
	Wireless Access in Vehicular Environments
	Wireless cellular systems

Wireless personal area networks

UF:	WPAN
BT:	Personal area networks

Wireless power transfer

UF:	Wireless energy transmission
BT:	Wireless power transmission
NT:	Simultaneous wireless information and power transfer

Wireless power transmission

BT:	Power transmission
RT:	Conductors
	Wireless networks
NT:	Wireless power transfer

Wireless sensor networks

UF:	Underwater sensor networks
BT:	Communication systems
	Vehicular and wireless technologies
RT:	Ad hoc networks

Cyber-physical systems
Edge computing
Internet of Things
Machine-to-machine
communications
Microsensors
Nanocommunication
Sensors
Wearable sensors
Wireless LAN
Wireless mesh networks
NT: Body sensor networks
Event detection

Wires
BT: Structural shapes
RT: Nanowires
Springs
NT: Wire drawing

Wiring
BT: Electric variables
RT: Building services
Cables
Conductors
Layout
Metallization
Printed circuits
Wire

Wood industry
BT: Industries
RT: Forestry
Pulp and paper industry
Pulp manufacturing

Wool
BT: Agricultural products
Textiles
RT: Clothing
Fabrics
Natural fibers
Textile fibers
Yarn

Workability
BT: Mechanical factors

Workflow management software
UF: Workflow management
system
BT: Office automation

Working environment noise
UF: Environmental noise

BT: Acoustic noise
RT: Ergonomics
Hazards
Occupational health
Occupational safety

Workstations
BT: Microcomputers
RT: Cluster computing
Computer displays
Computer graphics
Peer-to-peer computing

World Wide Web
UF: WWW
BT: Computer applications
RT: Cyberspace
InterPlanetary File System
Internet
Web sites
NT: Bot (Internet)
Mashups

Wounds
BT: Injuries

WRAN
UF: Wireless regional area
networks
BT: Regional area networks
Wireless communication
RT: IEEE 802.22 Standard
Wireless networks

Wrapping
BT: Packaging
RT: Packaging machines

Wrist
BT: Arms

Writing
UF: Business writing
Engineering writing
Report writing
Technical reports
Technical writing
BT: Professional
communication
RT: Manuals
Proposals
NT: Abstracts
Bibliographies
Biographies
Braille

Dictionaries
Documentation
Grammar
Readability metrics
Resumes
Reviews
Thesauri

X reality
UF: Cross reality
XR
BT: Augmented reality
Virtual reality

X-ray applications
BT: X-rays
RT: Collimators
Phantoms
X-ray detection
X-ray telescopes
NT: X-ray imaging
X-ray lasers

X-ray astronomy
BT: Astronomy
X-rays
RT: X-ray telescopes

X-ray detection
BT: X-rays
RT: Diagnostic radiography
Diffraction
Electromagnetic radiation
Phantoms
Radiography
X-ray applications
X-ray detectors
X-ray imaging

X-ray detectors
BT: Ionizing radiation sensors
RT: Crystallography
Electromagnetic radiation
Gamma-ray detectors
Radiation detectors
X-ray detection
X-ray imaging
X-rays

X-ray diffraction
BT: Electromagnetic diffraction

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

X-ray lithography
BT: Lithography

X-ray scattering
UF: XRD
BT: X-rays

X-ray telescopes
BT: Telescopes
X-rays
RT: Aerospace electronics
X-ray applications
X-ray astronomy

X-ray tomography
BT: X-rays

X-rays
BT: Medical services
RT: Collimators
Electromagnetic radiation
Synchrotron radiation
Undulators
X-ray detectors
X-ray lasers
NT: X-ray applications
X-ray astronomy
X-ray detection
X-ray scattering
X-ray telescopes
X-ray tomography

X3D
BT: Computer graphics
Three-dimensional displays
RT: ISO Standards

Xenon
BT: Gases

XML
UF: Automatic Test Markup Language

Extensible Markup
Language
    BT: Markup languages

Yagi-Uda antennas
    BT: Antennas

Yarn
    BT: Textile fibers
    RT: Wool

Yield estimation
    UF: Yield estimate
    BT: Estimation
    RT: Circuit analysis
             Crops
             Microprocessor chips

Young's modulus
    UF: Tensile modulus
             Young modulus
    BT: Solids

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
             Yttrium compounds
    RT: Barium compounds

Yttrium compounds
    BT: Yttrium
    RT: Alloying
    NT: Yttrium barium copper
oxide

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 Trust
    BT: Security
    RT: Access control
             Authentication
             Permission

Zero voltage switching
    UF: ZVS
             Zero-voltage switching
    BT: Switching circuits
    RT: Inverters
             Switching converters

Zigbee
    BT: Radio communication
    RT: Automation
             Biomedical equipment
             Bluetooth
             IEEE 802.15 Standard
             Personal area networks
             Personal communication
networks
             Smoke detectors

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

Zirconium
    BT: Chemical elements

Zoology
    BT: Biology
    NT: Animals
             Entomology