
2022 IEEE THESAURUS

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Created by
The Institute of Electrical
and Electronics
Engineers (IEEE)

2022 IEEE Thesaurus

The IEEE Thesaurus is a controlled vocabulary of almost 11,200 descriptive engineering, technical and scientific terms, as well as IEEE-specific society terms [referred to as “descriptors” or “preferred terms”]. * Each descriptor included in the thesaurus represents a single concept or unit of thought. The descriptors are considered the preferred terms for use in describing IEEE content. The scope of descriptors is based on the material presented in IEEE journals, conference papers, standards, and/or IEEE organizational material. A controlled vocabulary is a specific terminology used in a consistent and controlled fashion that results in better information searching and retrieval.

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

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

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

Abbreviations used in the Thesaurus:

BT - Broader term
NT - Narrower term
RT - Related term
USE- Use preferred term
UF - Used for

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



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1/f noise

UF: 1f
Pink noise
BT: Noise

1f

USE: 1/f noise

2-D displays

USE: Two dimensional displays

2-d hole gas

USE: Two dimensional hole gas

2-D photonic crystals

USE: Photonic crystals

21CN

USE: Next generation networking

21st century networks

USE: Next generation networking

2D displays

USE: Two dimensional displays

2d hole gas

USE: Two dimensional hole gas

2D photonic crystals

USE: Photonic crystals

3-D displays

USE: Three-dimensional displays

3-D modeling

USE: Three-dimensional displays

3-D modelling

USE: Three-dimensional displays

3-D reconstruction

USE: Three-dimensional displays

3D accelerators

USE: Hardware acceleration

3D audio

BT: Audio systems
Augmented reality
RT: Virtual reality

3D displays

USE: Three-dimensional displays

3D integrated circuits

USE: Three-dimensional integrated circuits

3D integration

USE: Three-dimensional integrated circuits

3D modeling

USE: Three-dimensional displays

3D modelling

USE: Three-dimensional displays

3D printing

USE: Three-dimensional printing

3D reconstruction

USE: Three-dimensional displays

3G

USE: 3G mobile communication

3G mobile communication

UF: 3G
3rd generation mobile communication
IMT-2000
Third generation mobile communication

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

3G partnership project

USE: 3GPP



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3GPP

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

3GPP Standards

BT: Standards publications
NT: Long Term Evolution

3rd generation mobile communication

USE: 3G mobile communication

3rd generation partnership project

USE: 3GPP

4G mobile communication

UF: 4th generation mobile 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

4K UHD

USE: UHDTV

4th generation mobile communication

USE: 4G mobile communication

5G

USE: 5G mobile communication

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
Land mobile radio
Next generation networking
Tactile Internet
Ultra-dense networks
Enhanced mobile

NT: broadband

New Radio

5th generation mobile systems

USE: 5G mobile communication

5th generation systems

USE: 5G mobile communication

5th generation wireless systems

USE: 5G mobile communication

6G mobile communication

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

802.11

USE: IEEE 802.11 Standard

802.11ax

USE: IEEE 802.11ax Standard

802.11e

USE: IEEE 802.11e Standard

802.11g

USE: IEEE 802.11g Standard

802.11n

USE: IEEE 802.11n Standard

802.15

USE: IEEE 802.15 Standard

802.16

USE: IEEE 802.16 Standard

802.3

USE: IEEE 802.3 Standard

8K UHD

USE: UHDTV



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9/11	USE:	Terrorism	NT:	Induction generators Synchronous generators		
9/11 attack	USE:	Terrorism	AC light emitting diode lamps	USE:	LED lamps	
911 attack	USE:	Terrorism	AC machines	UF:	Alternating current	
A/D	USE:	Analog-digital conversion	machines	BT:	Electric machines	
A/D conversion	USE:	Analog-digital conversion		RT:	AC-AC converters Pulse width modulation Sensorless control Windings	
A/D converter	USE:	Analog-digital conversion		NT:	AC motors Induction machines Synchronous machines	
AAL	USE:	Ambient assisted living	AC motors	UF:	Alternating current motors	
ABC algorithms	USE:	Artificial bee colony		BT:	AC machines Motors	
algorithm			inverters	RT:	Pulse width modulation Pulse width modulation	
Abdomen	BT:	Body regions	modulation		Space vector pulse width	
Abrasive water jet cutting	USE:	Water jet cutting	NT:	Hysteresis motors Induction motors		
Abrasives	BT:	Production materials	AC-AC converters	UF:	AC-AC converters AC-AC power conversion	
Absorption	BT:	Materials science and		BT:	Converters Power conversion	
technology	RT:	Semiconductor detectors		RT:	AC machines	
Abstract algebra	BT:	Algebra	AC-AC converters	USE:	AC-AC converters	
	NT:	Galois fields Modules (abstract algebra)		AC-AC power conversion	USE:	AC-AC converters
Abstracts	BT:	Writing	AC-DC power converters	UF:	AC-DC power converters AC/DC power converters Analog-to-digital converter Analog-to-digital convertor	
	RT:	Information retrieval Information services		BT:	Power conversion	
AC generators	UF:	Alternating current	inverters	RT:	Machine vector control Pulse width modulation	
generators	BT:	Generators			Voltage multipliers Voltage-source converters	
	RT:	Pulse width modulation		NT:	Rectifying circuits	



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AC-DC power convertors

USE: AC-DC power converters

AC-LED lamps

USE: LED lamps

AC/DC power converters

USE: AC-DC power converters

Accelerated aging

BT: Aging
Materials testing

Accelerated computing

USE: Hardware acceleration

Accelerated testing

USE: Life estimation

Acceleration measurement

USE: Accelerometers

Accelerator architectures

BT: Computer architecture

Accelerator beams

USE: Particle beams

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
NT: Accesslists
Authorization
Blocklists

Multi-factor authentication
Passwords

Access lists

USE: Accesslists

Access point base station

USE: Femtocell networks

Access protocols

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

Access rights

USE: Permission

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



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Accreditation

BT: Educational programs
RT: Conformance testing
Training

Acoustic signal processing
Loudspeakers
Nonlinear acoustics

Accuracy

BT: Mathematics

Acoustic distortion measurement

USE: Distortion measurement

Acoustic applications

UF: Ultrasonic applications
BT: Acoustics
RT: Acoustic measurements
Biomedical acoustics
NT: Acoustic communication

(telecommunication)

Acoustic imaging
Acoustic testing

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 arrays

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

Acoustic materials

UF: Acoustic metamaterials
BT: Materials
RT: Piezoelectric materials

Acoustic beams

BT: Beams

Acoustic measurements

BT: Measurement
RT: Acoustic applications
Acoustic testing
Anechoic chambers
Biomedical acoustics
Frequency measurement
Phase measurement
Seismic measurements
Wavelength measurement

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 metamaterials

USE: Acoustic materials AND
Metamaterials

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

Acoustic diffraction

BT: Acoustic propagation

Acoustic distortion

BT: Distortion
RT: Acoustic noise



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Noise reduction
Working environment noise

Acoustic measurements
Photoacoustic effects

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

Acoustic surface waves

USE: Surface acoustic waves

Acoustic testing

BT: Acoustic applications
Materials testing
RT: Acoustic emission
Acoustic imaging

Acoustic transducers

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

Acoustic wave attenuation

USE: Acoustic waves AND
Attenuation

Acoustic waveguides

BT: Acoustic devices

Acoustic waves

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

Acoustical engineering

BT: Engineering - general

Acoustics

UF: Ultrasonics
BT: 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



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Acousto-optic devices

USE: Acousto-optical devices

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

Acoustomagnetic effects

USE: Magnetoacoustic effects

Acoustooptic devices

USE: Acousto-optical devices

Acoustooptic effects

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

Acquired immune deficiency syndrome

UF: AIDS
Acquired immunodeficiency

syndrome

BT: Diseases
RT: Human immunodeficiency

virus

Acquired immunodeficiency syndrome

USE: Acquired immune
deficiency syndrome

Action potentials

UF: Bioelectric potentials
BT: Physiology

RT: Axons
Membrane potentials
Neurons
White matter

Activated sludge process

USE: Sludge treatment

Activation analysis

BT: Chemical analysis

Active appearance model

BT: Computer vision

Active circuits

BT: Circuits
NT: Active inductors
Gyrators
Operational amplifiers

Active contours

BT: Motion analysis

Active distribution networks

BT: Power distribution networks

Active disturbance rejection control

USE: Robust control

Active filters

BT: Filters
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 LEDs

USE: Active matrix organic light
emitting diodes



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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 organic light-emitting diodes

USE: Active matrix 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

Active-matrix

USE: Active matrix technology

Active-matrix liquid-crystal displays

USE: Active matrix liquid crystal displays

Activities

USE: IEEE activities

Activity recognition

BT: Cognition
Pattern recognition
Sensor systems
RT: Computer vision

Actuators

UF: Dielectric electroactive polymer actuators
Electroactive polymer actuators
Electrostrictive polymer actuators
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

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
AODV
NT: Mesh networks
Mobile ad hoc networks
Vehicular ad hoc networks

Ad hoc On Demand Distance Vector

USE: AODV

Adaptation models

BT: Adaptive algorithms



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Adaptive algorithms

BT: Algorithms
NT: Adaptation models

Adaptive antenna arrays

USE: Adaptive arrays

Adaptive arrays

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

countermeasures

Adaptive codes

USE: Adaptive coding

Adaptive coding

UF: Adaptive codes
BT: Data compression

Adaptive control

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

Adaptive equalisers

USE: Adaptive equalizers

Adaptive equalizers

UF: Adaptive equalisers
BT: Equalizers

Adaptive estimation

BT: Statistics

Adaptive filters

BT: Adaptive signal processing

Adaptive learning

BT: Education
RT: Distance learning
Human computer

interaction

User interfaces

Adaptive mesh refinement

BT: Numerical analysis

Adaptive optics

BT: Optics

Adaptive scheduling

BT: Scheduling
RT: Adaptive systems
Production control

Adaptive signal detection

BT: Adaptive signal processing
RT: Adaptive arrays
Blind source separation
Source separation

Adaptive signal processing

BT: Signal processing
NT: Adaptive filters
Adaptive signal detection

Adaptive systems

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

ADAS

USE: Advanced driver assistance
systems

Add-drop multiplexers

BT: Multiplexing equipment
NT: Optical add-drop
multiplexers

Added delay

BT: Delay systems

Adders

BT: Circuits
RT: Digital integrated circuits
Logic circuits

Additive manufacturing

USE: Three-dimensional printing

Additive metric

USE: Maximum likelihood
detection



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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

Adenoviridae

USE: Adenoviruses

Adenoviruses

UF: Adenoviridae
BT: Microorganisms

Adhesive bonding

USE: Adhesives

Adhesive strength

BT: Materials testing

Adhesives

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

Adiabatic processes

BT: Thermodynamics

Adjacent channel interference

USE: Interchannel interference

Admission control

BT: Quality of service
RT: Bandwidth

Admittance

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

Advanced Research Projects Agency Network

USE: ARPANET

Advanced TV

USE: HDTV

Advanced video coding

USE: Video coding

Adversarial learning

USE: Adversarial machine learning

Adversarial machine learning

UF: Adversarial learning
BT: Machine learning

Advertising

BT: Marketing management

Aerial robots

USE: Autonomous aerial vehicles



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Aerodynamics

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

simulation

Aircraft
Hardware-in-the-loop

Hypersonic vehicles
Military systems
Missiles
Motion control
Space vehicles
Velocity control
Air traffic control
Attitude control
Ground support

Aerosols

BT: Electrostatic processes
RT: Liquids
Particle production
Spraying

NT:

Aerospace accidents

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

Aerospace electronics

UF: Aerospace instrumentation
Aircraft electronics
Aircraft instrumentation
Avionics
Space vehicle electronics
Space vehicle

Aerospace and electronic systems

RT: Auditory displays
Digital signal processing
Programming
Systems engineering and

instrumentation

theory

NT: Aerospace control
Aerospace engineering
Aerospace materials
Aircraft manufacture
Aircraft navigation
Aircraft propulsion
Command and control

BT: Aerospace engineering
RT: Aircraft
Gamma-ray telescopes
Space vehicles
Total ionizing dose
X-ray telescopes

systems

Electronic warfare
Military equipment
Radar
Sensor systems
Sonar
Telemetry

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 biophysics

BT: Aerospace engineering
Biophysics
RT: Human factors

Aerospace ground equipment

USE: Ground support

Aerospace components

BT: Aerospace materials

Aerospace ground services

USE: Ground support

Aerospace control

UF: Aircraft control
Flight control
BT: Aerospace and electronic
systems
RT: Aerodynamics
Aerospace simulation

Aerospace industry

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



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Aerospace instrumentation

USE: Aerospace electronics

Aerospace materials

UF: Aircraft materials
Spacecraft materials
BT: Aerospace and electronic

systems

RT: Production materials
Aerospace engineering
Aerospace industry
Aircraft manufacture
Lightweight structures
Space vehicles
NT: Aerospace components

Aerospace navigation

USE: Aircraft navigation

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

Afterburners

USE: Incineration

Ag

USE: Silver

Age factors

USE: Aging

Age of information

USE: Information age

Aged

USE: Aging

Ageing

USE: Aging

Agent-based modeling

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

Aggregates

BT: Materials
RT: Building materials

Agile computing

USE: Agile software development

Agile manufacturing

BT: Manufacturing systems
RT: Computer integrated

manufacturing

systems

Flexible manufacturing

Agile software development

UF: Agile computing
BT: Software development

management



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NT:	Scrum (Software development)	RT:	Agricultural engineering Agricultural products Mobile robots
Aging		Agriculture	
UF:	Age factors Aged Ageing	UF:	Livestock
BT:	Materials science and technology	BT:	Industries
RT:	Alzheimer's disease Ambient assisted living Assisted living Cataracts Electric breakdown Energy storage Gerontology Insulation life Life estimation Older adults Reliability	RT:	Agricultural engineering Agricultural machinery Animals Dairy products Farming Food waste Genetic engineering Pest control Seeds (agriculture) Soil pollution Vegetation mapping
NT:	Accelerated aging	NT:	Agricultural products Aquaculture Fertilizers Greenhouses Irrigation Smart agriculture
Agricultural engineering		AI	
BT:	Engineering - general	USE:	Artificial intelligence
RT:	Agricultural machinery Agricultural robots Agriculture Farming	AI accelerators	
Agricultural machinery		UF:	AI chips Artificial intelligence chips
UF:	Combine harvesters Tractors	BT:	Artificial intelligence Microprocessor chips
BT:	Machinery	RT:	Application specific
RT:	Agricultural engineering Agriculture Applicators Blades	integrated circuits	Coprocessors Field programmable gate
NT:	Agricultural robots	arrays	Graphics processing units Learning (artificial
Agricultural products		intelligence)	Multiprocessing systems Neural network hardware Neural networks Neuromorphic engineering System-on-chip
BT:	Agriculture	AI chips	
RT:	Agricultural robots Farming Food products Food security Irrigation	USE:	AI accelerators
NT:	Cotton Crops Dairy products Sugar Wool	AI technologies	
Agricultural robots		USE:	Artificial intelligence
BT:	Agricultural machinery Robots		



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AIDS

USE: Acquired immune deficiency syndrome

Aids for the handicapped

USE: Assistive technologies

AIEE Standards

BT: IEEE Standards

Air accidents

BT: Aerospace accidents

RT: Air safety
Air traffic control

Air bags

USE: Automotive components

Air cleaners

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

Air conditioning

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

Air filters

USE: Air cleaners

Air gaps

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

Air interface

USE: Communication channels

Air pollutants

USE: Air pollution

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
Thermal pollution

Air purifiers

USE: Air cleaners

Air quality

BT: Atmosphere
RT: Atmospheric

measurements

NT: Environmental factors
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 traffic management

USE: Air traffic control

Air transportation

BT: Transportation
RT: Air traffic control
Global Positioning System
NT: Aircraft
Airports

Air-gap

USE: Air gaps

Airborne radar

BT: Radar



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	RT:	Synthetic aperture radar		NT:	Propellers
Aircraft			<i>Airfields</i>		
	BT:	Air transportation		USE:	Airports
	RT:	Aerospace control	<i>Airfoils</i>		
		Aerospace electronics		USE:	Automotive components
		Aircraft manufacture	Airplanes		
		Aircraft navigation		BT:	Aircraft
		Aircraft propulsion	Airports		
		Ground support		UF:	Airfields
		Military aircraft		BT:	Air transportation
		Propellers			
	NT:	Airplanes			
		Helicopters			
<i>Aircraft control</i>			<i>Al</i>		
	USE:	Aerospace control		USE:	Aluminum
<i>Aircraft electronics</i>			<i>Al₂O₃</i>		
	USE:	Aerospace electronics		USE:	Aluminum oxide
<i>Aircraft engines</i>			Alarm systems		
	USE:	Aircraft propulsion		UF:	Warning systems
<i>Aircraft instrumentation</i>				BT:	Security
	USE:	Aerospace electronics		RT:	Fall detection
Aircraft manufacture					Monitoring
	BT:	Aerospace and electronic			Motion detection
systems					Safety
	RT:	Aerospace industry			Safety devices
		Aerospace materials		NT:	Smoke detectors
		Aircraft	Alcoholic beverages		
<i>Aircraft materials</i>				BT:	Ethanol
	USE:	Aerospace materials	Alcoholism		
Aircraft navigation				BT:	Diseases
	UF:	Aerospace navigation	<i>Alexa</i>		
		Entry, descent and landing		USE:	Virtual assistants
	BT:	Aerospace and electronic	Algae		
systems				BT:	Organisms
		Navigation	Algebra		
	RT:	Aircraft		BT:	Mathematics
		Course correction		RT:	Nonlinear equations
Aircraft propulsion				NT:	Abstract algebra
	UF:	Aircraft engines			Boolean algebra
	BT:	Aerospace and electronic			Linear algebra
systems					Set theory
		Propulsion	Algorithm design and analysis		
	RT:	Aircraft		BT:	Algorithms
		Engines			
		Jet engines			
		Turbines			



2022 IEEE Thesaurus

NT:	Algorithmic efficiency	Hash functions
networks	Generative adversarial	Heuristic algorithms
		Inference algorithms
		MLFMA
		Machine learning
Algorithm design and theory		
BT:	Algorithms	algorithms
NT:	Backtracking	Matching pursuit algorithms
	Consensus algorithm	Maximum likelihood
		detection
Algorithmic efficiency		
BT:	Algorithm design and	Multicast algorithms
analysis		Parallel algorithms
RT:	Computational complexity	Partitioning algorithms
	Software performance	Prediction algorithms
	Software quality	Projection algorithms
NT:	Metaheuristics	Pursuit algorithms
		Signal processing
Algorithms		
UF:	Subroutines	Software algorithms
BT:	Mathematics	Viterbi algorithm
RT:	Biometrics (access control)	Whale optimization
	Ciphers	
	Cyclic redundancy check	
	Huffman coding	<i>All optical networks</i>
	Linear programming	USE: All-optical networks
	Maximum likelihood	
decoding		All-optical networks
	Model checking	UF: All optical networks
	Numerical stability	BT: Optical fiber networks
	Random processes	
	Software	<i>Allocation</i>
	Software libraries	USE: Resource management
	Stability analysis	
NT:	Adaptive algorithms	<i>Allow lists</i>
	Algorithm design and	USE: Accesslists
analysis		
theory	Algorithm design and	Alloying
	Approximation algorithms	BT: Metals
	Artificial bee colony	RT: Aluminum alloys
algorithm		Aluminum compounds
	Backpropagation algorithms	Barium compounds
	Basis algorithms	Bismuth compounds
	Change detection	Calcium
algorithms		Cobalt
	Classification algorithms	Cobalt alloys
	Clustering algorithms	Copper alloys
	Compression algorithms	Gallium alloys
	Density estimation robust	Gallium compounds
algorithm		Germanium alloys
	Detection algorithms	Gold alloys
	Distributed algorithms	Hafnium compounds
	Dynamic programming	Indium compounds
	Filtering algorithms	Iron alloys
	Genetic algorithms	Lithium
		Lithium compounds
		Neodymium alloys



2022 IEEE Thesaurus

Nickel alloys
Niobium alloys
Platinum alloys
Silicon alloys
Strontium compounds
Tin alloys
Titanium alloys
Yttrium compounds
NT: Intermetallic
Shape memory alloys

Alloys
USE: Metals

Alpha particles
BT: Nuclear physics
RT: Ions

Alphavoltaic power sources
USE: Radioactive materials

Alternating current generators
USE: AC generators

Alternating current machines
USE: AC machines

Alternating current motors
USE: AC motors

Alternators
BT: Electric machines
RT: Synchronous generators

Altimetry
BT: Pressure measurement
RT: Atmospheric
measurements

Aluminium
USE: Aluminum

Aluminium alloys
USE: Aluminum alloys

Aluminium compounds
USE: Aluminum compounds

Aluminium industry
USE: Metals industry

Aluminium oxide
USE: Aluminum oxide

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

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 industry
USE: Metals industry

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



2022 IEEE Thesaurus

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

Amblyopia

USE: Vision defects

Ambulatory surgery

BT: Surgery

American Express

USE: Credit cards

American National Institute of Standards

USE: ANSI

American Standards Association

USE: ASA

Americium

BT: Chemical elements

Amino acids

BT: Biochemistry

AMLCDs

USE: Active matrix liquid crystal displays

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

Amniotic fluid

BT: Amniocentesis

Fluids and secretions

AMOLEDs

USE: Active matrix organic light emitting diodes

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

Amplify-and-forward cooperative communication

USE: Cooperative communication

Amplitude estimation

BT: Parameter estimation
RT: Reflection coefficient

Amplitude modulation

BT: Modulation
RT: Demodulation
Intensity modulation



2022 IEEE Thesaurus

NT:	Amplitude shift keying		
	Quadrature amplitude		
modulation		circuits	Microwave integrated
			Millimeter wave integrated
		circuits	Neural network hardware
Amplitude shift keying			Submillimeter wave
UF:	ASK		
BT:	Amplitude modulation	integrated circuits	
			UHF integrated circuits
Amygdala		NT:	CMOS analog integrated
UF:	Amygdalae	circuits	
	Corpus amygdaloideum		Field programmable analog
BT:	Brain	arrays	
<i>Amygdalae</i>			
USE:	Amygdala	Analog memory	
		BT:	Memory
<i>AN Project</i>		RT:	Analog processing circuits
USE:	Ambient networks		
<i>Anaesthesia</i>		Analog processing circuits	
USE:	Anesthesia	BT:	Analog circuits
		RT:	Analog integrated circuits
			Analog memory
			Application specific
Analog circuits		integrated circuits	
BT:	Circuits		Mixed analog-digital
RT:	Microwave circuits	integrated circuits	
	Millimeter wave circuits		Signal processing
	Neuromorphics		
	Submillimeter wave circuits		
	Switched capacitor	<i>Analog to digital conversion</i>	
networks		USE:	Analog-digital conversion
	UHF circuits		
	VHF circuits	<i>Analog to digital converter</i>	
NT:	Analog integrated circuits	USE:	Analog-digital conversion
	Analog processing circuits		
<i>Analog CMOS integrated circuits</i>		Analog TV	
USE:	CMOS analog integrated	UF:	Analogue TV
circuits		BT:	TV
		<i>Analog-digital</i>	
		USE:	Analog-digital conversion
Analog computers			
UF:	Analogue computers	Analog-digital conversion	
BT:	Computers	UF:	A/D
RT:	Summing circuits		A/D conversion
			A/D converter
<i>Analog digital integrated circuits</i>			Analog to digital conversion
USE:	Analog-digital integrated		Analog to digital converter
circuits			Analog-digital
			Analog-to-digital conversion
			Analog-to-digital converter
Analog integrated circuits			Analog-digital conversion
UF:	Analogue integrated circuits		Analog-digital converter
	Linear integrated circuits		Analog-digital conversion
BT:	Analog circuits	BT:	Analogue-digital conversion
	Integrated circuits	RT:	Analogue-digital converters
RT:	Analog processing circuits		Data conversion
	MMICs		Data acquisition
			Quantization (signal)
		NT:	Delta modulation



2022 IEEE Thesaurus

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

Analog-to-digital conversion

USE: Analog-digital conversion

Analog-to-digital converter

USE: AC-DC power converters
 AND Analog-digital conversion

Analog-to-digital convertor

USE: AC-DC power converters

Analogue CMOS integrated circuits

USE: CMOS analog integrated circuits

Analogue computers

USE: Analog computers

Analogue digital integrated circuits

USE: Analog-digital integrated circuits

Analogue integrated circuits

USE: Analog integrated circuits

Analogue TV

USE: Analog TV

Analogue-digital conversion

USE: Analog-digital conversion

Analogue-digital converters

USE: Analog-digital conversion

Analogue-digital integrated circuits

USE: 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 hierarchy process

USE: Analytic hierarchy process

Analytical models

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

Anatomical structure

BT: Medical diagnostic imaging

Anatomy

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

Android (operating system)

USE: Operating systems

Androids

BT: Robots
 RT: Human factors
 Man-machine systems

Anechoic chambers

BT: Test facilities
 RT: Acoustic measurements
 Antenna measurements



2022 IEEE Thesaurus

measurements
Electromagnetic
Immunity testing
TEM cells

Anemometers
USE: Fluid flow measurement

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

Anesthesiology
BT: Medical specialties

Anesthetic drugs
BT: Anesthesia

Aneurism
USE: Aneurysm

Aneurysm
UF: Aneurism
BT: Medical conditions

Angiocardiology
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 diffusion

USE: Anisotropic
magnetoresistance

Anisotropic effects

USE: Anisotropic
magnetoresistance

Anisotropic magnetoresistance

UF: Anisotropic diffusion
Anisotropic effects
Anisotropic
magnetoresistance sensors
Anisotropic material
Anisotropic processing



2022 IEEE Thesaurus

BT: Anisotropically
Anisotropy
Magnetoresistance

Anisotropic magnetoresistance sensors
USE: Anisotropic
magnetoresistance

Anisotropic material
USE: Anisotropic
magnetoresistance

Anisotropic processing
USE: Anisotropic
magnetoresistance

Anisotropically
USE: Anisotropic
magnetoresistance

Anisotropy
USE: Anisotropic
magnetoresistance

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

Annealing temperature
USE: Annealing

Annotations
BT: Metadata
RT: Text analysis

Announcements
USE: IEEE news

Anodes
BT: Electrodes
RT: Electron tubes

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

ANOVA
USE: Analysis of variance

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

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

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 components
USE: Antenna accessories

Antenna diversity
USE: Spatial diversity

Antenna feeds
BT: Feeds
RT: Antennas
Aperture coupled antennas



2022 IEEE Thesaurus

Antenna measurements

BT: Measurement
RT: Anechoic chambers
Antennas
Electromagnetic

measurements

Antenna phased arrays

USE: Phased arrays

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

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

NT: Spatial diversity
Waveguide theory
Antenna accessories
Antenna arrays
Antenna radiation patterns
Antenna theory
Apertures
Broadband antennas
Dielectric resonator

antennas

Dipole antennas
Directional antennas
Directive antennas
Feeds
Fractal antennas
Helical antennas
Horn antennas
Leaky wave antennas
Loaded antennas

antennas

Log-periodic dipole

Microstrip antennas
Microwave antennas
Mobile antennas
Multifrequency antennas
Omnidirectional antennas
Patch antennas
Radar antennas
Receiving antennas
Rectennas
Reflector antennas
Satellite antennas
Slot antennas
Steerable antennas
Transmission line antennas
Transmitting antennas
UHF antennas
Yagi-Uda antennas

Antennas and propagation

RT: Communication systems
Communications

technology

NT: Signal processing
Antennas
Electromagnetic

propagation

Radio astronomy

Anthropometry

BT: Measurement
RT: Biomechanics
Biomedical measurement
Ergonomics
Human factors

Anthropomorphism

BT: Human factors

Anti freeze

USE: Anti-freeze

Anti-bacterial

USE: Antibacterial activity

Anti-biotics

USE: Antibiotics

Anti-freeze

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



2022 IEEE Thesaurus

Anti-fungal

UF: Antifungal
BT: Antibiotics

Anti-parasitical

UF: Antiparasitical
BT: Antibiotics

Anti-reflective coatings

USE: Antireflection coatings

Anti-virus software

BT: Software
RT: Computer viruses
Malware
Security

Antibacterial

USE: Antibacterial activity

Antibacterial activity

UF: Anti-bacterial
Antibacterial
BT: Antibiotics

Antibiotics

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

Antidepressants

BT: Drugs

Antiderivatives

USE: Integral equations

Antiferroelectric materials

USE: Dielectric materials

Antiferromagnetic materials

BT: Magnetic materials
RT: Antiferromagnetic

resonance

Antiferromagnetic resonance

BT: Magnetic resonance
RT: Antiferromagnetic materials

Antifreeze

USE: Anti-freeze

Antifreeze materials

USE: Coolants

Antifungal

USE: Anti-fungal

Antimony

BT: Chemical elements

Antiparasitical

USE: Anti-parasitical

Antireflection coatings

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

Antireflective coatings

USE: Antireflection coatings

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

AOI

USE: Information age

Aortic semilunar valves

USE: Heart valves

Apache hadoop

USE: Cluster computing

Apache spark

USE: Cluster computing

APCVD

USE: Atmospheric pressure
chemical vapor deposition

APDs

USE: Avalanche photodiodes

Aperture antennas

BT: Apertures
RT: Aperture coupled antennas
Reflector antennas



2022 IEEE Thesaurus

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

Appearance matching

USE: Image matching

Apple watch

USE: Wearable Health Monitoring

Systems

Appliances

USE: Home appliances

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

Approximation theory

USE: Approximation methods



2022 IEEE Thesaurus

Aquaculture

UF: Fisheries
BT: Agriculture
RT: Marine animals

Aquatic robots

UF: Swimming robots
BT: Robots

Aquatic vehicles

USE: Underwater vehicles

Ar

USE: Argon

Arc discharges

UF: Arc flash
Arc-flash
BT: Dielectric breakdown
RT: Electrostatic discharges
High intensity discharge

lamps

Light sources
Plasmas

Arc flash

USE: Arc discharges

Arc lamps

USE: Lighting

Arc-flash

USE: Arc discharges

Archaea

BT: Organisms

Archaeology

USE: Archeology

Archeology

UF: Archaeology
BT: Humanities

Architectural description languages

USE: Architecture description languages

Architecture

BT: Industries
RT: Building information
management
Buildings
Structural engineering

Architecture (computer)

USE: Computer architecture

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

Artificial intelligence chips

USE: AI accelerators

Arithmetic

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

Armature

BT: Electromechanical devices

Armpit

USE: Axilla

Arms

BT: Extremities
NT: Wrist

ARPANET

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

ARQ

USE: Automatic repeat request

Array

USE: Arrays



2022 IEEE Thesaurus

Array processing

USE: Arrays AND
Parallel processing

Layout
Museums
Photorealism
NT: Digital art
Fractal art

Array signal processing

UF: Beamforming
BT: Signal processing
RT: Acoustic arrays
Acoustic transducers
Adaptive arrays
Blind source separation
Direction-of-arrival

estimation

Signal resolution
Source separation
Time of arrival estimation

Arrayed waveguide gratings

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

Arrays

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

Arresters

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

Arsenic

BT: Chemical elements
NT: Arsenic compounds

Arsenic compounds

UF: Arsenite
Arsine
BT: Arsenic

Arsenite

USE: Arsenic compounds

Arsine

USE: Arsenic compounds

Art

BT: Humanities
RT: Computer graphics
Graphics

Arterial blood circulation

BT: Arteries

Arterial blood pressure

BT: Arteries

Arterial occlusion

BT: Arteries

Arterial pressure

USE: Blood pressure

Arterial wall structures

USE: Arteries

Arterial walls

USE: Arteries

Arteries

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

Arteriography

USE: Angiography

Arteriosclerosis

BT: Diseases
NT: Atherosclerosis
Coronary arteriosclerosis

Artery

USE: Arteries

Arthritis

BT: Diseases

Artificial bee colony algorithm

UF: ABC algorithms
BT: Algorithms
RT: Cooperative systems
Optimization
Particle swarm optimization
Search problems



2022 IEEE Thesaurus

Artificial biological organs

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

Artificial fibers

USE: Synthetic fibers

Artificial fibres

USE: Synthetic fibers

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
Feedforward neural

networks

networks

analysis

Generative adversarial

Independent component

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 limbs

BT: Artificial biological organs
Prosthetics

Artificial neural networks

BT: Neural networks
RT: Mathematical models
Neuromorphic engineering
Synapses
NT: Convolutional neural

networks

Hebbian theory
Long short term memory
Residual neural networks
Self-organizing feature

maps

Artificial organs

USE: Artificial biological organs

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



2022 IEEE Thesaurus

Ash

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

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

Asia

BT: Continents

Asset management

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

ASIC

USE: Application specific
integrated circuits

Asset-management

USE: Asset management

ASK

USE: Amplitude shift keying

Assisted living

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

Asphalt

UF: Bitumen
BT: Building materials

Asphyxia

BT: Death

Assistive devices

BT: Assistive technologies
RT: Ambient assisted living

Aspirin

BT: Drugs

Assistive robots

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

ASR

USE: Automatic speech
recognition

Assemblers (program)

USE: Program processors

Assembly

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

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

Assembly robots

USE: Robotic assembly

Assembly systems

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



2022 IEEE Thesaurus

	Wearable robots		Stellar dynamics
NT:	Assistive devices		
	Assistive robots	Asymptotic stability	
	Closed captioning	BT:	System analysis and design
	Video description	RT:	Discrete-time systems
	Wheelchairs		Eigenvalues and
		eigenfunctions	Stability
Association rules			
BT:	Data mining		
Associative memory		Asynchronous circuits	
UF:	Content addressable	BT:	Circuits
memory		Asynchronous communication	
BT:	Memory	BT:	Data communication
RT:	Neural networks	RT:	Web services
Associative processing		Asynchronous transfer mode	
BT:	Data processing	BT:	Data communication
RT:	Computers and information		Protocols
processing		RT:	B-ISDN
			Broadband communication
Astatine			ISDN
BT:	Chemical elements		Multiprotocol label
Asteroids		switching	SONET
BT:	Planets		
<i>Asthma</i>		Atherosclerosis	
USE:	Respiratory system	BT:	Arteriosclerosis
Astrochemistry		Atmosphere	
UF:	Planetary chemistry	BT:	Geoscience
BT:	Chemistry	RT:	Atmospheric
Astronomy		measurements	
BT:	Science - general		Meteorology
RT:	Extraterrestrial	NT:	Air quality
measurements			Atmospheric modeling
	Gamma-ray detectors		Atmospheric waves
	Telescopes	Atmospheric measurements	
NT:	Astrophysics	BT:	Measurement
	Extrasolar planets	RT:	Air pollution
	Gravitational waves		Air quality
	Observatories		Altimetry
	Radio astronomy		Atmosphere
	Solar system		Barometers
	Stars		Geophysical measurements
	X-ray astronomy		Global warming
Astrophysics			Meteorology
BT:	Astronomy		Pressure gauges
	Physics		Remote sensing
RT:	Gravity measurement		Terrestrial atmosphere
NT:	Dark matter	Atmospheric modeling	
	Orbits	BT:	Atmosphere
			Modeling



2022 IEEE Thesaurus

Atmospheric pressure chemical vapor deposition

UF: APCVD
BT: Chemical vapor deposition

Atmospheric sintering

USE: Materials preparation

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 energy

USE: Nuclear power generation

Atomic force microscopy

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

microscopy

Atomic frequency standards

USE: Atomic clocks

Atomic lasers

USE: Gas lasers

Atomic layer deposition

BT: Chemical vapor deposition

Atomic measurements

BT: Measurement
RT: Nuclear measurements
Radiation detectors
Spectroscopy

Atomic optics

USE: Atom optics

Atoms

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

ATPG

USE: Automatic test pattern generation

Atrial fibrillation

BT: Fibrillation

Atrioventricular valves

USE: Heart valves

Atrophy

BT: Medical conditions

Attenuation

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

Attenuation measurement

BT: Electric variables
measurement
RT: Attenuation
Loss measurement



2022 IEEE Thesaurus

Attenuators

BT: Signal processing
RT: Attenuation
NT: Optical attenuators

Attitude control

BT: Aerospace control
RT: Position control

Attitude determination

USE: Position measurement

ATV

USE: HDTV

Au

USE: Gold

Audible noise

USE: Acoustic noise

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 enhancement

USE: Acoustic signal processing

AND

Noise reduction

Audio recording

BT: Recording

Audio restoration

USE: Acoustic noise

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 video

USE: Audio-visual systems

Audio visual systems

USE: Audio-visual systems

Audio watermarking

USE: Watermarking

Audio-visual instructional aids

USE: Educational technology

Audio-visual systems

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

Audiovisual systems

USE: Audio-visual systems

Auditory displays

BT: Audio systems
Communication equipment
RT: Aerospace and electronic

systems

Communication aids

Auditory icons

USE: Audio user interfaces



2022 IEEE Thesaurus

Auditory implants

UF: Auditory midbrain implants
BT: Implants

Auditory midbrain implants

USE: Auditory 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
NT: Multi-factor authentication
Nonfungible tokens

Authoring systems

UF: Authoring tools
BT: Software tools
RT: Computer aided instruction
Courseware
Multimedia systems
Web design

Authoring tools

USE: Authoring systems

Authorisation

USE: Authorization

Authorization

UF: Authorisation
BT: Access control
RT: Privacy

Autism

BT: Medical conditions

Auto correlation

USE: Autocorrelation

Auto-pilot

USE: Autopilot

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 guided vehicles

USE: Remotely guided vehicles



2022 IEEE Thesaurus

Automated highways

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

Automated indexing

USE: Machine assisted indexing

Automated meter reading

USE: Automatic meter reading

Automated storage and retrieval systems

USE: Storage automation

Automatic control

BT: Control systems
NT: Power generation control

Automatic frequency control

BT: Frequency control

Automatic gain control

USE: Gain control

Automatic generation control

BT: Automation
Control systems
Power generation

Automatic indexing

USE: Machine assisted indexing

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 pilot

USE: Autopilot

Automatic programming

UF: Program generators
BT: Programming

Automatic protection switching

USE: Protection switching

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 Markup Language

USE: XML

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
Bagging
Biometrics (access control)
Flash memories
Home automation
Information technology
Substation automation
Zigbee
NT: Automated highways
Automatic generation

control

Automatic testing
Building automation
Fourth Industrial Revolution



2022 IEEE Thesaurus

	Intelligent automation		Automotive engineering
	Manufacturing automation		Axles
	Office automation		Belts
	Storage automation		Brakes
	Vehicular automation		Camshafts
<i>Automobile engineering</i>			Gears
USE:	Automotive engineering		Hoses
		engines	Internal combustion
Automobile manufacture			Shock absorbers
BT:	Manufacturing systems		Steering systems
RT:	Automobiles		Suspensions (mechanical
	Automotive components	systems)	
	Automotive engineering		Tires
	Automotive materials		Torque converters
	Die casting		Water pumps
	Engines		Wheels
	Tires		
	Wheels		
<i>Automobile materials</i>		Automotive control	
USE:	Automotive materials	BT:	Automotive engineering
		RT:	Control systems
<i>Automobile parts</i>			Automobiles
USE:	Automotive components		Automotive components
			Automotive electronics
			Intelligent transportation
		systems	
Automobiles			Road traffic control
UF:	Cars		Road vehicles
BT:	Road vehicles		
RT:	Automobile manufacture	Automotive electronics	
	Automotive components	BT:	Automotive engineering
	Automotive control	RT:	Advanced driver assistance
	Automotive engineering	systems	
	Automotive materials		Automotive control
<i>Automotive</i>		Automotive engineering	
USE:	Automotive engineering	UF:	Automobile engineering
			Automotive
Automotive applications		BT:	Vehicular and wireless
BT:	Automotive engineering	technologies	
		RT:	Automobile manufacture
Automotive components			Automobiles
UF:	Air bags		Automotive components
	Airfoils		Diesel engines
	Automobile parts		Road safety
	Radiators (automotive)		Wheels
	Starter motors (automotive)	NT:	Automotive applications
	Windscreens		Automotive control
	Windscreens		Automotive electronics
	Windshield wipers		Power steering
	Windshields		Vehicle crash testing
BT:	Mechanical products		Vehicle detection
RT:	Automobile manufacture		Vehicle driving
	Automobiles		Vehicle dynamics
	Automotive control		Vehicle safety



2022 IEEE Thesaurus

Automotive materials

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

Autonomic computing

USE: Distributed computing

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
Unmanned aerial vehicles
Unmanned air vehicles
Unmanned airborne
vehicles
Unpiloted aerial vehicles
Unpiloted air vehicles
BT: Autonomous vehicles
RT: Military robotics
Military systems

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 cars

USE: Autonomous automobiles

Autonomous driving

BT: Autonomous vehicles
Vehicle driving

Autonomous machines

USE: Autonomous systems

Autonomous mental development

BT: Computational and artificial
intelligence

Autonomous navigation

USE: Autonomous robots

Autonomous robots

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

Autonomous systems

UF: Autonomous machines
Self managing systems
Self-managing systems
BT: Intelligent systems
Robotics and automation
NT: Autonomous robots
Autonomous vehicles

Autonomous trucks

USE: 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
Unmanned autonomous
vehicles
Unmanned vehicles
BT: Autonomous systems



2022 IEEE Thesaurus

	Intelligent vehicles		NT:	Single-photon avalanche
RT:	Artificial intelligence	diodes		
	Mechatronics			
	Multi-agent systems	Avatars		
	Vehicular automation	BT:	Graphical user interfaces	
NT:	Autonomous aerial vehicles		Virtual reality	
	Autonomous automobiles	RT:	Metaverse	
	Autonomous driving			
	Autonomous underwater	<i>AVC</i>		
vehicles		USE:	Automatic voltage control	
Autopilot		<i>Avionics</i>		
UF:	Auto-pilot	USE:	Aerospace electronics	
	Automatic pilot			
BT:	Control systems	Awards		
Autopsy		BT:	IEEE indexing	
BT:	Medical diagnosis	RT:	IEEE Awards activities	
RT:	Pathology		IEEE Medals	
		NT:	Nobel Prize	
<i>Autoregressive moving average models</i>		<i>AWG device</i>		
USE:	Autoregressive processes	USE:	Arrayed waveguide gratings	
Autoregressive processes				
UF:	Autoregressive moving	AWGN		
average models		BT:	Additive noise	
	Box Jenkins models		Gaussian noise	
BT:	Statistics		White noise	
RT:	Noise	AWGN channels		
	Time series analysis	BT:	Gaussian channels	
		RT:	Intersymbol interference	
Auxetic materials			White noise	
UF:	Auxetics	Axilla		
BT:	Materials	UF:	Armpit	
<i>Auxetics</i>			Underarm	
USE:	Auxetic materials	BT:	Shoulder	
Auxiliary transmitters		Axles		
BT:	Transmitters	BT:	Mechanical products	
Availability		RT:	Automotive components	
UF:	System availability		Wheels	
BT:	Reliability	Axons		
RT:	Maintenance engineering	BT:	Nerve fibers	
Avalanche breakdown		RT:	Action potentials	
BT:	Electric breakdown		Myelin	
			White matter	
Avalanche photodiodes		Azimuth		
UF:	APDs	BT:	Mathematics	
BT:	Photodiodes	NT:	Azimuthal angle	
RT:	Optical fiber communication		Azimuthal component	
	Photomultipliers		Azimuthal current	
			Azimuthal harmonics	



2022 IEEE Thesaurus

	Azimuthal plane		Backpropagation	UF: Back propagation Backward propagation Backwards propagation of
Azimuthal angle	BT: Azimuth		errors	BT: Learning systems RT: Backpropagation algorithms Neural networks
Azimuthal component	BT: Azimuth			
Azimuthal current	BT: Azimuth		Backpropagation algorithms	BT: Algorithms RT: Backpropagation
Azimuthal harmonics	BT: Azimuth			
Azimuthal plane	BT: Azimuth		Backscatter	BT: Reflection RT: Meteorological radar
Azobenzene	BT: Polymers RT: Smart materials		<i>Backscattering</i>	USE: Scattering
B-ISDN	UF: Broadband ISDN BT: Broadband communication ISDN RT: Asynchronous transfer		Backstepping	BT: Control nonlinearities
mode	Data communication Frame relay Image communication Multimedia communication		Backtracking	BT: Algorithm design and theory
<i>B-Spline</i>	USE: Splines (mathematics)		<i>Backward propagation</i>	USE: Backpropagation
<i>Ba</i>	USE: Barium		<i>Backwards propagation of errors</i>	USE: Backpropagation
<i>Babies</i>	USE: Pediatrics		<i>Bacteria</i>	USE: Microorganisms
<i>Baby</i>	USE: Pediatrics		<i>Bacterial content</i>	USE: Microorganisms
Back	BT: Body regions		Bacterial infections	BT: Diseases
<i>Back propagation</i>	USE: Backpropagation		Bagging	BT: Packaging RT: Automation Packaging machines Plastic packaging
Background noise	BT: Acoustic noise		<i>Baidu</i>	USE: Web and internet services
Backplanes	BT: Data buses		Ball bearings	BT: Machinery RT: Mechanical bearings Metal products



2022 IEEE Thesaurus

	Rolling bearings	<i>Bandgap</i>	USE: Photonic band gap
<i>Ball grid arrays</i>	USE: Electronics packaging	<i>Bandpass filters</i>	USE: Band-pass filters
Ball milling	BT: Production RT: Milling machines	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
<i>Ball screws</i>	USE: Mechanical products		
<i>Ballasts</i>	USE: Electronic ballasts		
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)	<i>Bandwidth allocation</i>	USE: Channel allocation
<i>Band gap</i>	USE: Photonic band gap	<i>Bandwidth efficiency</i>	USE: Spectral efficiency
<i>Band pass filters</i>	USE: Band-pass filters	<i>Bang bang control</i>	USE: Bang-bang control
Band structures	BT: Energy states	Bang-bang control	UF: Bang bang control BT: Optimal control RT: Time factors
<i>Band-gap</i>	USE: Photonic band gap	Banking	BT: Financial industry RT: Finance NT: Online banking Open banking
Band-pass filters	UF: BPF Band pass filters Bandpass filters BT: Active filters RT: Frequency Signal processing NT: Filter banks	Bankruptcy	BT: Finance RT: Business Commercial law Economics
<i>Band-stop filters</i>	USE: Notch filters	Bar codes	BT: Optical detectors Product codes RT: Internet of Things Inventory management NT: QR codes



2022 IEEE Thesaurus

Barges

USE: Boats

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

Baroreceptor reflex

USE: Baroreflex

Baroreflex

UF: Baroreceptor reflex
BT: Cardiovascular system

Bars

BT: Structural shapes
NT: Billets

Basal cell carcinoma

USE: Skin cancer

Basal ganglia

BT: Brain

Base stations

BT: Radio communication

equipment

RT: Device-to-device

communication

Femtocell networks
NT: Femtocells

Baseball

USE: Sports

Baseband

BT: Digital communication
Radio communication
RT: Passband

Basis algorithms

BT: Algorithms

Batch manufacturing

USE: Batch production systems

Batch processing

USE: Batch production systems

Batch production systems

UF: Batch manufacturing
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
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



2022 IEEE Thesaurus

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

Bayesian approach

USE: Bayes methods

Bayesian belief networks

USE: Bayes methods

Bayesian estimation

USE: Bayes methods

Bayesian inference

USE: Bayes methods

Bayesian learning

USE: Bayes methods

Bayesian methods

USE: Bayes methods

Bayesian networks

USE: Bayes methods

BCI

USE: Brain-computer interfaces

Beak

BT: Animal structures
RT: Birds

Beam steering

BT: Microwave technology
RT: Antennas
NT: Steerable antennas

Beamforming

USE: Array signal processing

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

Bearing estimation

USE: Direction-of-arrival estimation

Behavioral sciences

BT: Social sciences
Systems, man, and

cybernetics

RT: Affective computing
Bio-inspired computing
Cyberbullying
Cyberethics
Digital intelligence
Emotion recognition
Ergonomics
Human factors
Medical services
Mental health
Persuasive systems
Social computing
System dynamics
NT: Animal behavior
Cognition
Consumer behavior
Psychiatry
Psychology
Social intelligence

Belief functions

USE: Evidence theory



2022 IEEE Thesaurus

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

Bench to bedside

USE: Translational research

Benchmark problems

USE: Benchmark testing

Benchmark tasks

USE: Benchmark testing

Benchmark testing

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

Benchmarking

USE: Benchmark testing

Bending

BT: Mechanical factors

Benign masses

USE: Benign tumors

Benign tumors

UF: Benign masses

BT: Tumors

BER

USE: Bit error rate

BER analysis

USE: Bit error rate

BER performance

USE: Bit error rate

Berry phase

BT: Waves

BERT

USE: Bit error rate

Beryllium

BT: Chemical elements

Bespoke production

USE: Job production systems

Best practices

BT: Management
 Quality assurance
 RT: Business communication
 Enterprise architecture

management

Beta rays

BT: Nuclear physics
 RT: Electrons

Betavoltaic power sources

USE: Radioactive materials

Bevel gears

USE: Gears

Beverage industry

BT: Industries
 RT: Bottling
 Food industry

Beyond CMOS

BT: Integrated circuit
 technology

BI

USE: Business intelligence

Bi

USE: Bismuth



2022 IEEE Thesaurus

Bi-stable circuits

USE: Bistable circuits

Bibliographies

BT: Writing
RT: Publishing

Bibliometrics

BT: Publishing
NT: Citation analysis

BiCMOS integrated circuits

UF: BiMOS integrated circuits
BT: Bipolar transistor circuits

Bicuspid valves

USE: Heart valves

Bicycles

BT: Land vehicles
RT: Sports equipment

Bidirectional communication

USE: Bidirectional control

Bidirectional control

UF: Bidirectional communication
BT: Bidirectional reflectance
Control systems

Bidirectional power flow

BT: Power system control

Bidirectional reflectance

USE: Bidirectional control

Bifurcation

BT: Nonlinear equations
RT: Chaos

Big Data

BT: Data collection
RT: 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

Bilinear systems

USE: Nonlinear systems

Billets

BT: Bars

Bills of materials

BT: Inventory management
Materials requirements

planning

BIM

USE: Building information management

BiMOS integrated circuits

USE: BiCMOS integrated circuits

Binary codes

BT: Codes
NT: Reflective binary codes

Binary decision diagrams

BT: Data structures

Binary phase shift keying

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

Binary phase-shift keying

USE: Binary phase shift keying

Binary search trees

BT: Binary trees

Binary sequences

BT: Sequences

Binary trees

BT: Tree data structures
NT: Binary search trees

Bio-computing

USE: Bio-inspired computing



2022 IEEE Thesaurus

Bio-inspired computing

UF: Bio-computing
Biocomputing
Bioinspired computing
Biologically inspired computing

BT: Artificial intelligence
Bio-inspired engineering
Behavioral sciences
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
Biology
Biomimetics
Complex systems

NT: Bio-inspired computing
Bio-inspired control
Bio-inspired robotics

Bio-inspired robotics

UF: bioinspired robotics
BT: Bio-inspired engineering
Robots

Bio-MEMs

USE: Biomedical microelectromechanical systems

Bio-nanotechnology

USE: Bionanotechnology

Bioacoustics

USE: Biomedical acoustics

Bioceramics

BT: Biological materials
Biomedical materials
Ceramics

RT: Ceramics industry
Prosthetics

Biochemical analysis

BT: Biochemistry
RT: Biochips

Biochemistry

UF: Enzymes
Hormones
Metabolic networks
Metabolism

BT: Biology
Chemistry

RT: Biological cells
Bioreactors
Cell signaling
Computational biochemistry
Drugs
Entomology
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

Biocomputing

USE: Bio-inspired computing

Biocontrol

USE: Biological control systems

Biocybernetics

USE: Cybernetics

Biodegradable materials

BT: Biodegradation

Biodegradation

BT: Environmental management

RT: Waste management

NT: Biodegradable materials

Biodiversity

BT: Biology
NT: Biogeography

Bioelectric phenomena

UF: Bioelectronics
Electrobiolgy

BT: Biology

RT: Brain



2022 IEEE Thesaurus

	Electrical accidents		Computational biophysics
	Electroencephalography	NT:	Neuroinformatics
	Electromyography		
	Electrooculography	<i>Bioinspired computing</i>	
	Nervous system	USE:	Bio-inspired computing
NT:	Electric shock		
<i>Bioelectric potentials</i>		<i>bioinspired robotics</i>	
USE:	Action potentials	USE:	Bio-inspired robotics
<i>Bioelectronics</i>		Biological cells	
USE:	Bioelectric phenomena	UF:	Cell biology
			Chromosomes
<i>Bioengineering</i>		BT:	Biology
USE:	Biomedical engineering	RT:	Biochemistry
			Biological materials
<i>Biofeedback</i>			Biomembranes
USE:	Biological control systems		DNA
Biofuels			Microorganisms
BT:	Fuels	NT:	Self-assembly
RT:	Food waste		Cell signaling
			Cells (biology)
Biogeography			Chromosome mapping
BT:	Biodiversity		Endothelial cells
			Fibroblasts
Biographies			RNA
BT:	Writing		Stem cells
RT:	Engineering profession	<i>Biological clocks</i>	
NT:	Autobiographies	USE:	Chronobiology
Biohazards		Biological control systems	
UF:	Germ warfare	UF:	Biocontrol
BT:	Hazards		Biofeedback
RT:	Chemical hazards	BT:	Systems, man, and
	Green products	cybernetics	
	Medical treatment	RT:	Immune system
	Terrorism		Legged locomotion
<i>Bioimaging</i>			Prosthetics
USE:	Biomedical imaging	NT:	Biomarkers
Bioimpedance		<i>Biological effects of protons</i>	
BT:	Biomedical engineering	USE:	Proton effects
	Current		
RT:	Blood flow	Biological effects of radiation	
Bioinformatics		UF:	Biological radiation effects
UF:	Biomedical informatics	BT:	Radiation effects
	Health informatics	RT:	Biomedical applications of
BT:	Biomedical computing	radiation	
	Informatics		Neutron capture therapy
RT:	Biology		Occupational health
	Computational biochemistry		Proton therapy
	Computational biology		Radiation protection



2022 IEEE Thesaurus

Biological EPR

USE: Electron paramagnetic resonance

Biological imaging

USE: Biomedical imaging

Biological information theory

BT: Biology
Information theory
RT: DNA
Genetic communication

Biological interactions

BT: Biological processes

Biological macromolecules

USE: Molecular biophysics

Biological markers

USE: Biomarkers

Biological materials

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

Biological membranes

USE: Biomembranes

Biological neural networks

UF: Neuronal networks
BT: Neural networks
Neurophysiology

Biological organs

USE: Biological systems

Biological processes

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

Biological radiation effects

USE: Biological effects of radiation

Biological sensors

USE: Biosensors

Biological system modeling

BT: Biology
RT: Mechanobiology
Neuromorphics
Synthetic biology

Biological systematics

USE: Systematics

Biological systems

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

Biological techniques

BT: Biomedical engineering
RT: Biomedical equipment

Biological tissue

USE: Biological tissues

Biological tissues

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

Biologically inspired computing

USE: Bio-inspired computing

Biologically inspired control

USE: Bio-inspired control

Biologically inspired engineering

USE: Bio-inspired engineering

Biology

BT: Engineering in medicine
and biology
Science - general



2022 IEEE Thesaurus

theory	RT:	Bio-inspired computing Bio-inspired engineering Bioinformatics Computational biology Immune system Life sciences	<i>Biomagnetism</i>	USE:	Biomagnetics
	NT:	Biochemistry Biodiversity Bioelectric phenomena Biological cells Biological information	Biomarkers	UF:	Biological markers Human disease markers
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	BT:	BT:	Biological control systems Biomedical measurement Molecular biomarkers
			Biomass	NT:	Renewable energy sources
processing			<i>Biomaterials</i>	BT:	Biological materials
			USE:		
processing			Biomechanics	BT:	Mechanical factors
			RT:	RT:	Anthropometry Cell signaling Entomology Mechanobiology Motion capture Wearable robots
processing			NT:	NT:	Fall detection
			Biomechatronics	BT:	Mechatronics
processing			Biomedical acoustics	UF:	Bioacoustics Biomedical ultrasonics
			BT:	BT:	Acoustics Acoustic applications Acoustic measurements Auditory system
processing			<i>Biomedical applications of electromagnetic radiation</i>	USE:	Biomedical applications of radiation
processing			Biomedical applications of radiation	UF:	Biomedical applications of electromagnetic radiation
			BT:	BT:	Radiation therapy Biomedical engineering Nuclear and plasma sciences
processing			RT:	RT:	Angiocardiology Biological effects of radiation
					Biomedical imaging Cancer Collimators



2022 IEEE Thesaurus

tomography	Computed tomography Gamma-ray detectors Medical treatment Positron emission	education	Biomedical electrodes Biomedical engineering
	Radiation effects Radiography Synchrotron radiation		Biomedical monitoring Biomedical optical imaging Colloidal lithography Genetic communication Genetic engineering Hospitals Microfluidics Orthotics
Biomedical communication			NT: Bioimpedance Biological techniques Biomedical applications of
BT: Communication systems Engineering in medicine			
and biology			
RT: Fall detection Medical devices Nanocommunication		radiation	
(telecommunication)			Biomedical electronics Biomedical signal
communication systems	Picture archiving and Point of care	processing	Biotechnology Cloning Drug delivery Neural engineering Protein engineering Tissue engineering Translational research
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 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



2022 IEEE Thesaurus

	NT:	Zigbee Assistive technologies Biomedical electrodes Biomedical telemetry Biomedical transducers Catheters Endoscopes Gerontechnology Hypodermic needles Implants Intracranial pressure			Data visualization Isosurfaces Medical diagnosis Molecular biophysics Nanobiophotonics Picture archiving and communication systems
sensors		Lithotriptors Medical devices Medical instruments Pacemakers Pulse oximeter Stethoscope Surgical instruments Ventilators		NT:	Radiation imaging Tomography Ultrasonic imaging Angiocardiology Angiography Biomedical optical imaging Cardiography DICOM Elastography Encephalography Mammography Medical diagnostic imaging Molecular imaging Phantoms Photoacoustic imaging
		Biomedical image processing			
	UF:	Medical image processing			
	BT:	Biomedical signal			
processing					<i>Biomedical informatics</i>
	RT:	Biomedical imaging Biomedical optical imaging Functional magnetic		USE:	Bioinformatics
resonance imaging		Magnetoencephalography Medical robotics Subtraction techniques			<i>Biomedical infrared imaging</i>
	NT:	Imaging phantoms Motion artifacts Neuroimaging Radiographic image		USE:	Biomedical optical imaging
enhancement					<i>Biomedical instruments</i>
		Radiology Radiomics Ultrasonography Whole body imaging		USE:	Biomedical measurement
		Biomedical imaging			Biomedical materials
	UF:	Bioimaging Biological imaging Biomedical X-ray imaging Medical imaging Tomosynthesis		BT:	Materials
	BT:	Engineering in medicine		RT:	Biological materials Diamond-like carbon Molecular biophysics
and biology				NT:	Bioceramics Biomembranes
	RT:	Imaging Biomedical applications of			Biomedical measurement
radiation		Biomedical image		UF:	Biomedical instruments Biomedical measurements
processing				BT:	Measurement
				RT:	Anthropometry Biomedical electrodes Biomedical equipment Biosensors Pulse oximetry
				NT:	Biomarkers Biomedical monitoring Electroencephalography Electromyography Electrooculography Electrophysiology



2022 IEEE Thesaurus

Photoplethysmography	Transducers
Plethysmography	
Pulse oximeter	<i>Biomedical ultrasonics</i>
Sensitivity and specificity	USE: Biomedical acoustics
<i>Biomedical measurements</i>	<i>Biomedical X-ray imaging</i>
USE: Biomedical measurement	USE: Biomedical imaging
Biomedical microelectromechanical systems	Biomembranes
UF: Bio-MEMs	UF: Biological membranes
BT: Micromechanical devices	Membranes
RT: Biomedical equipment	BT: Biomedical materials
	RT: Biological cells
Biomedical monitoring	<i>Biometric systems</i>
BT: Biomedical measurement	USE: Biometrics (access control)
RT: Biomedical engineering	
Epidemiology	
Internet of Medical Things	Biometrics (access control)
Phonocardiography	UF: Biometric systems
NT: Nanomedicine	BT: Identification of persons
	RT: Access control
<i>Biomedical MRI</i>	Algorithms
USE: Magnetic resonance	Automation
imaging	Handwriting recognition
	Information technology
Biomedical optical imaging	Security
UF: Biomedical infrared imaging	Speaker recognition
BT: Biomedical imaging	NT: Face recognition
RT: Biomedical engineering	Fingerprint recognition
Biomedical image	Gait recognition
processing	Iris recognition
	Keystroke dynamics
	Palmprint recognition
	Biomimetic materials
Endomicroscopy	BT: Biomimetics
Endoscopes	Smart materials
Infrared imaging	
Optical communication	
equipment	
Optical devices	
Biomedical signal processing	<i>Biomimetic microelectronics</i>
BT: Biomedical engineering	USE: Biomimetics
RT: Biomedical computing	
Fall detection	Biomimetics
Neurophysiology	UF: Biomimetic microelectronics
Time-frequency analysis	Biomimicry
NT: Biomedical image	Bionics
processing	BT: Microprocessors
	RT: Bio-inspired engineering
Biomedical telemetry	Whale optimization
UF: Biotelemetry	algorithms
BT: Biomedical communication	NT: Biomimetic materials
Biomedical equipment	
Telemetry	<i>Biomimicry</i>
	USE: Biomimetics
Biomedical transducers	
BT: Biomedical equipment	



2022 IEEE Thesaurus

Biomolecular electronics

USE: Molecular electronics

Biomolecules

USE: Molecular biophysics

Bionanotechnology

UF: Bio-nanotechnology

BT: Engineering in medicine

and biology

Nanotechnology

Bionics

USE: Biomimetics

Biophotonics

BT: Biology

Photonics

Biophysics

BT: Biology

Physics

RT: Computational biophysics

NT: Aerospace biophysics

Biomagnetism

Cellular biophysics

Molecular biophysics

Biopolymers

BT: Polymers

Biopsy

BT: Medical tests

Bioreactors

BT: Chemical reactions

RT: Biochemistry

Biorthogonal modulation

BT: Wavelet transforms

Biosensors

UF: 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

Biotelemetry

USE: Biomedical telemetry

Bioterrorism

BT: Engineering in medicine

and biology

Terrorism

Bipartite graph

BT: Graph theory

Biped locomotion

USE: Legged locomotion

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



2022 IEEE Thesaurus

RT:	Bismuth compounds	Bitcoin	BT:	Cryptocurrency
Bismuth compounds			RT:	Blockchains
UF:	BSCCO			Cryptography
BT:	Compounds			Finance
RT:	Alloying			Nonfungible tokens
	Bismuth			Online banking
<i>BIST</i>		<i>Bitrate</i>	USE:	Bit rate
USE:	Built-in self-test	<i>Bitumen</i>	USE:	Asphalt
<i>Bistability (optical)</i>		<i>Bixby</i>	USE:	Virtual assistants
USE:	Optical bistability	<i>Blackberry</i>	USE:	Personal digital devices
Bistable circuits		Bladder	BT:	Urogenital system
UF:	Bi-stable circuits	Blades	UF:	Vanes
BT:	Circuits		BT:	Mechanical products
NT:	Latches		RT:	Agricultural machinery
<i>Bistable multivibrator</i>				Cutting tools
USE:	Pulse circuits			Fans
Bistatic radar				Impellers
BT:	Radar			Propellers
<i>Bit allocation</i>				Turbomachinery
USE:	Bit rate	Blanking	BT:	Manufacturing systems
Bit error rate			RT:	Metal products
UF:	BER			Metals
	BER analysis			Sheet metal processing
	BER performance			
	BERT			
	Bit error rate test			
BT:	Error analysis			
<i>Bit error rate test</i>		Blast furnaces	BT:	Furnaces
USE:	Bit error rate		RT:	Smelting
<i>Bit interleaved coded</i>		Bleaching	BT:	Materials processing
USE:	Interleaved codes		RT:	Manufacturing systems
Bit rate				Paper making
UF:	Bit allocation			Process control
	Bitrate			Textile technology
BT:	Timing	<i>Bleeding</i>	USE:	Hemorrhaging
RT:	Communication system	<i>Blended learning</i>	USE:	Hybrid learning
signaling				
	Computer networks			
	Signal processing			
<i>Bit-interleaved coded</i>				
USE:	Interleaved codes			



2022 IEEE Thesaurus

Blind channel estimation

USE: Blind equalizers

Blind equalisers

USE: Blind equalizers

Blind equalizers

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

Blind signal separation

USE: Blind source separation

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 chain

USE: Blockchains

Block codes

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

Block coding

USE: Block codes

Block listing

USE: Blocklists

Block lists

USE: Blocklists

Block signaling

USE: Block signalling

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 blockchains
Private blockchains
Public blockchains
BT: Cryptography
Distributed databases
Authentication
Bitcoin
Computer security
Content management
Cryptocurrency
Data collection
Decentralized autonomous

organization

Directed acyclic graph
Distributed ledger
Federated identity
Metaverse
Proof of Work
NT: Consensus protocol
Nonfungible tokens

Blocklists

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

Blogging

USE: Blogs

Blogs

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



2022 IEEE Thesaurus

Blood

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

Blood clots

USE: Coagulation

Blood flow

BT: Blood pressure
RT: Bioimpedance
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

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

communication

Spread spectrum

Wireless LAN
Wireless communication
Zigbee

BNCT

USE: Neutron capture therapy

BNSC

UF: British National Space
Centre
BT: Organizations

Boat building industry

USE: Shipbuilding industry

Boats

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

Body area networking

USE: Body area networks

Body area networks

UF: Body area networking
BT: Personal area networks

Body borne computers

USE: Wearable computers

Body regions

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

Body sensor networks

BT: Personal area networks
Wireless sensor networks
RT: Fall detection
Wearable sensors

Boilers

BT: Heating systems



2022 IEEE Thesaurus

	RT:	Heat recovery Steam engines Turbines Waste heat		<i>Bone mineral density</i> USE:	Bone density
Bolometers	BT:	Radiation detectors		Bone tissue	
	RT:	Infrared detectors Temperature measurement		BT:	Biological tissues
				RT:	Bones
				NT:	Cancellous bone Cortical bone
<i>Bolts</i>	USE:	Fasteners		Bones	
				BT:	Skeleton
Boltzmann distribution	BT:	Statistics		RT:	Bone tissue Skull
	NT:	Lattice Boltzmann methods		NT:	Bone density Pelvic bones
Boltzmann equation	UF:	Boltzmann transport equation		<i>Bonuses</i>	
	BT:	Equations		USE:	Incentive schemes
<i>Boltzmann transport equation</i>	USE:	Boltzmann equation		Book reviews	
<i>Bomb</i>	USE:	Weapons		BT:	IEEE indexing
Bonding	BT:	Bonding processes		Boolean algebra	
	RT:	Manufacturing Materials processing		BT:	Algebra
	NT:	Adhesives		RT:	Logic Logic gates Set theory
Bonding forces	BT:	Materials testing		NT:	Boolean functions
Bonding processes	BT:	Fabrication Joining processes		Boolean functions	
	RT:	Soldering Welding		BT:	Boolean algebra
	NT:	Bonding Diffusion bonding Wafer bonding		RT:	Fault trees
Bone density	UF:	Bone mineral density		NT:	Logic functions
	BT:	Bones		Boosting	
	RT:	Density measurement		BT:	Machine learning Supervised learning
Bone diseases	BT:	Diseases		Booting	
	NT:	Osteoarthritis Osteoporosis		BT:	Operating systems
				Boring	
				BT:	Machining
				RT:	Drilling Milling Turning
				Boron	
				BT:	Chemical elements Metals
				RT:	Fertilizers
				NT:	Boron alloys
				Boron alloys	
				BT:	Boron



2022 IEEE Thesaurus

RT:	Magnetic materials	<i>Box Jenkins models</i>	USE:	Autoregressive processes
<i>Boron neutron capture therapy</i>				
USE:	Neutron capture therapy	<i>BPEL</i>	USE:	Business Process Execution Language
Bot (Internet)		<i>BPF</i>	USE:	Band-pass filters
UF:	WWW robot Web robot	<i>BPR</i>	USE:	Business process re-engineering
BT:	Computer applications Internet World Wide Web	<i>BPSK</i>	USE:	Binary phase shift keying
RT:	Crawlers	<i>Brachial</i>	USE:	Brachytherapy
Botany		Brachytherapy	UF:	Brachial
BT:	Biology	BT:	Medical treatment	
RT:	Seeds (agriculture)	RT:	Radiation effects	
Botnet		Bragg gratings	UF:	Fiber Bragg gratings Fiber-Bragg gratings
BT:	Interconnected systems Internet Software agents	BT:	Filters	
RT:	Computer crime Distributed denial-of-service	RT:	Optical devices Diffraction Diffraction gratings Laser beams Optical beams Optical transmitters Temperature sensors Wavelength division	
attack	Robots	multiplexing	NT:	Fiber gratings
Bottling		Braille	BT:	Writing
BT:	Packaging	RT:	Assistive technologies Blindness Haptic interfaces Tactile sensors	
RT:	Beverage industry Glass products Packaging machines Plastic products	Brain	BT:	Nervous system
Boundary conditions		RT:	Bioelectric phenomena Cerebrospinal fluid Cognition Cognitive informatics Cognitive science Diffusion tensor imaging	
BT:	Boundary value problems			
NT:	Upper bound			
<i>Boundary element methods</i>				
USE:	Boundary-element methods			
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			



2022 IEEE Thesaurus

sensors	Electroencephalography	Brain injuries	BT: Brain Injuries
	Encephalography		
	Head		
	Intracranial pressure	<i>Brain interfaces</i>	
		USE: Brain-computer interfaces	
	Magnetoencephalography	<i>Brain machine interfaces</i>	
	Soma	USE: Brain-computer interfaces	
	Synapses		
NT:	White matter		
	Amygdala	Brain mapping	
	Basal ganglia	BT: Nervous system	
	Brain cells	NT: Neuroimaging	
	Brain injuries		
	Brain modeling		
	Brain ventricles	Brain modeling	
	Brainstem	UF: Brain modelling	
	Cerebellum	BT: Brain Modeling	
	Cerebral cortex		
	Cerebrum		
	Corpus callosum	<i>Brain modelling</i>	
	Forebrain	USE: Brain modeling	
	Frontal lobe		
	Hindbrain	<i>Brain plasticity</i>	
	Hypothalamus	USE: Neuroplasticity	
	Limbic system		
	Midbrain	<i>Brain stem</i>	
	Neural activity	USE: Brainstem	
	Neural implants		
	Neurodynamics	<i>Brain stem implants</i>	
	Neurophysiology	USE: Brainstem implants	
	Neuroprostheses		
	Neuropsychology	Brain stimulation	
	Neurotechnology	BT: Medical treatment	
	Occipital Lobe	NT: Deep brain stimulation	
	Parietal lobe		
	Primary motor cortex	Brain ventricles	
	Sleep	BT: Brain	
	Temporal lobe		
	Thalamus	<i>Brain-computer interaction</i>	
	Ventricle system	USE: Brain-computer interfaces	
	Virtual artifact		
Brain cells		Brain-computer interfaces	
BT: Brain		UF: BCI	
		Brain computer interfaces	
<i>Brain computer interfaces</i>		Brain interfaces	
USE: Brain-computer interfaces		Brain machine interfaces	
		Brain-computer interaction	
<i>Brain imaging</i>		Brain-computer-interfaces	
USE: Neuroimaging		Brain-machine interfaces	
		Mind-machine interfaces	
<i>Brain implants</i>		BT: User interfaces	
USE: Neural implants		RT: Neural engineering	
		<i>Brain-computer-interfaces</i>	
		USE: Brain-computer interfaces	



2022 IEEE Thesaurus

Brain-machine interfaces

USE: Brain-computer interfaces

BrainLobe

USE: Frontal lobe

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

Branding

USE: Brand management

Brazing

BT: Soldering

RT: Welding

Breadboard

UF: Plugboard
Solderless breadboard

BT: Electronic circuits
Prototypes

Breakdown

USE: Electric breakdown

Breakdown voltage

BT: Voltage

RT: Current
Diodes
Insulators

Breast

BT: Body regions

NT: Breast biopsy
Breast cancer
Breast tissue
Breast tumors

Breast biopsy

BT: Breast

Breast cancer

UF: Breast-cancer

BT: Breast
Cancer

Breast neoplasms

UF: Mammary neoplasms

BT: Neoplasms

Breast tissue

UF: Breast tissues

BT: Biological tissues
Breast

Breast tissues

USE: Breast tissue

Breast tumor

USE: Breast tumors

Breast tumors

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

Breast tumour

USE: Breast tumors

Breast tumours

USE: Breast tumors

Breast-cancer

USE: Breast cancer

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



2022 IEEE Thesaurus

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

British National Space Centre

USE: BNSC

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

NT: Video on demand
B-ISDN
Broadband amplifiers

Broadband ISDN

USE: B-ISDN

Broadband networks

USE: Broadband communication

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

Broadcasts

USE: Broadcasting

Bromine

BT: Chemical elements
NT: Bromine compounds

Bromine compounds

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

Bronchi

USE: Respiratory system

Bronchoscopy

BT: Medical diagnosis

Brownian motion

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

Browsers

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

Brushes

BT: Contacts
RT: Rotating machines



2022 IEEE Thesaurus

Brushless DC motors

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

Brushless direct current motors

USE: Brushless DC motors

Brushless machines

BT: Electric machines

Brushless motors

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

BSCCO

USE: Bismuth compounds

Buck converters

BT: DC-DC power converters

Buckeyballs

USE: Fullerenes

Buckminsterfullerene

USE: Fullerenes

Buckyballs

USE: Fullerenes

Buckytubes

USE: Fullerenes

Buffer layers

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

Buffer overflows

BT: Computer crashes

Buffer storage

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

Bugs

USE: Computer bugs

Building automation

BT: Automation
Building services
RT: Construction industry

Building information management

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

Building information modelling

USE: Building information management

Building integrated photovoltaics

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

Building management systems

BT: Buildings
Management
RT: Building information management

Building materials

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



2022 IEEE Thesaurus

Building services

BT: Buildings
RT: Access control
Air conditioning
Building information
management
Building integrated
photovoltaics
Furnaces
Lighting
Space heating
Wiring
NT: Building automation
Elevators
Facilities management

Building-integrated photovoltaics

USE: Building integrated
photovoltaics

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

Buried objects

USE: Buried object detection

Burnishing

BT: Surface finishing
RT: Machining

Burst switching

BT: Packet switching
NT: Optical burst switching

Bushings

USE: Insulators

Business

UF: Commerce
Trade
BT: Engineering management
RT: Bankruptcy
Business process
integration
Business process
management
Commercial law
Consortia
Contracts
Employment
Enterprise resource
planning



2022 IEEE Thesaurus

	Finance
	Industrial communication
	Industries
	International trade
	Leadership
	Manufacturing
	Productivity
	Service computing
NT:	Business data processing
	Business intelligence
	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 organisation

USE: Organizational aspects

Business organization

USE: Organizational aspects

Business Process Execution Language

UF:	BPEL
	WP-BPEL
	Web services business
execution language	
BT:	Computer languages
	Web services

RT:	Business process re-
engineering	Information processing

Business process integration

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

Business process management

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

Business process re-engineering

UF:	BPR
BT:	Management
RT:	Business Process
Execution Language	Corporate acquisitions Organizational aspects Total quality management

Business writing

USE: Writing

Butler matrices

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

Butler matrix

USE: Butler matrices

Butter

USE: Dairy products

Buttocks

BT: Extremities

BYOD

USE: Bring your own device



2022 IEEE Thesaurus

<i>C band</i>	USE: C-band	Fault location Winches Wiring
C languages	BT: Computer languages RT: Object oriented programming	NT: Coaxial cables Communication cables Mechanical cables Optical fiber cables Power cables Underwater cables
<i>C sharp languages</i>	USE: C# languages C++ languages	
C# languages	UF: C sharp languages BT: C languages RT: Object oriented programming	<i>Cables (mechanical)</i> USE: Mechanical cables
C++ languages	BT: C languages	Cache memory BT: Memory RT: In-memory computing NT: Cache storage
C-band	UF: C band BT: Microwave bands	Cache storage BT: Cache memory
<i>Ca</i>	USE: Calcium	<i>CAD</i> USE: Design automation
Cable insulation	BT: Insulation RT: Cables Oil filled cables NT: Power cable insulation	Cadaver UF: Corpse BT: Pathological processes
Cable shielding	BT: Electromagnetic shielding RT: Cables	CADCAM BT: Computer aided manufacturing RT: Design automation Computer integrated manufacturing Integrated manufacturing systems Rapid prototyping Virtual manufacturing
<i>Cable splicing</i>	USE: Splicing	Cadmium BT: Metals NT: Cadmium compounds
Cable TV	UF: Community antenna television BT: TV RT: Broadband communication Image communication NT: Must-carry regulations	Cadmium compounds BT: Cadmium
Cables	BT: Transmission lines RT: Cable insulation Cable shielding Conductors	<i>CAE</i> USE: Computer aided engineering <i>Caesium</i> USE: Cesium <i>CAI</i> USE: Computer aided instruction



2022 IEEE Thesaurus

Calcination

BT: Heat treatment
RT: Kilns

Calcium

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

Calcium carbonate

USE: Calcium compounds

Calcium compounds

UF: Calcium carbonate
Calcium phosphate
BT: Calcium

Calcium phosphate

USE: Calcium compounds

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

Californium

BT: Chemical elements

Call admission control

BT: Telecommunication
congestion control
RT: Internet telephony

Call conference

BT: Collaborative tools

Callosal commissure

USE: Corpus callosum

Calorimetry

BT: Measurement
RT: Energy measurement
Thermal variables

measurement

CAM

USE: Computer aided
manufacturing

CAMAC

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

Cambelts

USE: Belts

Camcorders

USE: Video equipment

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

Canadian Standards Association

USE: CSA Group

Cancellous bone

BT: Bone tissue
RT: Osteoporosis

Cancer

UF: Malignancy



2022 IEEE Thesaurus

	BT: Malignant Diseases	RT: Access control	
radiation	RT: Biomedical applications of Chemotherapy Medical diagnostic imaging Oncological surgery Oncology Single photon emission	Capacitance BT: Electric variables RT: Capacitance measurement Capacitance-voltage characteristics Capacitive transducers Capacitors Supercapacitors Transmission line theory NT: Parasitic capacitance Quantum capacitance	
computed tomography	Tumors NT: Breast cancer Cervical cancer Lung cancer Metastasis Ovarian cancer Prostate cancer Skin cancer	Capacitance measurement BT: Electric variables measurement RT: Capacitance Capacitors Dielectric measurement Supercapacitors	
Cancer detection	BT: Medical tests	Capacitance-voltage characteristics BT: Electric variables RT: Capacitance Voltage	
Cancer drugs	BT: Drugs	Capacitive sensors UF: Strain based sensors Strain sensors BT: Mechanical sensors	
Cancer treatment	BT: Medical treatment	Capacitive transducers BT: Transducers RT: Capacitance Position control Sensors	
Canning	BT: Packaging RT: Containers Material storage Materials handling Materials processing	Capacitor testing USE: Capacitors	
<i>Cantilever beams</i>	USE: Structural beams	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	
<i>Cap and trade</i>	USE: Emissions trading		
<i>Cap-and-trade</i>	USE: Emissions trading		
Capability engineering	BT: Systems engineering and theory		
Capability maturity model	BT: Software engineering RT: Software performance Software reusability		
Capability-based security	BT: Security	networks	



2022 IEEE Thesaurus

NT:	Ceramic capacitors Power capacitors Varactors	RT:	Emissions trading Global warming Greenhouse effect Methane Pollution control Carbon footprint
Capacity planning			
BT:	Production planning	NT:	Carbon footprint
RT:	Supply chain management		
NT:	Storage management	Carbon footprint	
<i>Capital cost reduction</i>		BT:	Carbon emissions
USE:	Costing	RT:	Air pollution Carbon dioxide Environmental factors Greenhouse effect
CAPTCHAs		Carbon monoxide	
BT:	Symbols	BT:	Carbon compounds
RT:	Access protocols Authentication		
<i>Carbinol</i>		<i>Carbon nanotube</i>	
USE:	Methanol	USE:	Carbon nanotubes
<i>CarboFullerene</i>		<i>Carbon nanotube FETs</i>	
USE:	Fullerenes	USE:	CNTFETs
Carbon		<i>Carbon nanotube field effect transistors</i>	
BT:	Chemical elements	USE:	CNTFETs
RT:	Carbon compounds Low-carbon economy Organic compounds	<i>Carbon nanotube field-effect transistors</i>	
NT:	Carbon nanotubes Diamond Fullerenes Graphene Graphite	USE:	CNTFETs
Carbon capture and storage		Carbon nanotubes	
BT:	Carbon dioxide	UF:	Carbon nanotube Carbon-nanotube Single-wall carbon nanotubes
NT:	Carbon sequestration	BT:	Carbon Nanotubes
Carbon compounds		RT:	CNTFETs
BT:	Organic compounds	Carbon sequestration	
RT:	Carbon	BT:	Carbon capture and storage
NT:	Carbon dioxide Carbon emissions Carbon monoxide	RT:	Air pollution Environmental factors Global warming Greenhouse effect
Carbon dioxide		Carbon tax	
BT:	Carbon compounds	BT:	Environmental economics
RT:	Carbon footprint Carbon tax	RT:	Carbon dioxide
NT:	Carbon capture and storage	<i>Carbon-nanotube</i>	
Carbon emissions		USE:	Carbon nanotubes
BT:	Carbon compounds Gases	<i>Carbon-nanotube FETs</i>	
		USE:	CNTFETs



2022 IEEE Thesaurus

Carbon-nanotube field effect transistors

USE: CNTFETs

Carbon-nanotube field-effect transistors

USE: CNTFETs

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: Cardiography
Defibrillation
Heart
Pacemakers
Phonocardiography
NT: Cardiac tissue

Cardiopulmonary arrest

USE: Cardiac arrest

Cardiovascular diseases

BT: Diseases
NT: Cardiac arrest
Cardiac disease

Cardiovascular system

BT: Anatomy
NT: Baroreflex
Blood vessels
Heart

Career development

BT: Education

NT: Continuing education
Jobs listings
Mentoring

Careers

USE: Engineering profession

Cargo handling

USE: Freight handling

Carotid arteries

UF: Carotoid arteries
BT: Arteries

Carotoid arteries

USE: Carotid arteries

Carrier confinement

BT: Charge carrier processes

Carrier density

USE: Charge carrier density

Carrier lifetime

USE: Charge carrier lifetime

Carrier processes

USE: Charge carrier processes

Carrier sense multiaccess

USE: Multiaccess communication

Cars

USE: Automobiles

Cartilage

BT: Musculoskeletal system

Cascade lasers

USE: Quantum cascade lasers

Cascading style sheets

BT: Style sheet languages
RT: Markup languages

Casimir effect

UF: Casimir energy
Casimir force
BT: Electric fields
Nanotechnology
RT: Atomic force microscopy
Elementary particle vacuum
Vacuum systems



2022 IEEE Thesaurus

<i>Casimir energy</i>		RT:	Flyback transformers
USE:	Casimir effect		
<i>Casimir force</i>			<i>Cathode-ray oscilloscopes</i>
USE:	Casimir effect	USE:	Oscilloscopes
Cast iron		Cathodes	
BT:	Iron	UF:	Photocathodes
RT:	Casting	BT:	Electrodes
	Production materials	RT:	Electron emission
			Electron tubes
<i>Castellations</i>		Cats	
USE:	Flip chip solder joints	UF:	Felines
		BT:	Animals
Casting		<i>Cattle</i>	
BT:	Materials processing	USE:	Cows
RT:	Cast iron		
	Foundries		
NT:	Die casting	Cause effect analysis	
	Tape casting	UF:	Fishbone diagrams
			Ishikawa diagrams
Catalysis		BT:	Process planning
BT:	Chemical reactions	RT:	Expert systems
NT:	Electrocatalysis		Failure analysis
	Photocatalysis		Fault diagnosis
			Pareto analysis
Catalysts			Testing
BT:	Materials	Cavity perturbation methods	
NT:	Electrocatalysts	BT:	Perturbation methods
	Photocatalysts	RT:	Cavity resonators
<i>Catalytic converters</i>		Cavity resonators	
USE:	Exhaust systems	BT:	Resonators
<i>Catalytic convertors</i>		RT:	Cavity perturbation
USE:	Exhaust systems	methods	
Cataracts			Klystrons
BT:	Eyes		Microcavities
	Medical conditions		Resonance
RT:	Aging	NT:	Laser cavity resonators
Catheterization		<i>CCD</i>	
BT:	Medical services	USE:	Charge coupled devices
RT:	Catheters		
Catheters		CCD image sensors	
BT:	Biomedical equipment	BT:	Image sensors
RT:	Catheterization	RT:	Digital photography
	Surgery	CD recording	
Cathode ray tubes		UF:	Compact disk
UF:	CRT	BT:	Optical recording
BT:	Displays	RT:	Laser applications
	Electron devices	NT:	CD-ROMs



2022 IEEE Thesaurus

<i>CD-ROM</i>	USE:	CD-ROMs	communication	Device-to-device
CD-ROMs	UF:	CD-ROM	NT:	Handover
	BT:	CD recording		Femtocell networks
	RT:	Electronic publishing		Macrocell networks
		Information systems		Microcell networks
				Ultra-dense networks
<i>CDMA</i>	USE:	Multiaccess communication	Cellular neural networks	
			BT:	Neural networks
<i>Cell biology</i>	USE:	Biological cells	Cellular phones	
			UF:	Cell phones
<i>Cell clones</i>	USE:	Cloning	BT:	Telephone equipment
<i>Cell phones</i>	USE:	Cellular phones	Cellular radio	
			UF:	Cellular land mobile radio
Cell signaling	UF:	Cell signaling		Land mobile radio cellular
	BT:	Biological cells	systems	
	RT:	Biochemistry		Land-mobile radio cellular
		Biomechanics	systems	
		Mechanobiology	BT:	Land mobile radio
Cells (biology)	BT:	Biological cells	RT:	3G mobile communication
	NT:	Extracellular		4G mobile communication
		Ganglia		5G mobile communication
		Glial cells		6G mobile communication
		Membrane potentials		Bluetooth
		Progenitor cells		Channel estimation
Cellular biophysics	BT:	Biophysics		Code division multiplexing
	RT:	Molecular biophysics		Cross layer design
		Nanomedicine		Digital multimedia
<i>Cellular land mobile radio</i>	USE:	Cellular radio	broadcasting	
				Downlink
Cellular manufacturing	BT:	Manufacturing systems		Film bulk acoustic
	RT:	Flexible manufacturing	resonators	
systems		Production control		Intercell interference
Cellular networks	BT:	Cellular radio		Location awareness
	RT:	Cellular technology		Multiuser detection
		Cloud radio access		NOMA
networks				Network resource
			management	
			networks	Personal communication
				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



2022 IEEE Thesaurus

5G mobile communication
GSM
Land mobile radio networks
Multiaccess communication

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 air-conditioning

USE: Central 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 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
Cermets
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



2022 IEEE Thesaurus

Cerebrum					Information theory
BT:	Brain		RT:	Communication channels	
<i>Cerenkov lasers</i>					Convolutional codes
USE:	Free electron lasers				Polar codes
Cerium					Rate distortion theory
BT:	Chemical elements		NT:	Space-time codes	
				Block codes	
Cermet				Combined source-channel	
BT:	Composite materials	coding			
RT:	Ceramics			Turbo codes	
	Metallic materials				
Certification			Channel estimation		
BT:	Training		UF:	Channel state estimation	
RT:	Conformance testing			Channel-state estimation	
Cervical cancer			BT:	Communication channels	
BT:	Cancer		RT:	Cellular radio	
Cesium				Equalizers	
UF:	Caesium			Land mobile radio	
BT:	Chemical elements			Multipath channels	
<i>CFD</i>				Signal detection	
USE:	Computational fluid			Spread spectrum	
dynamics			communication		
<i>CGM</i>			Channel hot electron injection		
USE:	Computer generated music		UF:	Channel hot-electron	
<i>Chain codes</i>			injection		
USE:	Blockchains		BT:	Hot carrier injection	
Chalcogenides			<i>Channel hot-electron injection</i>		
BT:	Chemical compounds		USE:	Channel hot electron	
Change detection algorithms			injection		
BT:	Algorithms		Channel models		
Channel allocation			BT:	Communication channels	
UF:	Bandwidth allocation		Channel rate control		
BT:	Communication channels		BT:	Rate distortion theory	
NT:	Spectral efficiency		Channel spacing		
Channel bank filters			BT:	Communication channels	
BT:	Filters		RT:	Optical fiber applications	
Channel capacity				Rate distortion theory	
BT:	Communication channels		<i>Channel state estimation</i>		
RT:	Quantum communication		USE:	Channel estimation	
Channel coding			Channel state information		
BT:	Encoding		BT:	Communication channels	
			<i>Channel-state estimation</i>		
			USE:	Channel estimation	
			Chaos		
			BT:	Nonlinear systems	
			RT:	Bifurcation	



2022 IEEE Thesaurus

	Econophysics	Electron mobility
	Fractals	Electron traps
	Nonlinear circuits	Excitons
	Nonlinear dynamical	Space charge
systems		
	Pattern formation	<i>Charge carrier trapping</i>
	Predator prey systems	USE: Charge carrier processes
	Random media	
NT:	Chaotic communication	Charge carriers
	Complexity theory	BT: Elementary particles
	Spatiotemporal phenomena	RT: Conductivity
		Impact ionization
Chaotic communication		Semiconductivity
BT: Chaos		Semiconductor materials
RT: Cryptography		NT: Charge carrier density
Synchronization		Charge carrier lifetime
Time series analysis		Charge carrier mobility
		Charge carrier processes
		Hot carriers
Character generation		
BT: Graphics		Charge coupled devices
RT: Computer graphics		UF: CCD
Displays		Charge injection devices
Printing		Charge transfer devices
		Charge-injection devices
Character recognition		Charge-transfer devices
UF: Print readers		BT: MIS devices
BT: Pattern recognition		
RT: Text recognition		<i>Charge injection devices</i>
		USE: Charge coupled devices
Characteristic mode analysis		
BT: Electromagnetic analysis		Charge measurement
		BT: Electrostatic measurements
Charge carrier density		RT: Pulsed electroacoustic
UF: Carrier density		methods
BT: Charge carriers		NT: Battery charge
		measurement
Charge carrier lifetime		
UF: Carrier lifetime		Charge pumps
BT: Charge carriers		UF: Charge-pumping
		BT: Circuits
Charge carrier mobility		RT: Voltage multipliers
BT: Charge carriers		
		Charge transfer
Charge carrier processes		BT: Charge carrier processes
UF: Carrier processes		
Charge carrier trapping		<i>Charge transfer devices</i>
Electron carriers		USE: Charge coupled devices
Hole carriers		
Semiconductor charge		Charge-coupled image sensors
carriers		BT: Image sensors
BT: Charge carriers		Optoelectronic devices
RT: Diffusion processes		
Semiconductor impurities		<i>Charge-injection devices</i>
NT: Carrier confinement		USE: Charge coupled devices
Charge transfer		



2022 IEEE Thesaurus

Charge-pumping

USE: Charge pumps

Electronic noses
pH measurement

Charge-transfer devices

USE: Charge coupled devices

Chemical and biological sensors

BT: Sensors
NT: Biosensors
Gas detectors

Charged device model

USE: Electrostatic discharges

Chemical compounds

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

Charging devices

USE: Battery chargers

Charging stations

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

vehicles

Chemical elements

BT: Materials, elements, and compounds

NT: Aluminum
Americium
Antimony
Arsenic
Astatine
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

Chatbots

BT: Human computer interaction

Natural language processing

RT: Speech synthesis
Auditory system
Human factors
Question answering

(information retrieval)

CHCP

USE: Trigeneration

Chebyshev approximation

BT: Approximation methods
RT: Discrete cosine transforms

Checkpointing

BT: System recovery

Cheese

USE: Dairy products

Chemical analysis

BT: Chemistry
Materials science and technology

RT: Chemical technology
Drugs
Fractionation
NT: Activation analysis
Chemical processes
Chemicals



2022 IEEE Thesaurus

Polonium
Potassium
Praseodymium
Promethium
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: Toxic chemicals

Chemical industry

BT: Industries
RT: Chemical engineering
Chemical reactions
Chemical technology
Electrochemical processes
Petrochemicals
Petroleum industry
Pipelines
Plastic products

Plastics industry
Rubber industry

Chemical lasers

BT: Lasers
RT: Gas lasers

Chemical mechanical planarisation

USE: Planarization

Chemical mechanical planarization

USE: Planarization

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
Plastic products
Production materials
NT: Fats
Inhibitors
Lacquers
Mortar
Paints
Petrochemicals
Petroleum
Pharmaceuticals
Plastics
Propellants

Chemical reactions

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

reactor

Ignition



2022 IEEE Thesaurus

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 vapour deposition

USE: Chemical vapor deposition

Chemicals

BT: Chemical analysis

Chemistry

BT: Science - general
RT: Chemical products
Chemical technology
Drugs
Petrochemicals
Pharmaceutical technology

Pharmaceuticals
Pickling
Plastic products
NT: Astrochemistry
Biochemistry
Chemical analysis
Chemical compounds
Electrochemistry
Geochemistry
Inorganic chemicals
Interstellar chemistry
Organic chemicals
Photochemistry
Physical chemistry
Quantum chemistry

Chemotherapy

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

Chest medicine

USE: Pulmonology

Child

USE: Pediatrics

Children

USE: Pediatrics

Chip design

USE: Chip scale packaging

Chip development

USE: Chip scale packaging

Chip fabrication

USE: Chip scale packaging

Chip scale packaging

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

Chip-making process

USE: Chip scale packaging



2022 IEEE Thesaurus

Chirp	BT: Signal processing	BT: Biological cells
Chirp modulation	UF: Linear frequency	<i>Chromosomes</i>
modulation	BT: Modulation	USE: Biological cells
	RT: Sonar	
	Spread spectrum	Chronobiology
communication	Spread spectrum radar	UF: Biological clocks
		BT: Biological processes
Chlorine		<i>CIM</i>
BT: Chemical elements		USE: Common Information Model
NT: Chlorine compounds		(computing) AND
		Common Information Model
Chlorine compounds		Computer integrated
UF: Chlorine dioxide		manufacturing
		<i>Cinema</i>
		USE: Motion pictures
		Cinematography
		BT: Photography
		RT: Motion pictures
		Object tracking
<i>Chlorine dioxide</i>		
USE: Chlorine compounds		Ciphers
<i>Chloroform</i>		UF: Cyphers
USE: Chlorine compounds		BT: Cryptography
<i>Chokes</i>		RT: Algorithms
USE: Inductors		Codes
		Encryption
Choppers (circuits)		Circadian rhythm
BT: Switching circuits		UF: Circadian rhythms
RT: Power conversion		BT: Biological processes
<i>CHP</i>		<i>Circadian rhythms</i>
USE: Cogeneration		USE: Circadian rhythm
Chromatic dispersion		Circuit analysis
BT: Dispersion		BT: Circuits
Chrome plating		RT: Frequency-domain analysis
BT: Plating		SPICE
RT: Coatings		Sensitivity
Chromium		Tolerance analysis
UF: Cr		Yield estimation
BT: Metals		NT: Circuit analysis computing
NT: Chromium alloys		Coupled mode analysis
Chromium alloys		Nonlinear network analysis
BT: Chromium		Circuit analysis computing
Chromosome mapping		BT: Circuit analysis
		<i>Circuit boards</i>
		USE: Printed circuits



2022 IEEE Thesaurus

Circuit breakers

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

breakers

Circuit CAD

USE: Design automation

Circuit complexity

USE: Complexity theory

Circuit design

USE: Circuit synthesis

Circuit design (CAD)

USE: Design automation

Circuit design (logic)

USE: Logic design

Circuit faults

BT: Circuits
NT: Electrical fault detection

Circuit feedback

USE: Feedback circuits

Circuit layout CAD

USE: Design automation

Circuit noise

BT: Circuits
RT: Transmission lines
NT: Thermal noise

Circuit optimisation

USE: Circuit optimization

Circuit optimization

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

Circuit performance

USE: Circuit optimization

Circuit simulation

BT: Circuits
RT: Design automation

modeling

Semiconductor process

Circuit stability

BT: Stability
RT: Grounding
Jitter

Circuit subsystems

BT: Solid state circuits
RT: Circuits and systems

Circuit synthesis

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

Circuit testing

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

measurements

Circuit theory

BT: Solid state circuits

Circuit tolerance analysis

USE: Tolerance analysis

Circuit topology

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

Circuit tuning

USE: Circuit optimization

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



2022 IEEE Thesaurus

circuits	Asynchronous circuits	Sampled data circuits
	Bipolar transistor circuits	Sequential circuits
circuits	Bistable circuits	Silicon-on-insulator
	Bridge circuits	Submillimeter wave circuits
circuits	Charge pumps	Summing circuits
	Circuit analysis	Switched circuits
circuits	Circuit faults	Switching circuits
	Circuit noise	Thick film circuits
circuits	Circuit simulation	Thin film circuits
	Circuit synthesis	Thyristor circuits
circuits	Coprocessors	Time varying circuits
	Counting circuits	Trigger circuits
circuits	Coupling circuits	UHF circuits
	Digital circuits	UHF integrated circuits
circuits	Digital signal processors	Ultra large scale integration
	Distributed parameter	VHF circuits
circuits	Driver circuits	Very large scale integration
	Electronic circuits	Voltage multipliers
circuits	Equivalent circuits	Wafer scale integration
	Feedback	
circuits	Hybrid integrated circuits	Circuits and systems
	Integrated circuits	RT: Circuit subsystems
circuits	Isolators	Formal verification
	Large scale integration	Solid state circuits
circuits	Linear circuits	NT: Circuits
	Logic arrays	Contacts
circuits	Logic circuits	Filtering
	MOSFET circuits	Integrated circuit
circuits	Magnetic circuits	technology
	Microprocessors	Logic devices
circuits	Microwave circuits	Oscillators
	Millimeter wave circuits	Single electron devices
circuits	Millimeter wave integrated	Tunable circuits and
	Monolithic integrated	devices
circuits	Multiplying circuits	<i>Circular polarisation</i>
	Neural circuits	USE: Polarization
circuits	Nonlinear circuits	<i>Circular polarization</i>
	Passive circuits	USE: Polarization
circuits	Phase shifters	Circular waveguides
	Power dissipation	BT: Electromagnetic
circuits	Power integrated circuits	waveguides
	Printed circuits	
circuits	Programmable circuits	Circulators
	Programmable logic arrays	BT: Ferrite devices
circuits	Programmable logic	Microwave technology
	Pulse circuits	RT: Electromagnetic coupling
circuits	Quantum circuit	Waveguide components
	RLC circuits	
circuits	Radiation detector circuits	Circulatory system
	Rail to rail operation	UF: Vascular system
circuits	Rectifiers	BT: Anatomy



2022 IEEE Thesaurus

Citation analysis

UF: Citation studies
BT: Bibliometrics

Citation studies

USE: Citation analysis

Cities and towns

USE: Urban areas

City

USE: Urban areas

City planning

USE: Urban planning

Civil engineering

BT: Engineering - general
RT: Bridges
Buildings
Construction
Energy resources
Environmental factors
Power systems
Road transportation
Roads
Transmission lines
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

Cladistics

USE: Phylogeny

Clamping

USE: Clamps

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 model

USE: Client-server systems

Client server systems

USE: Client-server systems

Client-server model

USE: Client-server systems

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

Clientserver systems

USE: Client-server systems

Climate

USE: Meteorology

Climate change

BT: Environmental factors
NT: Global warming

Climbing robots

BT: Mobile robots

Clinical analysis

USE: Clinical diagnosis

Clinical diagnosis

UF: Clinical analysis
Clinical engineering



2022 IEEE Thesaurus

	BT: Clinical information		<i>Closed form solution</i>
	RT: Medical services		USE: Closed-form solutions
	NT: Point of care		
	NT: Clinical neuroscience		
<i>Clinical engineering</i>			Closed loop systems
USE: Clinical diagnosis			UF: Closed-loop systems
			BT: Control systems
			RT: H infinity control
<i>Clinical equipment</i>			<i>Closed-form expression</i>
USE: Biomedical equipment			USE: Closed-form solutions
<i>Clinical information</i>			Closed-form solutions
USE: Clinical diagnosis			UF: Closed form solution
			Closed-form expression
			BT: Mathematics
Clinical neuroscience			<i>Closed-loop systems</i>
UF: Cloud security			USE: Closed loop systems
BT: Clinical diagnosis			
Neuroscience			
Clinical trials			Clothing
BT: Medical treatment			UF: Garments
			BT: Consumer products
<i>Clock synchronization</i>			RT: Clothing industry
USE: Synchronization			Fabrics
			Wool
			NT: Footwear
			Protective clothing
Clocks			Clothing industry
BT: Time measurement			UF: Garment industry
RT: Timing			BT: Manufacturing industries
NT: Atomic clocks			RT: Clothing
Watches			Footwear
			Footwear industry
<i>Clone</i>			Protective clothing
USE: Cloning			Textile industry
<i>Clones</i>			
USE: Cloning			<i>Clotting</i>
Cloning			USE: Coagulation
UF: Cell clones			
Clone			Cloud computing
Clones			BT: Internet
Human cloning			RT: Big Data applications
Molecular clones			Dew computing
Reproductive cloning			Distributed computing
BT: Biomedical engineering			Edge computing
RT: DNA			Grid computing
Stem cells			Internet of Things
			Network function
Closed captioning			virtualization
BT: Assistive technologies			Service computing
Communication aids			Software as a service
RT: Media			Software defined
TV			networking
			Virtual power plants



2022 IEEE Thesaurus

NT:	Web services	RT:	Extreme learning machines
	Cloud computing security	NT:	Pattern clustering
	Cloud gaming		
	Elastic computing	Clutter	
	Platform as a service	BT:	Interference
	Serverless computing	RT:	Echo interference
Cloud computing security		<i>CMM</i>	
UF:	Cloud security	USE:	Coordinate measuring machines
BT:	Cloud computing		
	Computer security	CMOS analog integrated circuits	
Cloud gaming		UF:	Analog CMOS integrated circuits
UF:	Gaming on demand		Analogue CMOS integrated circuits
BT:	Cloud computing		CMOS analogue integrated circuits
	Games	BT:	Analog integrated circuits
RT:	Online services		CMOS integrated circuits
Cloud radio access networks		<i>CMOS analogue integrated circuits</i>	
BT:	Network function virtualization	USE:	CMOS analog integrated circuits
	Radio access networks		
RT:	Cellular networks	CMOS digital integrated circuits	
<i>Cloud security</i>		BT:	CMOS integrated circuits
USE:	Clinical neuroscience AND Cloud computing security	NT:	CMOS logic circuits
<i>Cloud-dew architecture</i>		CMOS image sensors	
USE:	Dew computing	BT:	Image sensors
<i>Cloud-dew computing</i>		CMOS integrated circuits	
USE:	Dew computing	BT:	Integrated circuits
Clouds		RT:	CMOSFETs
BT:	Terrestrial atmosphere		Neuromorphic engineering
Cluster computing		NT:	CMOS analog integrated circuits
UF:	Apache hadoop		CMOS digital integrated circuits
	Apache spark		CMOS logic circuits
	Network of workstations		CMOS memory circuits
	Workstation clusters		Transconductors
BT:	Distributed computing	CMOS logic circuits	
RT:	Distributed processing	BT:	CMOS digital integrated circuits
	Message systems		CMOS integrated circuits
	Parallel processing	RT:	Application specific integrated circuits
	Peer-to-peer computing		Power dissipation
	Resource management	CMOS memory circuits	
	Workstations	UF:	CMOS memory integrated circuits
Clustering algorithms			
BT:	Algorithms		
Clustering methods			
BT:	Pattern recognition		



2022 IEEE Thesaurus

BT:	CMOS integrated circuits	<i>Coagulate</i>	
RT:	Memory	USE:	Coagulation
	SRAM chips		
<i>CMOS memory integrated circuits</i>		Coagulation	
USE:	CMOS memory circuits	UF:	Blood clots
			Clotting
CMOS process			Coagulate
BT:	CMOS technology	BT:	Biological processes
			Blood
		RT:	Blood platelets
CMOS technology			
BT:	Integrated circuit	Coal	
technology		BT:	Fuels
RT:	MOSFET	RT:	Coal gas
	Microcontrollers		Coal mining
	Microprocessors		
	Transistors	<i>Coal ash</i>	
NT:	CMOS process	USE:	Fly ash
	Silicon on sapphire		
CMOSFET circuits		Coal gas	
BT:	MOSFET circuits	UF:	Coal gasification
RT:	Rail to rail operation		Illumination gas
			Town gas
CMOSFETs		BT:	Gases
BT:	MOSFET	RT:	Coal
RT:	CMOS integrated circuits		Fuels
	Semiconductor-insulator		
interfaces		<i>Coal gasification</i>	
		USE:	Coal gas
<i>CNC</i>		Coal industry	
USE:	Computer numerical control	BT:	Industries
		RT:	Coal mining
<i>CNFETs</i>		Coal mining	
USE:	CNTFETs	BT:	Mining industry
		RT:	Coal
CNTFETs			Coal industry
UF:	CNFETs		
	Carbon nanotube FETs	<i>Coal tar</i>	
	Carbon nanotube field	USE:	Fuel processing industries
effect transistors			
	Carbon nanotube field-	Coating techniques	
effect transistors		BT:	Coatings
	Carbon-nanotube FETs	NT:	Cladding techniques
	Carbon-nanotube field		
effect transistors		Coatings	
	Carbon-nanotube field-	BT:	Materials processing
effect transistors		RT:	Chemical vapor deposition
BT:	Field effect transistors		Chrome plating
RT:	Carbon nanotubes		Corrosion
	Quantum capacitance		Films
<i>Co-channel interference</i>			Magnetic multilayers
USE:	Interchannel interference		Painting
			Spraying



2022 IEEE Thesaurus

	Sputtering		Multiplexing
	Vapor deposition	RT:	Cellular radio
NT:	Antireflection coatings		Codes
	Claddings		Multicarrier code division
	Coating techniques	multiple access	
	Dip coating		Optical fiber applications
	Epitaxial layers		Software radio
	Glazes		Spread spectrum
	Lacquers	communication	
	Paints		
	Powders	Code refractoring	
Coaxial cables		UF:	Refractoring
BT:	Cables	BT:	Encoding
RT:	Electromagnetic	RT:	Information theory
waveguides			Software engineering
	Transmission lines	<i>Code-division multiple access</i>	
NT:	Coaxial components	USE:	Multiaccess communication
	Hybrid fiber coaxial cables		
Coaxial components		<i>Code-division multiple-access</i>	
BT:	Coaxial cables	USE:	Multiaccess communication
Cobalt		Codecs	
BT:	Metals	UF:	Coder-decoders
RT:	Alloying	BT:	Communication equipment
	Magnets	RT:	Decoding
NT:	Cobalt alloys		Encoding
		NT:	Speech codecs
Cobalt alloys			Video codecs
BT:	Cobalt	<i>Coder-decoders</i>	
RT:	Alloying	USE:	Codecs
<i>Cochannel interference</i>		Codes	
USE:	Interchannel interference	UF:	Parity check
Cochlear implants		BT:	Information theory
BT:	Implants	RT:	Ciphers
RT:	Ear		Code division multiplexing
<i>Code division multiaccess</i>			Cryptography
USE:	Multiaccess communication		Decoding
<i>Code division multiple access</i>			Encoding
USE:	Multiaccess communication		Error correction
<i>Code division multiplexed</i>			Redundancy
USE:	Code division multiplexing		Sequences
Code division multiplexing			Vector quantization
UF:	Code division multiplexed	NT:	Binary codes
OCDM			Convolutional codes
Optical code division			Cyclic redundancy check
multiplexing		codes	
BT:	Communication switching		Error correction codes
			Parity check codes
			Product codes
			Space-time codes
			Zero correlation zone



2022 IEEE Thesaurus

Coding

USE: Encoding

Coding theory

USE: Information theory

Coercive force

UF: Coercivity
BT: Magnetic forces

Coercivity

USE: Coercive force

Cogen

USE: Cogeneration

Cogeneration

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

Cogging

USE: Forging

Cognition

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

Cognitive computing

USE: Cognitive systems

Cognitive informatics

BT: Cybernetics
Informatics
RT: Brain

Cognitive neuroscience

BT: Cognition
Neuroscience

Cognitive processes

BT: Cognition

Cognitive radar

BT: Adaptive systems
Radar

Cognitive radio

UF: Cognitive radio network
BT: Wireless communication

Cognitive radio network

USE: Cognitive radio

Cognitive robotics

UF: Cognitive robots
BT: Robots
RT: Autonomous robots

Cognitive robots

USE: Cognitive robotics

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



2022 IEEE Thesaurus

Coherence time

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

Coherent detection

USE: Coherence

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
NT: Collaborative tools
Discussion forums
Teamwork
Virtual groups

Collaborative filtering

BT: Filtering theory
RT: Recommender systems

Collaborative intelligence

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

Collaborative learning

USE: Collaborative work

Collaborative networking

USE: Collaborative work

Collaborative problem solving

USE: Collaborative work

Collaborative software

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

software

Collaborative tools

BT: Collaboration
NT: Call conference
Collaborative software
Videoconferences

Collaborative work

UF: Collaborative learning
Collaborative networking
Collaborative problem

solving

Cooperative work
Federated learning
BT: Distributed computing
RT: Collaborative software
Communication

effectiveness

Multimedia computing
Professional

communication

NT: Collaborative intelligence
Cooperative communication
Crowdsourcing
Social computing

Collective bargaining

USE: Industrial relations

Collective intelligence

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

Colleges

USE: Educational institutions

Colliding beam accelerators

BT: Colliding beam devices
Particle accelerators



2022 IEEE Thesaurus

	RT:	Klystrons Particle beams Synchrotrons			Nanobioscience Nanotopography Polymers Surface treatment Tissue engineering
Colliding beam devices	BT:	Nuclear and plasma			
sciences	RT:	Particle accelerators	Colloidal nanocrystals	BT:	Nanocrystals Optical materials
	NT:	Colliding beam accelerators Muon colliders			
Collimators	UF:	Multileaf collimators	Colon	BT:	Digestive system
	BT:	Optical devices		NT:	Colonic polyps
radiation	RT:	Biomedical applications of	Colonic polyps	BT:	Colon Tumors
		Biomedical equipment Dosimetry Gamma-rays Linear accelerators Single photon emission	Colonography	BT:	Medical diagnosis
computed tomography		X-ray applications X-rays	Colonoscopy	BT:	Medical tests
				NT:	Virtual colonoscopy
Collision avoidance	UF:	Collision detection Obstacle avoidance Sense and avoid	Color	BT:	Optics
	BT:	Motion control		RT:	Electrochromism Imaging Photochromism Pigmentation
systems	RT:	Advanced driver assistance		NT:	
		Block signalling Lane departure warning	<i>Color blindness</i>	USE:	Vision defects
systems		Lane detection Vehicle crash testing	<i>Color center lasers</i>	USE:	Solid lasers
<i>Collision detection</i>	USE:	Collision avoidance	Color TV	BT:	TV
Collision mitigation	BT:	Motion control	Colored noise	UF:	Coloured noise
<i>Collision theory</i>	USE:	Kinetic theory		BT:	Noise
Colloidal crystals	BT:	Crystals	Colossal magnetoresistance	BT:	Magnetoresistance
	RT:	Crystallizers	<i>Coloured noise</i>	USE:	Colored noise
Colloidal lithography	BT:	Lithography Nanopatterning	Comb filters	BT:	Filters
	RT:	Biomedical engineering			



2022 IEEE Thesaurus

Combinational circuits

UF: Combinational logic circuits
BT: Logic circuits

Combinational logic circuits

USE: Combinational circuits

Combinatorial mathematics

BT: Mathematics
NT: Graph theory
Steiner trees

Combinatorial software testing

USE: Combinatorial testing

Combinatorial testing

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

Combine harvesters

USE: Agricultural machinery

Combined heat and power

USE: Cogeneration

Combined heat, cooling and power

USE: Trigeneration

Combined heat, cooling, and power

USE: Trigeneration

Combined source channel coding

USE: Combined source-channel coding

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

USE: Business

Commercial law

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

Commercial power systems

USE: Industrial power systems

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

common sense knowledge

USE: Commonsense reasoning

common sense reasoning

USE: Commonsense reasoning

common-sense knowledge

USE: Commonsense reasoning

common-sense reasoning

USE: Commonsense reasoning

commonsense knowledge

USE: Commonsense reasoning



2022 IEEE Thesaurus

Commonsense reasoning

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

Communicable disease

USE: Infectious diseases

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 cables (optical)

USE: Optical fiber cables

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 complexity

USE: Complexity theory

Communication effectiveness

BT: Professional
communication
RT: Collaborative work
Cooperative communication

Communication engineering education

BT: Engineering education

Communication equipment

BT: Communications
technology
RT: Bluetooth
Communication systems
Multiplexing equipment
Satellite ground stations
Auditory displays
NT: 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 network reliability

USE: Telecommunication
network reliability

Communication networks

UF: PSTN
Public switched telephone
network
BT: Communication systems



2022 IEEE Thesaurus

RT: Network security
 NT: Central office
 Cyberspace
 Industrial communication
 Maritime communications
 Radio access technologies
 Relay networks
 (telecommunication)
 Telecommunication
 network performance
 Virtual links

Communication protocols
 USE: Protocols

Communication satellites
 USE: Satellite communication

Communication standards

UF: Telecommunication
 standards
 BT: Standards categories
 RT: Communication systems
 FDDI
 IEC
 ISO
 ISO Standards
 Radio spectrum
 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

RT: Symbols
 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 privacy

USE: Communication system
 security

Communication system security

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



2022 IEEE Thesaurus

NT:	Streaming media		Indoor communication
			Internet
Communication system traffic			Local area networks
UF:	Mice flows		Low latency communication
BT:	Communication systems		MIMO communication
RT:	Telecommunication traffic		MISO communication
			Machine-to-machine
Communication system traffic control		communications	
BT:	Communication systems		Magnetic communication
			Metropolitan area networks
Communication systems			Microwave communication
BT:	Communications		Military communication
technology			Mobile communication
RT:	Antennas and propagation		Molecular communication
	Communication channels	(telecommunication)	
	Communication equipment		Multiaccess communication
	Communication industry		Multicast communication
	Communication standards		Multimedia communication
	Communication system		NOMA
operations and management			Nanocommunication
	Digital systems	(telecommunication)	
	Huffman coding		Narrowband
	Information theory		Optical fiber communication
	Office automation		Personal communication
	Telecontrol equipment	networks	
	Traffic control		Protocols
NT:	ARPANET		Quality of experience
	Biomedical communication		Quality of service
	Broadband communication		Quantum communication
	Communication networks		Radio communication
	Communication system		Regional area networks
control			Routing
	Communication system		SIMO communication
security			SISO communication
	Communication system		Satellite communication
signaling			Satellite ground stations
	Communication system		Spatial diversity
software			Submillimeter wave
	Communication system	communication	
traffic			Subscriber loops
	Communication system		Switching systems
traffic control			Synchronous digital
	Computer networks	hierarchy	
	Cross layer design		Telecommunications
	Data buses		Teleconferencing
	Data communication		Telegraphy
	Device-to-device		Telephony
communication			Teleprinting
	Digital communication		Teletext
	Duplex communication		Terahertz communications
systems			Token networks
	FDDI		UHF communication
	Facsimile		Underwater communication
	IP networks		Vehicle-to-everything
	ISDN		Videophone systems



2022 IEEE Thesaurus

Compliant mechanisms

USE: Manufacturing processes

Component architectures

UF: Component-based systems

BT: Components, packaging,
and manufacturing technology

Component-based systems

USE: Component architectures

Components, packaging, and manufacturing technology

NT: Component architectures
Electronic components
Electronic equipment

manufacture

Electronics packaging
Environmentally friendly

manufacturing techniques

Integrated circuit

manufacture

Integrated circuit packaging
Semiconductor device

packaging

Thermal management of

electronics

Composite materials

BT: Materials

NT: Cermet

Composite media

USE: Nonhomogeneous media

Composite systems

USE: Interconnected systems

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

Compression moulding

USE: Compression molding

Compressive sensing

USE: Compressed sensing

Compressive stress

BT: Stress

Compressors

BT: Electric machines

RT: Air conditioning
Pumps
Turbines
Turbomachinery

Computation complexity

USE: Computational complexity

Computation theory

BT: Computational intelligence

RT: Complexity theory

NT: Computational complexity
Concurrent computing
Greedy algorithms
Support vector machines

Computational and artificial intelligence

RT: Cognitive science

Digital systems

NT: Artificial intelligence

Autonomous mental

development

Computational intelligence

Logic

Machine intelligence

Neural networks

Computational biochemistry

BT: Computational biology

RT: Biochemistry

Bioinformatics

Computational biology

BT: Engineering in medicine
and biology

RT: Bioinformatics

Biology

Computational

neuroscience



2022 IEEE Thesaurus

NT: Synthetic biology
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
NT: Time complexity

Computational cultural dynamics

USE: Computational cultural
modeling

Computational cultural modeling

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

Computational efficiency

BT: Mathematics

Computational electrodynamics

USE: Computational
electromagnetics

Computational electromagnetics

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

Computational ethics

USE: Machine ethics

Computational fluid dynamics

UF: CFD
BT: Fluid dynamics
RT: Isosurfaces

Computational geometry

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

Computational intelligence

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

Computational life sciences

USE: Computational modeling
AND Life sciences

Computational linguistics

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

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: Neuroinformatics
Time complexity
NT: Agent-based modeling
Computational cultural
modeling
Computational materials
science
Reversible computing

Computational morality

USE: Machine ethics

Computational neuroscience

UF: Theoretical neuroscience



2022 IEEE Thesaurus

BT: Computer science
Neuroscience
RT: Computational biology
Nervous system

Computational science

USE: Scientific computing

Computational social and behavioral modeling

USE: Computational cultural modeling

Computational systems biology

BT: Computational biology

Computed microtomography

USE: Computed tomography

Computed tomography

UF: CT scan
Computed

microtomography

tomography 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 design

USE: Design automation

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

Computer aided learning

USE: Computer aided instruction

Computer aided manufacturing

UF: CAM
BT: Industrial electronics
Manufacturing automation
RT: Computer integrated

manufacturing Integrated manufacturing

systems

NT: CAD/CAM
Silicon compiler

Computer aided software engineering

BT: Software engineering
RT: Programming environments
Software tools

Computer animation

USE: Animation

Computer applications

UF: Volunteer computing
BT: Computers and information
processing
RT: Biomedical computing
Computational

electromagnetics
Computerized monitoring
Edge computing
Electrical engineering

computing



2022 IEEE Thesaurus

systems	Flexible manufacturing		Memory architecture Memory management Multiprocessor
	Humanities		
	Information technology	interconnection	
	Learning management		Parallel architectures Reconfigurable
systems	Middleware	architectures	
	Mobile agents		
	Software agents	<i>Computer arithmetic</i>	
	Software packages	USE: Digital arithmetic	
NT:	Application virtualization		
	Big Data applications	<i>Computer assisted diagnosis</i>	
	Bot (Internet)	USE: Computer aided diagnosis	
	Computer aided analysis		
	Computer aided	<i>Computer automated measurement and control</i>	
engineering		USE: CAMAC	
	Computer aided instruction		
	Computer generated music	Computer bugs	
	Computer integrated	UF: Bugs	
manufacturing		BT: Computer crashes	
	Control engineering		
computing		<i>Computer buses</i>	
	Engineering computing	USE: Data buses	
	Green computing		
	High energy physics	<i>Computer control</i>	
instrumentation computing		USE: Digital control	
	Knowledge management		
	Mathematics computing	Computer crashes	
	Medical information	BT: Computer errors	
systems		NT: Buffer overflows	
	Military computing		Computer bugs
	Mobile applications		
	Physics computing	Computer crime	
	Power engineering	UF: Cyber crime	
computing			Cyber-crime
			Cybercrime
computing	Power system analysis		DDoS attack
			DoS attack
	Publishing		Hacking
	Scientific computing		Piracy (software)
	Telecommunication		Software piracy
computing			Computer security
	Virtual assistants	BT: Botnet	
	Virtual enterprises	RT: Computer viruses	
	Virtual manufacturing		Computer worms
	Web sites		Control system security
	World Wide Web		Data security
			Digital rights management
			Distributed denial-of-service
Computer architecture			
	UF: Architecture (computer)		
	BT: Computers and information	attack	
processing			Privacy-invasive software
	RT: Microprogramming		Unsolicited e-mail
	NT: Accelerator architectures	NT: Counterfeiting	
	Data structures		Cyber terrorism
	Dynamic voltage scaling		



2022 IEEE Thesaurus

Cyberattack
SQL injection

Visualization
X3D

Computer displays

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

Computer documentation

USE: Documentation

Computer engineering education

USE: Computer science
education

Computer errors

BT: Computer performance
NT: Computer crashes

Computer generated music

UF: CGM
Computer music
BT: Computer applications
Music

Computer graphics

BT: Graphics
RT: Animation
Art
Character generation
Computational geometry
Computer displays
Computer peripherals
Curve fitting
Fractals
Graphics processing units
Mesh generation
Modeling
Multimedia computing
Ray tracing
Simulation
Surface fitting
Visual effects
Workstations
NT: Data visualization
Rendering (computer

graphics)

Shadow mapping
Sprites (computer)
Video sequences
Virtual reality

Computer hacking

UF: Hacker
Hacks
BT: Computer security

Computer hardware

USE: Hardware

Computer industry

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

Computer integrated manufacturing

UF: CIM
BT: Computer applications
Manufacturing automation
RT: Agile manufacturing
CAD/CAM
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

Computer languages

UF: Programming languages
BT: Formal languages
RT: Data structures
Natural languages



2022 IEEE Thesaurus

		Software		Computer networks	
NT:	Architecture description		UF:	Mice flows	
languages			BT:	Communication systems	
	Business Process			Computers and information	
Execution Language			processing		
	C languages		RT:	Bit rate	
	Command languages			Cyber terrorism	
	Database languages			Cyber warfare	
languages	Hardware design			Data communication	
				Delay estimation	
	High level languages			Distributed computing	
	Markup languages			File servers	
	Python			Firewalls (computing)	
	R language			Frame relay	
	Specification languages			Hypercubes	
	Style sheet languages			IEEE 802.11 Standard	
Language	Systems Modeling			IEEE 802.11g Standard	
				IEEE 802.11n Standard	
	Visual BASIC			IEEE 802.16 Standard	
				IEEE 802.3 Standard	
Computer mediated communication				IPTV	
UF:	Computer-mediated			Internetworking	
BT:	Social networking (online)			LAN interconnection	
Computer music				Middleware	
USE:	Computer generated music		interconnection	Multiprocessing systems	
AND	Music			Multiprocessor	
				Network security	
				Open systems	
Computer network management				Personal area networks	
BT:	Computer networks			Ports (computers)	
RT:	Bandwidth		networks	Radial basis function	
	Computer security			TCPIP	
	Data security			Web sites	
networking	Software defined		NT:	Ad hoc networks	
				Computer network	
	Traffic control		management		
NT:	Computer network reliability			Content distribution	
networking	Disruption tolerant		networks		
				Cyberspace	
base	Management information			Diffserv networks	
				Domain Name System	
	Middleboxes			Ethernet	
	Network address translation			Heterogeneous networks	
	Network synthesis			IP networks	
Computer network reliability				Internet	
BT:	Computer network			Intserv networks	
management				Metropolitan area networks	
	Network topology		interconnection networks	Multiprocessor	
NT:	Fault tolerant computer			Network function	
networks			virtualization		
				Network servers	
				Next generation networking	



2022 IEEE Thesaurus

networking		Overlay networks	Computer science BT: Computers and information processing RT: Function approximation Logic Software NT: Computational neuroscience Formal languages Network theory (graphs) Programming
		Peer-to-peer computing	
		Software defined	
		Storage area networks	
		Token networks	
		Unicast	
		Virtual private networks	
		Wide area networks	
		Wireless access points	
Computer numerical control			
	UF:	CNC	Computer science education UF: Computer engineering BT: Engineering education
		NC machines	
	BT:	Manufacturing automation	
	RT:	Digital control	
		Industrial control	
<i>Computer operating systems</i>			
	USE:	Operating systems	
Computer performance			
processing	BT:	Computers and information	RT: Security Access control Blockchains Computer network management Cryptography Data protection Data security Digital forensics Eavesdropping Operating systems Privacy Privacy-invasive software 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
	NT:	Computer errors Hardware acceleration Performance loss	
Computer peripherals			
processing	UF:	Computer terminals	NT:
		Peripheral equipment	
	BT:	Computers and information	
	RT:	Computer displays	
		Computer graphics	
		Computer interfaces	
		Device drivers	
		Firewire	
		Flash memories	
		User interfaces	
	NT:	Disk drives	
		Keyboards	
		Modems	
		Printers	
	<i>Computer pipeline processing</i>		
	USE:	Pipeline processing	
<i>Computer ports</i>			
	USE:	Ports (computers)	
<i>Computer programming profession</i>			
	USE:	Programming profession	
			Internet security Mobile security Passwords Penetration testing Permission Phishing



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Proof of Work
Trusted computing

Computer simulation

BT: Simulation
RT: EMTF
Human in the loop

Computer software

USE: Software

Computer terminals

USE: Computer peripherals

Computer viruses

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

Computer vision

BT: Robots
RT: Activity recognition
Advanced driver assistance

systems

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

Computer-aided design

USE: Design automation

Computer-aided diagnosis

USE: Computer aided diagnosis

Computer-aided instruction

USE: Computer aided instruction

Computer-aided learning

USE: Computer aided instruction

Computer-assisted diagnosis

USE: Computer aided diagnosis

Computer-mediated communication

USE: Computer mediated communication

Computerised axial tomography

USE: Computed tomography

Computerised instrumentation

USE: Computerized instrumentation

Computerised monitoring

USE: Computerized monitoring

Computerised tomography

USE: Computed tomography

Computerized axial tomography

USE: Computed tomography

Computerized instrumentation

UF: Computerised instrumentation
BT: Instrumentation and measurement

Computerized monitoring

UF: Computerised monitoring
BT: Monitoring
RT: Computer applications

Computerized tomography

USE: Computed tomography

Computers

UF: Computing technology
BT: Computers and information processing
RT: Cyberspace
NT: Analog computers
Calculators
Digital computers
Microcomputers
Parallel machines
Supercomputers
Tablet computers
Wearable computers



2022 IEEE Thesaurus

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

Computing technology

USE: Computers

Concatenated codes

BT: Programming

Concave programming

BT: Optimization methods

Concrete

BT: Building materials
 RT: Pressure vessels

Concurrency

USE: Concurrent computing

Concurrency control

BT: Computers and information processing
 RT: Distributed computing
 Distributed databases
 Multiprocessing systems
 Parallel processing
 Protocols
 Synchronization
 NT: Processor scheduling

Concurrent computing

UF: Concurrency
 BT: Computation theory
 RT: Granular computing
 Model checking

Concurrent engineering

BT: Engineering - general
 RT: Product design
 Project management
 Quality function deployment
 Research and development

management

Time to market
 Virtual manufacturing

Condition monitoring

BT: Preventive maintenance

Conditions of employment

USE: Employee welfare

Conducting bodies

USE: Conductors

Conducting materials

BT: Materials
 RT: Conductivity



2022 IEEE Thesaurus

	Conductors		Symposia
	Semiconductor materials		Workshops
NT:	Electrolytes	BT:	Meetings
Conductive adhesives		Configuration management	
BT:	Adhesives	BT:	Systems engineering and theory
Conductive films		RT:	Complex systems
BT:	Films		Maintenance engineering
NT:	Anisotropic conductive films		System analysis and design
Conductivity		Conformal mapping	
UF:	Electric conductivity	BT:	Mathematics
	Electrical conductivity	RT:	Coplanar waveguides
	Resistivity		Wave functions
BT:	Electric variables		Waveguide components
RT:	Charge carriers		Waveguide theory
	Conducting materials	Conformance testing	
	Conductivity measurement	UF:	Compliance testing
	Grain boundaries		Conformity assessment
	Impact ionization		Type testing
	Transmission line theory	BT:	Testing
NT:	Photoconductivity	RT:	Accreditation
	Semiconductivity		Certification
	Transconductance		Quality of service
Conductivity measurement			Standards
UF:	Resistivity measurement		Surveillance
BT:	Electric variables	<i>Conformity assessment</i>	
measurement		USE:	Conformance testing
RT:	Conductivity	Congestive heart failure	
Conductors		BT:	Medical conditions
UF:	Conducting bodies	<i>Connected cars</i>	
BT:	Electric machines	USE:	Connected vehicles
RT:	Cables	Connected vehicles	
	Conducting materials	UF:	Connected cars
	Core loss	BT:	Vehicles
	Power cables	RT:	Intelligent vehicles
	Power distribution lines	<i>Connecting</i>	
	Power transmission lines	USE:	Joining processes
	Proximity effects	Connective tissue	
	Skin effect	BT:	Biological tissues
	Thermal noise	Connectors	
	Three-phase electric power	BT:	Electronic components
	Wire	NT:	Plugs
	Wireless power		Sockets
transmission			
	Wiring		
Conference management			
BT:	Management		
Conferences			
UF:	Meetings (technical)		



2022 IEEE Thesaurus

Consensus algorithm

BT: Algorithm design and theory

Consensus control

BT: Decentralized control
RT: Decentralized applications
Swarm robotics

Consensus mechanism

USE: Consensus protocol

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 programming

USE: Constraint handling

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

Consumer behaviour

USE: Consumer behavior

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



2022 IEEE Thesaurus

	Market research		Hazards
	Plastic products		Impurities
	Product liability		Microfiltration
	Product safety		Pollution
	Watches		Quality control
NT:	Clothing		Radiation protection
	Games	NT:	Surface contamination
	Home appliances		
	Microwave ovens		
Consumer protection		<i>Content addressable memory</i>	
BT:	Law	USE:	Associative memory
	Product safety engineering	Content addressable storage	
RT:	Censorship	BT:	Memory
	Commercial law	RT:	Content-based retrieval
	Customer relationship	<i>Content based retrieval</i>	
management	Quality assurance	USE:	Content-based retrieval
<i>Consumer-generated media</i>		<i>Content delivery networks</i>	
USE:	User-generated content	USE:	Content distribution networks
Contact resistance		Content distribution networks	
BT:	Contacts	UF:	Content delivery networks
Contactors		BT:	Computer networks
BT:	Switches	Content management	
Contacts		BT:	Electronic publishing
BT:	Circuits and systems		Management
RT:	Semiconductor devices	RT:	Blockchains
NT:	Brushes		Document handling
	Contact resistance		MPEG 7 Standard
	Ohmic contacts		Multimedia computing
Containers			Publish subscribe systems
BT:	Material storage		Semantic Web
	Materials handling		Web design
equipment			Web sites
RT:	Bulk storage	Content-based retrieval	
	Canning	UF:	Content based retrieval
	Filling	BT:	Information retrieval
	Fuel storage	RT:	Content addressable storage
	Loading	<i>Content-centric networking</i>	
	Measurement	USE:	Information-centric networking
	Pallets	Context	
	Production	BT:	Professional communication
	Stacking	RT:	Pragmatics
NT:	Freight containers	<i>Context aware</i>	
Contamination		USE:	Context-aware services
BT:	Materials science and technology		
RT:	Chemical hazards		
	Decontamination		



2022 IEEE Thesaurus

Context awareness

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

Context modeling

BT: Modeling
RT: Computational linguistics

Context-aware applications

USE: Context-aware services

Context-aware computing

USE: Context-aware services

Context-aware services

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

Continents

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

Contingency management

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

Continuing education

UF: Further education
BT: Career development
Educational programs
RT: Computer aided instruction
Engineering education
Management training
Training

Continuing professional development

UF: Life long learning
BT: Human resource

management

RT: Qualifications
Training

Continuous improvement

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

Continuous phase modulation

BT: Phase modulation

Continuous production

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

Continuous systems

USE: Continuous time systems

Continuous time models

USE: Continuous time systems

Continuous time systems

UF: Continuous systems
Continuous time models
BT: Time factors

Continuous wavelet transforms

BT: Wavelet transforms

Continuous-stirred tank reactor

BT: Chemical reactions

Continuously variable transmission

USE: Mechanical power
transmission

Contract law

BT: Law
RT: Contracts
Employment law

Contract management

BT: Contracts
Management
RT: Risk management

Contracts

BT: Management
RT: Business
Contract law
Procurement
Proposals



2022 IEEE Thesaurus

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

simulation

Hardware-in-the-loop

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
Inventory control
Legged locomotion
Linear systems
Linearization techniques



2022 IEEE Thesaurus

control	NT:	MIMO communication	Missile control
		Manipulators	Moisture control
		Microcontrollers	Motion compensation
		Microsensors	Networked control systems
		Mobile robots	Nonlinear control systems
		Neuromodulation	Open loop systems
		Nonlinear systems	Optical control
		Parameter estimation	Optimal control
		Poles and zeros	PD control
		Real-time systems	PI control
		Robots	Pneumatic systems
		Robustness	Positive train control
		Sensitivity	Pressure control
		Stability	Proportional control
		State estimation	Radio control
		Stochastic systems	Robot control
		Switched systems	SCADA systems
		Target tracking	Sensorless control
		Time-varying systems	Sliding mode control
		Transfer functions	Supervisory control
Uncertain systems	Thermal variables control		
systems		Admittance control	Traffic control
		Automatic control	
		Automatic generation	Control systems synthesis
			USE: Control system synthesis
		Automotive control	Control theory
		Autopilot	BT: Cybernetics
		Bidirectional control	RT: Dynamics
		Block signalling	
		Brakes	NT: Feedback circuits
		CAMAC	Control nonlinearities
		Centralized control	Iterative learning control
		Closed loop systems	Observability
		Control design	
		Control engineering	Controllability
		Control equipment	BT: Control systems
		Control system synthesis	
		Controllability	Convection
		Cruise control	UF: Mixed convection
		Decentralized control	Rayleigh-Benard
		Delay systems	convection
Digital control	BT: Heat transfer		
Fault tolerant control			
Feedback	Convergence		
Feedback linearization	BT: Mathematics		
Fluid flow control			
Fluidics	Convergence of numerical methods		
Gaze tracking	BT: Numerical analysis		
Homeostasis			
Linear feedback control	Converters		
control		UF: Convertors	
		Switching convertors	
		BT: Power electronics	
		RT: Data conversion	
		Inrush current	

2022 IEEE Thesaurus

		Pulse width modulation	RT:	Deep learning
inverters		Pulse width modulation	networks	Generative adversarial
		Rectennas		Machine learning
modulation		Space vector pulse width	Convolvers	
NT:		AC-AC converters	BT:	Convolution
		DC-AC power converters		
converters		Digital-to-frequency	Coolants	
		Frequency conversion	UF:	Antifreeze materials
		Multilevel converters	BT:	Cooling
		Power conversion	RT:	Space cooling
converters		Pulse width modulation	NT:	Refrigerants
		Resonant converters	Cooling	
		Static power converters	BT:	Temperature control
		Voltage-source converters	RT:	Electronics cooling
		Wavelength converters		Electronics packaging
<i>Convertors</i>				HVAC
USE:		Converters		Heat pipes
Convex functions				Thermal engineering
UF:		Convex optimization		Water pumps
BT:		Mathematics	NT:	Air conditioning
<i>Convex optimization</i>				Cold plates
USE:		Convex functions		Coolants
Convolution				Heat sinks
BT:		Signal processing		Immersion cooling
RT:		Deconvolution		Laser cooling
		Numerical analysis		Liquid cooling
NT:		Convolvers		Refrigeration
Convolutional codes				Solar cooling
UF:		Trellis codes		Space cooling
BT:		Codes		Thermal quenching
RT:		Channel coding		Trigeneration
		Digital multimedia		Ultracold atoms
broadcasting				Ventilation
		Error correction		
		Error correction codes		
		Radio communication		
		Satellite communication		
		Telecommunications		
<i>Convolutional neural nets</i>				
USE:		Convolutional neural		
networks				
Convolutional neural networks				
UF:		Convolutional neural nets		
BT:		Artificial neural networks		



2022 IEEE Thesaurus

Cooperative systems

UF: Cooperative networks
BT: Artificial intelligence
RT: Artificial bee colony

algorithm

Cooperative work

USE: Collaborative work

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

Core losses

USE: Core loss

Core-shelf nanostructures

USE: Nanostructured materials

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

Corona virus

USE: Coronaviruses

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

Corpse

USE: Cadaver



2022 IEEE Thesaurus

Corpus amygdaloideum

USE: Amygdala

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

Cortana

USE: Virtual assistants

Cortical bone

BT: Bone tissue

Cortical plasticity

USE: Neuroplasticity

Cosmic gamma ray bursts

USE: Gamma-ray bursts

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 analysis

USE: Cost benefit analysis

Cost benefit analysis

UF: Cost analysis

Cost-benefit analysis

BT: Costs

RT: Functional point analysis

Cost function

BT: Optimization

Cost of living index

USE: Economic indicators

Cost-benefit analysis

USE: Cost benefit analysis

Cost-of-living index

USE: Economic indicators

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



2022 IEEE Thesaurus

	Textile industry Weaving		Shafts
<i>Counseling</i>		Course correction	
USE:	Employee welfare	UF:	Course-correction
		BT:	Navigation
		RT:	Aircraft navigation Path planning
<i>Counselling</i>		<i>Course-correction</i>	
USE:	Employee welfare	USE:	Course correction
<i>Counterfeit goods</i>		Courseware	
USE:	Counterfeiting AND Manufactured products	BT:	Educational technology
Counterfeiting		RT:	Authoring systems Computer aided instruction Hybrid learning Software
UF:	Counterfeit goods		
BT:	Computer crime		
<i>Counters</i>		Covariance matrices	
USE:	Radiation detectors	UF:	Covariance matrix
		BT:	Statistics
Counting circuits		<i>Covariance matrix</i>	
BT:	Circuits	USE:	Covariance matrices
RT:	Logic circuits Radiation detector circuits		
<i>Coupled circuits</i>		COVID-19	
USE:	Coupling circuits	BT:	Coronaviruses
		RT:	Pandemics Viruses (medical)
Coupled mode analysis		Cows	
BT:	Circuit analysis	UF:	Cattle
RT:	Multiconductor transmission lines	BT:	Bovine
Couplers		<i>CPU</i>	
BT:	Communications	USE:	Central Processing Unit
technology		<i>CPW</i>	
RT:	Apertures Coupling circuits Electromagnetic coupling	USE:	Coplanar waveguides
NT:	Directional couplers	<i>Cr</i>	
<i>Coupling (process)</i>		USE:	Chromium
USE:	Joining processes	<i>Cramer Rao bound</i>	
Coupling circuits		USE:	Cramer-Rao bounds
UF:	Coupled circuits	<i>Cramer Rao bounds</i>	
BT:	Circuits	USE:	Cramer-Rao bounds
RT:	Couplers		
Couplings		Cramer-Rao bounds	
UF:	Linkages	UF:	Cramer Rao bound Cramer Rao bounds Cramer-Rao inequality Information inequality
BT:	Mechanical products	BT:	Estimation theory
RT:	Fasteners Joining processes Machine components		



2022 IEEE Thesaurus

Cramer-Rao inequality

USE: Cramer-Rao bounds

Cranes

BT: Lifting equipment

Cranial

BT: Nervous system

NT: Cranial pressure

Cranial pressure

BT: Cranial

NT: Intracranial system

Cranium

BT: Head

Crawlers

BT: Web search

RT: Bot (Internet)

CRC codes

USE: Cyclic redundancy check codes

Creativity

BT: Innovation management

Credit cards

UF: American Express
Mastercard

Visa gold

BT: Financial management

Creep

BT: Material properties

Criminal law

BT: Law

Crimping

BT: Joining processes

Crisis management

BT: Contingency management

Critical current density

BT: Superconductivity

RT: Superconducting materials
Thermal factors

Critical infrastructure

UF: Critical national infrastructure

BT: Public infrastructure

Critical national infrastructure

USE: Critical infrastructure

Crops

BT: Agricultural products
Vegetation

RT: Fertilizers
Greenhouses
Irrigation
Water storage
Yield estimation

NT: Seeds (agriculture)

Cross cultural communication

USE: Cross-cultural communication

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 phase modulation

USE: Cross-phase modulation

Cross platform virtualization

USE: Application virtualization

Cross reality

USE: X reality

Cross-cultural communication

UF: Cross cultural communication

BT: Global communication

RT: Cultural differences

Cross-layer design

USE: Cross layer design

Cross-phase modulation

UF: Cross phase modulation
XPM

BT: Optical modulation
Phase modulation

RT: Kerr effect
Nonlinear optics
Refractive index

Cross-platform virtualization

USE: Application virtualization



2022 IEEE Thesaurus

Cross-site scripting

UF: XSS
BT: Computer security

NT: Liquid nitrogen

Cryonics

USE: Cryogenics

Crosstalk

UF: Crosstalk noise
BT: Interference
RT: Electromagnetic

Cryotherapy

BT: Medical treatment
Temperature measurement

interference

Interchannel interference
Transmission line theory

Crypto currency

USE: Cryptocurrency

Crosstalk noise

USE: Crosstalk

Cryptocurrency

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

Crowdsensing

BT: Crowdsourcing
RT: Collective intelligence
Mobile computing

Crowdsourcing

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

Cryptographic

USE: Cryptography

Cryptographic accelerators

USE: Hardware acceleration

CRT

USE: Cathode ray tubes

Cryptographic hash function

BT: Cryptography
Hash functions

Cruise control

BT: Control systems
Electromechanical systems
RT: Velocity control

Cryptographic protocols

BT: Protocols

Cryobiology

BT: Biology
Temperature measurement

Cryptography

UF: Cryptographic
BT: Data security
Security
RT: Bitcoin
Chaotic communication
Codes
Communication system
Computer security
Data handling
Encoding
Hash functions
Message authentication
Physical unclonable
Privacy
Quantum key distribution

Cryogenic electronics

BT: Industrial electronics
RT: Cryogenics
Superconducting devices
Superconducting materials

security

Cryogenics

UF: Cryonics
BT: Industry applications
Temperature measurement
RT: Cryogenic electronics

function



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2022 IEEE Thesaurus

function	NT:	Random sequences	NT:	Diffraction
		Trust management		X-ray detectors
		Blockchains		Crystallization
		Ciphers		
		Cryptocurrency	Crystals	BT: Materials
		Cryptographic hash		
		Encryption	RT: Crystallizers	Epitaxial growth
		Multi-party computation		
		Public key		
		Quantum cryptography		
generation		Random number	technology	Materials science and
Crystal growth		Side-channel attacks	growth	Molecular beam epitaxial
		Steganography		
		Zero knowledge proof		
		Crystallization	NT:	Phonons
		Epitaxial growth		
		Semiconductor growth		
Crystal microstructure				Piezoelectric materials
		Crystals		Semiconductor materials
		Microstructure		
Crystalline materials				Solids
		Materials		Colloidal crystals
		Martensite		
		Nanocrystals		
		Perovskites		
		Superlattices		Crystal microstructure
<i>Crystallisation</i>	USE:	Crystallization		Crystallography
<i>Crystallisers</i>	USE:	Crystallizers		Grain boundaries
Crystallization				Grain size
		Crystallisation		Liquid crystals
		Crystallography		
		Crystal growth		
Crystallizers				Quartz crystals
		Crystallisers		
		Chemical technology		
		Chemical reactions		
		Colloidal crystals		
		Crystallography		
		Crystals		
Crystallography				
		Crystals		
		Crystallizers		



2022 IEEE Thesaurus

Cultural differences

BT: Cultural aspects
Social implications of
technology
RT: 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 crowding

USE: Proximity effects

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 measurement (water)

USE: Sea measurements

Current mirrors

BT: Circuit topology

Current mode circuits

USE: Current-mode circuits

Current regulation

USE: Current control

Current slump

BT: Current

Current supplies

BT: Power supplies
RT: Current

Current transformers

BT: Transformers
RT: Current



2022 IEEE Thesaurus

Current voltage characteristics

USE: Current-voltage
characteristics AND
Electric variables

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

Custom integrated circuits

USE: Application specific
integrated circuits

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
Quality of experience
Quality of service
NT: Quality of service

Customer services

BT: Customer relationship
management
RT: Customer satisfaction

Cusum charts

USE: Control charts

Cut-off frequency

USE: Cutoff frequency

Cutoff frequency

UF: Cut-off frequency
BT: Integrated circuit modeling

Cutting fluids

USE: Lubricants

Cutting tools

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

CVD

USE: Chemical vapor deposition

Cyber attack

USE: Cyberattack

Cyber attacks

USE: Cyberattack

Cyber bullying

USE: Cyberbullying

Cyber crime

USE: Computer crime

Cyber eavesdropping

USE: Eavesdropping



2022 IEEE Thesaurus

Cyber espionage

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

Cyber ethics

USE: Cyberethics

Cyber harrassment

USE: Cyberbullying

Cyber sickness

USE: Cybersickness

Cyber spying

USE: Cyber espionage

Cyber terrorism

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

Cyber warfare

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

Cyber-crime

USE: Computer crime

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

Cyber-space

USE: Cyberspace

Cyberattack

UF: Cyber attack
Cyber attacks
BT: Computer crime
Computer security
RT: Cyber warfare
Cyberethics
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

Cybercrime

USE: Computer crime

Cybereavesdropping

USE: Eavesdropping

Cyberespionage

USE: Cyber espionage

Cyberethics

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

Cyberharrassment

USE: Cyberbullying

Cybernetics

UF: Biocybernetics



2022 IEEE Thesaurus

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

NT: Robots
Adaptive systems
Cognitive informatics
Cognitive science
Control theory
Decision theory
Econophysics
Emergent phenomena
Intelligent control
Linear feedback control

systems

Cyberphysical

USE: Cyber-physical 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

Cyberspying

USE: Cyber espionage

Cyberterrorism

USE: Cyber terrorism

Cyberwarfare

USE: Cyber warfare

Cyborgs

USE: Man-machine systems

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

Cyclonic storms

USE: Tropical cyclones

Cyclotrons

BT: Particle accelerators

Cyphers

USE: Ciphers

D-HEMTs

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

D/A

USE: Digital-analog conversion

D/A conversion

USE: Digital-analog conversion

D/A converters

USE: Digital-analog conversion

D2D

USE: Device-to-device
communication



2022 IEEE Thesaurus

Dairy products

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

Damascene integration

BT: Electronic equipment
manufacture
RT: Very large scale integration

Dampers

USE: Shock absorbers

Damping

BT: Mechanical factors
RT: Hysteresis
Impedance
Oscillators
Propagation
Shock absorbers
Stability
Transfer functions
Transient response
Vibration control
Vibrations

Dams

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

Dance

USE: Humanities

DAO

USE: Decentralized autonomous
organization

dapp

USE: Decentralized applications

DAQ

USE: Data acquisition

Dark current

BT: Current

Dark energy

BT: Physics

Dark matter

BT: Astrophysics

Dark states

BT: Laser applications

DARPANET

USE: ARPANET

Data acquisition

UF: DAQ
BT: Data systems
RT: Analog-digital conversion
Data handling
Data processing
High energy physics
instrumentation computing
Measurement
NT: 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
Formal concept analysis
R language
Text categorization
NT: Business intelligence
Data science
Itemsets
Training data

Data analytics

USE: Data analysis

Data assimilation

BT: Data handling
RT: Data aggregation
Meteorology

Data breach

UF: Data spill



2022 IEEE Thesaurus

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 centres

USE: Data centers

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
Asynchronous
Asynchronous transfer
Data buses
Data transfer
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 confidentiality

USE: Data privacy

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



2022 IEEE Thesaurus

Data engineering

BT: Data systems

Open data

Sorting

Data envelopment analysis

BT: Linear programming

Data integration

UF: Data fusion

BT: Data processing

RT: Data aggregation
Data dissemination

Data flow computing

BT: Multiprocessing systems

Data flow graphs

USE: Flow graphs

Data integrity

UF: Data freshness

Data quality

BT: Computer security

Data handling

RT: Data governance

Digital preservation

Quality assurance

Quality control

Data freshness

USE: Data integrity

Data fusion

USE: Data integration

Data gloves

BT: Haptic interfaces

Data lakes

UF: Data swamp

BT: Data collection

RT: Big Data

Data mining

Data warehouses

Data governance

BT: Data handling
Organizational aspects
Business data processing

RT: Data integrity
Data models
Data privacy
Data protection
Data security
Database systems
Quality management
NT: Government policies

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 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 dissemination
Data encapsulation
Data governance
Data integrity
Document handling
Merging

Data models

BT: Modeling

RT: Data governance

Database systems

Semantic Web

Semantic technology

NT: Data-driven modeling

Metadata



2022 IEEE Thesaurus

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
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 quality

USE: Data integrity

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
Virtual private networks
NT: Cryptography
Message authentication
Tokenization

Data sources

USE: Soft sensors

Data spill

USE: Data breach

Data storage

USE: Memory

Data storage systems

USE: Buffer storage

Data structures

BT: Computer architecture
RT: Computer languages
Database systems
File systems
NoSQL databases
NT: Arrays
Binary decision diagrams
Null value
Octrees
Persistent identifiers



2022 IEEE Thesaurus

	Table lookup	RT:	Customer relationship management
	Tree data structures		
<i>Data swamp</i>		Database languages	
USE:	Data lakes	UF:	Query languages
Data systems		BT:	Computer languages
BT:	Computers and information processing	RT:	Database systems
	Information systems	NT:	Structured Query Language
RT:	Big Data applications	Database machines	
NT:	Buffer storage	BT:	Computers and information processing
	Data acquisition	RT:	Database systems
	Data centers		Information systems
	Data compression	<i>Database management systems</i>	
	Data conversion	USE:	Database systems
	Data engineering	Database systems	
	Data handling	UF:	Database management systems
	Data processing		Technical data
	Data warehouses	BT:	Databases
Data transfer		RT:	Data aggregation
BT:	Data communication		Data governance
	Data processing		Data models
RT:	Packet switching		Data processing
NT:	Handover		Data structures
	Simultaneous wireless information and power transfer		Database languages
<i>Data transmission</i>			Database machines
USE:	Data communication		File systems
<i>Data visualisation</i>			Hypertext systems
USE:	Data visualization		Information architecture
Data visualization			Linked data
UF:	Data visualisation		Triples (Data structure)
BT:	Computer graphics	NT:	Audio databases
	User interfaces		Deductive databases
RT:	Biomedical imaging		Image databases
	Data mining		Indexes
	Modeling		Multimedia databases
	R language		NoSQL databases
NT:	Graph drawing		Object oriented databases
	Isosurfaces		Query processing
Data warehouses		Databases	
BT:	Data systems	BT:	Professional communication
RT:	Data lakes	NT:	Database systems
	NoSQL databases		Deductive databases
Data-driven modeling			Distributed databases
BT:	Data models		Image databases
	Modeling		Multimedia databases
			Object oriented databases



2022 IEEE Thesaurus

Relational databases
Spatial databases
Transaction databases
Visual databases

Daylighting

BT: Lighting

DBR

USE: Distributed Bragg reflectors

DBS

USE: Satellite broadcasting

DC distribution systems

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

DC generators

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

DC machines

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

DC motors

UF: Direct current motors
BT: DC machines
Motors
RT: Pulse width modulation
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 converters
BT: Converters
Power conversion

DC-AC power converters

USE: DC-AC power converters

DC-DC converters

USE: DC-DC power converters

DC-DC power conversion

USE: DC-DC power converters

DC-DC power converters

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

inverters

NT: Buck converters

DC-DC power converters

USE: DC-DC power converters

DCT

USE: Discrete cosine transforms

DDoS

USE: Distributed denial-of-service
attack

DDoS attack

USE: Computer crime

DDos attack

USE: Denial-of-service attack

DDSM

USE: Delta-sigma modulation

De broglie hypothesis

USE: Matter waves

De Broglie methods

USE: Matter waves

De-noising

USE: Noise reduction

Dead reckoning

BT: Navigation



2022 IEEE Thesaurus

Deadlocks (computers)

USE: System recovery

BT: Organizations

RT: Blockchains

Deafness

BT: Medical conditions

RT: Sign language

Death

BT: Pathological processes

NT: Asphyxia

Debugging

BT: System recovery

Deburring

BT: Surface finishing

RT: Drilling

Machining

Polishing machines

Decarbonisation

USE: Low-carbon economy

Decarbonised economy

USE: Low-carbon economy

Decarbonization

USE: Low-carbon economy

Decarbonized economy

USE: Low-carbon economy

Decentralised applications

USE: Decentralized applications

Decentralised autonomous organization

USE: Decentralized autonomous organization

Decentralised control

USE: Decentralized control

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

Decentralized control

UF: Decentralised control Distributed 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

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



2022 IEEE Thesaurus

BT:	Decision theory	RT:	Knowledge based systems
RT:	Random forests		
NT:	Classification tree analysis		
	Regression tree analysis		
<i>Decoder</i>		Deep architecture	
USE:	Decoding	BT:	Software architecture
			Systems architecture
		RT:	Machine learning
			Neural networks
		NT:	Deep learning
Decoding		Deep brain stimulation	
UF:	Decoder	BT:	Brain stimulation
BT:	Information theory		Neurosurgery
RT:	Codecs	RT:	Neural implants
	Codes		Neurostimulation
	Cyclic redundancy check		
codes		<i>Deep etching</i>	
	Demodulation	USE:	Etching
	Parity check codes		
	Product codes	<i>Deep fake</i>	
	Signal processing	USE:	Deepfakes
	Space-time codes		
	Speech codecs	Deep learning	
	Video codecs	UF:	Deep neural networks
NT:	Maximum likelihood		Deep structured learning
decoding			Hierarchical learning
		BT:	Deep architecture
Decontamination			Machine learning
BT:	Materials handling	RT:	Convolutional neural
RT:	Chemical technology	networks	
	Contamination		Feature extraction
	Environmental monitoring		Image classification
	Pollution control		Image segmentation
	Purification		Learning systems
Deconvolution			Recurrent neural networks
BT:	Inverse problems		Reinforcement learning
RT:	Convolution		Supervised learning
	Integral equations		Unsupervised learning
	Numerical analysis		
	Signal processing	Deep level transient spectroscopy	
	Signal restoration	BT:	Semiconductor materials
			Spectroscopy
Decorrelation		<i>Deep neural networks</i>	
BT:	Signal processing	USE:	Deep learning
Dedicated short range communication		<i>Deep space</i>	
UF:	DSRC	USE:	Deep-space
BT:	Wireless communication	communications	
RT:	Intelligent vehicles		
	On board unit	<i>Deep structured learning</i>	
	Vehicular ad hoc networks	USE:	Deep learning
Deductive databases		Deep-space communications	
UF:	Intelligent databases	UF:	Deep space
BT:	Database systems	BT:	Space communications
	Databases		



2022 IEEE Thesaurus

RT:	Telemetry		Speech processing
Deepfakes		Delay lines	
UF:	Deep fake	BT:	Delay systems
BT:	Fake news	RT:	Delay effects
	Videos		
RT:	Information integrity	<i>Delay lock loops</i>	
	Photorealism	USE:	Tracking loops
<i>Defence industry</i>		Delay systems	
USE:	Defense industry	BT:	Control systems
Defense industry		RT:	Delay effects
UF:	Defence industry		Telerobotics
BT:	Industries	NT:	Added delay
RT:	Military equipment		Delay lines
	Weapons		
Defibrillation		Delays	
BT:	Medical treatment	BT:	Timing
RT:	Cardiology	NT:	Delay estimation
	Fibrillation		
<i>Definitions</i>		Delta modulation	
USE:	Terminology	BT:	Analog-digital conversion
			Digital signal processing
		NT:	Delta-sigma modulation
			Sigma-delta modulation
Deformable models		<i>Delta sigma</i>	
BT:	Modeling	USE:	Sigma-delta modulation
<i>Deformation</i>		<i>Delta sigma modulators</i>	
USE:	Strain	USE:	Delta-sigma modulation
Degenerative diseases		Delta-sigma modulation	
BT:	Diseases	UF:	DDSM
Degradation			Delta sigma modulators
BT:	Materials science and		Delta-sigma modulators
technology		BT:	Delta modulation
Delamination		<i>Delta-sigma modulators</i>	
BT:	Materials testing	USE:	Delta-sigma modulation
Delay effects		<i>Demagnetisation</i>	
UF:	Time delay	USE:	Demagnetization
BT:	Electromagnetic analysis	Demagnetization	
RT:	Delay lines	UF:	Demagnetisation
	Delay systems	BT:	Magnetics
	Distortion		
	Phase distortion	Demand forecasting	
NT:	Propagation delay	BT:	Forecasting
		RT:	Production planning
Delay estimation		Demand response	
BT:	Delays	BT:	Power demand
RT:	Computer networks		
	Multiaccess communication		



2022 IEEE Thesaurus

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

Demodulators

USE: Demodulation

Demography

BT: Social factors

Dempster?Shafer theory

USE: Evidence theory

Demultiplexing

BT: Multiplexing
RT: Arrayed waveguide gratings

Dendrites (neurons)

UF: Dendrons
BT: Neurons

Dendrons

USE: Dendrites (neurons)

Denial-of-service attack

UF: DDos attack
DoS attack
BT: Communication system

security

RT: Computer security
Proof of Work
NT: Distributed denial-of-service

attack

Denoising

USE: Noise reduction

Density estimation robust algorithm

UF: DER
BT: Algorithms

Density function

USE: Density functional theory

Density function theory

USE: Density functional theory

Density functional theory

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

Density measurement

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

Density-function

USE: Density functional theory

Dental

USE: Dentistry

Dentistry

UF: Dental
BT: Medical treatment

Deny lists

USE: Blocklists

Dependability management

BT: Management
RT: Reliability
Safety management

Depletion mode HEMTs

USE: D-HEMTs

Depletion-mode HEMTs

USE: D-HEMTs

Deployable structures

USE: Flexible structures

Depression

UF: Major depressive disorder
BT: Medical conditions



2022 IEEE Thesaurus

DER

USE: Density estimation robust algorithm

Derailments

USE: Railway accidents

Dermatology

BT: Medical specialties

Dermis

BT: Skin

Desalination

BT: Water conservation
Water resources
RT: Reverse osmosis

Description logic

BT: Knowledge representation
Ontologies

Design

USE: Design methodology

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: CAD/CAM
Logic design
PSCAD

Design engineering

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

Design for disassembly

BT: Design methodology
RT: Pollution
Process design
Product design
Waste reduction

Design for experiments

BT: Design methodology

Design for manufacturability

USE: Design for manufacture

Design for manufacture

UF: Design for manufacturability
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
Graphics



2022 IEEE Thesaurus

Green design
Integrated design
Process design
Product design
Prototypes
Technical drawing
Time to market
User centered design
Virtual prototyping

Demodulation
Fall detection
Nonlinear filters
Readout electronics
Envelope detectors
Semiconductor detectors

Deuterium

BT: Hydrogen

Design optimization

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

Design standards

BT: Design methodology

Design tools

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

Design-for-test

USE: Design for testability

Design-for-testability

USE: Design for testability

Design-for-testing

USE: Design for testability

Desktop publishing

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

Detection (signal)

USE: Signal detection

Detection algorithms

BT: Algorithms

Detectors

BT: Sensor systems and applications
RT: Chemical sensors

Developing countries

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

Device chargers

USE: Battery chargers

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

Dew servers

USE: Dew computing

DFA

USE: Doped fiber amplifiers

DFIG

USE: Doubly fed induction generators

DFT

USE: Discrete Fourier transforms



2022 IEEE Thesaurus

DGPS

USE: Global Positioning System

DH-HEMTs

UF: Double heterojunction

HEMTs

BT: HEMTs

DHBTs

USE: Double heterojunction

bipolar transistors

Diabetes

UF: Diabetic

BT: Medical conditions

RT: Insulin pumps

Diabetic

USE: Diabetes

Diacs

USE: Thyristors

Diagnosis (medical)

USE: Medical diagnosis

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

UF: Diamonds

BT: Carbon

Diamond carbon

USE: Diamond-like carbon

Diamond like carbon

USE: Diamond-like carbon

Diamond-like carbon

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

Diamonds

USE: Diamond

DICOM

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

Dictionaries

BT: Information services
Terminology
Writing

Dictionary learning

USE: Machine learning

Die attach

USE: Microassembly

Die bonding

USE: Microassembly

Die casting

BT: Casting

RT: Automobile manufacture

Dies

Materials handling

Melt processing

Metals

Dielectric barrier discharges

USE: Discharges (electric)

Dielectric breakdown

UF: Dielectric strength
Voltage breakdown

BT: Electric breakdown

RT: Dielectric measurement

Insulation

Lightning

NT: Arc discharges

Discharges (electric)

Electrostatic discharges

Flashover



2022 IEEE Thesaurus

Glow discharges
Partial discharges
Surface discharges
Vacuum breakdown

RT: Dielectric loss
measurement
Insulation

Dielectric constant

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

Dielectric devices

BT: Dielectrics
RT: Dielectric materials
Dielectric resonator

antennas

NT: Electrets
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 electroactive polymer actuators

USE: Actuators

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: Dielectric loss
BT: Dielectrics

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 measurements

USE: Dielectric measurement

Dielectric properties

USE: Dielectrics

Dielectric resonator antennas

BT: Antennas
RT: Dielectric devices
Resonance

Dielectric strength

USE: Dielectric breakdown

Dielectric substrate

USE: Dielectric substrates



2022 IEEE Thesaurus

Dielectric substrates

UF: Dielectric substrate
BT: Dielectrics

RT: Discrete-time systems
Numerical analysis
Piecewise linear techniques

Dielectric thin films

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

Differential algebraic equations

BT: Differential equations

Differential amplifiers

BT: Amplifiers

Dielectrics

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

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

Dielectrics and electrical insulation

NT: Dielectrics
Electric breakdown
Insulation

Dielectrophoresis

BT: Dielectrics

Differential games

BT: Game theory
RT: Differential equations

Dielectric loss

USE: Dielectric losses

Differential gears

USE: Gears

Dies

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

Differential GPS

USE: Global Positioning System

Dies (machine tools)

USE: Dies

Differential operators

BT: Differential equations

Diesel engines

BT: Internal combustion engines
RT: Automotive engineering

Differential phase shift keying

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

Differential phase-shift keying

USE: Differential phase shift keying

Difference engines

BT: Calculators

Differential privacy

BT: Data privacy
Statistics
RT: Data protection

Difference equations

BT: Equations



2022 IEEE Thesaurus

Information security
Privacy

Differential quadrature phase shift keying

BT: Quadrature phase shift keying

Differentiated services networks

USE: Diffserv networks

Diffraction

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

Diffraction gratings

BT: Optical diffraction
RT: Bragg gratings

DiffServ

USE: Diffserv networks

Diffserv networks

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

Diffusion bonding

BT: Bonding processes
RT: Ceramics

Diffusion processes

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

Diffusion tensor imaging

UF: DT-MRI
DTI
Diffusion tensor magnetic resonance imaging

BT: Magnetic resonance imaging
RT: Brain

Diffusion tensor magnetic resonance imaging

USE: Diffusion tensor imaging

Digestive system

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

Digital age

USE: Information age

Digital agriculture

USE: Smart agriculture

Digital alloys

BT: Metals

Digital arithmetic

UF: Computer arithmetic
BT: Arithmetic
RT: Calculators
Coproductors

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 broadcasts

USE: Digital audio broadcasting



2022 IEEE Thesaurus

Digital audio players

UF: MP3
BT: Digital audio broadcasting

Digital camera

USE: Digital cameras

Digital cameras

UF: Digital camera
BT: Cameras
RT: Digital photography

Digital circuits

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

Digital communication

UF: Digital radio
BT: Communication systems
RT: Bluetooth
Data communication
Digital recording
Musical instrument digital

interfaces

Synchronous digital

hierarchy

TCPIP
Teleprinting
NT: 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
Mainframes

Digital control

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

Digital currency

USE: Online banking

Digital devices

USE: Personal digital devices

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 modeling

USE: Digital elevation models

Digital elevation models

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

Digital factories

USE: Virtual manufacturing

Digital filters

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

filters

Digital forensics

BT: Forensics
RT: Computer security
Data mining
Law enforcement



2022 IEEE Thesaurus

Digital health

USE: Electronic healthcare

Digital healthcare

USE: Electronic healthcare

Digital image

USE: Digital images

Digital images

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

Digital imaging

USE: Digital images

Digital Imaging and Communications in Medicine

USE: DICOM

Digital inclusion

USE: Digital divide

Digital integrated circuits

BT: Digital circuits
Integrated circuits
RT: Adders
Logic circuits
Multiplying circuits
NT: Integrated memory circuits

Digital intelligence

BT: Human intelligence
Man-machine systems
RT: Behavioral sciences
Cognition
Competitive intelligence
Digital systems
Ethics
Human factors
Psychology
Social intelligence

Digital magnetic recording

BT: Magnetic recording

Digital microfluidic biochips

BT: Biochips

Digital micromirror devices

USE: Micromirrors

Digital 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 multimedia broadcasts

USE: Digital multimedia
broadcasting

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 publishing

USE: Electronic publishing

Digital radio

USE: Digital communication

Digital Radio Mondiale

BT: Digital audio broadcasting

Digital recording

BT: Recording
RT: Digital communication



2022 IEEE Thesaurus

	Digital systems		Discrete event simulation
	Virtual museums		
Digital relays		Digital storage	
BT:	Relays	BT:	Digital systems
			Storage management
		NT:	Solid state drives
Digital representation		<i>Digital subscriber lines</i>	
BT:	Encoding	USE:	DSL
	Image representation		
	Information representation	<i>Digital subscriber loops</i>	
RT:	Augmented reality	USE:	DSL
	Quantization (signal)		
	Virtual museums		
	Virtual reality		
Digital rights management		Digital systems	
BT:	Intellectual property	BT:	Computers and information
RT:	Computer crime	processing	
	Copyright protection	RT:	Communication systems
	Software protection		Computational and artificial
<i>Digital sequences</i>		intelligence	
USE:	Sequences		Consumer electronics
			Cryptocurrency
Digital signal processing			Digital computers
UF:	DSP		Digital intelligence
BT:	Signal processing		Digital recording
RT:	Aerospace and electronic		Persistent identifiers
			Personal communication
systems		networks	
	Digital TV	NT:	Digital preservation
	Fast Fourier transforms		Digital storage
	OFDM		Digital transformation
NT:	Delta modulation		ISDN
	Digital signal processing		Internet
chips			Local area networks
			Metropolitan area networks
Digital signal processing chips			Smart agriculture
BT:	Digital signal processing		Token networks
			Virtual artifact
Digital signal processors		<i>Digital terrain model</i>	
BT:	Circuits	USE:	Digital elevation models
RT:	Signal processing		
Digital signatures		<i>Digital terrain modeling</i>	
BT:	Security	USE:	Digital elevation models
RT:	Message authentication		
	Message systems	<i>Digital terrain models</i>	
		USE:	Digital elevation models
Digital simulation		<i>Digital to analog conversion</i>	
BT:	Simulation	USE:	Digital-analog conversion
RT:	Computer aided analysis		
	Modeling	<i>Digital to analog converters</i>	
	Power system analysis	USE:	Digital-analog conversion
computing		Digital transformation	
NT:	Digital twins	BT:	Digital systems



2022 IEEE Thesaurus

RT:	Augmented reality Internet of Things Virtual reality	Interpolation
NT:	Fourth Industrial Revolution	<i>Digital-analog converters</i> USE: Digital-analog conversion
Digital TV		<i>Digital-analogue conversion</i> USE: Digital-analog conversion
BT:	TV	
RT:	Digital multimedia	<i>Digital-analogue converters</i> USE: Digital-analog conversion
broadcasting	Digital signal processing HbbTV Standards	
NT:	HDTV IPTV	Digital-controlled oscillators BT: Oscillators
Digital twins		<i>Digital-to-analog conversion</i> USE: Digital-analog conversion
BT:	Cyber-physical systems Digital simulation	
RT:	Augmented reality Internet of Things Virtual reality	<i>Digital-to-analog converters</i> USE: Digital-analog conversion
<i>Digital versatile discs</i>		Digital-to-frequency converters BT: Converters
USE:	DVD	
Digital video broadcasting		<i>Dike</i> USE: Levee
UF:	Digital video broadcasts	
BT:	Broadcasting Digital communication	<i>DIL</i> USE: Electronics packaging
<i>Digital video broadcasts</i>		<i>Dimension reduction</i> USE: Dimensionality reduction
USE:	Digital video broadcasting	
<i>Digital video discs</i>		Dimensionality reduction UF: Dimension reduction BT: Information retrieval Machine learning Statistics NT: Manifold learning
USE:	DVD	
<i>Digital watermarking</i>		Dinosaurs BT: Animals
USE:	Watermarking	
<i>Digital-analog</i>		Diode lasers UF: Laser diodes BT: Diodes Lasers
USE:	Digital-analog conversion	
Digital-analog conversion		Diodes BT: Electronic components Voltage multipliers RT: Breakdown voltage Optical transmitters Semiconductor diodes NT: Active matrix organic light emitting diodes
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	



2022 IEEE Thesaurus

diodes	Diode lasers		division multiple access	Direct sequence code	
	Light emitting diodes			Direct-sequence CDMA	
	Organic light emitting			Multiaccess communication	
	P-i-n diodes				
	Schottky diodes				
<i>DIP</i>	Semiconductor lasers		Directed acyclic graph		
	Superluminescent diodes			BT:	Graph theory
				RT:	Blockchains
USE:	Electronics packaging		Directed graphs	BT:	Graph theory
				NT:	Fuzzy cognitive maps
Dip coating			<i>Direction of arrival</i>		
	BT:			USE:	Direction-of-arrival
Dipole antennas			estimation		
	BT:		<i>Direction of arrival estimation</i>		
	Antennas		USE:	Direction-of-arrival	
			estimation		
<i>Direct broadcast satellites</i>			USE:	Direction-of-arrival	
	USE:		estimation		
	Satellite broadcasting		<i>Direction-finding</i>		
			USE:	Navigation	
<i>Direct current generators</i>			Direction-of-arrival estimation		
	USE:			UF:	Bearing estimation
	DC generators			DOA estimation	
				Direction of arrival	
<i>Direct current machines</i>				Direction of arrival	
	USE:		estimation		
	DC machines		of arrival	Estimation of the direction	
			BT:	Parameter estimation	
<i>Direct current motors</i>			RT:	Array signal processing	
	USE:			Position measurement	
	DC motors			Spectral analysis	
				Time of arrival estimation	
<i>Direct current power transmission</i>			Directional antennas		
	USE:			BT:	Antennas
	DC power transmission		Directional couplers		
				BT:	Couplers
<i>Direct sequence CDMA</i>			RT:	Hybrid junctions	
	USE:		Directive antennas		
Direct-sequence code-		BT:		Antennas	
division multiple access			<i>Disaster and recovery</i>		
				USE:	Disaster management
<i>Direct sequence code division multiple access</i>			Disaster management		
	USE:			UF:	Disaster and recovery
	Direct-sequence code-			Disaster planning	
	division multiple access			BT:	Contingency management
Direct-sequence code-division multiple access					
	UF:				
	Direct sequence CDMA				



2022 IEEE Thesaurus

Disaster planning

USE: Disaster management

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 element method

USE: Finite element analysis

Discrete event simulation

BT: Digital simulation
NT: Time warp simulation

Discrete event systems

USE: Discrete-event systems

Discrete Fourier transforms

UF: DFT
BT: Fourier transforms
RT: Signal processing

Discrete Fournier transforms

USE: Discrete transforms

Discrete time systems

USE: Discrete-time systems

Discrete transforms

UF: Discrete Fournier
transforms
BT: Transforms
NT: Discrete cosine transforms

Discrete wavelet transforms

BT: Wavelet transforms

RT: Finite impulse response
filters

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
Human immunodeficiency

virus

Infectious diseases
Influenza
Multiple sclerosis
Neurological diseases
Parasitic diseases
Parkinson's disease
Pathogens
Pulmonary diseases
Retinopathy



2022 IEEE Thesaurus

Disk drives

BT: Computer peripherals
RT: Disk recording
Perpendicular magnetic

recording

Disk recording

BT: Recording
RT: Disk drives

Disks (structures)

USE: Structural discs

Dismissal

USE: Termination of employment

Dispatching

BT: Object oriented
programming
RT: Materials handling

Dispersed power generation

USE: Distributed power
generation

Dispersion

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

Dispersion effect

USE: Dispersion

Dispersion measurement

USE: Dispersion

Dispersion relations

USE: Dispersion

Dispersive

USE: Dispersion

Displacement control

BT: Mechanical variables
control

Displacement measurement

BT: Mechanical variables
measurement

Display systems

BT: Displays

Displays

BT: Optical devices
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 air flotation

USE: Wastewater treatment

Dissolved gas analysis

BT: Fault diagnosis

Distance

USE: Distance measurement

Distance learning

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



2022 IEEE Thesaurus

Mobile learning

Distance measurement

UF: Distance
Ranging
BT: Measurement
RT: Micrometers
Position measurement
NT: Euclidean distance

Distance relays

USE: Protective relaying

Distillation columns

USE: Distillation equipment

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 information

USE: Distortion

Distortion measurement

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

Distributed control

USE: Decentralized control

Distributed algorithms

BT: Algorithms

Distributed amplifiers

BT: Amplifiers

Distributed antennas

USE: Antenna arrays

Distributed Bragg reflectors

UF: DBR
BT: Mirrors
RT: Integrated optics
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
Collaborative work
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



2022 IEEE Thesaurus

Distributed denial-of-service attack

UF: DDoS
BT: Denial-of-service attack
RT: Botnet
Computer crime

Distributed energy resources

USE: Distributed power generation

Distributed feedback devices

UF: Distributed feedback lasers
BT: Laser applications
RT: Feedback circuits
Optical feedback

Distributed feedback lasers

USE: Distributed feedback devices

Distributed generation

USE: Decentralized control AND
Distributed power generation

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 modeling

USE: Decentralized control

Distributed parameter circuits

UF: Nonuniform transmission lines
BT: Transmission line circuits
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

Distribution functions

BT: Statistical distributions
RT: Probability
Probability density function

Distribution networks

BT: Supply chains

Distribution of electric power

USE: Power distribution

Distribution strategy

BT: Marketing management

Disturbance observers

BT: Observers
RT: Adaptive control
Robust control



2022 IEEE Thesaurus

Diversity gain

USE: Diversity methods

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

Diving equipment

USE: Underwater equipment

DLT

USE: Distributed ledger

DMB

USE: Digital multimedia
broadcasting

DNA

BT: Genetics
RT: Biological cells
Biological information
theory
Cloning
DNA computing
Epigenetics
Genetic communication
Molecular biophysics
NT: Genetic mutations

DNA computing

BT: Computers and information
processing
RT: Nanobioscience
DNA
Molecular computing

DOA estimation

USE: Direction-of-arrival
estimation

Docking stations

USE: Computer interfaces

DOCSIS

USE: Data over cable service
interface specification

Doctor

USE: Medical services

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
Document image
NT: 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

DoD

USE: US Department of Defense

DoE

USE: US Department of Energy

Dogs

BT: Animals

Dolphins

BT: Marine animals

Domain Name System

BT: Computer networks



2022 IEEE Thesaurus

Domain specific languages

UF: Domain-specific languages
BT: Specification languages

Domain-specific languages

USE: Domain specific languages

Domestic appliances

USE: Home appliances

Domestic induction appliances

USE: Home appliances

Domestic safety

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

Doped fiber amplifiers

UF: DFA
BT: Optical amplifiers

Doping

BT: Materials preparation
RT: Semiconductor device

doping

NT: Silicon devices
Doping profiles

Doping profiles

BT: Doping
RT: Optimization
Thin film devices

Doppler

USE: Doppler effect

Doppler effect

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

Doppler 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

DoS attack

USE: Computer crime AND
Denial-of-service attack

Dosimetry

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

DOT

USE: US Department of
Transportation

Double gate FETs

USE: Double-gate FETs

Double heterojunction bipolar transistors

UF: DHBTs
BT: Heterojunction bipolar
transistors

Double heterojunction HEMTs

USE: DH-HEMTs

Double-gate FETs

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

Doubly fed induction generators

UF: DFIG
BT: Induction generators
RT: Wind turbines

Downlink

BT: Satellite communication
RT: Cellular radio



2022 IEEE Thesaurus

DP industry

USE: Computer industry

DPKS

USE: Differential phase shift

keying

Drag

BT: Fluid dynamics

RT: Friction

DRAM

USE: DRAM chips

DRAM chips

UF: DRAM

BT: Random access memory

RT: Solid state drives

Drama

USE: Humanities

Dredging

USE: Excavation

Drift velocity

USE: Electron mobility

Drilling

BT: Machining

RT: Boring

Deburring

Drilling machines

Geoengineering

Oil drilling

Drilling machines

BT: Machine tools

RT: Drilling

Drilling oil

USE: Oil drilling

Driver circuits

BT: Circuits

RT: Power transistors

Driver free automobiles

USE: Autonomous automobiles

Driver free cars

USE: Autonomous automobiles

Driver-free car

USE: Autonomous automobiles

Driverless automobiles

USE: Autonomous automobiles

Driverless cars

USE: Autonomous automobiles

Drives

BT: Machinery

RT: Mechanical power

transmission

Sensorless control

Torque converters

NT: Hydraulic drives

Motor drives

Variable speed drives

Drones

BT: Remotely guided vehicles

Drug delivery

UF: Drug delivery systems

BT: Biomedical engineering

RT: Nanocarriers

NT: Targeted drug delivery

Drug delivery systems

USE: 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

DSP

USE: Digital signal processing

DSRC

USE: Dedicated short range

communication



2022 IEEE Thesaurus

DT-MRI

USE: Diffusion tensor imaging

DTI

USE: Diffusion tensor imaging

Dual band

UF: Dual-band
Dualband
BT: Mobile communication
RT: GSM
Mobile handsets
Roaming

Dual inline packaging

USE: Electronics packaging

Dual-band

USE: Dual band

Dualband

USE: Dual band

Ducts

BT: Structural shapes
RT: Air conditioning
Vents

Duplex communication systems

BT: Communication systems
NT: Full-duplex system
Half-duplex system

Dusty plasma

USE: Dusty plasmas

Dusty plasmas

UF: Dusty plasma
BT: Plasma properties

DVD

UF: DVD-ROM
Digital versatile discs
Digital video discs
BT: Video coding
RT: Video recording

DVD-ROM

USE: DVD

Dynamic algorithms

USE: Heuristic algorithms

Dynamic compiler

BT: Runtime

Dynamic equilibrium

BT: Measurement techniques
NT: Steady-state

Dynamic program analysis

USE: Performance analysis

Dynamic programming

BT: Algorithms
RT: Markov processes
Neural networks
Viterbi algorithm

Dynamic range

BT: Measurement

Dynamic scheduling

BT: Scheduling

Dynamic service delivery

USE: Network resource
management

Dynamic spectrum access

BT: Radio transceivers
RT: Telecommunication
network topology
Wireless communication

Dynamic systems

USE: Dynamical systems

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
Control theory
Force
Friction
Vibrations
NT: Aerodynamics
Elastodynamics
Electrodynamics
Hydrodynamics
Magnetohydrodynamics



2022 IEEE Thesaurus

Dynamo

USE: Generators

Dynamometers

UF: Dyno
BT: Force measurement
Meters
Power measurement
Torque measurement

Dyno

USE: Dynamometers

Dysprosium

BT: Chemical elements

E health

USE: Electronic healthcare

E learning

USE: Electronic learning

e-agriculture

USE: Smart agriculture

E-banking

USE: Online banking

E-books

USE: Electronic publishing

E-commerce

USE: Electronic commerce

E-currency

USE: Online banking

E-government

USE: Electronic government

E-health records

USE: Electronic medical records

E-learning

USE: Electronic learning

E-mail

USE: Electronic mail

E-publishing

USE: Electronic publishing

E-reader

USE: Electronic publishing

E-voting

USE: Electronic voting

E-wallets

USE: Online banking

E-waste

USE: Electronic waste

EAM

USE: Electro-absorption
modulators

Ear

BT: Head
Sense organs
RT: Cochlear implants

EAROM

USE: EPROM

Earphones

USE: Headphones

Earth

BT: Geoscience
Planets
RT: Geophysics
Remote sensing
Soil
Terrain factors
Terrain mapping

Earth atmosphere

USE: Terrestrial atmosphere

Earth observation system

USE: Earth Observing System

Earth Observing System

UF: EOS
Earth observation system
BT: Artificial satellites
Observers
NT: Global Earth Observation
System of Systems

Earth science

USE: Geoscience

earthing

USE: Grounding

Earthquake engineering

UF: Seismic retrofitting



2022 IEEE Thesaurus

	BT:	Earthquakes		Ecodesign	
	RT:	Seismology		UF:	Eco design
Earthquakes					Eco-design
	BT:	Geoscience		BT:	Green design
	RT:	Seismic waves		RT:	Energy conservation
		Seismology			Environmental factors
	NT:	Earthquake engineering		Ecology	
Eavesdropping				BT:	Environmental factors
	UF:	Cyber eavesdropping		RT:	Entomology
		Cybereavesdropping			Seeds (agriculture)
	BT:	Privacy		Ecommerce	
	RT:	Computer security		USE:	Electronic commerce
<i>ECC</i>				Econometrics	
AND	USE:	Elliptic curve cryptography		BT:	Economics
		Error correction codes		RT:	Costs
<i>ECCM</i>					Cybernetics
	USE:	Electronic countermeasures			Mathematics
<i>ECG</i>					Profitability
	USE:	Electrocardiography			Regression analysis
				NT:	Statistics
<i>Echo cancellation</i>					Economic forecasting
	USE:	Echo cancellers		Economic forecasting	
Echo cancellers				BT:	Econometrics
	UF:	Echo cancellation			Forecasting
	BT:	Active noise reduction		RT:	Economic indicators
Echo interference				Economic indicators	
	BT:	Interference		UF:	Cost of living index
	RT:	Clutter			Cost-of-living index
		TV interference			GDP
Echocardiography					GNP
	UF:	ECHOEG			Gross domestic product
	BT:	Cardiography			Gross national product
<i>ECHOEG</i>					Harmonised index of
	USE:	Echocardiography		consumer prices	Harmonized index of
<i>ECM</i>				consumer prices	Index of production
	USE:	Electronic countermeasures			Interest rates
<i>Eco design</i>					RPI
	USE:	Ecodesign			Retail price index
<i>Eco-design</i>				BT:	Economics
	USE:	Ecodesign		RT:	Economic forecasting
					Exchange rates
				NT:	Share prices
				Economics	
				BT:	Engineering management
				RT:	Bankruptcy
					Commercial law
					Cost accounting



2022 IEEE Thesaurus

	Digital divide
	Econophysics
	Finance
	Food security
	Planning
NT:	Access charges
	Costs
	Developing countries
	Econometrics
	Economic indicators
	Electronic commerce
	Environmental economics
	Exchange rates
	Fuel economy
	International trade
	Macroeconomics
	Microeconomics
	Monopoly
	Oligopoly
	Power generation

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

considerations

Philosophical

Science - general

Ecosystems

BT: Environmental factors
RT: Consensus protocol
Low-carbon economy
NT: Wetlands

EDA

USE: Electronic design automation and methodology

Eddy current losses

USE: Eddy currents

Eddy current testing

BT: Eddy currents
RT: Finite element analysis

Eddy currents

UF: Eddy current losses
BT: Electromagnetic induction
RT: Magnetic losses
NT: Eddy current testing

EDFA

USE: Erbium-doped fiber amplifiers

Edge computing

UF:	Fog computing
BT:	Application virtualization
	Distributed processing
RT:	Cloud computing
	Computer applications
	Dew computing
	Mobile computing
	Wireless sensor networks
NT:	Multi-access edge

computing

Edge detection

USE: Image edge detection

EDTV

USE: HDTV

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



2022 IEEE Thesaurus

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
BT: Education
RT: Audio-visual systems
Visualization
NT: Computer aided instruction
Courseware
Electronic learning

EEG

USE: Electroencephalography

EEPROM

USE: EPROM

Effective mass

BT: Energy states

EFFF

USE: Field-flow fractionation

Effluents

BT: Waste materials
RT: Flue gases
Industrial waste
Waste disposal
Waste management
Water pollution

Ehealth

USE: Electronic healthcare

Eigenfunctions

USE: Eigenvalues and
eigenfunctions

Eigenfunctions and eigenvalues

USE: Eigenvalues and
eigenfunctions

Eigenplaces

USE: Eigenvalues and
eigenfunctions

Eigenvalues

USE: Eigenvalues and
eigenfunctions

Eigenvalues and eigenfunctions

UF: Eigenfunctions
Eigenfunctions and
eigenvalues

Eigenplaces
Eigenvalues
BT: Mathematics
RT: Asymptotic stability
Functional analysis
Linear algebra
Vectors

EKG

USE: Electrocardiography

Elastic computing

BT: Cloud computing
Resource management

Elastic recovery

BT: Materials testing



2022 IEEE Thesaurus

Elasticity		Dielectric breakdown Sparks
BT:	Material properties	
RT:	Strain	
Elastodynamics		<i>Electric characteristics</i>
BT:	Dynamics	USE: Electric variables
RT:	Seismic waves Vibrations	<i>Electric coils</i>
		USE: Coils
Elastography		<i>Electric condensers</i>
BT:	Biomedical imaging	USE: Capacitors
Elbow		<i>Electric conductivity</i>
BT:	Extremities	USE: Conductivity
<i>Elderly</i>		<i>Electric current</i>
USE:	Older adults	USE: Current
<i>Elearning</i>		Electric current control
USE:	Electronic learning	BT: Current control
		RT: Inrush current Power control Power transmission Voltage control
Electo-optic effects		NT: Power factor correction Shunts (electrical)
UF:	Electrooptic effects Electrooptical effects	
BT:	Lasers and electrooptics	
RT:	Electro-optic devices Electroluminescence Nonlinear optics	
NT:	Electrochromism Kerr effect Optical bistability Stark effect	<i>Electric current measurement</i>
		USE: Current measurement
		<i>Electric distortion measurement</i>
		USE: Distortion measurement
Electrets		Electric fences
BT:	Dielectric materials	BT: Electric machines
RT:	Capacitors Ceramics Dielectric devices	<i>Electric field</i>
		USE: Electric fields
<i>Electric admittance</i>		Electric fields
USE:	Admittance	UF: Electric field
<i>Electric ballast</i>		BT: Electromagnetic fields
USE:	Electronic ballasts	RT: Electrohydrodynamics Electrokinetics Electrostatic analysis Electrostatic discharge
Electric breakdown		protection
UF:	Breakdown	Electrostatic processes Inrush current Maxwell equations Synchrotrons
BT:	Dielectrics and electrical	NT: Acoustoelectric effects Casimir effect Nonuniform electric fields
insulation		
RT:	Aging Electrostatic discharge	
protection		
NT:	Fault currents Avalanche breakdown Corona	



2022 IEEE Thesaurus

Electric generators

BT: Generators
RT: Nanogenerators

Occupational health
Occupational safety
Safety

Electric heating

USE: Resistance heating

Electric stimulation therapy

USE: Electrical stimulation

Electric impedance

USE: Impedance

Electric utilities

USE: Electricity supply industry

AND

Power industry

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 variables

UF: Current voltage
characteristics
Electric characteristics
Electrical characteristics
Instrumentation and
BT: measurement
RT: Electric variables control
Electric variables

measurement

Frequency
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 motors

BT: Motors
NT: Planar motors

Electric potential

BT: Electric variables
RT: Electrostatic discharge

protection

Electric power

USE: Power electronics AND
Power systems

Electric resistance

UF: Electrical resistivity
BT: Resistance

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

Electric sensing devices

BT: Sensor systems and
applications

Electric shock

UF: Shock
BT: Bioelectric phenomena
RT: Accidents
Electrical accidents
Grounding



2022 IEEE Thesaurus

Reactive power control
Voltage control

Solar powered vehicles
Vehicle-to-grid

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

Electrical accidents

BT: Accidents
RT: Bioelectric phenomena
Electric shock
Electrical safety

Electrical appliances

USE: Electrical products

Electrical ballast

USE: Electronic ballasts

Electrical ballasts

BT: Current control
Lighting
RT: High intensity discharge

lamps

Inductors
Resistors

Electrical brain stimulation

USE: Electrical stimulation

Electrical capacitance tomography

BT: Tomography

Electrical characteristics

USE: Electric variables

Electrical conductivity

USE: Conductivity

Electrical double layer capacitors

USE: Supercapacitors

Electrical engineering

BT: Engineering - general
RT: Engineering profession
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



2022 IEEE Thesaurus

Electrical engineering industry

BT: Industries

Electrical brain stimulation
Microelectronic stimulation
Spinal cord stimulation
BT: Medical treatment

Electrical equipment industry

BT: Power industry
RT: Electrical products industry
Electricity supply industry
Electronics industry

Electrically alterable read only memory
USE: EPROM

Electrical fault detection

BT: Circuit faults
RT: Electrostatic discharge

Electrically erasable programmable read only memory
USE: EPROM

protection

Electrical impedance tomography

BT: Tomography

Electricity

BT: Science - general
NT: Photoelectricity
Piezoelectricity
Pyroelectricity
Thermoelectricity
Triboelectricity

Electrical insulation

USE: Dielectrics

Electrical products

UF: Electrical appliances
BT: Electrical products industry
Manufactured products
RT: Consumer products
NT: Washing machines

Electricity grids

USE: Power grids

Electricity market

USE: Electricity supply industry

Electricity markets

USE: Power markets

Electrical products industry

BT: Manufacturing industries
RT: Electrical equipment

industry

Electronics industry
NT: Electrical products

Electricity supply industry

UF: Electric utilities
Electricity market
Power supply industry
BT: Power industry
RT: Electrical equipment

industry

Electrical resistance measurement

UF: Ohmmeters
BT: Electric variables
measurement
RT: Resistance

Power demand
Power distribution
Power quality
Power system faults
Power system planning
Power system restoration
Public infrastructure
Electricity supply industry

Electrical resistivity

USE: Electric resistance

Electrical safety

BT: Power system protection
RT: Domestic safety
Electrical accidents
Islanding
Partial discharge

measurement

NT: Fault protection
Grounding

NT: deregulation

Electricity supply industry deregulation

UF: Electricity supply industry
liberalisation
Electricity supply industry
liberalization
Electricity supply industry
privatisation
Electricity supply industry
privatization

Electrical stimulation

UF: Electric stimulation therapy



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2022 IEEE Thesaurus

BT: Electricity supply industry
Power generation
economics
RT: Power system economics
NT: Power markets

Electricity supply industry liberalisation

USE: Electricity supply industry
deregulation

Electricity supply industry liberalization

USE: Electricity supply industry
deregulation

Electricity supply industry privatisation

USE: Electricity supply industry
deregulation

Electricity supply industry privatization

USE: Electricity supply industry
deregulation

Electricity trading

USE: Power markets

Electro hydraulics

USE: Electrohydraulics

Electro oculography

USE: Electrooculography

Electro-absorption modulators

UF: EAM
Electroabsorption

modulators

modulators Electroabsorptive

BT: Franz-Keldysh effect
Optical modulators
RT: Laser beams

Electro-chromic devices

USE: Electrochromic devices

Electro-fluid dynamics

USE: Electrohydrodynamics

Electro-oculography

USE: Electrooculography

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: Electro-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 devices

USE: Electro-optic devices

Electro-optical modulators

USE: Electro-optic modulators

Electro-optical waveguides

UF: EO waveguides
Electrooptic waveguides
Electrooptical waveguides
BT: Optical waveguides

Electro-osmosis

BT: Osmosis

Electroabsorption modulators

USE: Electro-absorption
modulators

Electroabsorptive modulators

USE: Electro-absorption
modulators

Electroacoustic devices

USE: Acoustoelectric devices



2022 IEEE Thesaurus

Electroacoustic effects

USE: Acoustoelectric effects

Electroactive polymer actuators

USE: Actuators

Electroactive polymers

USE: Polymers

Electrobiolology

USE: Bioelectric phenomena

Electrocardiography

UF: ECG

EKG

BT: Cardiography

RT: Biomedical equipment

Electrocatalysis

BT: Catalysis

Electrochemistry

RT: Electrocatalysts

Electrocatalysts

BT: Catalysts

RT: Electrocatalysis

Electrochemistry

Mesoporous materials

Electrochemical deposition

UF: Electroplating

BT: Surface treatment

RT: Materials processing

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: Electro-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



2022 IEEE Thesaurus

BT: Biomedical measurement
RT: Bioelectric phenomena
Biomedical equipment
Brain
Electrooculography
Medical diagnosis

Electrofluid dynamics

USE: Electrohydrodynamics

Electrohydraulics

UF: Electro hydraulics
BT: Hydraulic systems
RT: Fluid flow
Liquids
Magnetohydrodynamics

Electrohydrodynamics

UF: Electro-fluid dynamics
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: Electro-optic effects
Organic light emitting

diodes

NT: Electroluminescent devices

Electroluminescent devices

BT: Electroluminescence
Light sources
Luminescent devices
RT: Electro-optic devices

Electrolysis

USE: Electrochemical processes

Electrolytes

BT: Conducting materials
RT: Electrochemical processes
Supercapacitors

Electrolytic machining

USE: Electrochemical machining

Electromagnetic absorbers

BT: Electromagnetic wave
absorption

Electromagnetic analysis

BT: Electromagnetics
RT: Electrostatic analysis
Magnetic analysis
Mie scattering
NT: Air gaps
Characteristic mode

analysis

Computational

electromagnetics

Delay effects
Electromagnetic fields
Electromagnetic forces
Electromagnetic refraction
Permeability
Spark gaps
Time-domain analysis

Electromagnetic beams

USE: Beams

Electromagnetic compatibility

UF: EMC
BT: Electromagnetic
compatibility and interference
NT: Immunity testing
Reverberation chambers

Electromagnetic compatibility and interference

RT: Electromagnetic
interference
Open area test sites
TEM cells
NT: Electromagnetic
compatibility
Electromagnetics
Interference

Electromagnetic coupling

BT: Electromagnetics
RT: Circulators
Couplers
Electromagnetic induction
Electromagnetic shielding
NT: Mutual coupling
Optical coupling



2022 IEEE Thesaurus

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 guns

USE: Electromagnetic launching

Electromagnetic heating

UF: Microwave heating
BT: Heating systems
RT: Hyperthermia
Induction heating

Electromagnetic induction

UF: Induction (electromagnetic)
BT: Electromagnetics
RT: Electromagnetic coupling
Geomagnetism
Magnetic communication
NT: Eddy currents
Inductive power
transmission

Electromagnetic interference

UF: EMI
Electromagnetic noise
RF interference
Radio interference
BT: Interference
RT: Crosstalk
Electromagnetic
compatibility and interference
Environmental factors
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



2022 IEEE Thesaurus

measurements	Millimeter wave		Radiowave propagation
	Parameter extraction	propagation	Submillimeter wave
	Polarimetry		UHF propagation
	Radiometry		
measurements	Submillimeter wave	Electromagnetic propagation in absorbing media	
		BT: Electromagnetic	
Electromagnetic metamaterials		propagation	
BT: Electromagnetics			
Metamaterials			
RT: Optical metamaterials		<i>Electromagnetic propulsion</i>	
Photonics		USE: Electromagnetic launching	
Split ring resonators			
NT: Terahertz metamaterials		<i>Electromagnetic pulse</i>	
		USE: EMP radiation effects	
<i>Electromagnetic model</i>			
USE: Electromagnetic modeling		<i>Electromagnetic pulse propagation</i>	
		USE: Electromagnetic transients	
Electromagnetic modeling			
UF: Electromagnetic model		<i>Electromagnetic pulse scattering</i>	
Electromagnetic modelling		USE: Electromagnetic transients	
BT: Electromagnetic			
measurements		Electromagnetic radiation	
		BT: Electromagnetics	
		RT: Electromagnetic fields	
		Electromagnetic wave	
<i>Electromagnetic modelling</i>		polarization	
USE: Electromagnetic modeling			Radiofrequency exposure
			Radiofrequency safety
<i>Electromagnetic noise</i>			Waves
USE: Electromagnetic			X-ray detection
interference			X-ray detectors
			X-rays
Electromagnetic propagation		NT: Bremsstrahlung	
UF: Electromagnetic wave		Correlators	
propagation		Electromagnetic wave	
BT: Antennas and propagation			
Propagation		absorption	
RT: Electromagnetic fields			Frequency
Electromagnetic transients			Gamma-rays
Electromagnetic			Line-of-sight propagation
Terahertz radiation			Terahertz radiation
waveguides			
	Magnetostatic waves		
	Mie scattering		
	Waves		
NT: Electromagnetic diffraction		Electromagnetic radiative interference	
Electromagnetic		BT: Interference	
propagation in absorbing media			
Electromagnetic reflection		Electromagnetic reflection	
Microwave propagation		UF: Electromagnetic wave	
Millimeter wave		reflection	
		BT: Electromagnetic	
propagation		propagation	
	Optical propagation		Reflection
	Propagation constant	RT: Electromagnetic fields	
	Propagation losses	Electromagnetic scattering	
	Radio propagation	Reflectometry	
		NT: Optical reflection	



2022 IEEE Thesaurus

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
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 transient program

USE: EMTTP

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 transients DC

USE: EMTDC

Electromagnetic transients including DC

USE: EMTDC

Electromagnetic wave absorption

BT: Electromagnetic radiation
NT: Electromagnetic absorbers
Terahertz wave absorption

Electromagnetic wave attenuation

USE: Attenuation

Electromagnetic wave polarisation

USE: Electromagnetic wave
polarization

Electromagnetic wave polarization

UF: Electromagnetic wave
polarisation
BT: Electrodynamics
RT: Electromagnetic radiation
Photonic band gap

Electromagnetic wave propagation

USE: Electromagnetic
propagation

Electromagnetic wave reflection

USE: Electromagnetic reflection

Electromagnetic wave scattering

USE: Electromagnetic scattering

Electromagnetic waveguides

BT: Transmission lines
RT: Coaxial cables
Coplanar waveguides
Electromagnetic
propagation
Helical antennas
Microwave devices
Microwave propagation
Optical fibers
Propagation
Waveguide discontinuities
NT: Circular waveguides
Gap waveguide
Hollow waveguides
Loaded waveguides
Planar waveguides
Rectangular waveguides
Waveguide components
Waveguide lasers
Waveguide theory



2022 IEEE Thesaurus

Electromagnetic waves

USE: Electromagnetic scattering

Electromagnetics

BT: Electromagnetic compatibility and interference

RT: Cyberspace

Neuroradiology

NT: Electromagnetic analysis

Electromagnetic coupling

Electromagnetic devices

Electromagnetic induction

Electromagnetic

metamaterials

Electromagnetic radiation

Electromagnetic shielding

Electromagnetic transients

Proximity effects

Electromagnets

BT: Magnets

RT: Coils

Magnetic confinement

Magnetic levitation

Magnetic levitation vehicles

NT: Superconducting magnets

Electromechanical devices

BT: Electromechanical systems

NT: Armature

SAW filters

Electromechanical sensors

BT: Sensors

NT: Microsensors

Electromechanical systems

BT: Industry applications

NT: Cruise control

Electromechanical devices

Electromigration

BT: Diffusion processes

Electromyography

UF: EMG

BT: Biomedical measurement

RT: Bioelectric phenomena

Electron accelerators

BT: Particle accelerators

RT: Electron beams

Electron sources

Electrons

Electron beam applications

BT: Electron beams

RT: Flyback transformers

Scanning electron

microscopy

Electron beam pumping

USE: Laser excitation

Electron beams

BT: Particle beams

RT: Electrodynamics

Electron accelerators

Electron emission

Electron sources

Electrons

Flyback transformers

Free electron lasers

Gyrotrons

Relativistic effects

Transmission electron

microscopy

NT: Electron beam applications

Electron carriers

USE: Charge carrier processes

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



2022 IEEE Thesaurus

sciences BT: Nuclear and plasma

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

microscopy

Transmission electron

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 spin resonance

USE: Electron paramagnetic
resonance

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 banking

USE: Online banking

Electronic books

USE: Electronic publishing

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



2022 IEEE Thesaurus

Internet
Marketing management
Neuromarketing
Online banking
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 counter-countermeasures

USE: Electronic countermeasures

Electronic countermeasures

UF: ECCM
ECM
Electronic counter-
countermeasures
BT: Electronic warfare
RT: Jamming
Military communication
Radar countermeasures
Radio communication
countermeasures
communication
Spread spectrum
Spread spectrum radar
Weapons

Electronic currency

USE: Online banking

Electronic data interchange

USE: Data handling

Electronic design automation and methodology

UF: EDA
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 health records

USE: Electronic medical records

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



2022 IEEE Thesaurus

BT: Virtual learning
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
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 portfolios

USE: Portfolios

Electronic publications

USE: IEEE online publications

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 textiles

USE: Smart textiles

Electronic visual prosthesis

USE: Visual prosthesis

Electronic voting

UF: E-voting
Online voting
BT: Voting

Electronic voting systems

BT: Electronic equipment

Electronic wallets

USE: Online banking

Electronic warfare

BT: Aerospace and electronic
systems



2022 IEEE Thesaurus

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: Ball grid arrays
DIL
DIP
Dual inline packaging
PGA
Pin grid arrays
QFP
Quad flat packs
BT: Components, packaging,
and manufacturing technology
RT: Constraint optimization
Cooling
Plastic packaging

Printed circuits
NT: Chip scale packaging

Electrons

BT: Elementary particles
RT: Beta rays
Cosmic rays
Electron accelerators
Electron beams
Electron emission
Elementary particle

exchange interactions

Impact ionization
Phonons
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

Electrooptic devices

USE: Electro-optic deflectors
AND
Electro-optic devices

Electrooptic effects

USE: Electro-optic effects

Electrooptic modulators

USE: Electro-optic modulators

Electrooptic waveguides

USE: Electro-optical waveguides

Electrooptical devices

USE: Electro-optic deflectors
AND
Electro-optic devices

Electrooptical effects

USE: Electro-optic effects

Electrooptical modulators

USE: Electro-optic modulators



2022 IEEE Thesaurus

Electrooptical waveguides

USE: Electro-optical waveguides

Electropermeabilization

USE: Electroporation

Electrophotography

UF: Xerography
BT: Electrostatic processes
Photoconducting devices
RT: Gas discharge devices
Photography

Electrophotoluminescence

USE: Photoluminescence

Electrophysiology

BT: Biomedical measurement
RT: Biomedical electrodes
Electrodes
Voltage

Electroplating

USE: Electrochemical deposition

Electroporation

UF: Electropermeabilization
BT: Medical treatment
Microbiology

Electrostatic actuation

USE: Electrostatic actuators

Electrostatic actuators

UF: Electrostatic actuation
BT: Actuators
RT: Electrostatic devices

Electrostatic analysis

BT: Electrostatic processes
RT: Electric fields
Electromagnetic analysis
Electrostatic measurements

Electrostatic charges

USE: Electrostatic discharges

AND

Electrostatics

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



2022 IEEE Thesaurus

NT: Aerosols
Electrophotography
Electrostatic analysis
Electrostatic induction
Electrostatics
Particle charging
Particle production
Space charge
Surface charging
Triboelectricity

Electrostatic self assembly

USE: Electrostatic self-assembly

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

Electrostrictive hydrodynamics

USE: Electrohydrodynamics

Electrostrictive polymer actuators

USE: Actuators

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

Elementary school engineering

USE: Pre-college engineering

Elevators

BT: Building services
RT: Buildings
Stairs

Ellipsoids

BT: Elliptic design



2022 IEEE Thesaurus

Ellipsometry

BT: Optical variables
measurement
RT: Polarimetry

simulation

Hardware-in-the-loop

Microprocessors
Embedded computing

Elliptic curve cryptography

UF: ECC
Elliptic curve cryptosystems
BT: Public key cryptography

Embolization

BT: Medical treatment
Noninvasive treatment

Elliptic curve cryptosystems

USE: Elliptic curve cryptography

Embossing

BT: Manufacturing
Production
RT: Injection molding
Micromachining
Sheet metal processing
Watermarking

Elliptic curves

BT: Geometry

Elliptic design

UF: Elliptical design
BT: Geometry
NT: Ellipsoids

Embryo

BT: Embryonic structures

Elliptical design

USE: Elliptic design

Embryonic structures

BT: Anatomy
NT: Embryo
Fetus

Elongation

BT: Material properties
RT: Strain

EMC

USE: Electromagnetic
compatibility

Email

USE: Electronic mail

Emergency lighting

BT: Lighting
RT: High intensity discharge
lamps

eMBB

USE: Enhanced mobile
broadband

Emergency management

USE: Emergency services

Embedded computing

BT: Embedded systems

Emergency medical services

USE: Medical services

Embedded multicore processing

BT: Multicore processing

Emergency power generators

USE: Standby generators

Embedded power generation

USE: Distributed power
generation

Emergency power supplies

UF: Standby power supplies
BT: Power supplies
RT: Batteries
Standby generators
Uninterruptible power

Embedded software

BT: Software

systems

Embedded system

USE: Embedded systems

Emergency response

USE: Emergency services

Embedded systems

UF: Embedded system
BT: Operating systems
RT: Cyber-physical systems



2022 IEEE Thesaurus

Emergency services

UF: Emergency management
Emergency response
BT: Safety
RT: Accidents
Fires
Food security
Internet of Medical Things
Medical services
Rescue robots

Emergent phenomena

BT: Cybernetics
RT: System of systems

EMG

USE: Electromyography

EMI

USE: Electromagnetic interference

Emirates Mars Mission

USE: Interplanetary exploration

Emissions trading

UF: Cap and trade
Cap-and-trade
BT: Environmental economics
Pollution
RT: Carbon emissions
Market opportunities
Power markets

Emotion models

USE: Emotion recognition

Emotion recognition

UF: Emotion models
Emotion theory
Models of emotion
BT: User interfaces
RT: Affective computing
Anxiety disorders
Behavioral sciences
Emotional responses
Image recognition
Psychology
Sentiment analysis
Social robots
Speech recognition

Emotion theory

USE: Emotion recognition

Emotional responses

BT: Psychology
RT: Emotion recognition

EMP radiation effects

UF: Electromagnetic pulse
BT: Electromagnetic transients
RT: Electromagnetic shielding

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
Personnel
Programming profession
NT: Employee rights
Termination of employment

Employment law

BT: Law
RT: Contract law
Employment



2022 IEEE Thesaurus

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 refracting
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

End-effectors

USE: End effectors

Endocrine glands

USE: Glands

Endocrine system

BT: Anatomy

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

Endoscopy

USE: Endoscopes

Endothelial cells

BT: Biological cells
RT: Blood vessels

Energy

energy
BT: Power engineering and
RT: Thermal energy
NT: Energy barrier
Energy capture
Energy consumption



2022 IEEE Thesaurus

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

USE: Energy efficiency

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 levels

USE: Energy states

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



2022 IEEE Thesaurus

Energy measurement

BT: Electric variables
measurement
RT: Calorimetry
Enthalpy
Watt-hour meters
NT: Energy loss

Flywheels
Fuel cells
Hydrogen storage
Supercapacitors
Superconducting magnetic

energy storage

Energy storage systems

USE: Energy storage

Energy transfer

USE: Energy exchange

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-efficient computing

USE: Energy efficient computing

Engine cylinders

BT: Machine components
RT: Engines
Gaskets
Pistons
Structural rings

Energy scavenging

USE: Energy harvesting

Energy states

UF: Energy levels
Levels, energy
BT: Energy
NT: Band structures
Effective mass
Orbital calculations
Polaritons
Surface states

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

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

Engineering computing

BT: Computer applications

Engineering drawings

BT: Graphics
RT: Documentation
Technical drawing



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NT:	Flowcharts		Project engineering
			Research and development
Engineering education		management	
BT:	Education		Research initiatives
RT:	Continuing education		Software development
	Educational robots	management	
	Laboratories		
	Logic design	Engineering profession	
NT:	Biomedical engineering	UF:	Careers
education		BT:	Engineering - general
	Communication	RT:	Biographies
engineering education			Electrical engineering
	Computer science		Employment
education			Ethics
	Control engineering		Programming profession
education			Research and development
	Electrical engineering		Research and development
education		management	
	Engineering students	NT:	Professional aspects
	Physics education		
	Power engineering	Engineering students	
education		UF:	Student engineers
	Student experiments	BT:	Engineering education
	Systems engineering		
education		<i>Engineering writing</i>	
<i>Engineering geology</i>		USE:	Writing
USE:	Geoengineering		
Engineering in medicine and biology		Engines	
NT:	Biology	BT:	Industry applications
	Biomedical communication	RT:	Aircraft propulsion
	Biomedical computing		Automobile manufacture
	Biomedical engineering		Cams
	Biomedical equipment		Camshafts
	Biomedical imaging		Engine cylinders
	Bionanotechnology		Exhaust systems
	Bioterrorism		Fuel pumps
	Computational biology		Gaskets
	Genetic engineering		Machine components
	Medical services		Manifolds
	Medical specialties		Mechanical power
	Nuclear medicine	transmission	
	Synthetic biology		Oils
Engineering management			Pistons
NT:	Business		Propellers
	Commercialization		Propulsion
	Consortia		Rockets
	Economics		Torque converters
	Innovation management	NT:	Turbomachinery
	Legal factors		Heat engines
	Market research	engines	Internal combustion
	Planning		Jet engines
	Product development	Enhanced magnetoresistance	
		BT:	Magnetoresistance



2022 IEEE Thesaurus

RT:	Nanocontacts	Entrepreneurship	UF:	Entrepreneurial
Enhanced mobile broadband			BT:	Business
UF:	eMBB		RT:	Disruptive innovation
BT:	5G mobile communication			Innovation management
RT:	4G mobile communication	Entropy	BT:	Physics
<i>Entangled states</i>			RT:	Heating systems
USE:	Quantum entanglement			Nuclear thermodynamics
Enterprise architecture management		Entropy coding	BT:	Encoding
BT:	Information architecture		RT:	Data compression
	Information management		NT:	Huffman coding
RT:	Best practices	<i>Entry, descent and landing</i>		
	Enterprise resource	USE:		Aircraft navigation
planning		Envelope detectors	BT:	Detectors
Enterprise resource planning		<i>Environmental design</i>		
BT:	Management	USE:		Green design
RT:	Business	Environmental economics	BT:	Economics
	Data handling			Environmental factors
	Data processing		RT:	Energy resources
	Enterprise architecture			Environmental
management			management	
	Software			Pollution
	System integration		NT:	Carbon tax
	Venture capital			Emissions trading
NT:	Business process	Environmental engineering	BT:	Engineering - general
integration			RT:	Environmental factors
				Environmental
Entertainment industry		management		
BT:	Industries			
RT:	Broadcasting			
	Films			
	Games			
	Motion pictures			
	TV			
NT:	Sports			
Enthalpy		Environmental factors	UF:	Environmental problems
BT:	Thermodynamics		BT:	Geoscience and remote
RT:	Energy measurement			
	Thermal management			
Entomology		sensing		
BT:	Zoology			
RT:	Biochemistry			
	Biomechanics			
	Ecology	technology		
	Insects			
	Morphology	RT:		
	Physiology			
<i>Entrepreneurial</i>				
USE:	Entrepreneurship			



2022 IEEE Thesaurus

interference	Electromagnetic	<i>Environmental noise</i>	USE: Working environment noise
	Environmental engineering	<i>Environmental problems</i>	USE: Environmental factors
NT:	Epidemiology	Environmentally friendly manufacturing techniques	BT: Components, packaging, and manufacturing technology
	Food security	<i>Enzymatic fuel cells</i>	USE: Fuel cells
NT:	Green buildings	<i>Enzymes</i>	USE: Biochemistry
	Green computing	<i>EO waveguides</i>	USE: Electro-optical waveguides
NT:	Greenhouse effect	<i>EOG</i>	USE: Electrooculography
	Health and safety	<i>EOS</i>	USE: Earth Observing System
NT:	International collaboration	Epidemics	BT: Epidemiology
	Meteorology	RT: Coronaviruses	Diseases
NT:	Occupational health	NT: Pandemics	Influenza
	Ozonation	Epidemiology	BT: Science - general
NT:	Safety	RT: Biomedical monitoring	Environmental factors
	Biosphere	NT: Epidemics	Public healthcare
NT:	Climate change	<i>Epidermal</i>	USE: Epidermis
	Ecology	Epidermis	UF: Epidermal
NT:	Ecosystems	BT: Skin	Epigenetics
	Environmental economics	BT: Genetics	RT: DNA
NT:	Environmental engineering	Epilepsy	BT: Diseases
	Global warming		
NT:	International collaboration		
	Low-carbon economy		
NT:	Public infrastructure		
	Sanitary engineering		
NT:	Biodegradation		
	Land use planning		
NT:	Pest control		
	Pollution control		
NT:	Recycling		
	Renewable energy sources		
NT:	Sustainable development		
	Waste management		
NT:	Water conservation		
	Water resources		
NT:	Environmental management		
	BT: Industry applications		
NT:	RT: Dams		
	Environmental economics		
NT:	Environmental engineering		
	Global warming		
NT:	International collaboration		
	Low-carbon economy		
NT:	Public infrastructure		
	Sanitary engineering		
NT:	Biodegradation		
	Land use planning		
NT:	Pest control		
	Pollution control		
NT:	Recycling		
	Renewable energy sources		
NT:	Sustainable development		
	Waste management		
NT:	Water conservation		
	Water resources		
NT:	Environmental monitoring		
	BT: Environmental factors		
NT:	Monitoring		
	Decontamination		
NT:	Pollution control		
	Pollution measurement		



2022 IEEE Thesaurus

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

Epitaxy

USE: Epitaxial growth

EPON

UF: Ethernet passive optical
 networks
 BT: Ethernet
 RT: Passive optical networks

Epoxy resins

BT: Dielectric materials
 Plastics
 Resins

EPROM

UF: EAROM
 EEPROM
 Electrically alterable read
 only memory
 Electrically erasable
 programmable read only memory
 Erasable programmable
 read only memory
 BT: PROM

Epublishing

USE: Electronic publishing

Equal opportunities

BT: Human resource
 management
 RT: Industrial relations
 Labor resources
 Personnel
 Recruitment
 NT: Gender equity
 Gender issues

Equalisers

USE: Equalizers

Equalizers

UF: Equalisers
 BT: Filters
 RT: Channel estimation
 Impedance matching
 Intersymbol interference
 NT: Adaptive equalizers
 Blind equalizers
 Decision feedback

equalizers

Equations

BT: Mathematics
 NT: Boltzmann equation
 Difference equations
 Integrodifferential equations
 Maxwell equations
 Nonlinear equations
 Polynomials
 Riccati equations

Equipment failure

BT: Failure analysis

Equivalent circuits

BT: Circuits

Er

USE: Erbium

Er-doped fiber amplifier

USE: Erbium-doped fiber
 amplifiers

Er-doped fiber lasers

USE: Erbium-doped fiber lasers

Erasable programmable read only memory

USE: EPROM



2022 IEEE Thesaurus

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 laser

USE: Erbium-doped fiber lasers

Erbium-doped fiber lasers

UF: Er-doped fiber lasers
Erbium-doped fiber laser
Erbiumdoped fiber laser
BT: Fiber lasers

Erbiumdoped fiber laser

USE: Erbium-doped fiber lasers

Erection

USE: Construction

Ergonomics

UF: Human engineering
Human factors engineering
BT: Systems, man, and
cybernetics
RT: Anthropometry
Behavioral sciences
Cybernetics
Design methodology
Human factors
Keyboards
Man-machine systems
Occupational health
Working environment noise
NT: Job design
Smart spaces
User experience

Error analysis

UF: Error estimation
Error rate
Error rates
Error statistics
BT: Testing
RT: Cyclic redundancy check

codes

Cyclic redundancy check

Error correction
Estimation
Mean square error methods
Measurement errors
Numerical analysis
Roundoff errors
NT: Bit error rate
Finite wordlength effects

Error compensation

BT: Information theory
RT: Error correction

Error correcting codes

USE: Error correction codes

Error correction

BT: Signal processing
RT: Codes
Convolutional codes
Cyclic redundancy check
Cyclic redundancy check

codes

Error analysis
Error compensation
Error correction codes
Linear codes
Power system faults
Product codes
Turbo codes
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 estimation

USE: Error analysis

Error free operation

USE: Error-free operations

Error probability

BT: Probability



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<i>Error rate</i>	USE: Error analysis		Signal processing Spectral analysis
<i>Error rates</i>	USE: Error analysis	NT: Estimation error Estimation theory Functional point analysis Life estimation Maximum likelihood	
<i>Error recovery (computers)</i>	USE: System recovery	estimation	Pose estimation State estimation Yield estimation
<i>Error statistics</i>	USE: Error analysis		
<i>Error-correcting codes</i>	USE: Error correction codes	Estimation error	
<i>Error-correction codes</i>	USE: Error correction codes	BT: Estimation	
<i>Error-free operations</i>	UF: Error free operation BT: Testing	<i>Estimation of the direction of arrival</i>	
<i>Errorcorrection codes</i>	USE: Error correction codes	USE: Direction-of-arrival estimation	
<i>ESA</i>	USE: European Space Agency	Estimation theory	
Escalators	BT: Transportation RT: Buildings Mechanical products Stairs	BT: Estimation RT: Mean square error methods Signal processing Statistics NT: Cramer-Rao bounds Maximum a posteriori	
<i>ESD</i>	USE: Electrostatic discharges	estimation	
<i>ESD protection</i>	USE: Electrostatic discharge protection	<i>Etalons</i>	
Esophagus	BT: Digestive system	USE: Interferometers	
Estimation	UF: Signal estimation BT: Mathematics RT: Control systems Error analysis Filtering theory Kalman filters Measurement uncertainty Prediction methods Prediction theory Reduced order systems	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	
		<i>EtherEEE</i>	
		USE: Energy efficient ethernet	
		Ethernet	
		BT: Computer networks RT: IEEE 802.3 Standard Local area networks Virtual links	



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NT:	EPON	<i>Euclidean metric</i>	USE:	Euclidean distance
	Energy efficient ethernet			
	<i>Ethernet passive optical networks</i>			
USE:	EPON	Europe	BT:	Continents
Ethical aspects		European Space Agency	UF:	ESA
BT:	Social implications of		BT:	Organizations
technology			RT:	NASA
RT:	Digital divide	<i>European Telecommunications Standards Institute</i>	USE:	ETSI
	Ethics			
	Genetic engineering	Europium	BT:	Chemical elements
	Legal factors			
	Management	<i>EUV Lithography</i>	USE:	Extreme ultraviolet
	Philosophical	lithography		
considerations		<i>EV charging</i>	USE:	Electric vehicle charging
Ethics		Event detection	BT:	Wireless sensor networks
UF:	Morals			
BT:	Social implications of	<i>Everyware</i>	USE:	Pervasive computing
technology		Evidence theory	UF:	Belief functions
RT:	Digital intelligence		BT:	Dempster-Shafer theory
	Engineering profession		RT:	Uncertainty
	Ethical aspects			Belief propagation
	General Data Protection	<i>Evolution</i>	USE:	Evolution (biology)
Regulation		Evolution (biology)	UF:	Evolution
NT:	Neuromarketing		BT:	Biology
	Cyberethics		NT:	Memetics
	Machine ethics			Phylogeny
<i>Ethyl alcohol</i>		<i>Evolutionary algorithm</i>	USE:	Evolutionary computation
USE:	Ethanol			
ETSI		Evolutionary computation	UF:	Evolutionary algorithm
UF:	European		BT:	Computational intelligence
Telecommunications	Standards Institute		RT:	Metaheuristics
BT:	Standards organizations		NT:	Evolutionary robotics
				Particle swarm optimization
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			
<i>Euclidean measurement</i>				
USE:	Euclidean distance			



2022 IEEE Thesaurus

Evolutionary robotics

BT: Evolutionary computation
Robots

RT: Engines
Exhaust gases
Manifolds

Exascale computing

BT: High performance
computing
Supercomputers

Exo planets

USE: Extrasolar planets

Exo-planets

USE: Extrasolar planets

Excavation

UF: Dredging
BT: Geotechnical engineering
RT: Construction industry
Marine technology
Mining industry
Rivers
Roads
Soil

Exocrine glands

USE: Glands

Exoplanet

UF: Extrasolar planetary mass
BT: Extrasolar planets

Exoplanets

USE: Extrasolar planets

Exchange rates

BT: Economics
RT: Costs
Economic indicators
International trade

Exoskeletons

BT: User interfaces

Excitation of lasers

USE: Laser excitation

Expectation-maximisation algorithms

USE: Expectation-maximization
algorithms

Excitons

BT: Charge carrier processes
RT: Semiconductor materials

Expectation-maximization algorithms

UF: Expectation-maximisation
algorithms
BT: Iterative methods

Executive programs

USE: Operating systems

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

Exhaust gases

BT: Gases
RT: Air pollution
Ash
Combustion
Exhaust systems
Flue gases
Internal combustion

Explosion protection

BT: Protection
Safety
RT: Accident prevention
Flammability
Hazards
Military equipment

engines

Jet engines

Exhaust manifolds

USE: Manifolds

Exhaust systems

UF: Catalytic converters
Catalytic convertors
Mufflers
BT: Machine components
Production systems

Explosions

BT: Hazards
RT: Accidents
Chemical hazards
Flammability



2022 IEEE Thesaurus

	Hazardous areas		Extrapolation	
	Safety		BT:	Approximation methods
	Seismic waves		RT:	Statistics
NT:	Explosives			
Explosives			<i>Extrasolar planetary mass</i>	
BT:	Explosions		USE:	Exoplanet
Exponential distribution			Extrasolar planets	
BT:	Probability distribution		UF:	Exo planets
<i>Extended definition TV</i>				Exo-planets
USE:	HDTV			Exoplanets
Extended reality				Extra solar planets
UF:	HumanXR			Extra-solar planets
BT:	Human computer			Super earths
interaction			BT:	Astronomy
	Man-machine systems		RT:	Extraterrestrial
	Virtual reality		measurements	
RT:	Augmented reality			Extraterrestrial phenomena
<i>Extensible Markup Language</i>			NT:	Exoplanet
USE:	XML		Extraterrestrial measurements	
External stimuli			UF:	Planetary composition
UF:	PhysiStimuli			Space measurements
BT:	Interactive systems		BT:	Measurement
	Physiology		RT:	Astronomy
Extinction coefficients				Extrasolar planets
BT:	Optics			Extraterrestrial phenomena
NT:	Extinction ratio			Interstellar chemistry
Extinction ratio			Extraterrestrial phenomena	
BT:	Extinction coefficients		UF:	Space phenomena
<i>Extra solar planets</i>			BT:	Geophysics
USE:	Extrasolar planets		RT:	Extrasolar planets
<i>Extra-solar planets</i>				Extraterrestrial
USE:	Extrasolar planets		measurements	
Extracellular				Planets
BT:	Cells (biology)			Space technology
Extranets			NT:	Cosmic rays
BT:	Virtual private networks			Solar radiation
RT:	Data communication		Extreme learning machines	
	Information systems		BT:	Feedforward neural
	Internet		networks	
	Web sites		RT:	Clustering methods
Extraordinary magnetoresistance			Extreme ultraviolet lithography	
BT:	Magnetoresistance		UF:	EUV Lithography
			BT:	Lithography
			Extremities	
			BT:	Body regions
			NT:	Arms
				Buttocks
				Elbow
				Fingers



2022 IEEE Thesaurus

	Foot	<i>Fabrication process</i>	
	Hip	USE:	Fabrication
	Knee		
	Leg	Fabrics	
	Shoulder	UF:	Knitted fabric composites
	Thigh		Woven fabric composites
		BT:	Textiles
		RT:	Clothing
			Weaving
			Wool
Eye protection		Fabry-Perot	
UF:	Goggles	BT:	Interferometry
BT:	Safety devices	NT:	Fabry-Perot interferometers
RT:	Occupational health		
	Occupational safety		
	Protective clothing		
	Safety		
Eyebrows		Fabry-Perot interferometers	
BT:	Hair	BT:	Fabry-Perot
Eyelashes		Face detection	
BT:	Eyes	BT:	Computer vision
	Hair	RT:	Facial animation
		NT:	Facial features
Eyelids		Face recognition	
BT:	Eyes	UF:	Facial recognition
Eyes		BT:	Biometrics (access control)
BT:	Sense organs		Identification of persons
RT:	Electrooculography		Pattern recognition
	Gaze tracking	RT:	Gaze tracking
	Ophthalmology		Image recognition
	Optical coherence		
tomography		<i>Facebook</i>	
NT:	Cataracts	USE:	Social networking (online)
	Cornea		
	Eyelashes	Faces	
	Eyelids	BT:	Head
	Iris	RT:	Stomatognathic system
	Pupils	NT:	Facial muscles
	Retina		
FAA		Facial animation	
UF:	Federal Aviation	BT:	Animation
Administration		RT:	Face detection
BT:	US Government agencies	<i>Facial attributes</i>	
Fabrication		USE:	Facial features
UF:	Fabrication process	Facial features	
BT:	Manufacturing	UF:	Facial attributes
RT:	Etching	BT:	Face detection
	Materials processing		
NT:	Bonding processes	Facial muscles	
	Microfabrication	BT:	Faces
	Optical device fabrication		
	Soldering	<i>Facial recognition</i>	
	Welding	USE:	Face recognition



2022 IEEE Thesaurus

Facilities management

BT: Building services
Management
Organizational aspects
RT: Building information
management

Facsimile

BT: Communication systems
Image communication

Factories

USE: Production facilities

Factory automation

USE: Manufacturing automation

FACTS

USE: Flexible AC transmission
systems

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
Weibull distribution
NT: Equipment failure
Semiconductor device
breakdown

Failure analytics

USE: Failure analysis

Failure mechanisms

USE: Failure analysis

Fake content

USE: Fake news

Fake news

UF: Fake content
False information
Misinformation
BT: Media
RT: Information integrity
NT: Deepfakes

Fall detection

BT: Biomechanics
Domestic safety
Accelerometers
Alarm systems
Assisted living
Biomedical communication
Biomedical signal
processing

Body sensor networks
Detectors
Geriatrics
Home automation
Image motion analysis
Image recognition
Injuries
Patient monitoring
Video signal processing
Wearable computers

False information

USE: Fake news

Fans

BT: Machinery
Ventilation
RT: Air conditioning
Blades
Jet engines

Faraday effect

UF: Faraday rotation
BT: Magneto optic effects
RT: Gyromagnetism
Gyrotropism

Faraday rotation

USE: Faraday effect



2022 IEEE Thesaurus

Farming

UF: Farms
BT: Industries
RT: Agricultural engineering
Agricultural products
Agriculture
Food products

RT: Electric breakdown
Grounding
Leakage currents
NT: Fault protection

Farms

USE: Farming

Fascia

BT: Musculoskeletal system

Fast Fourier transforms

BT: Fourier transforms
RT: Digital signal processing
Harmonic analysis

Fast light

BT: Light sources

Fasteners

UF: Bolts
Hinges
Nuts (fasteners)
Screws
Zip fasteners
BT: Control equipment
Mechanical products
RT: Belts
Couplings
Joining processes
Welding

Fastening

USE: Joining processes

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

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



2022 IEEE Thesaurus

networks	RT:	Fault tolerant computer	<i>FDTD</i>	USE:	Finite difference methods
		Fault tolerant computing	AND		Time-domain analysis
Fault tolerant systems					
	BT:	System analysis and design	<i>FDX</i>		
networks	RT:	Fault tolerant computer		USE:	Full-duplex system
		Fault tolerant computing	<i>Fe</i>		
			USE:		Iron
Fault trees					
	BT:	Risk analysis	Feathers		
	RT:	Boolean functions		BT:	Animal structures
		Failure analysis	Feature detection		
		Fault location		BT:	Computer vision
<i>FBAR</i>					Image processing
resonators	USE:	Film bulk acoustic		RT:	Feature extraction
					Saliency detection
<i>FBARs</i>			Feature extraction		
resonators	USE:	Film bulk acoustic		BT:	Image processing
				RT:	Blob detection
<i>FBT</i>					Deep learning
	USE:	Flyback transformers			Feature detection
					Image annotation
FCC					Image edge detection
Commission	UF:	Federal Communications	analysis		Image recognition
	BT:	US Government agencies			Independent component
FDA					Mixture models
Administration	UF:	Food and Drug			Motion capture
	BT:	US Government agencies	analysis		Pattern classification
					Pattern recognition
FDDI					Principal component
interface	UF:	Fiber distributed data			Saliency detection
	BT:	Communication systems	<i>Feature learning</i>		Signal processing
		Optical fiber communication		USE:	Speech recognition
	RT:	Communication standards			
		Local area networks	<i>Federal Aviation Administration</i>		
<i>FDM</i>				USE:	FAA
multiplexing	USE:	Frequency division	<i>Federal Communications Commission</i>		
				USE:	FCC
<i>FDMA</i>			Federated identity		
multiaccess	USE:	Frequency division		UF:	FIM
				BT:	Identity management
			systems		
				RT:	Authentication
					Blockchains



2022 IEEE Thesaurus

	Token networks		Feedback loop	
	Tokenization		BT:	Feedback communications
			NT:	Negative feedback loops
<i>Federated learning</i>				
USE:	Collaborative work		<i>Feedforward neural nets</i>	
			USE:	Feedforward neural
<i>Federated search</i>			networks	
USE:	Metasearch			
			Feedforward neural networks	
<i>Federated searching</i>			UF:	Feedforward neural nets
USE:	Metasearch		BT:	Neural networks
			RT:	Artificial intelligence
				Pattern recognition
				Self-organizing feature
Feedback			maps	
UF:	Saturation detection			
BT:	Circuits			
	Control systems			
RT:	Control design		NT:	Support vector machines
	Positive train control			Extreme learning machines
	SIMO communication			Multilayer perceptrons
	Scrum (Software			
development)				
	System dynamics			
	Time invariant systems			
NT:	Feedback circuits			
	Negative feedback			
	Neurofeedback			
			Feedforward systems	
			BT:	Intelligent control
			RT:	Forward error correction
				Open loop systems
Feedback amplifiers			Feeds	
UF:	NFB		BT:	Antennas
	Negative feedback amplifier		NT:	Antenna feeds
BT:	Operational amplifiers			
			FeFETs	
			UF:	Ferroelectric FETs
			BT:	Field effect transistors
Feedback circuits			<i>Felines</i>	
UF:	Circuit feedback		USE:	Cats
BT:	Feedback			
RT:	Control theory		<i>FEM</i>	
	Distributed feedback		USE:	Finite element analysis
devices				
	Feedback communications			
NT:	Output feedback		Femtocell networks	
			UF:	Access point base station
			BT:	Cellular networks
			RT:	Base stations
Feedback communications			Femtocells	
BT:	Telecommunications		BT:	Base stations
RT:	Feedback circuits			
NT:	Automatic repeat request			
	Feedback control			
	Feedback loop			
Feedback control			Ferrimagnetic materials	
BT:	Feedback communications		BT:	Magnetic materials
NT:	Windup		NT:	Ferrite films
				Ferrites
				Garnet films
				Garnets
Feedback linearization			Ferrite devices	
BT:	Control nonlinearities		BT:	Magnetic devices
	Control systems			



2022 IEEE Thesaurus

RT:	Ferrites	RT:	Resonance
	Flyback transformers		Magnetic resonance
	Gyrators		Nonlinear magnetics
NT:	Circulators		
Ferrite films		<i>Fertilisers</i>	
BT:	Ferrimagnetic materials	USE:	Fertilizers
	Ferrites	Fertilizers	
	Films	UF:	Fertilisers
	Magnetic films	BT:	Agriculture
	Magnetic materials	RT:	Boron
			Crops
Ferrites		FET circuits	
BT:	Ferrimagnetic materials	BT:	Solid state circuits
	Magnetic materials	RT:	Nuclear electronics
RT:	Ferrite devices		Operational amplifiers
	Gyromagnetism	NT:	FET integrated circuits
NT:	Ferrite films		JFET circuits
			MESFET circuits
			MOSFET circuits
Ferroelectric devices		FET integrated circuits	
BT:	Dielectric devices	BT:	FET circuits
RT:	Ferroelectric materials		Integrated circuits
		RT:	Field effect transistors
<i>Ferroelectric FETs</i>		NT:	Field effect MMIC
USE:	FeFETs		MESFET integrated circuits
Ferroelectric films			
BT:	Ferroelectric materials	Fetal heart	
RT:	Magnetic field induced	BT:	Heart
strain		Fetal heart rate	
Ferroelectric materials		BT:	Heart rate
BT:	Ultrasonics, ferroelectrics,	<i>FETs</i>	
and frequency control		USE:	Field effect transistors
RT:	Dielectric materials	Fetus	
	Ferroelectric devices	BT:	Embryonic structures
	Magnetic field induced	<i>FFF</i>	
strain		USE:	Field-flow fractionation
NT:	Pyroelectricity	<i>Fiber Bragg gratings</i>	
	Ferroelectric films	USE:	Bragg gratings
	Relaxor ferroelectrics	<i>Fiber distributed data interface</i>	
Ferrofluid		USE:	FDDI
UF:	LiquiFerrofluid	Fiber gratings	
BT:	Fluids	UF:	Fibre gratings
	Magnetic materials	BT:	Bragg gratings
Ferromagnetic materials			
BT:	Magnetic materials		
Ferromagnetic resonance			
BT:	Magnetic resonance		
Ferroresonance			
BT:	Power engineering		



2022 IEEE Thesaurus

Fiber lasers

UF: Fibre lasers
BT: Ring lasers
NT: Erbium-doped fiber lasers
High power fiber lasers

Fiber nonlinear optics

BT: Fiber optics
Nonlinear optics

Fiber optic sensors

USE: Optical fiber sensors

Fiber optics

UF: Fibre optics
BT: Optics
NT: Fiber nonlinear optics
Optical fibers

Fiber reinforced plastics

UF: Fibre reinforced plastics
BT: Plastics
RT: Plastic insulators

Fiber-Bragg gratings

USE: Bragg gratings

Fiber-in-the-loop

USE: Optical fiber subscriber

loops

Fibers

USE: Textile fibers

Fibre gratings

USE: Fiber gratings

Fibre lasers

USE: Fiber lasers

Fibre optic sensors

USE: Optical fiber sensors

Fibre optics

USE: Fiber optics

Fibre reinforced plastics

USE: Fiber reinforced plastics

Fibrillation

BT: Medical treatment
RT: Defibrillation
NT: Atrial fibrillation

Fibroblasts

BT: Biological cells

Fiducial markers

UF: Imagimarkers
BT: Image processing
RT: Microfabrication
Semiconductor device

manufacture

Field assisted sintering

USE: Spark Plasma sintering

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
CNTFETs
Double-gate FETs
FeFETs
HEMTs
JFETs
MESFETs
MISFETs
MODFETs
MOSFET
MOSHFETs
OFETs
Schottky gate field effect

transistors

TFETs
Thin film transistors

Field electron emission

USE: Electron emission

Field emitter arrays

BT: Electron tubes
RT: Vacuum technology

Field flow fractionation

USE: Field-flow fractionation



2022 IEEE Thesaurus

Field ion emission

USE: Ion emission

Field multiplication

USE: Galois fields

Field programmable analog arrays

UF: FPAAs
Field programmable

analogue arrays

BT: Analog integrated circuits
Programmable circuits

RT: Application specific

integrated circuits

Field programmable gate

arrays

Space technology

Field programmable analogue arrays

USE: Field programmable analog

arrays

Field programmable gate arrays

UF: FPGAs
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

Field-programmable gate arrays

USE: Field programmable gate

arrays

Filament lamps

BT: Lamps
RT: Lighting

File servers

BT: Computers and information
processing

RT: Computer networks
Data communication
Local area networks

File sharing

USE: Peer-to-peer computing

File system permissions

USE: Permission

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: FBARs
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
Ferrite films
Garnet films
Magnetic films
Optical films
Piezoelectric films
Plastic films
Polymer films



2022 IEEE Thesaurus

	Semiconductor films		IIR filters
	Thick films		Kalman filters
	Thin films		Low-pass filters
<i>Films (Motion pictures)</i>			Matched filters
USE:	Motion pictures		Microstrip filters
Filter banks			Nonlinear filters
UF:	Filterbank		Notch filters
BT:	Band-pass filters		Particle filters
<i>Filter-theory</i>			Power filters
USE:	Filtering theory		Resonator filters
<i>Filterbank</i>			Spatial filters
USE:	Filter banks		Superconducting filters
Filtering		Filtration	Transversal filters
BT:	Circuits and systems	UF:	Nanofiltration
RT:	Noise cancellation	BT:	Materials science and
NT:	Filters	technology	
	Information filtering	NT:	Microfiltration
Filtering algorithms		<i>FIM</i>	
UF:	Loop-filtering algorithm	USE:	Federated identity
	Post-filtering algorithm	Finance	
BT:	Algorithms	UF:	Taxes
Filtering theory		BT:	Financial management
UF:	Filter-theory	RT:	Banking
BT:	Filters		Bitcoin
RT:	Estimation		Business
	Line enhancers		Cryptocurrency
	Matched filters		Economics
	Maximum likelihood		Open banking
detection		NT:	Bankruptcy
	Transversal filters		Currencies
NT:	Collaborative filtering	<i>Finance sector</i>	
	Image filtering	USE:	Financial industry
Filters		Financial industry	
BT:	Filtering	UF:	Finance sector
	Signal processing	BT:	Industries
RT:	Passive filters	NT:	Banking
	Signal to noise ratio		Financial services
NT:	Active filters	Financial management	
	Anisotropic	UF:	Financial planning
	Bragg gratings		Money management
	Channel bank filters	BT:	Management
	Comb filters	RT:	Electronic commerce
	Digital filters		Profitability
	Equalizers		Public finance
	Filtering theory	NT:	Costing
	Gabor filters		Credit cards
	Harmonic filters		Finance
			Insurance



2022 IEEE Thesaurus

	Investment		<i>Fingerprinting</i>	
	Loans and mortgages		USE:	Fingerprint recognition
	Management accounting			
	Mutual funds		Fingers	
	Pricing		BT:	Extremities
	Venture capital		NT:	Thumb
<i>Financial planning</i>			Finishing	
USE:	Financial management		BT:	Surface treatment
Financial services			RT:	Machining
BT:	Financial industry			Materials processing
				Planing
FinFETs			NT:	Surface finishing
BT:	MOSFET			
<i>Fingerprint identification</i>			Finite difference methods	
USE:	Fingerprint recognition		UF:	FDTD
				Finite difference time
<i>Fingerprint images</i>			domain analysis	Finite difference time
USE:	Image matching		domain methods	Finite-difference methods
				Finite-difference time-
<i>Fingerprint indexing</i>			domain methods	
USE:	Fingerprint recognition		BT:	Mathematics
				Numerical analysis
<i>Fingerprint matching</i>			RT:	Computational
USE:	Fingerprint recognition		electromagnetics	Perfectly matched layers
<i>Fingerprint modality</i>			<i>Finite difference time domain analysis</i>	
USE:	Fingerprint recognition		USE:	Finite difference methods
Fingerprint recognition			<i>Finite difference time domain methods</i>	
UF:	Fingerprint identification		USE:	Finite difference methods
	Fingerprint indexing			
	Fingerprint matching		Finite element analysis	
	Fingerprint modality		UF:	Discrete element method
	Fingerprint sensing			FEM
	Fingerprint sensors			Finite element methods
	Fingerprint verification			Finite element modeling
	Fingerprinting			Finite element modelling
BT:	Biometrics (access control)			Finite-element analysis
	Identification of persons			Finite-element methods
	Pattern recognition			Finite-element modeling
RT:	Image matching			Finite-element modelling
			BT:	Mathematics
<i>Fingerprint sensing</i>				Numerical analysis
USE:	Fingerprint recognition		RT:	Eddy current testing
				Perfectly matched layers
<i>Fingerprint sensors</i>				
USE:	Fingerprint recognition		<i>Finite element methods</i>	
			USE:	Finite element analysis
<i>Fingerprint verification</i>				
USE:	Fingerprint recognition		<i>Finite element modeling</i>	
			USE:	Finite element analysis



2022 IEEE Thesaurus

Finite element modelling

USE: Finite element analysis

Finite fields

USE: Galois fields

Finite impulse response filters

UF: FIR
FIR filters
BT: Digital filters
RT: Discrete wavelet transforms
Frequency response

Finite state machines

USE: Automata

Finite volume methods

UF: Finite-volume method
BT: Numerical analysis
RT: Navier-Stokes equations

Finite wordlength effects

UF: Overflow oscillations
Truncation errors
BT: Error analysis
RT: Quantization (signal)
NT: Roundoff errors

Finite-difference methods

USE: Finite difference methods

Finite-difference time-domain methods

USE: Finite difference methods

Finite-element analysis

USE: Finite element analysis

Finite-element methods

USE: Finite element analysis

Finite-element modeling

USE: Finite element analysis

Finite-element modelling

USE: Finite element analysis

Finite-volume method

USE: Finite volume methods

Finline

BT: Planar transmission lines

FIR

USE: Finite impulse response

filters

FIR filters

USE: Finite impulse response filters

Fire extinguishers

BT: Safety devices
RT: Fire safety

Fire retardants

USE: Flame retardants

Fire safety

BT: Safety
RT: Fire extinguishers

Fireproofing

USE: Flame retardants

Fires

UF: Flames
Wild fires
Wildfires
BT: Hazards
RT: Accidents
Emergency services
Flammability
Hazardous areas
Safety
Smoke detectors

Firewalls (computing)

BT: Computer security
RT: Computer networks
Hardware
Software

FireWire

USE: Firewire

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



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2022 IEEE Thesaurus

RT:	Ceramics Heat treatment Kilns	<i>Flames</i>	USE:	Fires	
<i>Firmware</i>	USE:	Microprogramming	Flammability	UF: Inflammability BT: Hazards RT: Explosion protection Explosions Fires Flame retardants Hazardous materials	
Fish	BT:	Organisms	Flanges	BT: Mechanical products RT: Rails Structural plates Wheels	
<i>Fishbone diagrams</i>	USE:	Cause effect analysis	Flash memories	UF: NAND flash BT: Memory RT: Automation Computer peripherals Solid state drives Flash memory cells	
<i>Fisheries</i>	USE:	Aquaculture	Flash memory cells	BT: Flash memories NT: Split gate flash memory cells	
Fission reactors	UF: Nuclear fission Nuclear reactors (fission) BT: Nuclear power generation RT: Pressure vessels Radiation protection		Flashover	BT: Dielectric breakdown	
<i>Fitbit</i>	USE:	Wearable Health Monitoring	Flat panel displays	UF: Plasma display panel BT: Displays RT: Consumer electronics TV	
Systems			<i>Flex</i>	USE:	Flexible printed circuits
Fitting	BT: Assembly RT: Assembly systems		<i>Flexible ac transmission systems</i>	USE:	Flexible AC transmission systems
<i>Fixed point arithmetic</i>	USE:	Fixed-point arithmetic	Flexible AC transmission systems	UF: FACTS Flexible ac transmission systems BT: Power transmission	
Fixed-point arithmetic	UF: Fixed point arithmetic BT: Arithmetic		Flexible electronics	BT: Assembly systems	
Fixtures	UF: Fixturing Jigs BT: Production equipment RT: Machine tools				
<i>Fixturing</i>	USE:	Fixtures			
Flame retardants	UF: Fire retardants Fireproofing BT: Retardants RT: Bromine compounds Flammability Materials preparation				



2022 IEEE Thesaurus

RT:	Graphene devices Soft electronics	Flip-flops	BT: Pulse circuits RT: Logic circuits
<i>Flexible fuel vehicles</i>		<i>FLL</i>	USE: Frequency locked loops
USE:	Land vehicles		
Flexible manufacturing systems		<i>Floating point arithmetic</i>	USE: Floating-point arithmetic
BT:	Manufacturing automation		
RT:	Agile manufacturing Cellular manufacturing Computer applications	Floating-point arithmetic	UF: Floating point arithmetic BT: Arithmetic
Flexible printed circuits		Floods	BT: Hazards Hydrology RT: Land use planning Rain Rivers Structural engineering
UF:	Flex		
BT:	Printed circuits	Floors	BT: Building materials RT: Construction industry Tiles
Flexible structures		Floppy disks	BT: Magnetic memory
UF:	Deployable structures	<i>Flotation devices</i>	USE: Underwater equipment
BT:	Buildings Structural shapes	<i>Flow</i>	USE: Fluid flow
RT:	Control systems Decentralized control Mechanical variables	<i>Flow batteries</i>	USE: Batteries
control	Structural engineering	Flow graphs	UF: Data flow graphs Signal flow graphs BT: Programmable control RT: Circuits
<i>Flight control</i>		<i>Flow meters</i>	USE: Flowmeters
USE:	Aerospace control	Flow production systems	UF: Sequential production BT: Manufacturing systems RT: System dynamics NT: Continuous production
<i>Flight simulation</i>			
USE:	Aerospace simulation		
<i>Flip chip</i>			
USE:	Flip-chip devices		
Flip chip solder joints			
UF:	Castellations		
BT:	Soldering		
RT:	Flip-chip devices		
<i>Flip-chip</i>			
USE:	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		



2022 IEEE Thesaurus

Flowcharts

BT: Engineering drawings
RT: Programming
System analysis and design

Pipelines
Supersonic flow
Valves

Flowmeters

UF: Flow meters
BT: Meters
RT: Automatic meter reading
Fluid flow
Velocity measurement

Fluid flow control

BT: Control systems
RT: Valves

Fluid flow measurement

UF: Anemometers
BT: Measurement
RT: Fluid flow
Hydrologic measurements
Pressure gauges

Fluctuations

BT: Reliability

Flue ash

USE: Fly ash

Fluidic microsystems

BT: Micromechanical devices
RT: Microfluidics

Flue gases

BT: Gases
RT: Air pollution
Effluents
Exhaust gases

Fluidics

BT: Control systems
RT: Fluid flow
Nanotechnology
Pneumatic systems
NT: Microfluidics
Nanofluidics

Fluid dynamics

BT: Fluid flow
Fluids
RT: Hydrodynamics
Lattice Boltzmann methods
NT: Buoyancy
Computational fluid

Fluidisation

USE: Fluidization

dynamics

Drag
Navier-Stokes equations
Rheology

Fluidization

UF: Fluidisation
BT: Chemical technology
RT: Fluids

Fluid flow

UF: Flow
Gas flow
Liquid flow
Smoothed particle

Fluids

BT: Materials
RT: Buoyancy
Fluidization
Oils
NT: Ferrofluid
Fluid dynamics
Gases
Hydraulic fluids
Liquids
Viscosity

hydrodynamics

BT: Physics
RT: Electrohydraulics
Flowmeters
Fluid flow measurement
Fluidics
Hydraulic systems
Hydrodynamics
Magnetohydrodynamics
NT: Fluid dynamics
Hydraulic diameter
Hydrology

Fluids and secretions

BT: Anatomy
NT: Amniotic fluid
Cerebrospinal fluid

Fluorescence

BT: Luminescence
Optics



2022 IEEE Thesaurus

RT:	Fluorescent lamps Judd-Ofelt theory	<i>fnirs</i>	USE:	Functional near-infrared spectroscopy
Fluorescent lamps		Focusing		
BT:	Lamps	BT:		Imaging
RT:	Fluorescence Lighting	RT:		Lenses
Fluorine		<i>Fog computing</i>		
BT:	Chemical elements	USE:		Edge computing
NT:	Fluorine compounds	<i>Food and Drug Administration</i>		
Fluorine compounds		USE:		FDA
BT:	Fluorine	Food industry		
NT:	Hydrogen fluoride	BT:		Manufacturing industries
Flux pinning		RT:		Beverage industry Consumer products Food preservation Food products Food technology Smart agriculture Sugar industry Sugar refining Food manufacturing
BT:	Magnetic flux Superconductivity			
RT:	Type II superconductors	NT:		
<i>Fluxtronics</i>		<i>Food loss</i>		
USE:	Spintronics	USE:		Food waste
Fly ash		Food manufacturing		
UF:	Coal ash Flue ash Fly-ash	BT:		Food industry Manufacturing systems
BT:	Ash	RT:		Consumer products Food preservation Food products Food technology Food waste
RT:	Slag	NT:		Food packaging
<i>Fly-ash</i>		Food packaging		
USE:	Fly ash	BT:		Food manufacturing Packaging
Flyback transformers		RT:		Food products Food technology Food waste
UF:	FBT LOPT Line output transformer	Food preservation		
BT:	Transformers	UF:		Food preservatives
RT:	Cathode ray tubes Electron beam applications Electron beams Ferrite devices	BT:		Food technology
Flywheels		RT:		Food industry Food manufacturing Food products
BT:	Energy storage	<i>Food preservatives</i>		
<i>FM</i>		USE:		Food preservation
USE:	Frequency modulation			
<i>fMRI</i>				
USE:	Functional magnetic resonance imaging			



2022 IEEE Thesaurus

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

Football

USE: Sports

Footprinting

USE: Network reconnaissance

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



2022 IEEE Thesaurus

NT:	Olfactory bulb	<i>Formal logic</i>	
		USE:	Logic
Forecast uncertainty		Formal specifications	
BT:	Forecasting	BT:	Standardization
	Uncertainty	RT:	Service-oriented systems engineering
Forecasting		Formal verification	
BT:	Probability	BT:	Software engineering
RT:	Prediction methods	RT:	Circuits and systems
NT:	Demand forecasting		Model checking
	Economic forecasting		
	Forecast uncertainty		
	Technology forecasting		
Forehead		Formation control	
BT:	Head	BT:	Motion control
		RT:	Multi-agent systems
			Robot control
<i>Forensic photography</i>		Forward contracts	
USE:	Image forensics	BT:	Contracts
Forensics		Forward error correction	
BT:	Law	BT:	Error correction
NT:	Digital forensics	RT:	Feedforward systems
	Image forensics		
Forestry		Fossil fuels	
BT:	Geoscience	BT:	Fuels
RT:	Pulp and paper industry	RT:	Air pollution
	Resource management	NT:	Natural gas
	Vegetation		
	Vegetation mapping	Foundries	
	Wood industry	BT:	Production facilities
Forgery		RT:	Casting
UF:	Imposter signature		Furnaces
generation			Heat treatment
BT:	Handwriting recognition		Materials processing
Forging		<i>Four wave mixing</i>	
UF:	Cogging	USE:	Four-wave mixing
BT:	Manufacturing systems	Four-wave mixing	
Formal concept analysis		UF:	Four wave mixing
BT:	Mathematical analysis	BT:	Distortion
RT:	Classification tree analysis		Optics
	Data analysis	RT:	Multiwave mixing
	Knowledge representation		
	Unsupervised learning	Fourier series	
Formal languages		BT:	Mathematics
BT:	Computer science	RT:	Data compression
NT:	Computer languages		Signal processing
	Runtime library		Spectroscopy
		<i>Fourier transform infrared spectra</i>	
		USE:	Fourier transform infrared spectroscopy



2022 IEEE Thesaurus

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: Industry 4.0
BT: Automation
Digital transformation
Manufacturing
RT: Internet of Things
Machine-to-machine
communications
Smart devices
Smart manufacturing

FPAA

USE: Field programmable analog arrays

FPGA

USE: Field programmable gate arrays

Fracking

USE: Fracking

Fracking

UF: Fracking
Hydraulic fracturing
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 brownian motion

USE: Brownian motion

Fractional calculus

BT: Mathematical analysis

Fractionation

BT: Separation processes
RT: Chemical analysis
Oils
Petroleum industry
Field-flow fractionation
NT:

Frame relay

BT: Communication switching
Packet switching
RT: B-ISDN
Computer networks
ISDN
Protocols
Wide area networks

Franchises

USE: Franchising

Franchising

UF: Franchises
BT: Business

Franz-Keldysh effect

USE: Electro-absorption modulators

Free electron lasers

UF: Cerenkov lasers
BT: Lasers
RT: Electron beams
Relativistic effects
Undulators

Free trade

USE: Trade agreements



2022 IEEE Thesaurus

Free-space optical communication

BT: Optical fiber communication
RT: NOMA

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 allocation

USE: Radio spectrum
management

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 dependent

USE: Frequency dependence

Frequency diversity

BT: Frequency

Frequency division

USE: Frequency conversion

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 domain

USE: Frequency-domain analysis

Frequency domain analysis

USE: Frequency-domain analysis

Frequency estimation

BT: Frequency measurement
Parameter estimation
RT: Spectral analysis
Speech analysis

Frequency hop communication

USE: Spread spectrum

communication

Frequency hop radar

USE: Spread spectrum radar



2022 IEEE Thesaurus

Frequency locked loops

UF: FLL
BT: Linear feedback control systems
RT: Signal processing
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 multiplexing

USE: Frequency division
multiplexing

Frequency multiplication

USE: Frequency conversion

Frequency regulation

USE: Frequency control

Frequency response

BT: Testing
RT: Amplifiers
Digital filters
Finite impulse response
filters
Frequency measurement
Impulse testing

Frequency selective surfaces

BT: Antenna theory

Frequency shift keying

UF: FSK
Frequency-shift modulation
Frequency-shift signaling
BT: Frequency modulation

Frequency synchronization

BT: Frequency
NT: Frequency synthesizers

Frequency synthesizers

BT: Frequency synchronization
RT: Frequency locked loops
Tuners

Frequency-domain analysis

UF: Frequency domain
Frequency domain analysis
BT: Frequency measurement
RT: Circuit analysis
Functional analysis
Signal analysis
NT: Time-frequency analysis

Frequency-hop communication

USE: Spread spectrum
communication

Frequency-selective fading channels

BT: Fading channels

Frequency-shift modulation

USE: Frequency shift keying

Frequency-shift signaling

USE: Frequency shift keying

Fresnel integral

USE: Fresnel reflection

Fresnel lenses

USE: Fresnel reflection

Fresnel reflection

UF: Fresnel integral
Fresnel lenses
Fresnel zones
BT: Reflection

Fresnel zones

USE: Fresnel reflection



2022 IEEE Thesaurus

Friction

BT: Mechanical factors
RT: Drag
Dynamics
Lubrication
NT: Mechanical bearings

Friction stir processing

USE: Strain control

Frittage

USE: Sintering

Frontal lobe

UF: BrainLobe
BT: Brain

Froth flotation

USE: Manufacturing processes

FSK

USE: Frequency shift keying

FTTH

loops

USE: Optical fiber subscriber

Fuel additives

USE: Additives

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

Fuel tanks

USE: Fuel storage

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 duplex system

USE: Full-duplex system

Full-duplex system

UF: FDX
Full duplex system
BT: Duplex communication

systems



2022 IEEE Thesaurus

Fullerenes

UF: Buckeyballs
Buckminsterfullerene
Buckyballs
Buckytubes
CarboFullerene
Fullerites
BT: Carbon

Fullerites

USE: Fullerenes

Function approximation

BT: Approximation methods
RT: Computer science

Function generators

USE: Signal generators

Functional analysis

BT: Mathematics
RT: Eigenvalues and

eigenfunctions

Frequency-domain analysis
Inverse problems
Lyapunov methods
Wave functions

Functional electrical stimulation

USE: Neuromuscular stimulation

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: Organisms

Furnaces

BT: Machinery
RT: Building services
Foundries
Gas appliances
Heating systems
NT: Blast furnaces
Kilns

Further education

USE: Continuing education

Fuses

BT: Electronic components
RT: Interrupters
Power system protection
Protection
Switchgear

Fusion power generation

BT: Nuclear and plasma
sciences
RT: Nuclear power generation
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

Fusion splicing

USE: Splicing

Futurism

USE: Technology forecasting

Fuzz testing

USE: Fuzzing



2022 IEEE Thesaurus

Fuzzing

UF: Fuzz testing
BT: Software testing

Fuzzy sets
Fuzzy systems
Power system faults
TOPSIS

Fuzzy cognitive maps

BT: Directed graphs
Knowledge representation
RT: Cognitive systems
Decision making
Fuzzy logic
Fuzzy reasoning
Fuzzy set theory
Fuzzy systems
Inference mechanisms
Learning (artificial

intelligence)

Neural networks

Fuzzy control

BT: Fuzzy systems
RT: Fuzzy logic
Fuzzy sets
Takagi-Sugeno model

Fuzzy inference

USE: Fuzzy logic

Fuzzy logic

UF: Fuzzy inference
BT: Logic
RT: Fuzzy cognitive maps
Fuzzy control
Fuzzy reasoning
Fuzzy sets
Fuzzy systems
Possibility theory
NT: Takagi-Sugeno model

Fuzzy neural nets

USE: Fuzzy neural networks

Fuzzy neural networks

UF: Fuzzy neural nets
Neuro fuzzy networks
Neuro-fuzzy networks
BT: Fuzzy systems

Fuzzy reasoning

BT: Inference mechanisms
RT: Fuzzy cognitive maps
Fuzzy logic

Fuzzy set theory

BT: Set theory
RT: Fuzzy cognitive maps

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

Ga

USE: Gallium

GaAs

USE: Gallium arsenide

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



2022 IEEE Thesaurus

RT:	Electric variables		Gallium nitride
			Indium gallium arsenide
measurement	Refractive index		Indium gallium nitride
<i>Gait assessment</i>		<i>Gallium devices</i>	
USE:	Legged locomotion	USE:	Gallium compounds
<i>Gait control</i>		<i>Gallium materials</i>	
USE:	Legged locomotion	USE:	Gallium compounds
<i>Gait disorders</i>		Gallium nitride	
USE:	Legged locomotion	BT:	Gallium compounds
Gait recognition		<i>Gallium-arsenide</i>	
BT:	Biometrics (access control)	USE:	Gallium arsenide
RT:	Motion capture	<i>Gallium-arsenide (GaAs)</i>	
<i>Galerkin method</i>		USE:	Gallium arsenide
USE:	Method of moments	Galois fields	
Gallbladder		UF:	Field multiplication
BT:	Digestive system		Finite fields
		BT:	Abstract algebra
Gallium		<i>Galvanising</i>	
UF:	Ga	USE:	Galvanizing
BT:	Metals		
	Semiconductor materials	Galvanizing	
RT:	Epitaxial growth	UF:	Galvanising
	Gallium compounds	BT:	Surface treatment
	Molecular beam epitaxial	RT:	Corrosion
growth			Corrosion inhibitors
	Semiconductor thin films		Protection
NT:	Gallium alloys	Game theory	
Gallium alloys		BT:	Decision making
BT:	Gallium	RT:	Control systems
RT:	Alloying		Games
	Wide band gap		Minimax techniques
semiconductors			Oligopoly
Gallium arsenide			Optimal control
UF:	GaAs		Predator prey systems
	Gallium-arsenide	NT:	Differential games
	Gallium-arsenide (GaAs)		Nash equilibrium
BT:	Gallium compounds	Games	
	Semiconductor materials	UF:	Video games
Gallium compounds			video-game
UF:	Gallium devices	BT:	Consumer products
	Gallium materials	RT:	Entertainment industry
BT:	Compounds		Game theory
RT:	Alloying		Metaverse
	Gallium		Sports
NT:	Aluminum gallium nitride	NT:	Cloud gaming
	Gallium arsenide		Serious games



2022 IEEE Thesaurus

Gaming on demand

USE: Cloud gaming

Gamma distribution

BT: Statistics

RT: Probability

Gamma phase iron

USE: Austenite

Gamma radiation detectors

USE: Gamma-ray detectors

Gamma ray bursters

USE: Gamma-ray bursts

Gamma ray bursts

USE: Gamma-ray bursts

Gamma ray detection

USE: Gamma-ray detection

Gamma ray detectors

USE: Gamma-ray detectors

Gamma ray effects

USE: Gamma-ray effects

Gamma ray telescopes

USE: Gamma-ray telescopes

Gamma rays

USE: Gamma-rays

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 imaging

USE: Nuclear imaging

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

GAN

USE: Generative adversarial

networks

Ganglia

UF: Ganglion

BT: Cells (biology)

Nervous system

Ganglion

USE: Ganglia

Gap waveguide

BT: Electromagnetic

waveguides

RT: Waveguide components

Garbage collection (computers)

USE: Memory management

Garment industry

USE: Clothing industry

Garments

USE: Clothing

Garnet films

BT: Ferrimagnetic materials

Films

Garnets

Magnetic films



2022 IEEE Thesaurus

	Magnetic materials		RT:	Gas insulated transmission lines
Garnets				Gases
BT:	Ferrimagnetic materials		NT:	Sulfur hexafluoride
	Magnetic materials			
NT:	Garnet films	Gas lasers		
Gas appliances		UF:	Atomic lasers	
BT:	Home appliances		Metal vapor lasers	
RT:	Furnaces	BT:	Lasers	
	Space heating	RT:	Atom lasers	
			Chemical lasers	
			Gases	
Gas chromatography				
BT:	Measurement	<i>Gas platforms</i>		
Gas detectors		USE:	Offshore installations	
UF:	Gas sensors	<i>Gas sensors</i>		
BT:	Chemical and biological	USE:	Gas detectors	
sensors				
RT:	Chemical transducers	<i>Gas-insulated lines</i>		
NT:	Amperometric sensors	USE:	Gas insulated transmission lines	
Gas discharge devices				
BT:	Nuclear and plasma	<i>Gas-insulated transmission lines</i>		
sciences		USE:	Gas insulated transmission lines	
RT:	Discharges (electric)			
	Electrophotography			
	Gases	Gases		
	Lighting	BT:	Fluids	
	Plasma devices	RT:	Discharges (electric)	
	Thyratrons		Gas discharge devices	
<i>Gas discharges</i>			Gas insulation	
USE:	Discharges (electric)		Gas lasers	
<i>Gas flow</i>			Materials science and technology	
USE:	Fluid flow			
Gas industry				
BT:	Industries			
RT:	Petroleum industry			
<i>Gas insulated switchgear</i>				
USE:	Gas insulation			
Gas insulated transmission lines				
UF:	GITL			
	Gas-insulated lines			
	Gas-insulated transmission			
BT:	Power transmission lines	Gaskets		
RT:	Gas insulation	BT:	Seals	
Gas insulation		RT:	Engine cylinders	
UF:	Gas insulated switchgear		Engines	
BT:	Insulation		Pistons	



2022 IEEE Thesaurus

Gasoline

USE: Petroleum

NT: TV interference
AWGN

Gastroenterologists

USE: Gastroenterology

Gastroenterology

UF: Gastroenterologists

BT: Medical specialties

Gastrointestinal

USE: Gastrointestinal tract

Gastrointestinal tract

UF: Gastrointestinal

BT: Digestive system

Gate drivers

BT: Power electronics

RT: High power amplifiers
MOSFET

Gate leakage

BT: Leakage currents
Solid state circuits
Tunneling

Gate leakage current

USE: Leakage currents

GATT

USE: Trade agreements

Gaussian approximation

BT: Gaussian distribution

Gaussian channels

BT: Communication channels

RT: Intersymbol interference

NT: AWGN channels

Gaussian distribution

UF: Normal distribution

BT: Statistical distributions

NT: Gaussian approximation

Gaussian mixture model

BT: Gaussian processes
Statistics

Gaussian noise

BT: Noise

RT: Additive white noise
Image denoising
Signal processing

Gaussian processes

BT: Stochastic processes

RT: Inference mechanisms

Learning (artificial
intelligence)
NT: Prediction methods
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

GDP

USE: Economic indicators

GDPR

USE: General Data Protection
Regulation

Ge Si

USE: Germanium silicon alloys

Gears

UF: Bevel gears
Differential gears
Helical gears
Spur gears
Worm gears
BT: Machinery
Mechanical products
Automotive components
Machine components
Machine tools
Mechanical power

transmission

Mechanical splines
Mechanical systems
Production equipment
Shafts
Torque converters
NT: Magnetic gears



2022 IEEE Thesaurus

Gender equality

USE: Gender issues

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 agreement on tariffs and trade

USE: Trade agreements

General Data Protection Regulation

UF: GDPR

BT: Data protection

Government policies

Legislation

RT: Data handling

Ethics

Privacy

Generation of electric power

USE: Power generation

Generation Y

USE: Millennials

Generative adversarial networks

UF: GAN

BT: Algorithm design and

analysis

RT: Artificial intelligence

Convolutional neural

networks

Machine learning

Neural networks

Unsupervised learning

Generators

UF: Dynamo

BT: Electric machines

Rotating machines

RT: Coils

Islanding

Power generation

NT:

AC generators

DC generators

Electric generators

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

Genetically modified crops

USE: Genetic engineering

Genetics

BT: Biology

RT: Amniocentesis

Genetic engineering

Memetics



2022 IEEE Thesaurus

NT:	Molecular biophysics	sensing	BT:	Geoscience and remote	
	DNA				
	Epigenetics			Global communication	
	Gene therapy			Intelligent transportation	
	Genetic communication		systems		
	Genetic expression			RT:	Image databases
	Genetic programming			NT:	Geospatial analysis
	Genomics				Gunshot detection systems
Optogenetics					
Genomes		Geographical information systems			
USE:	Genomics	systems	USE:	Geographic information	
Genomics					
UF:	Genomes	Geography	BT:	Geoscience	
BT:	Genetics		RT:	Geospatial analysis	
	Molecular biomarkers		NT:	Rural areas	
				Urban areas	
Geo tagging					
USE:	Location awareness	Geologic measurements			
Geoacoustic inversion		BT:	Measurement		
BT:	Sea measurements	RT:	Geology		
Geochemistry			Geophysical measurements		
UF:	Hydrochemistry		Hyperspectral sensors		
BT:	Chemistry		Remote sensing		
	Geoscience		Terrain mapping		
RT:	Geophysics		Theodolites		
	Salinity (geophysical)	Geological engineering			
Geodesy		USE:	Geoengineering		
BT:	Geophysical measurements	Geology			
RT:	Position measurement	BT:	Geoscience		
	Theodolites	RT:	Geoengineering		
NT:	Level measurement		Geologic measurements		
Geodynamics			Geophysics		
BT:	Geophysics	NT:	Landslides		
Geoengineering			Minerals		
UF:	Engineering geology		Rocks		
	Geological engineering	Geomagnetic disturbances			
BT:	Geoscience	USE:	Geomagnetic storms		
RT:	Drilling	Geomagnetic navigation			
	Geology	USE:	Geomagnetism AND		
	Geophysics		Navigation		
	Hydrological techniques	Geomagnetic storms			
	Mining industry	UF:	Geomagnetic disturbances		
Geographic information systems		BT:	Geomagnetism		
UF:	GIS		Storms		
	Geographical information	Geomagnetism			
systems		UF:	Geomagnetic navigation		
			Geomatics		



2022 IEEE Thesaurus

BT:	Magnetic fields		Buried object detection
RT:	Electromagnetic induction		Geologic measurements
	Geophysical measurements		Geomagnetism
	Geophysics		Geophysical signal
	Magnetosphere	processing	
NT:	Geomagnetic storms		Geophysics
<i>Geomatics</i>			Gravity measurement
USE:	Geomagnetism		Pressure gauges
			Remote sensing
			Soil measurements
			Terrain mapping
Geometric modeling			
BT:	Computational geometry	NT:	Geodesy
	Mathematical models		Sea measurements
			Seismic measurements
Geometrical optics			
BT:	Optics	Geophysical signal processing	
RT:	Reflectivity	BT:	Geoscience and remote
NT:	Ray tracing	sensing	
			Signal processing
Geometry		RT:	Geophysical measurements
BT:	Mathematics		
RT:	Layout	<i>Geophysical techniques</i>	
	Shape	USE:	Geophysical measurements
NT:	Computational geometry		
	Elliptic curves	Geophysics	
	Elliptic design	BT:	Geoscience
	Information geometry		Physics
	Projective geometry	RT:	Earth
	Surface topography		Geochemistry
			Geoengineering
Geophysical image processing			Geology
BT:	Geophysical measurement		Geomagnetism
techniques			Geophysical measurements
	Image processing		Hydrologic measurements
			Hydrological techniques
Geophysical measurement techniques			Oceans
BT:	Geoscience and remote		Terrestrial atmosphere
sensing		NT:	EMTDC
	Laser radar		Extraterrestrial phenomena
	Magneto electrical		Geodynamics
resistivity imaging technique			Geophysics computing
	Remote sensing		Meteorology
	Theodolites		Moisture
	Tomography		Seismology
	Vegetation mapping		Surface waves
NT:	Geophysical image		Well logging
processing			
Geophysical measurements		Geophysics computing	
UF:	Geophysical techniques	BT:	Geophysics
BT:	Geoscience and remote	RT:	Computer aided analysis
sensing			
	Measurement	Geoscience	
RT:	Atmospheric	UF:	Earth science
measurements		BT:	Geoscience and remote
		sensing	



2022 IEEE Thesaurus

RT: Science - general
 NT: Hydrological techniques
 Antarctica
 Arctic
 Atmosphere
 Biosphere
 Continents
 Cyclones
 Earth
 Earthquakes
 Forestry
 Geochemistry
 Geoengineering
 Geography
 Geology
 Geophysics
 Ice
 Lakes
 Land surface
 Levee
 Meteorological factors
 Oceanography
 Oceans
 Rivers
 Sediments
 Soil
 Tornadoes
 Tsunami
 Volcanoes
 Wetlands

Geoscience and remote sensing

NT: Environmental factors
 Geographic information
 systems
 Geophysical measurement
 techniques
 Geophysical measurements
 Geophysical signal
 processing
 Geoscience
 Land surface temperature
 Photometry
 Radar
 Radiometry
 Remote sensing
 Terrain mapping
 Terrestrial atmosphere
 Vegetation mapping

Geospatial analysis

BT: Geographic information
 systems
 RT: Geography
 Software

GEOSS

USE: Global Earth Observation
 System of Systems

Geostationary communication satellites

USE: Geostationary satellites

Geostationary satellites

UF: Geostationary
 communication satellites
 Geosynchronous
 communication satellites
 Geosynchronous satellites
 BT: Satellites
 RT: Orbits

Geosynchronous communication satellites

USE: Geostationary satellites

Geosynchronous satellites

USE: Geostationary satellites

Geotechnical engineering

BT: Civil engineering
 NT: Excavation

Geotechnical structures

BT: Civil engineering
 NT: Dams

Geothermal energy

BT: Energy resources
 RT: Geothermal power
 generation

Geothermal power generation

BT: Power generation
 RT: Geothermal energy

Geriatrics

BT: Medical treatment
 RT: Assisted living
 Assistive robots
 Fall detection
 Gerontology
 Older adults

Germ warfare

USE: Biohazards

Germanium

BT: Metals
 Semiconductor materials
 RT: Epitaxial growth
 Semiconductor thin films



2022 IEEE Thesaurus

NT:	Silicon germanium Germanium alloys	<i>Girders</i>	USE:	Structural beams
Germanium alloys		<i>GIS</i>	USE:	Geographic information systems
BT:	Germanium	<i>Github</i>	USE:	Software development management
RT:	Alloying	<i>GITL</i>	USE:	Gas insulated transmission lines
NT:	Germanium silicon alloys	Glands	UF:	Endocrine glands Exocrine glands
Germanium silicon alloys			BT:	Biological tissues
UF:	Ge Si		NT:	Mammary glands Pituitary gland Salivary glands Sebaceous glands Sweat glands Thyroid
BT:	Germanium alloys Silicon alloys	Glass	BT:	Amorphous materials Glass products
<i>Germs</i>			RT:	Ceramics Dielectric materials Glass industry Insulation Optical materials
USE:	Pathogens	<i>Glass bottles</i>	USE:	Glass products
Gerontechnology		<i>Glass ceramics</i>	USE:	Ceramics
BT:	Biomedical equipment Gerontology	<i>Glass furnaces</i>	USE:	Glass manufacturing
RT:	Assistive technologies	Glass industry	BT:	Manufacturing industries
Gerontology			RT:	Glass Glass manufacturing Glass products
BT:	Medical specialties	Glass manufacturing	UF:	Glass furnaces
RT:	Aging Alzheimer's disease Geriatrics Older adults		BT:	Manufacturing systems
NT:	Gerontechnology		RT:	Glass industry
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			
<i>Getters</i>				
USE:	Gettering			
<i>GHZ transverse electromagnetic cells</i>				
USE:	TEM cells			
Giant magnetoresistance				
BT:	Magnetoresistance			
RT:	Hard disks Magnetoresistive devices Thin film devices			



2022 IEEE Thesaurus

Glass products

UF: Glass bottles
BT: Manufactured products
RT: Bottling
Ceramic products
Ceramics
Chemical products
Glass industry
Windows
NT: Glass

Glazes

BT: Coatings
RT: Ceramics

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 groups

USE: Global communication

Global markets

USE: Globalization

Global navigation satellite system

UF: GNSS
BT: Satellite navigation systems
RT: Global Positioning System

Global Navigational Positioning System

USE: 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 System for Mobile Communications

USE: GSM

Global teams

USE: Global communication

Global warming

BT: Climate change
Environmental factors
Temperature measurement
Terrestrial atmosphere
RT: Air pollution
Atmospheric

measurements

Carbon emissions
Carbon sequestration
Energy informatics
Environmental

management

Greenhouse effect
Land surface temperature
Low-carbon economy
Ocean temperature
Thermal pollution

Globalisation

USE: Globalization

Globalization

UF: Global markets
Globalisation
BT: Social implications of

technology

RT: Developing countries
International collaboration
International relations
International trade
Trade agreements

Glossaries

USE: Terminology



2022 IEEE Thesaurus

Glow discharges

BT: Dielectric breakdown

Glucose

BT: Sugar

Glucose sensors

BT: Sensors

Glycomics

BT: Molecular biomarkers

GNP

USE: Economic indicators

GNSS

USE: Global navigation satellite system

Goggles

USE: Eye protection

Gold

UF: Au
BT: Metals
NT: Gold alloys

Gold alloys

BT: Gold
RT: Alloying

Goniometers

BT: Meters

Google

USE: Internet AND Search engines

Google Chrome

USE: Browsers

Government

BT: Organizations
RT: Governmental factors
Leadership
Macroeconomics
Public finance
NT: Electronic government
Government policies
Legislation
Local government
US Government
Voting

Government borrowing

USE: Public finance

Government expenditure

USE: Public finance

Government policies

BT: Data governance
Government
RT: Censorship
Developing countries
Food waste
Open data
Public infrastructure
General Data Protection
NT: Regulation

Regulation

Must-carry regulations
Public policy
Regulation

Governmental factors

BT: Management
RT: Government
Legal factors
Social factors
NT: Public finance

GPR

USE: Ground penetrating radar

GPS

USE: Global Positioning System

GPU

USE: Graphics processing units

Gradient methods

BT: Mathematics
Numerical analysis
Optimization methods
RT: Level set
Search methods

Grain alcohol

USE: Ethanol

Grain boundaries

BT: Crystals
RT: Conductivity
Corrosion
Grain size
Thermal conductivity



2022 IEEE Thesaurus

Grain size

BT: Crystals
RT: Grain boundaries

Flexible electronics
Molecular electronics
Nanoelectronics

Grammar

BT: Professional
communication
RT: Writing
Syntactics

Graphic user interfaces

USE: Graphical user interfaces

Graphical models

BT: Modeling

Granular computing

BT: Programming
RT: Concurrent computing
Information processing
Quantization (signal)

Graphical user interfaces

UF: GUI
Graphic user interfaces
BT: Product development
User interfaces
NT: Avatars

Granular superconductors

BT: Superconducting materials
RT: High-temperature
superconductors

Graphics

BT: Design methodology
RT: Art
Displays
Technical drawing
NT: Animation
Character generation
Computer graphics
Engineering drawings
Layout
Shape
Symbols
Virtual reality
Visualization

Graph drawing

BT: Data visualization
RT: Computational complexity
Graph theory
Knowledge representation
Mathematics computing
Social sciences

Graph neural networks

BT: Neural networks

Graph theory

BT: Combinatorial mathematics
Mathematics
RT: Ant colony optimization
Belief propagation
Circuit topology
Graph drawing
Topology
NT: Bipartite graph
Directed acyclic graph
Directed graphs
Optimal matching
Reachability analysis
Shortest path problem
Tree graphs

Graphics processing units

UF: GPU
VPU
BT: Program processors
RT: AI accelerators
Computer graphics
Hardware acceleration

Graphene

BT: Carbon
NT: Graphene devices

Graphite

UF: Plumbago
BT: Carbon
RT: Lead

Graphene devices

BT: Graphene
RT: Field effect transistors

Grasping

BT: Haptic interfaces

Gratings

UF: Optical gratings
Transient gratings
BT: Periodic structures
RT: Optical devices



2022 IEEE Thesaurus

<i>Gravimeter</i>		RT:	Environmental factors Sustainable development
USE:	Gravity measurement		
<i>Gravitational force</i>		Green design	
USE:	Gravity	UF:	Environmental design Sustainable design
Gravitational waves		BT:	Design methodology
BT:	Astronomy Gravity	RT:	Energy informatics Green buildings
<i>Gravitometer</i>		NT:	Ecodesign Green computing
USE:	Gravity measurement		
Gravity		<i>Green function</i>	
UF:	Gravitational force	USE:	Green's function methods
BT:	Force		
RT:	Force measurement	Green manufacturing	
NT:	Gravitational waves	BT:	Environmental factors Manufacturing
Gravity measurement		Green products	
UF:	Gravimeter Gravitometer	BT:	Environmental factors Biohazards
BT:	Force measurement	RT:	Pollution
RT:	Astrophysics Geophysical measurements	NT:	Green buildings Green cleaning
<i>Gray codes</i>		Green transportation	
USE:	Reflective binary codes	BT:	Environmental factors Transportation
<i>Gray matter</i>		<i>Green's function</i>	
USE:	Grey matter	USE:	Green's function methods
Gray-scale		Green's function methods	
UF:	Grayscale	UF:	Green function Green's function Green's functions
BT:	Image processing	BT:	Modeling
<i>Grayscale</i>		RT:	Failure analysis Materials reliability
USE:	Gray-scale	<i>Green's functions</i>	
Greedy algorithms		USE:	Green's function methods
BT:	Computation theory		
Green buildings		Greenhouse effect	
BT:	Construction Green products	UF:	Greenhouse gas
RT:	Environmental factors Green design	BT:	Infrared heating
Green cleaning		RT:	Carbon emissions Carbon footprint Carbon sequestration Environmental factors Global warming Low-carbon economy Pollution control
BT:	Green products		
Green computing			
BT:	Computer applications Energy conservation Green design		



2022 IEEE Thesaurus

Greenhouse gas

USE: Greenhouse effect

Greenhouses

BT: Agriculture
Production facilities
RT: Crops

Grey codes

USE: Reflective binary codes

Grey matter

UF: Gray matter
BT: Central nervous system

Grid computing

UF: Grid maze
BT: Metacomputing
RT: Cloud computing

Grid maze

USE: Grid computing

Grinding machines

BT: Machine tools

Grippers

UF: Microgrippers
Worms
BT: Materials handling
equipment
RT: End effectors
Loading

Gross domestic product

USE: Economic indicators

Gross national product

USE: Economic indicators

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 source heat pumps

USE: Heat pumps

Ground state

USE: Stationary state

Ground support

UF: Aerospace ground
equipment
Aerospace ground services
BT: Aerospace control
RT: Aircraft
Military equipment
Missiles
Navigation
Rockets
Space vehicles

Ground temperature

USE: Land surface temperature

Ground transportation

USE: Land transportation

Ground vehicles

USE: Land vehicles

Ground-penetrating radar

USE: Ground penetrating radar

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

Groupware

USE: Collaborative software

GSM

UF: Global System for Mobile
Communications
BT: Cellular technology
Wireless communication
RT: Dual band
Roaming
NT: GSM-R



2022 IEEE Thesaurus

GSM-R

UF: GSM-Railway
BT: GSM
RT: Railway communication

GSM-Railway

USE: GSM-R

GTEM cells

USE: TEM cells

GUI

USE: Graphical user interfaces

Guided electromagnetic wave propagation

USE: Waveguide theory

Guidelines

BT: Standardization
RT: IEEE publishing
ISO
Publishing

Guideways (mechanical)

USE: Mechanical guides

Gunn devices

UF: Transferred electron
devices
BT: Semiconductor devices

Guns

BT: Weapons

Gunshot detection systems

BT: Geographic information
systems
Sensor systems

Gynaecology

USE: Gynecology

Gynecology

UF: Gynaecology
BT: Medical specialties

Gyrators

BT: Active circuits
RT: Active inductors
Ferrite devices

Gyroklystrons

USE: Klystrons

Gyromagnetism

BT: Magnetism
RT: Faraday effect
Ferrites
Gyrotropism

Gyros

USE: Gyroscopes

Gyroscopes

UF: Gyros
Non-gyroscopes
Nongyroscopes
BT: Level control
RT: Laser applications
Ring lasers

Gyrotrons

BT: Masers
RT: Electron beams

Gyrotropism

BT: Magneto optic 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

H-infinity control

USE: H infinity control

H2O

USE: Water

Hacker

USE: Computer hacking

Hacking

USE: Computer crime

Hacks

USE: Computer hacking

Haemorrhaging

USE: Hemorrhaging

Hafnium

UF: Hf
BT: Chemical elements



2022 IEEE Thesaurus

	Metals		<i>HAMR</i>	
RT:	Nuclear physics	USE:	Heat-assisted magnetic	
NT:	Hafnium compounds		recording	
Hafnium compounds			<i>Hand held computers</i>	
BT:	Hafnium	USE:	Personal digital devices	
RT:	Alloying			
NT:	Hafnium oxide			
Hafnium oxide			Hand tools	
BT:	Hafnium compounds	BT:	Tools	
		RT:	Machine tools	
Hair			<i>Handheld computers</i>	
BT:	Integumentary system	USE:	Personal digital devices	
NT:	Eyebrows			
	Eyelashes		<i>Handicapped aids</i>	
	Hair follicle	USE:	Assistive technologies	
Hair follicle			Handover	
BT:	Hair	BT:	Communication switching	
			Data transfer	
		RT:	Cellular networks	
			Communication system	
<i>Half duplex system</i>			signaling	
USE:	Half-duplex system		Satellite communication	
Half-duplex system			<i>Handsets</i>	
UF:	HDX	USE:	Telephone sets	
	Half duplex system			
	Semi-duplex systems		Handwriting recognition	
BT:	Duplex communication	UF:	Signature detection	
systems			Signature verification	
			Written character	
<i>Half-wave plates</i>			recognition	
USE:	Optical retarders		Written characters	
			Written-character	
Hall effect			recognition	
UF:	Hall mobility	BT:	Identification of persons	
BT:	Magnetoelectric effects		Pattern recognition	
RT:	Hall effect devices	RT:	Biometrics (access control)	
		NT:	Forgery	
Hall effect devices			Haptic interfaces	
BT:	Semiconductor devices	UF:	Haptic systems	
RT:	Hall effect		Haptics	
		BT:	Computer interfaces	
<i>Hall mobility</i>		RT:	Braille	
USE:	Hall effect		Modeling	
			Touch sensitive screens	
Ham radios		NT:	Data gloves	
BT:	Radio communication		Force feedback	
equipment			Grasping	
			Tactile Internet	
Hamming distance			<i>Haptic systems</i>	
BT:	Information theory	USE:	Haptic interfaces	
Hamming weight				
BT:	Information theory			



2022 IEEE Thesaurus

Haptics

USE: Haptic interfaces

Hard amorphous carbon

USE: Diamond-like carbon

Hard disc drives

USE: Hard disks

Hard discs

USE: Hard disks

Hard disk drives

USE: Hard disks

Hard disks

UF: Hard disc drives
Hard discs
Hard disk drives
Hard-disc drives
Hard-disk drives
BT: Magnetic memory
RT: Giant magnetoresistance

Hard-disc drives

USE: Hard disks

Hard-disk drives

USE: Hard disks

Hardsuit

USE: Wearable robots

Hardware

UF: Computer hardware
BT: Computers and information processing
RT: Firewalls (computing)
Ports (computers)
NT: Hardware acceleration
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 accelerators

USE: Hardware acceleration

Hardware description languages

USE: Hardware design languages

Hardware design languages

UF: HDL
HDVL
Hardware description languages
IEEE 1364
BT: Computer languages
RT: Design automation
NT: VHDL

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

Harmonic generation

USE: Frequency conversion

Harmonics

USE: Harmonic analysis



2022 IEEE Thesaurus

Harmonics suppression

BT: Harmonic distortion

Harmonised index of consumer prices

USE: Economic indicators

Harmonized index of consumer prices

USE: Economic indicators

Hash functions

BT: Algorithms

RT: Cryptography

Encoding

NT: Cryptographic hash

function

Hashtag

USE: Tagging

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

Hazmat

USE: Hazardous materials

HbbTV Standards

BT: ETSI Standards

RT: Digital TV

TV

HBT

USE: Heterojunction bipolar transistors

HCCI engines

USE: Internal combustion engines

HCI

USE: Human computer interaction

HD

USE: High definition video

HD video

USE: High definition video

HDL

USE: Hardware design languages

HDTV

UF: ATV

Advanced TV

EDTV

Extended definition TV

High definition television

High-definition TV

IDTV

Improved definition TV

BT: Digital TV

NT: UHDTV

HDVL

USE: Hardware design languages



2022 IEEE Thesaurus

HDX

USE: Half-duplex system

Head

BT: Body regions
RT: Auditory system
Brain
Visual systems
NT: Cranium
Ear
Faces
Forehead
Lips
Mouth
Nose
Scalp
Skull

Head sets

USE: Headphones

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

Head-worn displays

USE: Head-mounted displays

Headphones

UF: Earphones
Head sets
Headsets
BT: Audio systems

Heads up displays

USE: Head-up displays

Headsets

USE: Headphones

Health (occupational)

USE: Occupational health

Health and safety

BT: Safety
RT: Environmental factors

NT: Occupational health
Occupational safety
Personal protective

equipment

Health care

USE: Medical services

Health informatics

USE: Bioinformatics

Health information management

BT: Medical services

Health physics

USE: Radiation monitoring

Healthcare

USE: Medical services

Hearing

USE: Auditory system

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 arrest

USE: Cardiac arrest

Heart attack

USE: Cardiac arrest

Heart beat

UF: Heartbeat
BT: Heart rate

Heart rate

UF: HR
BT: Heart
NT: Fetal heart rate
Heart beat
Heart rate detection
Heart rate interval



2022 IEEE Thesaurus

Heart rate measurement	RT:	Boilers
Heart rate variability		Thermal engineering
Heart rate detection		Heat sinks
BT: Heart rate	UF:	Heatsinks
	BT:	Cooling
Heart rate interval		Heat transfer
BT: Heart rate	BT:	Thermal conductivity
	RT:	Heat pipes
Heart rate measurement	NT:	Convection
BT: Heart rate		Heat treatment
RT: Phonocardiography	BT:	Materials processing
	RT:	Curing
Heart rate variability		Firing
UF: HRV		Foundries
BT: Heart rate		Kilns
		Smelting
Heart valves		Thermal factors
UF: Aortic semilunar valves	NT:	Annealing
Atrioventricular valves		Calcination
Bicuspid valves		
Mitral valves		
Pulmonary semilunar		
valves		Heat-assisted magnetic recording
	UF:	HAMR
	BT:	Magnetic recording
BT: Heart		Heating systems
	BT:	Temperature control
Heart ventricles	RT:	Entropy
BT: Heart		Furnaces
		HVAC
<i>Heartbeat</i>		High-temperature
USE: Heart beat		techniques
		Laser applications
Heat engines		Rapid thermal processing
BT: Engines		Thermal engineering
NT: Steam engines	NT:	Boilers
Stirling engines		Cogeneration
		Electromagnetic heating
<i>Heat islands</i>		Heat pipes
USE: Thermal pollution		Heat recovery
		Induction heating
Heat pipes		Infrared heating
BT: Heating systems		Resistance heating
RT: Cooling		Solar heating
Heat transfer		Space heating
		Thermal energy
Heat pumps		Trigeneration
UF: Ground source heat pumps		Water heating
BT: Pumps		
RT: Refrigerants		
		<i>Heating, ventilation, and air conditioning</i>
Heat recovery	USE:	HVAC
UF: Industrial heat recovery		
BT: Heating systems		



2022 IEEE Thesaurus

<i>Heatsinks</i>		BT:	Medical conditions
USE:	Heat sinks	RT:	Blood flow
<i>Hebb's methods</i>		HEMTs	
USE:	Hebbian theory	UF:	Heterostructure FETs
<i>Hebb's rule</i>			High electron mobility
USE:	Hebbian theory	transistors	High electron-mobility
<i>Hebbian learning</i>		transistors	High-electron mobility
USE:	Hebbian theory	transistors	High-electron-mobility
<i>Hebbian principle</i>		transistors	
USE:	Hebbian theory	BT:	Field effect transistors
Hebbian theory		RT:	MODFETs
UF:	Hebb's methods	NT:	D-HEMTs
	Hebb's rule		DH-HEMTs
	Hebbian learning		PHEMTs
	Hebbian principle		mHEMTs
BT:	Artificial neural networks	Hepatectomy	
		BT:	Medical treatment
Helical antennas			Surgery
BT:	Antennas	Hermetic seals	
RT:	Electromagnetic	BT:	Seals
waveguides		Hetero-nanocrystal memory	
	Telecommunications	BT:	Single electron memory
	Transmission lines	Heterogeneous networks	
	VHF circuits	BT:	Computer networks
	Waveguide components	Heterojunction bipolar transistors	
<i>Helical gears</i>		UF:	HBT
USE:	Gears	BT:	Transistors
Helicopters		RT:	Heterojunctions
BT:	Aircraft		Integrated optoelectronics
RT:	Military systems		Semiconductor devices
Helium		NT:	Double heterojunction
BT:	Chemical elements	bipolar transistors	
	Gases	Heterojunctions	
<i>Helmet mounted displays</i>		BT:	Junctions
USE:	Head-mounted displays	RT:	Heterojunction bipolar
Hemodynamics		transistors	
UF:	Hemorheology	<i>Heterostructure FETs</i>	
BT:	Blood flow	USE:	HEMTs AND
<i>Hemorheology</i>			MODFETs
USE:	Hemodynamics	Heuristic algorithms	
Hemorrhaging		UF:	Dynamic algorithms
UF:	Bleeding	BT:	Algorithms
	Haemorrhaging	RT:	Metaheuristics



2022 IEEE Thesaurus

HEV

USE: Hybrid electric vehicles

HEVC

USE: High efficiency video coding

Hf

USE: Hafnium

HF radar

USE: High frequency radar

HFC

USE: Hybrid fiber coaxial cables

Hg

USE: Mercury (metals)

Hidden Markov models

BT: Modeling

RT: Markov processes
Pattern recognition

Hierarchical learning

USE: Deep learning

Hierarchical systems

BT: Systems engineering and theory

NT: Multilevel systems

High definition television

USE: HDTV

High definition video

UF: HD
HD video

BT: Video recording

NT: Ultra-high definition video

High efficiency video coding

UF: HEVC
High-efficiency video

coding

BT: Video coding

RT: MPEG 4 Standard

High electron mobility transistors

USE: HEMTs

High electron-mobility transistors

USE: HEMTs

High energy physics

UF: Particle physics

BT: Physics

High energy physics instrumentation computing

BT: Computer applications
Instrumentation and measurement

Nuclear and plasma sciences

RT: Data acquisition
Elementary particles
Nuclear electronics
Particle measurements
Particle tracking
Position sensitive particle

detectors

Proton effects
Radiation effects
Real-time systems
Synchrotrons
Linear particle accelerator

High frequency

BT: Radio frequency

High frequency radar

UF: HF radar

BT: Radar

High frequency transformers

USE: High-frequency transformers

High intensity discharge lamps

BT: Discharge lamps
RT: Arc discharges
Electrical ballasts
Emergency lighting
Light sources
Lighting
Lighting control

High K

USE: High-k dielectric materials

High level languages

BT: Computer languages
RT: Page description languages
NT: Java
Linux
Parallel languages

High level synthesis

BT: Circuit synthesis



2022 IEEE Thesaurus

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 resolution imaging

USE: High-resolution imaging

High school engineering

USE: Pre-college engineering

High speed electronics

USE: High-speed electronics

High speed integrated circuits

USE: High-speed integrated circuits

High speed networking

USE: High-speed networks

High speed networks

USE: High-speed networks

High speed optical methods

USE: High-speed optical techniques

High speed optical techniques

USE: High-speed optical techniques

High speed rail transportation

USE: High-speed rail transportation

High speed techniques

USE: High-speed electronics

High T_c superconductors

USE: High-temperature superconductors

High T_c superconductors

USE: High-temperature superconductors

High temperature superconductors

USE: High-temperature superconductors

High voltage

USE: High-voltage techniques

High-definition TV

USE: HDTV

High-efficiency video coding

USE: High efficiency video coding

High-electron mobility transistors

USE: HEMTs

High-electron-mobility transistors

USE: HEMTs

High-frequency transformers

UF: High frequency transformers
BT: Transformers

High-K

USE: High-k dielectric materials

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



2022 IEEE Thesaurus

High-performance computing

USE: High performance computing

High-power fiber lasers

USE: High power fiber lasers

High-power microwave generation

USE: High power microwave generation

High-resolution imaging

UF: High resolution imaging

BT: Image resolution

High-speed electronics

UF: High speed electronics

High speed 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 networking

USE: High-speed networks

High-speed networks

UF: High speed networking

High speed networks

High-speed networking

BT: High-speed electronics

RT: Long Term Evolution

High-speed optical methods

USE: High-speed optical

techniques

High-speed optical techniques

UF: High speed optical methods

High speed optical

techniques

High-speed optical methods

BT: Optical design techniques

RT: Light fidelity

High-speed rail transportation

UF: High speed rail transportation

BT: Rail transportation

RT: Magnetic levitation vehicles

High-speed techniques

USE: High-speed electronics

High- T_c superconductors

USE: High-temperature

superconductors

High- T_c superconductors

USE: High-temperature

superconductors

High-temperature effects

USE: Thermal factors

High-temperature superconductors

UF: HTS

High T_c superconductors

High T_c superconductors

High temperature

superconductors

High- T_c superconductors

High- T_c superconductors

Superconductors (high

temperature)

BT: Superconducting materials

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



2022 IEEE Thesaurus

Higher order statistics

BT: Statistics
RT: Differential equations

Highways

USE: Road transportation

HIL simulation

USE: Hardware-in-the-loop simulation

Hilbert space

BT: Euclidean distance

Hilbert?Huang transforms

USE: Empirical mode decomposition

Hindbrain

UF: Rhombencephalon
BT: Brain
RT: Forebrain
Midbrain

Hinges

USE: Fasteners

Hip

BT: Extremities

Hip joint replacements

USE: Prosthetics

Hippocampus

BT: Temporal lobe
RT: Alzheimer's disease

Histograms

BT: Statistics

Histology

USE: Histopathology

Histopathology

UF: Histology
BT: Pathology

History

BT: Humanities

HITL

USE: Human in the loop

HIV

USE: Human immunodeficiency virus

Hockey

USE: Sports

Hoists

USE: Lifting equipment

Hole carriers

USE: Charge carrier processes

Holey fibers

UF: Holey fibres
BT: Photonic crystal fibers

Holey fibres

USE: Holey fibers

Hollow waveguides

BT: Electromagnetic waveguides
NT: Liquid waveguides

Holmium

BT: Chemical elements

Holographic optical components

BT: Optical devices
RT: Holography

Holography

BT: Imaging
RT: Holographic optical components
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



2022 IEEE Thesaurus

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

Home networks

USE: Home automation

Home phone

USE: Landline

Home shopping

USE: Electronic commerce

Homeostasis

BT: Biology
 Control systems

Homomorphic encryption

UF: Privacy preserving computation
 Privacy-preserving 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 networks

USE: Hopfield neural networks

Hopfield neural networks

UF: Hopfield networks
 BT: Recurrent neural networks

Hormones

USE: Biochemistry

Horn antennas

BT: Antennas

Horses

BT: Animals

Hoses

BT: Mechanical products
 RT: Automotive components
 Rubber products

Hospitals

BT: Medical services
 Medical treatment
 RT: Biomedical engineering

Hot carrier effects

BT: Hot carriers

Hot carrier injection

UF: Hot-carrier injection
 BT: Hot carriers
 NT: Channel hot electron injection
 Secondary generated hot electron injection
 Substrate hot electron injection

Hot carriers

BT: Charge carriers
 RT: Semiconductor devices
 NT: Hot carrier effects
 Hot carrier injection

Hot-carrier injection

USE: Hot carrier injection

Household appliances

USE: Home appliances

HPC

USE: High performance computing

HPFL

USE: High power fiber lasers



2022 IEEE Thesaurus

<i>HPM generation</i>					
USE:	High power microwave generation			NT:	Affective computing
					Chatbots
					Extended reality
					Gaze tracking
<i>HR</i>					Head-mounted displays
USE:	Heart rate				Head-up displays
					Human in the loop
<i>HRV</i>					Immersive experience
USE:	Heart rate variability				Telepresence
					Telexistence
HTML					
BT:	Markup languages			<i>Human disease markers</i>	
				USE:	Biomarkers
<i>HTS</i>				<i>Human engineering</i>	
USE:	High-temperature superconductors			USE:	Ergonomics
Huffman coding				<i>Human enhancement</i>	
BT:	Data compression			USE:	Human augmentation
	Entropy coding				
RT:	Algorithms			Human factors	
	Communication systems			UF:	Human factors engineering
	Multimedia communication				Stress (psychological)
	Multimedia databases			BT:	Systems, man, and
	Multimedia systems			cybernetics	
	Symbols			RT:	Aerospace biophysics
Human anatomy					Affective computing
BT:	Anatomy				Androids
Human augmentation					Anthropometry
UF:	Human enhancement				Behavioral sciences
BT:	Augmented reality				Chatbots
	Human factors				Cognitive science
<i>Human cloning</i>					Digital intelligence
USE:	Cloning				Ergonomics
					Human computer
Human computer interaction				interaction	
UF:	HCI				Man-machine systems
	Human machine interaction				Persuasive systems
	Human-centered computing				Problem-solving
	Human-computer			(security)	Productivity
interaction					Social engineering
	Human-computer interfaces				Telerobotics
	Human-machine interaction			NT:	User experience
	User friendliness				Anthropomorphism
BT:	User interfaces				Human augmentation
RT:	Adaptive learning				Human image synthesis
	Cyber-physical systems				Human intelligence
	Human factors				Mental health
	Human-vehicle systems				Technology acceptance
	Immersive audio			model	
	Man-machine systems			<i>Human factors engineering</i>	
	User experience			USE:	Ergonomics AND
					Human factors



2022 IEEE Thesaurus

Human image synthesis

BT: Human factors
Image synthesis
RT: Films
Photorealism

Termination of employment
Unemployment

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
RT: Simulation
Computer simulation
Modeling

Human intelligence

BT: Cognitive science
Human factors
NT: Digital intelligence
Hyper-intelligence

Human machine interaction

USE: Human computer
interaction

Human machine interface

USE: Man-machine systems

Human machine systems

USE: Man-machine systems

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

Human robot interaction

USE: Human-robot interaction

Human voice

BT: Speech processing

Human-centered computing

USE: Human computer
interaction

Human-computer interaction

USE: Human computer
interaction

Human-computer interfaces

USE: Human computer
interaction

Human-in-the-loop

USE: Human in the loop

Human-machine interaction

USE: Human computer
interaction

Human-robot interaction

UF: Human robot interaction
BT: User interfaces
RT: Admittance control
Tactile Internet
Wearable robots
NT: Social robots

Human-vehicle interaction

USE: Human-vehicle systems

Human-vehicle systems

UF: Human-vehicle interaction
BT: User interfaces
RT: Human computer
interaction

Humanitarian activities

UF: Humanitarian aid
BT: IEEE Corporate activities

Humanitarian aid

USE: Humanitarian activities

Humanities

UF: Dance
Drama



2022 IEEE Thesaurus

BT: Humanities data processing
RT: Education
Computer applications
Journalism
Museums
Philosophical
considerations
NT: Archeology
Art
History
Music
Natural languages
Social sciences

Humanities data processing

USE: Humanities

Humanoid robotics

USE: Humanoid robots

Humanoid robots

UF: Humanoid robotics
Humanoids
BT: Robots
RT: Mobile robots
Social robots

Humanoids

USE: Humanoid robots

HumanXR

USE: Extended reality

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 automobiles

USE: Hybrid electric vehicles

Hybrid cars

USE: Hybrid electric vehicles

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 fibre coaxial cables

USE: Hybrid fiber coaxial cables

Hybrid integrated circuits

BT: Circuits
Integrated circuits
RT: Thick film circuits
Thin film circuits

Hybrid intelligent systems

BT: Fuzzy systems
RT: Intelligent systems



2022 IEEE Thesaurus

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 fracking

USE: Fracking

Hydraulic liquids

USE: Hydraulic fluids

Hydraulic oils

USE: Hydraulic fluids

Hydraulic systems

UF: Hydraulics
BT: Machinery
RT: Fluid flow
Irrigation
NT: Electrohydraulics
Hydraulic equipment
Hydraulic fluids

Hydraulic turbines

BT: Turbines
RT: Hydroelectric power

generation

Hydraulics

USE: Hydraulic systems

Hydrocarbon reservoirs

BT: Hydrocarbons

Hydrocarbons

UF: Oil sands
Oil shale
BT: Organic chemicals
Petroleum
NT: Hydrocarbon reservoirs

Hydrochemistry

USE: Geochemistry

Hydrodynamics

UF: Smoothed particle
hydrodynamics
BT: Dynamics
Mechanical factors
RT: Fluid dynamics
Fluid flow
Microfluidics
Water
NT: Electrohydrodynamics
Magnetohydrodynamics

Hydroelectric power

USE: Hydroelectric power

generation

Hydroelectric power generation

UF: Hydroelectric power
Hydroelectricity
Hydropower
Hydroelectric
BT: Power generation
RT: Dams
Hydraulic turbines



2022 IEEE Thesaurus

NT: Hydroelectric-thermal
power generation
Microhydro power
Picohydro power
Wave energy conversion

Hydroelectric-thermal power generation

BT: Hydroelectric power
generation

Hydroelectricity

USE: Hydroelectric power
generation

Hydrogen

BT: Chemical elements
Gases
RT: Water splitting
NT: Deuterium

Hydrogen chloride

USE: Chlorine compounds

Hydrogen fluoride

BT: Fluorine compounds

Hydrogen powered vehicles

BT: Vehicles

Hydrogen storage

BT: Energy storage

Hydrologic measurements

BT: Hydrology
RT: Fluid flow measurement
Geophysics
Hydrological techniques
Oceanographic techniques
Water

Hydrological techniques

BT: Hydrology
RT: Geoengineering
Geophysics
Geoscience
Hydrologic measurements
NT: Fracking

Hydrology

BT: Fluid flow
RT: Water
Wetlands
NT: Floods
Hydrologic measurements
Hydrological techniques

Ocean waves

Hydromagnetics

USE: Magnetohydrodynamics

Hydrometers

BT: Density measurement

Hydrophones

USE: Sonar equipment

Hydropower

USE: Hydroelectric power
generation

Hyper intelligent systems

USE: Hyper-intelligent systems

Hyper ledger

USE: Distributed ledger

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

Hyperdermic needles

USE: Hypodermic needles

Hyperintelligent systems

USE: Hyper-intelligent systems

Hyperledger

USE: Distributed ledger

Hyperlinks

USE: Hypertext systems

Hypermedia

BT: Multimedia communication

Hypersonic vehicles

BT: Vehicles



2022 IEEE Thesaurus

RT:	Aerospace control Missiles Space vehicles	Hysteresis motors	BT:	AC motors Motors Rotating machines Synchronous machines Synchronous motors	
Hyperspectral imaging	BT:	Hyperspectral sensors			
Hyperspectral sensors	BT:	Remote sensing	<i>I/O programs</i>	USE:	Input-output programs
	RT:	Geologic measurements Military aircraft Military communication Military satellites Mining industry Submillimeter wave	<i>IC</i>	USE:	Integrated circuits
measurements			<i>IC packaging</i>	USE:	Integrated circuit packaging
	NT:	Wavelength measurement Hyperspectral imaging	Ice	BT:	Geoscience
Hypertension	BT:	Medical conditions		RT:	Meteorology Snow
Hypertext systems	UF:	Hyperlinks		NT:	Ice shelf Ice surface Ice thickness Sea ice
	BT:	Computer interfaces Information retrieval	Ice shelf	BT:	Ice
	RT:	Database systems	Ice surface	BT:	Ice
Hyperthermia	BT:	Medical conditions Medical treatment	Ice thickness	BT:	Ice
	RT:	Electromagnetic heating			
<i>Hypervisors</i>	USE:	Virtual machine monitors	<i>ICIC</i>	USE:	Inter-cell interference
Hypodermic needles	UF:	Hyperdermic needles	<i>ICP</i>	USE:	Iterative closest point algorithm
	BT:	Biomedical equipment	<i>ICs</i>	USE:	Integrated circuits
Hypothalamus	BT:	Brain	<i>ICT</i>	USE:	Information and communication technology
	RT:	Central nervous system	<i>ID-based encryption</i>	USE:	Identity-based encryption
<i>Hydroelectric</i>	USE:	Hydroelectric power	Identification of persons	BT:	Systems, man, and cybernetics
generation				RT:	Access control
Hysteresis	BT:	Materials science and technology			
	RT:	Damping Magnetic hysteresis Magnetization processes Spin valves			



2022 IEEE Thesaurus

NT: Palmprint recognition
Security
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 cryptography

USE: Identity-based encryption

Identity-based encryption

UF: ID-based encryption
Identity-based cryptography
BT: Public key cryptography

IDTV

USE: HDTV

IEC

UF: International
electrotechnical commission
BT: Standards organizations
RT: Communication standards
IEC Standards
Standardization
Standards
NT: Moving Pictures Experts
Group

IEC publications

USE: IEC Standards

IEC Standards

UF: IEC publications
BT: Standards publications
RT: Common Information Model
(electricity)
IEC
NT: MPEG standards

IEEE 1364

USE: Hardware design
languages

IEEE 1394 Standard

UF: P1394
BT: IEEE Standards
RT: Data buses

Data communication
Firewire
Machine vision
Video signal processing

IEEE 802 LAN-MAN Standards

BT: IEEE Standards
NT: IEEE 802.11 Standard
IEEE 802.15 Standard
IEEE 802.16 Standard
IEEE 802.19 Standard
IEEE 802.22 Standard
IEEE 802.3 Standard

IEEE 802.11 Standard

UF: 802.11
P802.11
WiGig
BT: IEEE 802 LAN-MAN
Standards
RT: Bluetooth
Butler matrices
Computer networks
MIMO communication
Modulation
Protocols
Radio communication
Wireless LAN
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



2022 IEEE Thesaurus

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

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 Arc Flash Standards

USE: Power and energy
standards

IEEE Associate Members

BT: IEEE members

IEEE Awards activities

BT: IEEE activities
RT: Awards
IEEE Educational activities



2022 IEEE Thesaurus

activities
 NT: IEEE Fellows
 IEEE Foundation
 IEEE Professional activities
 IEEE Technical activities
 IEEE United States
 NT: IEEE Corporate awards
 IEEE Society awards
 IEEE Standards awards
 National Society Agreement

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 Electric Machinery Standards

USE: Power and energy
 standards

IEEE employees

USE: IEEE staff

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



2022 IEEE Thesaurus

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 History Center

USE: IEEE Center for the History
of Electrical Engineering

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 on-line publications

USE: IEEE online 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 Power Substations Standards

USE: Power and energy
standards

IEEE Press

BT: IEEE entities
RT: IEEE publishing

IEEE Prize Paper awards

BT: IEEE Recognitions

IEEE procedures

USE: IEEE policy and procedures



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2022 IEEE Thesaurus

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 Standards development

USE: IEEE Standards activities

IEEE Surge Protective Devices Standards

USE: Power and energy
 standards

IEEE Technical activities

BT: IEEE activities



2022 IEEE Thesaurus

RT: IEEE Awards activities IEEE Professional activities	<i>Illumination control</i> USE: Lighting control
IEEE Technical Field awards BT: IEEE Corporate awards	<i>Illumination gas</i> USE: Coal gas
IEEE transactions BT: IEEE publications	<i>IM</i> USE: Instant messaging
IEEE United States activities UF: US activities BT: IEEE activities RT: IEEE Awards activities IEEE Professional activities	Image analysis UF: Scene analysis Scene classification 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
<i>IEEE Volunteer activities</i> USE: IEEE activities	
IEEE Xplore BT: IEEE products RT: Information services NT: IEL	
<i>IEEE/IEE Electronic Library</i> USE: IEL	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
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	Image capture BT: Image processing RT: Cameras Computer vision Image sensors Photography
III-V semiconductor materials BT: Semiconductor materials RT: Aluminum gallium nitride	Image classification BT: Image analysis RT: Deep learning Image annotation
<i>IIOT</i> USE: Industrial Internet of Things	
IIR filters UF: Infinite impulse response filters BT: Filters	Image coding UF: Image compression BT: Image processing RT: Image communication Image databases Image storage MPEG standards
<i>Illumination</i> USE: Lighting	



2022 IEEE Thesaurus

Rate distortion theory
Steganography
Transcoding
Vector quantization
Video codecs
Video coding

Image color analysis

UF: Image colour analysis
BT: Image processing
RT: Image filtering

Image colour analysis

USE: Image color analysis

Image communication

UF: Image transmission
BT: Communications
technology
RT: B-ISDN
Cable TV
ISDN
Image coding
Motion compensation
TV
Teleconferencing
Videophone systems
Visual communication
NT: Facsimile
Picture archiving and
communication systems

Image compression

USE: Image coding

Image converters

BT: Imaging
RT: Frequency conversion
Image sensors
NT: Image intensifiers

Image databases

BT: Database systems
Databases
RT: Geographic information
systems
Image coding
Image storage
Video sequences
NT: Image retrieval

Image de-noising

USE: Image denoising

Image deblurring

USE: Image restoration

Image decomposition

BT: Image processing

Image denoising

UF: Image de-noising
BT: Image processing
RT: Diffusion processes
Gaussian noise
Image enhancement
Image filtering
Image reconstruction
Image resolution
Image restoration

Image edge analysis

USE: Image edge detection

Image edge detection

UF: Edge detection
Image edge analysis
BT: Image recognition
RT: Corner detection
Feature extraction
Image segmentation
Thresholding (Imaging)

Image enhancement

BT: Image processing
RT: Image denoising
Image intensifiers
Image restoration

Image filtering

BT: Filtering theory
Image processing
RT: Image color analysis
Image denoising
Image segmentation

Image forensics

UF: Forensic photography
BT: Forensics
Photography
RT: Image processing
Law enforcement
Visualization

Image fusion

BT: Image processing

Image generation

USE: Image synthesis



2022 IEEE Thesaurus

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

Image motion analysis

BT: Image analysis
RT: Fall detection
Motion capture
Motion detection
Object tracking
Robotics and automation
NT: Video tracking

Image object detection

USE: Object detection

Image object recognition

USE: Object recognition

Image pattern recognition

USE: Pattern recognition

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

processing

Geophysical image

Gray-scale
Image analysis
Image annotation
Image capture
Image coding
Image color analysis
Image decomposition
Image denoising
Image enhancement
Image filtering
Image fusion
Image recognition
Image reconstruction
Image registration
Image representation
Image resolution
Image restoration
Image sampling
Image segmentation
Image sequences
Image stitching
Image synthesis
Image texture
Machine vision
Morphological operations
Optical feedback
Pansharpening
Saliency detection
Smart pixels
Spatial coherence
Structure from motion
Table lookup
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
Image analysis
Image matching
Machine vision
Object recognition
Video signal processing
NT: Image edge detection



2022 IEEE Thesaurus

Image reconstruction

BT: Image processing
RT: Holography
Image denoising
Inverse problems
Magnetic resonance

imaging

Pattern clustering
Tomography

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: Deep learning
Image edge detection
Image filtering
Mixture models
Object tracking

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 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 tagging

USE: Image annotation

Image texture

BT: Image processing

Image texture analysis

BT: Image analysis

Image transmission

USE: Image communication

Image watermarking

USE: Watermarking

Imagimarkers

USE: Fiducial markers



2022 IEEE Thesaurus

Imaging

RT: Color
Motion pictures
Radiometry
Remote sensing
Robot vision systems
NT: Biomedical imaging
Cameras
Focusing
Ground penetrating radar
Holography
Image converters
Image sensors
Image storage
Infrared imaging
Magnetic resonance

imaging

resistivity imaging technique
Magneto electrical
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

IMC

USE: In-memory computing

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

UF: Immune systems
BT: Anatomy
RT: Biological control systems
Biology
Microorganisms
Sepsis
NT: Artificial immune systems

Immune systems

USE: Immune system

Immunity testing

BT: Electromagnetic
compatibility
Electronic equipment
testing

RT: Electrostatic interference
Anechoic chambers
Electromagnetic

interference

Open area test sites

Impact ionisation

USE: Impact ionization

Impact ionization

UF: Impact ionisation
BT: Ionization
RT: Charge carriers
Conductivity
Electrons
Insulators

Impedance

UF: Electric impedance
BT: Electric variables
RT: Admittance
Damping
Impedance matching
Impedance measurement

Impedance matching

BT: Electric variables
RT: Circuits
Equalizers
Impedance
NT: Baluns

Impedance measurement

UF: Impedance methods
Impedance performance
BT: Electric variables
measurement



2022 IEEE Thesaurus

RT: Admittance measurement
Impedance
Transmission line
measurements

Impedance methods
USE: Impedance measurement

Impedance performance
USE: Impedance measurement

Impellers
BT: Machine components
RT: Blades
Propellers
Pumps

Impersonation attacks
BT: Communication system
security

Implantable biomedical devices
USE: Implants

Implantable devices
USE: Implants

Implantable electronics
USE: Implants

Implants
UF: Implantable biomedical
devices
Implantable devices
Implantable electronics
BT: Biomedical equipment
NT: Auditory implants
Brainstem implants
Cochlear implants
Microelectronic implants
Neural implants

Importance sampling
USE: Monte Carlo methods

Imposter signature generation
USE: Forgery

Improved definition TV
USE: HDTV

Impulse generation
USE: Pulse generation

Impulse measurements
USE: Pulse measurements

Impulse testing
BT: Testing
RT: Frequency response
Insulation testing

Impurities
BT: Materials science and
technology
RT: Contamination
NT: Semiconductor impurities

IMT-2000
USE: 3G mobile communication

In memory computing
USE: In-memory computing

In memory processing
USE: In-memory computing

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

In-memory processing
USE: In-memory computing

Incentive schemes
UF: Bonuses
Merit pay
Performance related pay
Profit sharing schemes
BT: Human resource
management
Remuneration



2022 IEEE Thesaurus

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

Incinerators

USE: Incineration

Independent component analysis

BT: Numerical analysis
RT: Artificial intelligence
Blind source separation
Computer aided analysis
Feature extraction
Principal component

analysis

Signal processing

Index of production

USE: Economic indicators

Indexes

BT: Database systems
RT: Information retrieval
Information systems
NT: Indexing
Machine assisted indexing
Spatial indexes

Indexing

UF: Online indexing
BT: Indexes
Information analysis
RT: Keyword search
Machine assisted indexing
Tagging

Indirect liquid cooling

BT: Liquid cooling

Indium

BT: Metals
RT: Indium compounds

Indium compounds

BT: Compounds
RT: Alloying
Indium
NT: Indium gallium arsenide
Indium tin oxide

Indium gallium arsenide

UF: InGaAs
BT: Gallium compounds
Indium 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: Mobile communication
Optical fiber communication
Optical modulation
NT: Indoor environment

Indoor environment

BT: Indoor communication

Indoor navigation

BT: Navigation
RT: Computer vision
Global Positioning System
Land mobile radio
Path planning
Radio navigation

Indoor radio

USE: Indoor radio communication

Indoor radio communication

UF: Indoor radio



2022 IEEE Thesaurus

communications
BT: Indoor radio
Radio communication

Indoor radio communications
USE: Indoor radio communication

Inductance

BT: Electric variables
RT: Coils
Inductance measurement
Inductors
Transmission line theory

Inductance measurement

BT: Electric variables
measurement
RT: Inductance

Induction (electromagnetic)
USE: Electromagnetic induction

Induction (electrostatic)
USE: Electrostatic induction

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 energy transfer
USE: Inductive power
transmission

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

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



2022 IEEE Thesaurus

	Manipulators	BT:	Internet of Things
	Manufacturing automation	RT:	Machine-to-machine
	Mobile robots	communications	
	Motor drives		Robotics and automation
	Programmable control		
	Robots	<i>Industrial IoT</i>	
NT:	Process control	USE:	Industrial Internet of Things
	Production control		
<i>Industrial democracy</i>			
USE:	Industrial relations		
Industrial economics		Industrial plants	
UF:	Manufacturing economics	UF:	Plants (industrial)
	Production economics	BT:	Production facilities
BT:	Microeconomics	RT:	Industrial control
RT:	Economies of scale		Industrial engineering
	Privatization		Industrial facilities
			Industrial power systems
			Industries
			Manufacturing
			Paper mills
			Production systems
Industrial electronics		Industrial pollution	
NT:	Assembly systems	BT:	Pollution
	Computer aided	RT:	Air pollution
manufacturing			Industrial waste
	Cryogenic electronics		Land pollution
	Industrial control		Radioactive pollution
	Integrated manufacturing		Thermal pollution
systems			Water pollution
	Machine control		
	Manufacturing automation		
	Testing	Industrial power systems	
Industrial engineering		UF:	Commercial power systems
BT:	Industry applications	BT:	Power systems
RT:	Design methodology	RT:	Buildings
	Industrial control		Cogeneration
	Industrial plants		Industrial plants
	Industrial training		Power distribution
	Precision engineering	Industrial psychology	
	Production engineering	BT:	Psychology
	Production management	RT:	Employee welfare
	Research and development		Human resource
NT:	Industrial communication	management	
			Productivity
Industrial facilities			Psychometric testing
BT:	Production facilities	Industrial relations	
RT:	Industrial plants	UF:	Collective bargaining
	Manufacturing systems		Industrial democracy
NT:	Seaports		Trade unions
<i>Industrial heat recovery</i>		BT:	Business
USE:	Heat recovery	RT:	Equal opportunities
Industrial Internet of Things		Industrial training	
UF:	IIOT	BT:	Training
	Industrial IoT	RT:	Industrial engineering



2022 IEEE Thesaurus

	Multiskilling		Cryogenics
	On the job training		Electrochemical devices
	Vocational training		Electrochemical processes
Industrial waste			Electromechanical systems
BT:	Waste materials		Electrostatic devices
RT:	Effluents		Electrostatic precipitators
	Industrial pollution		Electrostatic processes
	Slurries		Engines
	Waste heat	management	Environmental
	Wastewater		Food technology
NT:	Ash		High-temperature
	Slag	techniques	
Industries			Industrial engineering
BT:	Industry applications		Industries
RT:	Business		Inspection
	Industrial plants		Machinery
NT:	Agriculture		Manufacturing
	Architecture		Packaging
	Beverage industry		Paper technology
	Chemical industry		Production
	Coal industry		Safety
	Communication industry		Security
	Computer industry		Wine industry
	Construction	Inertial confinement	
	Construction industry	BT:	Plasma confinement
	Defense industry	Inertial navigation	
	Electrical engineering	BT:	Navigation
industry		Inertial sensors	
	Entertainment industry	BT:	Sensors
	Farming	<i>Infant</i>	
	Financial industry	USE:	Pediatrics
	Gas industry	<i>Infants</i>	
	Information industry	USE:	Pediatrics
	Manufacturing industries	Infectious diseases	
	Metals industry	UF:	Communicable disease
	Mining industry		Transmissible disease
	Natural gas industry	BT:	Diseases
	Petroleum industry	Inference algorithms	
	Power industry	BT:	Algorithms
	Steel industry	Inference mechanisms	
	Sugar industry	UF:	Model-based reasoning
	Textile technology	BT:	Knowledge engineering
	Tourism industry	RT:	Cognitive science
	Toy industry		Fuzzy cognitive maps
	Transportation industry		Gaussian processes
	Wood industry		Learning systems
<i>Industry 4.0</i>			
USE:	Fourth Industrial Revolution		
Industry applications			
NT:	Accident prevention		
	Chemical technology		



2022 IEEE Thesaurus

NT:	Belief propagation Fuzzy reasoning	RT:	Database systems
		NT:	Enterprise architecture management
Infinite horizon			<i>Information centric networking</i>
BT:	Optimal control	USE:	Information-centric networking
RT:	Markov processes Optimization methods		<i>Information centric networks</i>
<i>Infinite impulse response filters</i>		USE:	Information-centric networking
USE:	IIR filters		
<i>Inflammability</i>		Information entropy	
USE:	Flammability	BT:	Information theory
Influenza		Information exchange	
BT:	Diseases Viruses (medical)	BT:	Data processing Information processing
RT:	Epidemics Pandemics	RT:	Common Information Model (computing)
Informatics			Common Information Model (electricity)
BT:	Information processing Information systems		Information management Information sharing
RT:	Computational materials		Ports (computers) Tactile Internet
science		<i>Information extraction</i>	
NT:	Bioinformatics Cognitive informatics Energy informatics Neuroinformatics	USE:	Information retrieval
Information age		Information filtering	
UF:	AOI Age of information Digital age New media age	BT:	Filtering Information retrieval
BT:	Information technology	NT:	Information filters Recommender systems
Information analysis		Information filters	
BT:	Professional	UF:	Web filters
communication		BT:	Information filtering
RT:	Big Data applications Sentiment analysis	RT:	Information retrieval
NT:	Decision analysis Indexing	NT:	Accesslists Blocklists
Information and communication technology		Information geometry	
UF:	ICT	BT:	Geometry
BT:	Communications	RT:	Probability
technology		Information industry	
RT:	Information technology	BT:	Industries
RT:	Energy informatics	<i>Information inequality</i>	
NT:	Ambient assisted living	USE:	Cramer-Rao bounds
Information architecture			
BT:	Information systems		



2022 IEEE Thesaurus

Information integrity

BT: Professional
communication
RT: Deepfakes
Fake news

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
Vocabulary
Web sites

Information science

BT: Professional
communication
NT: Quantum information
science

Information security

BT: Information management
Security
RT: Data protection
Differential privacy
Internet security
NT: Cyber espionage
Data breach
Intrusion detection
Phishing



2022 IEEE Thesaurus

(security)		Privacy breach			Information management
		SQL injection			Information processing
		Social engineering			Management information
			systems		
		Trust management			Medical information
			systems		
Information services					
communication	BT:	Professional			
	RT:	Abstracts			
		IEEE Xplore			
		Information management			
		Journalism			
	NT:	Dictionaries			
		Document delivery			
		Encyclopedias			
		Libraries			
		Teletext			
		Videotex			
Information sharing					
	BT:	Information management			
	RT:	Collaboration			
		Information exchange			
		Information processing			
	NT:	Data dissemination			
Information systems					
communication	BT:	Professional			
	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 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			
		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 distance			
		Hamming weight			
		Information entropy			
		Mutual information			
		Network coding			
		Rate distortion theory			



2022 IEEE Thesaurus

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

Information-centric networks
USE: Information-centric

networking

Informationtheoretic
USE: Information theory

Infrared communication
USE: Optical fiber communication

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 lasers

USE: Lasers

Infrared propagation

USE: Optical propagation

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

InGaAs

USE: Indium gallium arsenide

Inhibitors

BT: Chemical products
Production materials
RT: Retardants
NT: Corrosion inhibitors

Inhomogeneous media

USE: Nonhomogeneous media

Injected beams

USE: Particle beam injection

Injection lasers

USE: Semiconductor lasers

Injection locked oscillators

USE: Injection-locked oscillators

Injection locking

USE: Injection-locked oscillators

Injection molding

UF: Injection moulding
Power injection molding
Power injection moulding
BT: Production
RT: Compression molding
Embossing

Injection moulding

USE: Injection molding



2022 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

Injury

USE: Injuries

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

Ink-jet printers

USE: Ink jet printing

Ink-jet printing

USE: Ink jet printing

Inkjet printing

USE: Ink jet printing

Innovation

USE: Technological innovation

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

Inorganic LEDs

USE: Inorganic light emitting diodes

Inorganic light emitting diodes

UF: Inorganic LEDs
BT: Light emitting diodes

Inorganic materials

BT: Materials
RT: Soft electronics

Inorganic organic hybrid materials

USE: Organic inorganic hybrid materials

Inorganic-organic hybrid materials

USE: Organic inorganic hybrid materials

InP

USE: Indium phosphide

Input devices

BT: Computer interfaces
Hardware

Input surge current

USE: Inrush current

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



2022 IEEE Thesaurus

Insect control

USE: Pest control

Pulse oximetry
Testing

Insects

BT: Animals
RT: Entomology

Instrumentation buses

USE: Field buses

Insertion loss

BT: Propagation
RT: Attenuation

Instruments

BT: Instrumentation and measurement
RT: Design tools
Measurement
Barometers
Compass
Medical instruments
Meters
Microscopy
Network analyzers
Oscilloscopes
Pressure gauges
Probes
Telescopes
Theodolites
Tuners

Inspection

BT: Industry applications
RT: Coordinate measuring machines
Maintenance engineering
Testing
NT: Automatic optical inspection

Instant messaging

UF: IM
BT: Electronic messaging
Internet

Instanton vacuum

USE: Elementary particle vacuum

Insulated gate bipolar transistors

BT: Bipolar transistors

Instruction repertory

USE: Instruction sets

Insulation

BT: Dielectrics and electrical insulation
RT: Dielectric breakdown
Dielectric losses
Dielectric materials
Glass
Insulation life
Insulation testing
Oils
Polymer foams
Power transformer

Instruction sets

UF: Instruction repertory
BT: Program processors
NT: Out of order
Prefetching
Reduced instruction set

computing

Instructional aids

USE: Educational technology

insulation

Instrument transformers

BT: Transformers
RT: Protective relaying
NT: Voltage transformers

NT: Spark gaps
Cable insulation
Ceramics
Gas insulation
Insulators
Isolation technology
Oil insulation
Plastic insulation

Instrumentation and measurement

NT: Computerized

instrumentation

Electric variables
High energy physics
Instruments
Measurement
Monitoring

instrumentation computing

Insulation life

BT: Insulation testing
RT: Aging
Insulation
Life estimation



2022 IEEE Thesaurus

measurement Partial discharge
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 design

USE: Integrated circuit synthesis

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 metallisation

USE: Integrated circuit
metallization

Integrated circuit metallization

UF: Integrated circuit
metallisation
BT: Metallization

Integrated circuit modeling

UF: Integrated circuit modelling
BT: Integrated circuits
Modeling
NT: Cutoff frequency



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2022 IEEE Thesaurus

Integrated circuit modelling

USE: Integrated circuit modeling

Integrated circuit noise

BT: Integrated circuits
RT: Semiconductor device

noise

NT: Threshold voltage
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

integrated circuits

Application specific

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



2022 IEEE Thesaurus

integrated circuits	Thin film circuits	Microwave photonics
	Three-dimensional	Smart pixels
circuits	Through-silicon vias	<i>Integrated services digital networks</i>
	UHF integrated circuits	USE: ISDN
	Ultra large scale integration	<i>Integrated services networks</i>
	Very high speed integrated	USE: Intserv networks
	Very large scale integration	Integrodifferential equations
	Wafer scale integration	BT: Equations
<i>Integrated circuits industry</i>		RT: Differential equations
	USE: Electronics industry	Integral equations
<i>Integrated control</i>		Integumentary system
	USE: Centralized control	BT: Anatomy
Integrated design		NT: Hair
	BT: Design methodology	Nails
theory	Systems engineering and	Skin
		<i>Intellectual capital</i>
Integrated manufacturing systems		USE: Knowledge management
	BT: Industrial electronics	Intellectual property
manufacturing	Manufacturing systems	UF: IP rights
	RT: CAD/CAM	IPR
	Computer aided	BT: Copyright protection
	System integration	RT: Cyberethics
Integrated memory circuits		Notice of Violation
	BT: Digital integrated circuits	Patents
	Semiconductor memory	Software protection
	RT: Solid state drives	NT: Digital rights management
Integrated optics		Intelligent actuators
	BT: Optics	UF: Smart actuators
transistors	RT: Arrayed waveguide gratings	BT: Actuators
	Distributed Bragg reflectors	Intelligent agents
	Electro-optic modulators	BT: Software agents
	Integrated optoelectronics	<i>Intelligent agriculture</i>
	Microoptics	USE: Smart agriculture
	Optical films	Intelligent automation
	Optical waveguides	UF: Robotic process automation
	Synapses	BT: Automation
	Thermo-optical devices	Intelligent systems
		RT: Intelligent robots
Integrated optoelectronics		Intelligent control
	BT: Optoelectronic devices	BT: Cybernetics
	RT: Heterojunction bipolar	RT: Context awareness
	Integrated circuits	H infinity control
	Integrated optics	Mechatronics
	Liquid crystal on silicon	NT: Feedforward systems
	Microoptics	



2022 IEEE Thesaurus

Neurocontrollers

Intelligent databases

USE: Deductive databases

Intelligent manufacturing systems

BT: Manufacturing systems
Production systems
RT: Smart manufacturing

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 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

Inter-cell interference

USE: Inter-cell interference

Inter-cell interference coordination

USE: Inter-cell interference

Interactive systems

BT: Man-machine systems
RT: Affordances
Authentication
NT: External stimuli

Intercalibration

USE: Calibration

Inter-cell interference

UF: ICIC
Inter-cell interference



2022 IEEE Thesaurus

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

Interconnection networks

USE: Multiprocessor
interconnection

Interest point detection

BT: Computer vision

Interest rates

USE: Economic indicators

Interface management

BT: Management
Systems engineering and
theory
RT: Computer interfaces
Network interfaces

Interface phenomena

BT: Computer interfaces
RT: Adsorption
NT: Network interfaces

Interface states

BT: Computer interfaces
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 (signal)

USE: Interference

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



2022 IEEE Thesaurus

interferometry	RT:	Micrometers	<i>International electrotechnical commission</i>
		Talbot effect	USE: IEC
	NT:	Fabry-Perot	<i>International organization for standardization</i>
		Interferometers	USE: ISO
		Optical interferometry	
		Phase shifting	
		Radar interferometry	International relations
		Radio interferometry	BT: Social implications of
		Sagnac interferometers	technology
			RT: Globalization
			International collaboration
			Social factors
Interleaved codes			
	UF:	Bit interleaved coded	
		Bit-interleaved coded	
	BT:	Modulation coding	International Space Station
			BT: Space stations
Intermetallic			
	BT:	Alloying	<i>International standards organization</i>
			USE: ISO
Intermodulation distortion			
	BT:	Nonlinear distortion	International System of Units
			BT: Measurement units
Internal combustion engines			
	UF:	HCCI engines	<i>International Telecommunications Union</i>
	BT:	Engines	USE: ITU
	RT:	Automotive components	
		Exhaust gases	International trade
		Hybrid electric vehicles	UF: Trade (international)
	NT:	Diesel engines	BT: Economics
		Ignition	RT: Business
			Developing countries
Internal stresses			
	BT:	Stress	Exchange rates
	RT:	Surface stress	Globalization
			International collaboration
			Macroeconomics
International Atomic Time			
	UF:	TAI	Trade agreements
	BT:	Standards categories	
	RT:	Atomic clocks	Internet
			UF: Google
International collaboration			
	UF:	Joint ventures	BT: Communication systems
	BT:	Management	Computer networks
	RT:	Environmental factors	Digital systems
		Environmental	Distributed computing
			RT: ARPANET
management			
			Blogs
			Cyberspace
			Diffserv networks
			Electronic commerce
			Electronic learning
			Extranets
			Hybrid learning
			IEEE 802.16 Standard
			IP networks
			IPTV
			Internetworking
			Intserv networks



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	Multicast protocols		Wearable computers
	Multiprotocol label		
switching		Internet of Things	
	Next generation networking	UF:	IOT
	Online services		Internet of Everything
	Open data	BT:	Internet
	Point-to-multipoint	RT:	Ambient intelligence
communications			Bar codes
	Routing protocols		Cloud computing
	Service level agreements		Cyber-physical systems
	Smart TV		Digital transformation
	Social networking (online)		Digital twins
	Streaming media		Fourth Industrial Revolution
	TCPIP		Machine-to-machine
	Virtual enterprises	communications	
	Virtual private networks		Middleware
	Web sites		Object detection
	World Wide Web		Protocols
NT:	Bot (Internet)		Radiofrequency
	Botnet	identification	
	Cloud computing		Simultaneous wireless
	Crowdsourcing	information and power transfer	
	Instant messaging		Tagging
	Internet of Things		Virtual environments
	Internet privacy		Watermarking
	Internet security		Wireless sensor networks
	Internet telephony	NT:	Industrial Internet of Things
	Internet topology		Internet of Medical Things
	Linked data		Internet of Vehicles
	Middleboxes		Tactile Internet
	Semantic Web		
	Social computing	Internet of Vehicles	
	Web 2.0	UF:	IOV
	Web services		Internet-of-Vehicles
		BT:	Internet of Things
			Vehicles
		RT:	Vehicular ad hoc networks
<i>Internet banking</i>			
USE:	Online banking		
<i>Internet bullying</i>		Internet privacy	
USE:	Cyberbullying	BT:	Internet
			Privacy
<i>Internet neutrality</i>		RT:	Internet security
USE:	Network neutrality		
<i>Internet of Everything</i>		<i>Internet Protocol networks</i>	
USE:	Internet of Things	USE:	IP networks
Internet of Medical Things		<i>Internet protocol television</i>	
BT:	Internet of Things	USE:	IPTV
	Medical services		
RT:	Biomedical monitoring	Internet security	
	Emergency services	BT:	Computer security
	Medical treatment		Internet
	Remote monitoring	RT:	Information security
	Smart healthcare		Internet privacy



2022 IEEE Thesaurus

Internet services

USE: Web and internet services

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

Internet-of-Vehicles

USE: Internet of Vehicles

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

Interpolating

USE: Interpolation

Interpolation

UF: Interpolating
BT: Approximation methods

RT: Curve fitting
Digital-analog conversion
Radial basis function

networks

Statistics
Surface fitting

Interpreters (program)

USE: Program processors

Interrupters

UF: Interruption
BT: Switchgear
RT: Circuit breakers
Fuses

Interruption

USE: Interrupters

Interstellar chemistry

BT: Chemistry
RT: Extraterrestrial

measurements

Intersymbol interference

BT: Interference
RT: AWGN channels
Equalizers
Gaussian channels

Intersystem interference

USE: Interchannel interference

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



2022 IEEE Thesaurus

networks	UF: Integrated services		Numerical analysis
	BT: Computer networks	NT: Signal reconstruction	
	RT: Internet		Deconvolution
	Multimedia communication	<i>Inverse scattering</i>	
		USE: Inverse problems	
Intubation		Inverse synthetic aperture radar	
UF: Tracheal intubation		BT: Synthetic aperture radar	
BT: Medical treatment			
RT: Respiratory system		<i>Inverse transforms</i>	
Ventilators		USE: Laplace equations	
<i>Invasive software</i>		<i>Inverted classroom</i>	
USE: Privacy-invasive software		USE: Education AND	
		Online services	
<i>Invention</i>			
USE: Technological innovation			
Inventory control		Inverters	
BT: Operations research		BT: Power electronics	
RT: Control systems		RT: Maximum power point	
Production control		trackers	
Production management			Zero current switching
			Zero voltage switching
		NT: Multilevel inverters	
			Pulse inverters
			Resonant inverters
			Voltage source inverters
Inventory management		Investment	
BT: Production management		BT: Financial management	
RT: Bar codes		RT: Developing countries	
Production engineering		Open banking	
NT: Bills of materials			
<i>Inverse distortion</i>		<i>Iodides</i>	
USE: Predistortion		USE: Iodine compounds	
<i>Inverse method</i>			
USE: Inverse problems		Iodine	
<i>Inverse methods</i>		BT: Chemical elements	
USE: Inverse problems		NT: Iodine compounds	
<i>Inverse modeling</i>		Iodine compounds	
USE: Inverse problems		UF: Iodides	
<i>Inverse problem</i>		Iodine monofluoride	
USE: Inverse problems		BT: Iodine	
Inverse problems		<i>Iodine monofluoride</i>	
UF: Inverse method		USE: Iodine compounds	
Inverse methods			
Inverse modeling		Ion accelerators	
Inverse problem		BT: Particle accelerators	
Inverse scattering		RT: Ion beam effects	
BT: Modeling		Ion beams	
RT: Functional analysis		Ion sources	
Image reconstruction		Ions	
Integral equations		Proton accelerators	



2022 IEEE Thesaurus

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 optics

USE: Particle beam optics

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

Ionisation

USE: Ionization

Ionisation chambers

USE: Ionization chambers

Ionising radiation

USE: Ionizing radiation

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

Ionized jet deposition

USE: Physical vapor deposition

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

Ionomeric polymer-metal composite actuators

USE: Actuators

Ionosphere

BT: Terrestrial atmosphere



2022 IEEE Thesaurus

	RT:	Meteorology Plasmas			
Ions	BT:	Elementary particles		IPTV	UF: Internet protocol television
	RT:	Alpha particles Elementary particle			BT: Digital TV
exchange interactions					RT: Broadband communication Computer networks IP networks Internet Local area networks Protocols Streaming media
		Ion accelerators Ion beams Ion emission Protons Storage rings		<i>IR Spectra</i>	
	NT:	Ion sources Ionization		USE:	Infrared spectra
				IRE Standards	
<i>IOT</i>	USE:	Internet of Things		BT:	IEEE Standards
<i>IOV</i>	USE:	Internet of Vehicles		Iridium	
<i>IP</i>	USE:	IP networks		BT:	Chemical elements
IP networks				Iris	BT: Eyes RT: Ophthalmology
UF:		IP IP-networks Internet Protocol networks		Iris recognition	BT: Biometrics (access control)
BT:		Communication systems Computer networks Telecommunications		<i>Irises</i>	USE: Waveguide discontinuities
RT:		IPTV Internet Machine-to-machine		Iron	UF: Fe BT: Metals NT: Cast iron Iron alloys
communications				Iron alloys	
		Next generation networking Quality of service Transport protocols		BT:	Iron
	NT:	TCPIP		RT:	Alloying Metallurgy
<i>IP rights</i>	USE:	Intellectual property		NT:	Austenite
<i>IP telephony</i>	USE:	Internet telephony		<i>Irradiation</i>	USE: Radiation effects
<i>IP-networks</i>	USE:	IP networks		Irrigation	BT: Agriculture RT: Agricultural products Crops Hydraulic systems Water pumps
<i>iPOD</i>	USE:	Portable media players		<i>Irtran 5</i>	USE: Magnesium oxide
<i>IPR</i>	USE:	Intellectual property			



2022 IEEE Thesaurus

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

Ishikawa diagrams

USE: Cause effect analysis

Islanding

BT: Power supplies

RT: Electrical safety
Generators

ISO

UF: International organization for standardization

organization

BT: Standards organizations
RT: Communication standards
Guidelines
ISO Standards
Measurement standards
Software standards
Standardization
Standards

NT: Moving Pictures Experts

Group

ISO 9000

USE: Quality management

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



2022 IEEE Thesaurus

NT: Expectation-maximization
algorithms
Iterative algorithms
Iterative learning control

ITU

UF: International
Telecommunications Union
BT: Standards organizations

ITU Standards

BT: Standards publications
RT: UHDTV

J2EE

USE: Java

Jacks

USE: Lifting equipment

Jacobian matrices

UF: Jacobian matrix
BT: Matrices

Jacobian matrix

USE: Jacobian matrices

Jakarta EE

USE: Java

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 circuit technology

USE: 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

Jigs

USE: Fixtures

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 rotation

USE: Multiskilling

Job shop scheduling

BT: Scheduling
RT: Genetic algorithms

Job specification

BT: Human resource
management
RT: Multiskilling
Recruitment

Jobs listings

BT: Career development
RT: Employment

Johnson Nyquist noise

USE: Thermal noise

Joining materials

BT: Production materials
RT: Joining processes
Soldering equipment
NT: Filler metals
Sealing materials



2022 IEEE Thesaurus

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

Joint ventures

USE: International collaboration

Joints

BT: Skeleton

Josephson devices

USE: Superconducting devices

Josephson effect

BT: Tunneling
RT: Josephson junctions

Josephson junctions

UF: Josephson logic
Superconducting junction

devices

BT: Superconducting devices
RT: Josephson effect

Josephson logic

USE: Josephson junctions

Journalism

BT: Publishing
RT: Broadcasting
Electronic publishing
Humanities
Information services
Multimedia communication
Radio broadcasting
Social networking (online)

JPEG

USE: Transform coding

JPEG2000

USE: Transform coding

Judd-Ofelt theory

BT: Spectral analysis
RT: Fluorescence
Photoluminescence

Junction detectors

USE: Semiconductor counters

Junction FETs

USE: JFETs

Junction lasers

USE: Semiconductor lasers

Junctionless nanowire transistors

BT: MOSFET
Nanoelectronics
RT: Nanowires
Silicon-on-insulator

Junctions

BT: Semiconductor devices
NT: Heterojunctions
Hybrid junctions
P-n junctions
Waveguide junctions

Junk e-mail

USE: Unsolicited e-mail

Junk email

USE: Unsolicited e-mail

Jupiter

BT: Planets

k neighbor methods

USE: Nearest neighbor methods

k neighbour methods

USE: Nearest neighbor methods

K-band

BT: Microwave bands

K-NN methods

USE: Nearest neighbor methods

Kaizen

USE: Continuous improvement



2022 IEEE Thesaurus

Kalman filtering

USE: Kalman filters

Kalman filters

UF: Kalman filtering

BT: Filters

RT: Estimation

Nonlinear dynamical

systems

Prediction methods

Sensor fusion

Soft sensors

Kaons

USE: Mesons

Karhunen-Loeve transforms

BT: Transforms

KBO

USE: Kuiper belt

Kelvin

BT: Temperature measurement

Kernel

BT: Mathematics

Operating systems

NT: Null space

System kernels

Kerr effect

BT: Electro-optic effects

RT: Cross-phase modulation

Magneto-optic 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

Keyword searches

USE: Keyword search

Keyword searching

USE: Keyword search

Kidney

BT: Urogenital system

NT: Kidney stones

Kidney stones

UF: Nephrolithiasis

Renal calculi

Urinary calculosis

BT: Kidney

Medical conditions

RT: Lithotripsy

Kilns

BT: Furnaces

RT: Calcination

Curing

Firing

Heat treatment

Kindle

USE: Consumer electronics AND

Electronic publishing

Kinematic analysis

USE: Kinematics

Kinematic faults

USE: Kinematics

Kinematic model

USE: Kinematics

Kinematic noise

USE: Kinematics

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



2022 IEEE Thesaurus

RT: Mechanical energy
Potential energy
Thermal energy

Kinetic molecular theory

USE: Kinetic theory

Kinetic theory

UF: Collision theory
Kinetic molecular theory
Kinetic-molecular theory
Kinetics

BT: Motion control
Physics

NT: Kinetic energy

Kinetic-molecular theory

USE: Kinetic theory

Kinetics

USE: Kinetic theory

Kirchhoff approximation

USE: Kirchhoff's Law

Kirchhoff current law

USE: Kirchhoff's Law

Kirchhoff law

USE: Kirchhoff's Law

Kirchhoff scattering

USE: Kirchhoff's Law

Kirchhoff's Law

UF: Kirchhoff approximation
Kirchhoff current law
Kirchhoff law
Kirchhoff scattering
BT: Spectroscopy

Kirk effect

USE: Kirk field collapse effect

Kirk field collapse effect

UF: Kirk effect
BT: Bipolar transistors

Klystrons

UF: Gyroklystrons
BT: Electron tubes
RT: Amplifiers
Cavity resonators
Colliding beam accelerators
Oscillators

Relativistic effects
Ring oscillators

Knee

BT: Extremities

Knee joint replacements

USE: Prosthetics

Knitted fabric composites

USE: Fabrics

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 management

UF: Intellectual capital
BT: Computer applications
Management



2022 IEEE Thesaurus

RT: Competitive intelligence
Information management
Knowledge discovery
Knowledge engineering
Management information

systems

NT: Semantic Web
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
Ontologies
Thesauri

Knowledge systems

USE: Knowledge based systems

Knowledge transfer

BT: Information management
Knowledge management

Knowledge-based systems

USE: Knowledge based systems

Kohonen maps

USE: Self-organizing feature

maps

KPI

USE: Key performance indicator

Krypton

BT: Chemical elements

Kuiper belt

UF: KBO
Kuiper belt objects
Kuiper belts
BT: Solar system

Kuiper belt objects

USE: Kuiper belt

Kuiper belts

USE: Kuiper belt

L-band

BT: Microwave bands

Lab-on-a-chip

UF: Lab-on-chip
BT: System-on-chip

Lab-on-chip

USE: Lab-on-a-chip

Label swapping

USE: Multiprotocol label

switching

Labeling

UF: Labelling
BT: Packaging
RT: Applicators
Packaging machines

Labelling

USE: Labeling

Labor productivity

USE: Productivity

Labor resources

UF: Labor supply
Labour resources
Labour supply
Manpower planning
BT: Human resource

management

RT: Personnel
Equal opportunities
Recruitment

Labor supply

USE: Labor resources

Laboratories

BT: Test facilities
RT: Engineering education
Research and development
Student experiments
NT: Remote laboratories

Labour productivity

USE: Productivity

Labour resources

USE: Labor resources

Labour supply

USE: Labor resources



2022 IEEE Thesaurus

Lacquers

BT: Chemical products
Coatings
Materials
RT: Paints

Lagrange duality

USE: Lagrangian functions

Lagrange functions

USE: Lagrangian functions

Lagrange relaxation

USE: Lagrangian functions

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

USE: Local area networks

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 mine detection

USE: Landmine detection

Land mines

USE: Landmine detection

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 cellular systems

USE: 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



2022 IEEE Thesaurus

NT:	Mobile antennas	NT:	Rail transportation
Land mobile radio networks			Bicycles
BT:	Cellular technology		Electric vehicles
			Road vehicles
<i>Land mobile radio service</i>		<i>Land-mobile radio</i>	
USE:	Land mobile radio	USE:	Land mobile radio
Land pollution		<i>Land-mobile radio cellular systems</i>	
BT:	Pollution	USE:	Cellular radio
RT:	Industrial pollution		
	Land use planning	<i>Land-mobile radio equipment</i>	
	Oil pollution	USE:	Land mobile radio
	Radioactive pollution	equipment	
NT:	Soil pollution	Landline	
Land surface		UF:	Home phone
BT:	Geoscience		Landline telephone
RT:	Land surface temperature		Main line
			POTS
Land surface temperature		BT:	Telephone equipment
UF:	Ground temperature	<i>Landline telephone</i>	
	Land temperature	USE:	Landline
BT:	Geoscience and remote		
sensing		Landmine detection	
RT:	Global warming	UF:	Land mine detection
	Land surface		Land mines
	Ocean temperature		Landmines
	Remote sensing	BT:	Buried object detection
<i>Land temperature</i>		RT:	Military equipment
USE:	Land surface temperature		Radar imaging
			Remote sensing
Land transportation		<i>Landmines</i>	
UF:	Ground transportation	USE:	Landmine detection
	Planetary landers		
BT:	Transportation	Landslides	
RT:	Global Positioning System	BT:	Geology
	Land vehicles	RT:	Hazards
NT:	Rail transportation	Lane departure warning systems	
	Road transportation	BT:	Road safety
			Vehicle safety
Land use planning		RT:	Collision avoidance
BT:	Environmental		Lane detection
management		Lane detection	
RT:	Floods	BT:	Vehicle safety
	Land pollution	RT:	Collision avoidance
	Reservoirs		Lane departure warning
	Water storage	systems	
Land vehicles			Road safety
UF:	Flexible fuel vehicles		
	Ground vehicles		
BT:	Vehicles		
RT:	Land transportation		



2022 IEEE Thesaurus

Lanthanum

BT: Metals
NT: Lanthanum compounds

Lanthanum compounds

BT: Lanthanum

Laparoscopes

BT: Surgical instruments
RT: Minimally invasive surgery

Laparoscopic surgery

USE: Minimally invasive surgery

Laplace equations

UF: Inverse transforms
Laplace operator
Laplace transform
Laplacian
BT: Mathematics

Laplace operator

USE: Laplace equations

Laplace transform

USE: Laplace equations

Laplacian

USE: Laplace equations

Lapping

BT: Machining
RT: Surface finishing

Laptops

USE: Microcomputers AND
Portable computers

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 integration

USE: Large scale integration

Large-scale systems

BT: System analysis and design
RT: Complex systems
Fuzzy systems

Large-screen displays

USE: Large screen displays

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



2022 IEEE Thesaurus

	Electro-optic modulators	NT:	Laser mode locking
	Laser theory		
	Lasers	Laser noise	
	Optical beams	BT:	Noise
	Optical vortices		Optical signal processing
	Refractive index	RT:	Lasers and electrooptics
	Supercontinuum generation	NT:	Laser feedback
	Thermal lensing		
NT:	Laser cooling	<i>Laser physics</i>	
		USE:	Laser theory
Laser cavity resonators		Laser printers	
BT:	Cavity resonators	BT:	Printers
RT:	Optical resonators		
	Surface emitting lasers	Laser radar	
Laser cladding		UF:	Lidar
BT:	Claddings		Optical radar
RT:	Pulsed laser deposition	BT:	Radar
		RT:	Geophysical measurement
Laser cooling		techniques	Optical scattering
BT:	Cooling		
	Laser beams	<i>Laser science</i>	
RT:	Ultracold atoms	USE:	Laser theory
<i>Laser deposition</i>		Laser sintering	
USE:	Pulsed laser deposition	UF:	Selective laser sintering
<i>Laser diodes</i>		BT:	Materials preparation
USE:	Diode lasers AND	RT:	Design automation
	Semiconductor lasers		Prototypes
			Stereolithography
Laser excitation		Laser stability	
UF:	Electron beam pumping	BT:	Lasers
	Excitation of lasers	RT:	Stability analysis
	Pumping of lasers		
BT:	Lasers	Laser surgery	
NT:	Optical pumping	BT:	Surgery
Laser feedback		Laser theory	
BT:	Laser noise	UF:	Laser physics
			Laser science
Laser fusion		BT:	Laser applications
BT:	Laser applications	RT:	Laser beams
<i>Laser guide stars</i>			Lasers
USE:	Laser beams		Optical beams
			Optical design
Laser materials processing			Optics
BT:	Materials processing		Particle beams
			Quantum mechanics
Laser mode locking		Laser transitions	
BT:	Laser modes	BT:	Lasers
Laser modes			
BT:	Lasers		



2022 IEEE Thesaurus

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 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: Electro-optic effects
Electro-optic devices
Lasers
Optics
Optoelectronic devices
Photonics

Latches

BT: Bistable circuits

Lattice Boltzmann

USE: Lattice Boltzmann methods

Lattice Boltzmann methods

UF: Lattice Boltzmann
BT: Boltzmann distribution
Lattices
RT: Fluid dynamics

Lattices

UF: Optical lattices
BT: Mathematics
NT: Lattice Boltzmann methods

Launching (electromagnetic)

USE: Electromagnetic launching

Launching (electrothermal)

USE: Electrothermal launching

Law

UF: Legal aspects
BT: Legal factors
NT: Censorship
Commercial law
Consumer protection
Contract law
Criminal law
Employment law
Forensics
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



2022 IEEE Thesaurus

Layered media

USE: Nonhomogeneous media

Layered-division-multiplexing

USE: Layered division
multiplexing

Layout

BT: Graphics
RT: Art
Geometry
Integrated circuit layout
Wiring

LCD

USE: Liquid crystal displays

LCDs

USE: Liquid crystal displays

Lcos

USE: Liquid crystal on silicon

LDM

USE: Layered division
multiplexing

LDPA

USE: Log-periodic dipole
antennas

LDPC

USE: Parity check codes

Ldpc codes

USE: Parity check codes

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

Lead-acid batteries

USE: Lead acid batteries

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

Leaky-wave antennas

USE: Leaky wave antennas

Lean production

BT: Manufacturing systems
Production systems
RT: Production management

Learning (artificial intelligence)

BT: Artificial intelligence
RT: AI accelerators
Electronic learning
Fuzzy cognitive maps
Gaussian processes
Image annotation
Manifold learning
Soft sensors
NT: Distance learning



2022 IEEE Thesaurus

Naive Bayes methods	BT:	Least squares
Nearest neighbor methods	approximations	Mean square error methods
Learning automata		
UF:	Learning automaton	
BT:	Learning systems	
<i>Learning automaton</i>		
USE:	Learning automata	
Learning management systems		
BT:	Computer aided instruction	
	Learning systems	
RT:	Computer applications	
	Electronic learning	
	Management	
	Training	
<i>Learning mechanisms</i>		
USE:	Learning systems	
<i>Learning methods</i>		
USE:	Learning systems	
Learning systems		
UF:	Learning mechanisms	
	Learning methods	
	Learning-based method	
BT:	Artificial intelligence	
RT:	Adaptive systems	
	Context awareness	
	Cybernetics	
	Deep learning	
	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	
<i>Learning-based method</i>		
USE:	Learning systems	
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	
	<i>Least-squares approximations</i>	
	USE:	Least squares
	approximations	
	<i>LED</i>	
	USE:	Light emitting diodes
	LED lamps	
	UF:	AC light emitting diode
	lamps	
		AC-LED lamps
		Light emitting diode lamps
	BT:	Lamps
		Light emitting diodes
	RT:	Light sources
	<i>LEDs</i>	
	USE:	Light emitting diodes
	<i>Left handed materials</i>	
	USE:	Metamaterials
	<i>Left-handed materials</i>	
	USE:	Metamaterials
	Leg	
	BT:	Extremities
	<i>Legal aspects</i>	
	USE:	Law
	Legal factors	
	BT:	Engineering management
	RT:	Censorship
		Ethical aspects
		Governmental factors
		IEEE Corporate activities
		Law enforcement
	NT:	Copyright protection



2022 IEEE Thesaurus

	Law	BT:	Mechanical variables
	Patents	control	
	Product liability	NT:	Gyroscopes
	Software protection		
	Trademarks		
Legged locomotion		Level measurement	
UF:	Biped locomotion	UF:	Liquid level measurement
	Gait assessment	BT:	Geodesy
	Gait control		
	Gait disorders	Level set	
	Walking	BT:	Calculus
BT:	Mobile robots	RT:	Gradient methods
RT:	Biological control systems		
	Control systems	<i>Levels, energy</i>	
	Motion control	USE:	Energy states
	Stairs		
Legislation		Levitation	
BT:	Government	BT:	Physics
NT:	General Data Protection	NT:	Electrostatic levitation
Regulation			Magnetic levitation
		<i>LF noise</i>	
Length measurement		USE:	Low-frequency noise
BT:	Measurement		
RT:	Micrometers	<i>LHC</i>	
	Size measurement	USE:	Large Hadron Collider
<i>Lens</i>			
USE:	Lenses	<i>Li</i>	
		USE:	Lithium
Lenses		<i>li-fi</i>	
UF:	Lens	USE:	Light fidelity
BT:	Optical devices		
RT:	Focusing	<i>Li-ion batteries</i>	
	Optical materials	USE:	Lithium-ion batteries
<i>LEO</i>		<i>Li-S batteries</i>	
USE:	Low earth orbit satellites	USE:	Lithium-sulfur batteries
Lesions		Libraries	
BT:	Tumors	BT:	Information services
NT:	Tissue damage	NT:	Software libraries
Levee		<i>Licence</i>	
UF:	Dike	USE:	Licenses
	Levee system		
BT:	Geoscience	<i>License plate recognition</i>	
<i>Levee system</i>		USE:	Optical character
USE:	Levee	recognition software	
Level control		Licenses	
UF:	Liquid level control	UF:	Licence
			Licensing
		BT:	Contracts
		RT:	Must-carry regulations



2022 IEEE Thesaurus

Licensing

USE: Licenses

Licensing (nuclear facilities)

USE: Nuclear facility regulation

Lidar

USE: Laser radar

Life estimation

UF: Accelerated testing

BT: Estimation

RT: Aging
Failure analysis
Fatigue
Insulation life

Life long learning

USE: Continuing professional development

Life sciences

UF: Computational life sciences

BT: Science - general

RT: Animals
Biology
Plants (biology)

Life sciences computing

USE: Computational modeling

Life testing

BT: Testing

RT: Reliability

Lifetime estimation

UF: Lifetime measurement

BT: Lifetime tests

BT: Measurement

Lifetime measurement

USE: Lifetime estimation

Lifetime tests

USE: Lifetime estimation

lifi

USE: Light fidelity

Lifting equipment

UF: Hoists

Jacks

BT: Materials handling

equipment

RT: Freight handling

Materials handling

Pulleys

Winches

NT: Cranes

Ligaments

BT: Musculoskeletal system

Light attenuation

USE: Attenuation

Light emitters

USE: Light emitting diodes

Light emitting diode lamps

USE: LED lamps

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 interferometry

USE: Optical interferometry



2022 IEEE Thesaurus

Light polarisation

USE: Optical polarization

Light polarization

USE: Optical polarization

Light rail systems

UF: Light railways
Streetcars

BT: Rail transportation
RT: Public transportation

Light railways

USE: Light rail systems

Light scattering

BT: Scattering
RT: Optical scattering
Resonance light scattering

Light sources

BT: Optics
RT: Arc discharges
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

Light-emitting diodes

USE: Light emitting diodes

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: Daylighting
Electrical ballasts
Emergency lighting
Lamps
Smart lighting
Solid state lighting

Lighting control

UF: Illumination control
BT: Optical control
RT: High intensity discharge

lamps

Lamps
Light sources
Lighting

Lightning

BT: Meteorology
RT: Dielectric breakdown
Electrostatic processes
Storms
NT: Lightning protection

Lightning protection

BT: Lightning
Protection

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 cycle

USE: Limit-cycles



2022 IEEE Thesaurus

Limit-cycle

USE: Limit-cycles

Limit-cycles

UF: Limit cycle
Limit-cycle
BT: Mathematics

Limiting

BT: Signal processing
RT: Nonlinear distortion
Voltage control

Linac

USE: Linear particle accelerator

LINACS

USE: Linear accelerators

Line enhancers

BT: Adaptive systems
RT: Digital filters
Filtering theory

Line output transformer

USE: Flyback transformers

Line-of-sight propagation

BT: Electromagnetic radiation

Linear accelerators

UF: LINACS
BT: Particle accelerators
RT: Collimators

Linear algebra

UF: Linear systems (algebraic)
BT: Algebra
RT: Eigenvalues and

eigenfunctions

NT: Linear programming
Matrices
Vectors

Linear antenna arrays

BT: Antenna arrays

Linear approximation

BT: Approximation methods
RT: Nonlinear equations
Nonlinear systems

Linear circuits

BT: Circuits
RT: Ohmic contacts

Linear codes

BT: Block codes
RT: Error correction
NT: Polar codes

Linear discriminant analysis

UF: Linear discriminant
classification
BT: Statistics
RT: Machine learning

Linear discriminant classification

USE: Linear discriminant analysis

Linear feedback control systems

BT: Control systems
Cybernetics
RT: Linear systems
NT: Frequency locked loops
Phase locked loops
State feedback
Tracking loops

Linear feedback shift registers

BT: Shift registers

Linear filtering

USE: Maximum likelihood
detection

Linear frequency modulation

USE: Chirp modulation

Linear integrated circuits

USE: Analog integrated circuits

Linear matrix inequalities

BT: Mathematics
RT: Linear systems
Uncertain systems

Linear parameter varying systems

USE: Linear systems

Linear particle accelerator

UF: Linac
Particle accelerator
BT: High energy physics
instrumentation computing

Linear predictive coding

BT: Prediction methods

Linear programming

UF: Linear-programming



2022 IEEE Thesaurus

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 flow

USE: Fluid flow

Liquid insulation

USE: Dielectric liquids

Liquid level control

USE: Level control

Liquid level measurement

USE: Level measurement

Liquid nitrogen

BT: Cryogenics
 Refrigerants

Liquid waveguides

BT: Hollow waveguides

Liquid-crystal devices

USE: Liquid crystal devices

Liquid-crystal displays

USE: Liquid crystal displays

Liquid-crystal polymers

USE: Liquid crystal polymers

Liquids

BT: Fluids
 RT: Aerosols
 Electrohydraulics
 Materials science and

technology

NT: Spraying
 Water

LiquiFerrofluid

USE: Ferrofluid

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 ion batteries

USE: Lithium-ion batteries

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



2022 IEEE Thesaurus

lithography	NT:	Proximity effects Colloidal lithography Extreme ultraviolet	Load flow control	UF:	Power flow control
		Interferometric lithography Nanolithography Soft lithography Stereolithography X-ray lithography		BT:	Power system control
				NT:	Power factor correction
Lithotripsy			Load forecasting	BT:	Power demand
BT:		Medical treatment		RT:	Load management Load monitoring
RT:		Kidney stones Lithotriptors	Load management		
Lithotriptors			UF:		Load balancing Load compensation Load composition Load variations
BT:		Biomedical equipment		BT:	Energy management
RT:		Lithotripsy		RT:	Energy storage Load forecasting Pallets Power demand Vehicle-to-grid
Liver				NT:	Load monitoring Load shedding
BT:		Digestive system			
NT:		Liver diseases	Load modeling		
Liver diseases			BT:		Modeling Power system modeling
BT:		Liver		RT:	Power demand
Liver neoplasms			Load monitoring		
BT:		Neoplasms	BT:		Load management Monitoring
<i>Livestock</i>				RT:	Energy consumption Load forecasting Power system control Power system
USE:		Agriculture	measurements		SCADA systems
<i>LNG</i>			Load shedding		
USE:		Liquefied natural gas	BT:		Load management
<i>Load balancing</i>			RT:		Power distribution
USE:		Load management	<i>Load tap changers</i>		
<i>Load compensation</i>			USE:		On load tap changers
USE:		Load management	<i>Load variations</i>		
<i>Load composition</i>			USE:		Load management
USE:		Load management	Loaded antennas		
Load flow			BT:		Antennas
UF:		Power flow	Loaded waveguides		
BT:		Power system management	BT:		Electromagnetic waveguides
NT:		Load flow analysis			
Load flow analysis					
UF:		Power flow analysis			
BT:		Load flow			
RT:		Power system security Power transmission			



2022 IEEE Thesaurus

	RT: Dielectric materials Waveguide discontinuities		Location awareness UF: Geo tagging Localization Location based services Location metadata Mobile location management management BT: Mobile communication RT: Cellular radio Intercell interference Land mobile radio Mobile computing Navigation Personal communication networks Position measurement Wireless communication Network location NT: awareness <i>Location based services</i> USE: Location awareness <i>Location metadata</i> USE: Location awareness <i>Log normal distribution</i> USE: Log-normal distribution 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
Loading	BT: Freight handling RT: Containers Filling Grippers Pulleys		
Loans and mortgages	UF: Mortgages BT: Financial management		
<i>Local area network emulation</i>	USE: LAN emulation		
Local area networks	UF: LAN BT: Communication systems Digital systems Distributed computing RT: 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		
<i>Local authorities</i>	USE: Local government		
Local government	UF: Local authorities BT: Government		
Local oscillators	BT: Oscillators		
<i>Localization</i>	USE: Location awareness		



2022 IEEE Thesaurus

Logic arrays

BT: Circuits
Logic circuits
NT: Programmable logic arrays

Logic CAD

USE: Logic design

Logic circuit testing

USE: Logic testing

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 inverters

USE: Pulse inverters

Logic programming

BT: Programming
NT: Constraint handling

Logic test

USE: Logic testing

Logic testing

UF: Logic circuit testing
Logic test
BT: Integrated circuit testing
RT: Design for testability

Logical decomposition

USE: System analysis and design

Logistics

UF: Physical distribution
management
BT: Production management
RT: Procurement
NT: Reverse logistics
Supply chains

Long short term memory

UF: LSTM
BT: Artificial neural networks
RT: Machine learning

Long Term Evolution

UF: LTE
LTE advanced
BT: 3GPP Standards
Communication standards
4G mobile communication
High-speed networks
Mobile communication
Mobile handsets
Wireless communication

Look-up table

USE: Table lookup



2022 IEEE Thesaurus

Lookup table

USE: Table lookup

Loop-filtering algorithm

USE: Filtering algorithms

LOPT

USE: Flyback transformers

Loran

USE: Radio navigation

Lorentz covariance

UF: Lorentz force
Lorentz invariance
BT: Physics

Lorentz force

USE: Lorentz covariance

Lorentz invariance

USE: Lorentz covariance

Loss measurement

BT: Measurement
RT: Attenuation measurement
Magnetic losses
Optical losses
NT: Packet loss

Lot sizing

BT: Production control
RT: Materials requirements

planning

Loudspeakers

BT: Audio systems
RT: Acoustic distortion

Low density parity check codes

USE: Parity check codes

Low earth orbit satellites

UF: LEO
Low-earth-orbit
BT: Artificial satellites

Low fossile fuel economy

USE: Low-carbon economy

Low frequency noise

USE: Low-frequency noise

Low latency communication

UF: Low-latency communication

BT: Communication systems

NT: Ultra reliable low latency communication

Low noise amplifiers

USE: Low-noise amplifiers

Low pass filters

USE: Low-pass filters

Low power electronics

USE: Low-power electronics

Low temperature plasmas

USE: Low-temperature plasmas

Low voltage

UF: Low-voltage
BT: Voltage measurement

Low-carbon economy

UF: Decarbonisation
Decarbonised economy
Decarbonization
Decarbonized economy
Low fossile fuel economy
BT: Power system economics
RT: Carbon
Ecosystems
Environmental

management

Global warming
Greenhouse effect
Renewable energy sources

Low-earth-orbit

USE: Low earth orbit satellites

Low-frequency noise

UF: LF noise
Low frequency noise
BT: Noise

Low-latency communication

USE: Low latency communication

Low-noise amplifiers

UF: Low noise amplifiers
BT: Amplifiers

Low-pass filters

UF: Low pass filters
BT: Filters



2022 IEEE Thesaurus

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

Low-voltage

USE: Low voltage

LPWAN

USE: Low-power wide area networks

LSI

USE: Large scale integration

LSTM

USE: Long short term memory

LTE

USE: Long Term Evolution

LTE advanced

USE: Long Term Evolution

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

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

Lunar

USE: Moon

Lung

BT: Respiratory system
RT: Pulmonary diseases
Pulmonology

Lung cancer

BT: Cancer

Lung diseases

USE: Pulmonary diseases

Lung neoplasms

BT: Neoplasms

LUT

USE: Table lookup

Lutecium

USE: Lutetium

Lutetium

UF: Lutetium
BT: Chemical elements

Lyapunov function

USE: Lyapunov methods

Lyapunov methods

UF: Lyapunov function
Lyapunov stability
BT: System analysis and design
RT: Control design
Functional analysis
Stability



2022 IEEE Thesaurus

Lyapunov stability

USE: Lyapunov methods

Lymph nodes

BT: Lymphatic system

Lymphatic system

BT: Anatomy

NT: Lymph nodes

M2M

USE: Machine-to-machine
communications

MAC

USE: Media Access Protocol

MAC protocol

USE: Media Access Protocol

Mach-Zehnder interferometers

UF: Mach-Zehnder modulation

BT: Interferometers

Mach-Zehnder modulation

USE: Mach-Zehnder
interferometers

Machine added indexing

USE: Machine assisted indexing

Machine aided indexing

USE: Machine assisted indexing

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 indexing

USE: Machine assisted indexing

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

Deep architecture

Energy informatics

Generative adversarial

networks

Linear discriminant analysis

Long short term memory

Naive Bayes methods

Predictive analytics

Radiomics



2022 IEEE Thesaurus

learning NT: Adversarial machine
Boosting
Deep learning
Dimensionality reduction
Random forests
Reinforcement learning
Relevance vector machines
Representation learning
Robot learning
Statistical learning
Transfer learning

Machine learning algorithms

BT: Algorithms

Machine morality

USE: Machine ethics

Machine shops

BT: Production facilities
RT: Machine tools
Machinery production

industries

Machining

Machine tool spindles

UF: Spindle bearings
BT: Machine tools
RT: Mechanical splines
Shafts

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-added indexing

USE: Machine assisted indexing

Machine-aided indexing

USE: Machine assisted indexing

Machine-assisted indexing

USE: Machine assisted indexing

Machine-learning

USE: Machine learning

Machine-to-machine communications

UF: M2M
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



2022 IEEE Thesaurus

Machinery

BT: Industry applications
RT: Machinery production industries

Machining
Materials handling
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
Lapping
Laser beam machining
Milling
Planing
Sawing
Turning
Virtual machining

Macrocell networks

UF: Macrocells
BT: Cellular networks
RT: Rural areas

Macrocells

USE: Macrocell networks

Macroeconomics

BT: Economics
RT: Government
International trade
Public finance
NT: Privatization

Maglev

USE: Magnetic levitation

Maglev trains

USE: Magnetic levitation vehicles

Maglev transportation

USE: Magnetic levitation vehicles

Maglev vehicles

USE: Magnetic levitation vehicles

Magnesium

UF: Mg
BT: Metals
NT: Magnesium compounds

Magnesium compounds

BT: Magnesium
NT: Magnesium oxide

Magnesium oxide

UF: Irtran 5
MgO
BT: Magnesium compounds
RT: Ceramics
Optical materials

Magnetic analysis

BT: Magnetism
RT: Electromagnetic analysis
Magnetic fields
NT: Magnetization

Magnetic anisotropy

BT: Magnetism
NT: Magnetic domain walls
Magnetic domains
Magnetic moments
Perpendicular magnetic

anisotropy

Magnetic anomaly detection

BT: Magnetic variables
measurement



2022 IEEE Thesaurus

RT:	Magnetic fields Object detection	Magnetic domain walls BT: Magnetic anisotropy
Magnetic anomaly detectors BT: Magnetometers RT: Magnetic fields Military equipment Object detection		Magnetic domains BT: Magnetic anisotropy
<i>Magnetic bearings</i> USE: Magnetic levitation		Magnetic field induced strain BT: Magnetomechanical effects RT: Ferroelectric films Ferroelectric materials MISFETs Semiconductor diodes Semiconductor films Semiconductor-metal
Magnetic circuits BT: Circuits RT: Coils Magnetic devices Windings		interfaces
Magnetic communication BT: Communication systems RT: Electromagnetic induction Near field communication		Magnetic field measurement BT: Magnetic variables measurement RT: Magnetic fields
Magnetic confinement BT: Plasma confinement RT: Electromagnets Fusion power generation Tokamak devices Tokamaks		Magnetic fields BT: Magnetism 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 Geomagnetism Magnetic reconnection Magnetic separation Magnetostatics Toroidal magnetic fields
<i>Magnetic core losses</i> USE: Magnetic losses		
Magnetic cores BT: Magnetic devices RT: Inductors NT: Transformer cores		
Magnetic devices BT: Magnetism RT: Magnetic circuits Magnetic materials NT: Accelerator magnets Ferrite devices Magnetic cores Magnetic gears Magnetic heads Magnetic memory Magnetic modulators Magneto optic devices Magnetoresistive devices Magnetostriuctive devices Solenoids Transformer cores Undulators		Magnetic films UF: Magnetic thin films BT: Films Magnetic materials RT: Thin films NT: Ferrite films Garnet films
		<i>Magnetic filters</i> USE: Magnetic separation



2022 IEEE Thesaurus

Magnetic fluids

USE: Magnetic liquids

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 materials
Ferrite films
Ferrites
Ferrofluid
Ferromagnetic materials
Garnet films
Garnets
Magnetic films
Magnetic liquids
Magnetic semiconductors
Magnetic superlattices



2022 IEEE Thesaurus

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 storage

USE: Magnetic memory

Magnetic superlattices

BT: Magnetic materials
Superlattices

Magnetic susceptibility

BT: Magnetics

Magnetic switching

BT: Magnetics

Magnetic thin films

USE: Magnetic films

Magnetic tunnel junctions

USE: Magnetic tunneling

Magnetic tunneling

UF: Magnetic tunnel junctions
Magnetic tunnelling
Spin-dependent tunneling
Spin-dependent tunnelling
BT: Magnetoelectric effects
Tunneling
RT: Magnetoelectronics
Spin polarized transport

Magnetic tunnelling

USE: Magnetic tunneling

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
Nonlinear magnetics
Remanence
Spin systems

Magnetisation

USE: Magnetization

Magnetisation processes

USE: Magnetization processes

Magnetisation reversal

USE: Magnetization reversal

Magnetization

UF: Magnetisation
BT: Magnetic analysis



2022 IEEE Thesaurus

Magnetization processes

UF: Magnetisation processes
BT: Magnetism
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

Magneto-electronics

USE: Magnetoelectronics

Magneto-optical effects

USE: Magneto-optic effects

Magnetoacoustic effects

UF: Acoustomagnetic effects
BT: Magnetism
RT: Acoustics
Magnetomechanical effects

Magnetoelasticity

BT: Magnetomechanical effects
RT: Magnetic materials
NT: Magnetostriction

Magnetoelectric effects

BT: Magnetism
NT: Hall effect
Magnetic tunneling
Magnetoelectronics
Magnetoresistance
Spintronics

Magnetoelectronic devices

USE: Magnetoelectronics

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

Magnetofluid dynamics

USE: Magnetohydrodynamics

Magnetofluid dynamics

USE: Magnetohydrodynamics

Magnetohydrodynamic power generation

BT: Power generation
RT: Magnetohydrodynamics

Magnetohydrodynamics

UF: Hydromagnetics
MHD
Magnetofluid dynamics
Magnetofluid dynamics
BT: Dynamics
Hydrodynamics
Mechanical factors
RT: Electrohydraulics
Fluid flow
Magnetohydrodynamic

power generation

Magnetomechanical effects

UF: Piezomagnetic effects
BT: Magnetism
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

Magnetometry

USE: Magnetometers

Magneto-optic devices

UF: Photomagnetic devices
BT: Magnetic devices
RT: Magneto-optic effects



2022 IEEE Thesaurus

Magneto-optic effects

UF: Magneto-optical effects
Photomagnetic effects
BT: Magnetics
RT: Kerr effect
Magneto-optic devices
Magneto-optic recording
Optics
Ultracold atoms
NT: Faraday effect
Gyrotropism

Magneto-optic recording

BT: Laser applications
Magnetic recording
RT: Magneto-optic 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
Tunneling
magnetoresistance
Magnetoresistivity
USE: Magnetoresistance
Magnetoresistors
USE: Magnetoresistive devices

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

Magnetotail

USE: Magnetosphere

Magnetrons

BT: Electron tubes
RT: Relativistic effects
Sputtering

Magnets

BT: Magnetics
RT: Cobalt
Saturation magnetization
NT: Electromagnets
Micromagnetics
Permanent magnets

Magnonics

BT: Magnetics

MAI

USE: Machine assisted indexing

Mail

USE: Postal services

Mail (electronic)

USE: Electronic mail

Main frames

USE: Mainframes



2022 IEEE Thesaurus

Main line

USE: Landline

main secondary

USE: Main-secondary

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

Major depressive disorder

USE: Depression

Maldistribution

BT: Reliability

Malicious software

USE: Malware

Malignancy

USE: Cancer

Malignant

USE: Cancer

Malignant tumors

BT: Tumors

Malware

UF: Malicious software
BT: Software
RT: Anti-virus software
Cyber espionage
Phishing
Privacy
Security
NT: Computer viruses
Computer worms
Ransomware
Rootkit
Trojan horses

Mammary glands

BT: Glands

Mammary neoplasms

USE: Breast neoplasms

Mammography

BT: Biomedical imaging
RT: Medical tests

Man machine systems

USE: Man-machine systems

Man-machine interfaces

USE: User interfaces

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



2022 IEEE Thesaurus

	RT:	Analytic hierarchy process	Risk analysis
		Ethical aspects	Safety management
		Learning management	Security management
systems			Storage management
		Management information	Supply chain management
systems			Technical management
		Management training	Technology management
		Operations research	
		Personnel	
		Productivity	
	NT:	Asset management	Management accounting
		Best practices	BT: Financial management
		Building management	NT: Cost accounting
systems		Business continuity	Management information base
		Business process	UF: MIB
			BT: Computer network
management		Business process re-	management
			RT: Information systems
engineering		Communication system	Telecommunication
			network management
operations and management		Conference management	Virtual environments
		Content management	
		Contingency management	Management information systems
		Contract management	BT: Information systems
		Contracts	RT: Customer relationship
		Customer relationship	management
management		Decision making	Knowledge management
		Dependability management	Management
		Distributed management	Supply chain management
		Enterprise resource	NT: Portals
planning		Facilities management	Management training
		Financial management	BT: Training
		Governmental factors	RT: Continuing education
		Human resource	Management
management		Information management	<i>MANET</i>
		Interface management	USE: Mobile ad hoc networks
		International collaboration	
		Knowledge management	Manganese
		Marketing management	UF: Mn
		Organizational aspects	BT: Metals
		Outsourcing	NT: Manganese alloys
		Process planning	
		Production management	Manganese alloys
		Program management	BT: Manganese
		Project management	
		Public relations	Manifold learning
		Quality management	BT: Dimensionality reduction
		Requirements management	RT: Learning (artificial
		Research and development	intelligence)
management		Resource management	Manifolds
			UF: Exhaust manifolds
			BT: Machine components
			RT: Engines



2022 IEEE Thesaurus

Exhaust systems		NT:		Ceramic products
Valves				Chemical products
Manipulator dynamics				Consumer products
BT:	Manipulators			Electrical products
<i>Manipulator sensing systems</i>				Food products
USE:	Robot sensing systems			Fuels
<i>Manipulator vision systems</i>				Glass products
USE:	Robot vision systems			Mechanical products
Manipulators				Metal products
BT:	Robots			Paper products
RT:	Assembly			Paper pulp
	Assembly systems			Plastic products
	Control equipment			Rubber products
	Control systems			Sports equipment
	Industrial control			Textile products
	Manufacturing automation			Tools
	Materials handling			Windows
	Mechanical variables			
control		Manufacturing	BT:	Industry applications
	Medical robotics		RT:	Bonding
	Motion control			Business
	Nonlinear systems			Discrete-event systems
	Position control			Industrial plants
	Service robots			Machine tools
	Servomechanisms			Machining
	Servosystems			Materials handling
	Telerobotics			Materials processing
NT:	End effectors			Production control
	Manipulator dynamics			Production engineering
	Micromanipulators			Production facilities
<i>Manipulators (nonrobotic)</i>				Production systems
USE:	Remote handling			Productivity
<i>Manpower planning</i>				Soldering
USE:	Labor resources			Stereolithography
Manuals				Welding
UF:	Technical manuals			Wheels
BT:	Professional			Wire drawing
communication			NT:	Assembly
RT:	Documentation			Assembly systems
	Training			Embossing
	Writing			Fabrication
Manufactured products				Fourth Industrial Revolution
UF:	Counterfeit goods			Green manufacturing
BT:	Manufacturing			Lithography
RT:	Product customization			Manufactured products
	Product design			Manufacturing systems
	Product development			Mass customization
				Smart manufacturing
				Tolerance analysis
		Manufacturing automation	UF:	Factory automation
			BT:	Automation
				Industrial electronics



2022 IEEE Thesaurus

RT:	Assembly	BT:	Manufacturing process
	Assembly systems	BT:	Manufacturing systems
	Automatic optical inspection	RT:	Rapid prototyping
	Industrial control	NT:	Sintering
	Machine vision		
	Manipulators	Manufacturing systems	
	Mobile robots	BT:	Manufacturing
	Process control		Production systems
	Programmable control	RT:	Bleaching
	Robots		Industrial facilities
NT:	Computer aided		Production engineering
manufacturing		NT:	Agile manufacturing
	Computer integrated		Automobile manufacture
manufacturing			Batch production systems
	Computer numerical control		Blanking
	Flexible manufacturing		Cellular manufacturing
systems			Flow production systems
			Food manufacturing
<i>Manufacturing economics</i>			Forging
USE:	Industrial economics		Glass manufacturing
			Integrated manufacturing
<i>Manufacturing facilities</i>		systems	
USE:	Production facilities		Intelligent manufacturing
		systems	
Manufacturing industries			Job production systems
BT:	Industries		Joining processes
NT:	Aerospace industry		Layered manufacturing
	Cement industry		Lean production
	Ceramics industry		Manufacturing processes
	Clothing industry		Mass production
	Electrical products industry		Melt processing
	Electronics industry		Pulp manufacturing
	Food industry		Sheet metal processing
	Footwear industry		Thermoforming
	Fuel processing industries		Three-dimensional printing
	Glass industry		
	Machinery production	<i>Many core processing</i>	
industries		USE:	Multicore processing
	Metal product industries		
	Plastics industry	<i>Many core systems</i>	
	Pulp and paper industry	USE:	Multicore processing
	Rubber industry		
	Shipbuilding industry	<i>Many valued logic</i>	
	Textile industry	USE:	Multivalued logic
	Toy manufacturing industry		
		<i>Manycore computing</i>	
<i>Manufacturing management</i>		USE:	Manycore processors
USE:	Production management		
		Manycore processors	
<i>Manufacturing process</i>		UF:	Manycore computing
USE:	Manufacturing processes	BT:	Multicore processing
		RT:	Program processors
Manufacturing processes			
UF:	Compliant mechanisms		
	Froth flotation		



2022 IEEE Thesaurus

Marine accidents

BT: Accidents
RT: Marine pollution
Marine safety
Marine vehicles

RT: Marine accidents
Marine technology
Marine vehicles

Marine science

USE: Oceanography

Marine animals

UF: Ocean animals
Sea animals
BT: Animals
RT: Aquaculture
NT: Dolphins
Whales

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 cables

USE: Underwater cables

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 transportation

BT: Marine technology
RT: Global Positioning System
Seaports
NT: Marine vehicles

Marine pollution

BT: Water pollution
RT: Marine accidents
Oil pollution
Oils
Thermal pollution

Marine vegetation

UF: Ocean vegetation
Sea vegetation
BT: Vegetation

Marine robots

BT: Marine vehicles
Robots
Underwater technology
RT: Autonomous underwater

Marine vehicles

UF: Ships
BT: Marine transportation
RT: Marine accidents
Marine safety
Propellers
Seaports
NT: Boats
Marine robots
Underwater vehicles

vehicles

Boats
Marine equipment
Marine navigation
Military vehicles
Mobile robots
Oceanography
Rescue robots
Underwater vehicles

Maritime communications

BT: Communication networks

Market opportunities

BT: Marketing management
RT: Consumer behavior
Customer profiles
Disruptive innovation
Disruptive technologies

Marine safety

BT: Safety



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2022 IEEE Thesaurus

	Emissions trading		Mars		
	Neuromarketing		BT:	Planets	
Market research			<i>Mars Express</i>		
BT:	Customer relationship		USE:	Interplanetary exploration	
management			<i>Mars Odyssey</i>		
RT:	Engineering management		USE:	Interplanetary exploration	
	Brand management		Martensite		
	Competitive intelligence		BT:	Crystalline materials	
	Consumer products			Steel	
	Customer satisfaction		RT:	Smart materials	
	Neuromarketing				
Marketing management			Masers		
BT:	Management		UF:	Microwave lasers	
RT:	Electronic commerce		BT:	Microwave devices	
	Public relations			Microwave technology	
NT:	Advertising		RT:	Atomic clocks	
	Brand management			Relativistic effects	
	Distribution strategy			Ring oscillators	
	Market opportunities			Stimulated emission	
	Mass customization		NT:	Gyrotrons	
	Promotion - marketing				
<i>Markov decision processes</i>			<i>MASH</i>		
USE:	Markov processes		USE:	Multi-stage noise shaping	
<i>Markov network</i>			<i>Mashing</i>		
USE:	Markov random fields		USE:	Mashups	
Markov processes			Mashups		
UF:	Markov decision processes		UF:	Mashing	
BT:	Stochastic processes		BT:	Web services	
RT:	Belief propagation			World Wide Web	
	Dynamic programming		Masking threshold		
	Hidden Markov models		BT:	Psychoacoustic models	
	Infinite horizon				
	Q-learning		Mass customization		
NT:	Markov random fields		BT:	Manufacturing	
				Marketing management	
Markov random fields			Mass production		
UF:	Markov network		BT:	Manufacturing systems	
BT:	Markov processes		RT:	Production management	
Markup languages			<i>Mass spectrometry</i>		
BT:	Computer languages		USE:	Mass spectroscopy	
RT:	Cascading style sheets				
	Semantic Web		Mass spectroscopy		
NT:	HTML		UF:	Mass spectrometry	
	OWL		BT:	Spectroscopy	
	Page description languages				
	SGML		Massive machine type communications		
	XML		UF:	MMTC	



2022 IEEE Thesaurus

BT: mmtc
Machine-to-machine
communications
RT: Intelligent systems

Massive MIMO

BT: MIMO communication

Mastercard

USE: Credit cards

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

materials

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
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
Lacquers
Laminates
Magnetic materials
Material properties
Media
Mesoporous materials
Metal foam
Metallic materials
Metamaterials
Nanostructured materials
Oils
Optical materials
Organic inorganic hybrid
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



2022 IEEE Thesaurus

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

Materials handling equipment

BT: Materials handling
RT: Machinery
Production equipment
Waste handling equipment
NT: Containers
Grippers
Lifting equipment
Pulleys
Remote handling
equipment
Winches

Materials handling systems

USE: Materials handling

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



2022 IEEE Thesaurus

Materials science

USE: Materials science and technology

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

NT: Testing
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

Maternity benefits

USE: Employee welfare

Mathematical analysis

BT: Mathematical models
NT: Formal concept analysis
Fractional calculus
Modal analysis

Mathematical models

BT: Mathematics
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
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



2022 IEEE Thesaurus

Functional analysis		Numerical analysis
Geometry		Simulation
Gradient methods		Software libraries
Graph theory		
Harmonic analysis	Matrices	
Iterative methods	UF:	Matrix algebra
Kernel	BT:	Linear algebra
Laplace equations	RT:	Method of moments
Lattices		Mode matching methods
Limit-cycles	NT:	Jacobian matrices
Linear matrix inequalities		Matrix decomposition
Linear systems		Singular value
Linearization techniques	decomposition	
Mathematical models	<i>Matrix algebra</i>	
Mathematical programming	USE:	Matrices
Method of moments		
Minimization	Matrix converters	
Mode matching methods	UF:	Matrix convertors
Network theory (graphs)	BT:	Power conversion
Nonlinear equations	RT:	Power electronics
Nonlinear systems		
Numerical analysis	<i>Matrix convertors</i>	
Optimization	USE:	Matrix converters
Piecewise linear techniques		
Predator prey systems	Matrix decomposition	
Probability	BT:	Matrices
Quaternions	RT:	Signal processing
Random processes		Statistics
Root mean square	<i>Matrix laboratory</i>	
Sequences	USE:	Matlab
Set theory	Matter waves	
Simulated annealing	UF:	De Broglie methods
Smoothing methods		De broglie hypothesis
Spirals	BT:	Waves
Statistics		
Stochastic processes	Maximum a posteriori estimation	
Superposition calculus	UF:	Maximum a posteriori
Taylor series	estimator	
Tensors	framework	Maximum a posteriori
Topology	method	Maximum a posteriori
Transforms	probability	Maximum a posteriori
Transmission line matrix		Maximum a-posteriori
		Maximum aposteriori
Uncertain systems	BT:	Estimation theory
Utility theory	<i>Maximum a posteriori estimator</i>	
	USE:	Maximum a posteriori
Mathematics computing	estimation	
BT:		
RT:		
NT:		
Matlab		
UF:	Matrix laboratory	
BT:	Mathematics computing	
RT:	Computer aided instruction	



2022 IEEE Thesaurus

Maximum a posteriori framework

USE: Maximum a posteriori estimation

Maximum a posteriori method

USE: Maximum a posteriori estimation

Maximum a posteriori probability

USE: Maximum a posteriori estimation

Maximum a-posteriori

USE: Maximum a posteriori estimation

Maximum aposteriori

USE: Maximum a posteriori estimation

Maximum likelihood decoding

BT: Decoding
RT: Algorithms

Maximum likelihood detection

UF: Additive metric
Complexity constrained detection

BT: Linear filtering
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

Maximum power point tracking

USE: Maximum power point trackers

Maxwell equations

BT: Equations
RT: Electric fields
Magnetic fields
Perfectly matched layers

Maxwell-Boltzmann distribution

UF: Maxwell-Boltzmann statistics
BT: Probability distribution

Maxwell-Boltzmann statistics

USE: Maxwell-Boltzmann distribution

MC-CDMA

USE: Multicarrier code division multiple access

MCCDMA

USE: Multicarrier code division multiple access

MDDI

USE: Musical instrument digital interfaces

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



2022 IEEE Thesaurus

RT:	Containers		Micrometers
	Data acquisition		Moisture measurement
	Food security		Noise measurement
	Instruments		Nuclear measurements
	Measurement standards		Optical variables
	Phase frequency detectors	measurement	
	Telemetry		Particle beam
	Testing	measurements	
NT:	Transducers		Particle measurements
	Accelerometers		Performance evaluation
	Acoustic measurements		Phase measurement
	Antenna measurements		Plasma measurements
	Anthropometry		Pollution measurement
	Area measurement		Pressure measurement
measurements	Atmospheric		Pulse measurements
	Atomic measurements		Reflectometry
	Bathymetry		Replicability
	Biomedical measurement		Reproducibility of results
	Calorimetry		Scintillation counters
	Coordinate measuring		Sea state
machines		measurement	Semiconductor device
	Density measurement		Sensitivity
	Distance measurement		Shape measurement
	Distortion measurement		Size measurement
	Doppler measurement		Software measurement
	Dosimetry		Soil measurements
	Dynamic range		Spectral efficiency
	Electric variables		Spectroscopy
measurement			Thermal variables
measurements	Electromagnetic	measurement	
	Extraterrestrial		Time measurement
measurements			UHF measurements
	Fluid flow measurement	measurement	Ultrasonic variables
	Frequency measurement		Viscosity
	Gain measurement		Wavelength measurement
	Gas chromatography		Wide area measurements
	Geologic measurements		pH measurement
	Geophysical measurements		
	Interferometry		
	Key performance indicator		
	Length measurement		
	Lifetime estimation		
	Loss measurement		
measurement	Magnetic variables		
beam	Measurement by laser		
	Measurement errors		
	Measurement techniques		
	Measurement uncertainty		
	Measurement units		
measurement	Mechanical variables		

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 unit



2022 IEEE Thesaurus

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
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



2022 IEEE Thesaurus

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

NT: Mechanical factors
Mobile robots
Motor drives
Robots
Displacement control
Force control
Level control
Motion control
Pitch control (position)
Position control
Shape control
Size control
Strain control
Stress control
Thickness control
Torque control
Velocity control
Vibration control
Weight control

Mechanical properties

USE: Mechanical factors

Mechanical sensors

BT: Sensors
NT: Capacitive sensors

Mechanical splines

BT: Machine components
RT: Gears
Machine tool spindles
Shafts

Mechanical stress

USE: Stress

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 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

Mechanical vibrations

USE: Vibrations

Mechanobiology

BT: Biology
RT: Biological system modeling
Biomechanics
Cell signaling
Nanomedicine

Mechatronics

BT: Electron devices
RT: Autonomous vehicles
Control equipment
Intelligent control



2022 IEEE Thesaurus

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 control

USE: Media Access Protocol

Media Access Protocol

UF: MAC
MAC protocol
Media access control
Medium access control
BT: Access protocols
RT: Local area networks
Metropolitan area networks

Media streaming

USE: Streaming media

Mediation

BT: Middleware

Medical computing

USE: Biomedical computing

Medical conditions

UF: Medical disorders
BT: Medical services
RT: Anxiety disorders
NT: Aneurysm
Atrophy
Autism
Blindness
Cataracts
Congestive heart failure
Cybersickness
Deafness
Dementia
Depression
Diabetes

Diseases
Hemorrhaging
Hypertension
Hyperthermia
Injuries
Kidney stones
Motion sickness
Obesity
Paralysis
Pregnancy
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
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



2022 IEEE Thesaurus

tomography	Positron emission	<i>Medical robots</i>	USE: Medical robotics
	Solid scintillation detectors		
	Tumors	Medical services	
NT:	Anatomical structure	UF:	Doctor Emergency medical
<i>Medical diagnostics</i>		services	Health care Healthcare Nursing Physician
USE:	Medical diagnosis		Engineering in medicine
<i>Medical disorders</i>		BT:	
USE:	Medical conditions	and biology	
<i>Medical equipment</i>		RT:	Behavioral sciences Chemotherapy Emergency services Translational research
USE:	Biomedical equipment AND Medical instruments		Assisted living Catheterization Clinical diagnosis Cybercare Electronic healthcare Health information
Medical expert systems		NT:	
BT:	Biomedical computing Expert systems		
RT:	Medical diagnosis Medical treatment		
<i>Medical image processing</i>		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
USE:	Biomedical image processing		
<i>Medical imaging</i>			
USE:	Biomedical imaging		
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		Medical signal detection	
UF:	Medical robots Surgical robots	BT:	Medical diagnosis
BT:	Robots		
RT:	Biomedical equipment Biomedical image	Medical simulation	
processing		BT:	Simulation
	Endomicroscopy Kinematics Manipulators Motion control Position control Telerobotics Wearable robots	Medical specialties	
NT:	Assistive robots	BT:	Engineering in medicine
		and biology	Anesthesiology Cardiology Dermatology Gastroenterology
		NT:	



2022 IEEE Thesaurus

Gerontology
Gynecology
Neonatology
Neurology
Oncology
Ophthalmology
Pathology
Pediatrics
Pulmonology

Neutron capture therapy
Noninvasive treatment
Orthopedic procedures
Orthotics
Patient rehabilitation
Pharmaceuticals
Precision medicine
Proton therapy
Surgery

Medical tests

BT: Medical services
RT: Mammography
NT: Amniocentesis
Biopsy
Cancer detection
Colonoscopy
Pregnancy test

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: 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
Intubation
Lithotripsy
Magnetic stimulation
Neuromuscular stimulation

Medium access control

USE: Media Access Protocol

Medium resolution imaging spectrometer

USE: MERIS

Medium voltage

UF: Medium-voltage
BT: Voltage measurement

Medium-voltage

USE: Medium voltage

Meeting planning

BT: Planning

Meetings

UF: Technical meetings
BT: Professional
communication
RT: Public speaking
Teleconferencing
NT: Conferences

Meetings (technical)

USE: Conferences

Mel frequency cepstral coefficient

UF: MFCC
Mel-frequency cepstral
coefficient
BT: Cepstral analysis

Mel-frequency cepstral coefficient

USE: Mel frequency cepstral
coefficient

Melanoma

BT: Skin cancer

Melt processing

BT: Manufacturing systems
Materials processing
RT: Die casting
Smelting



2022 IEEE Thesaurus

NT:	Vacuum arc remelting	Memory management	UF:	Garbage collection
Membrane potentials		(computers)	BT:	Computer architecture
UF:	Membrane voltage			Memory
	Transmembrane potential	RT:		Memory architecture
BT:	Cells (biology)			Memory modules
RT:	Action potentials			Storage management
	Neurons	NT:		In-memory computing
<i>Membrane voltage</i>				Neural network
USE:	Membrane potentials	compression		
<i>Membranes</i>		Memory modules	BT:	Printed circuits
USE:	Biomembranes		RT:	Integrated circuits
				Memory management
Memetics		<i>Memory resistors</i>	USE:	Memristors
BT:	Evolution (biology)			
RT:	Cultural differences	<i>Memoryless channel</i>	USE:	Memoryless systems
	Genetics			
<i>Memoirs</i>		Memoryless systems	UF:	Memoryless channel
USE:	Autobiographies		BT:	Probability
Memory		<i>Memristor circuits</i>	USE:	Memristors
UF:	Data storage			
BT:	Computers and information	Memristors	UF:	Memory resistors
processing				Memristor circuits
RT:	CMOS memory circuits		BT:	Resistors
	Memory architecture		RT:	Neuromorphic engineering
	Phase change materials			Resistive RAM
	Recording			
NT:	Analog memory	<i>MEMS</i>	USE:	Microelectromechanical
	Associative memory	systems		
	Cache memory	<i>MEMS switches</i>	USE:	Microswitches
	Content addressable			
storage		Mental disorders	UF:	Mental illness
	Flash memories		BT:	Psychiatry
	Magnetic memory		NT:	Anxiety disorders
	Memory management	Mental health	BT:	Human factors
	Nonvolatile memory			Psychology
	Phase change memory		RT:	Anxiety disorders
	Random access memory			Behavioral sciences
	Read only memory			
	Read-write memory			
	Registers			
storage	Scanning probe data			
	Semiconductor memory			
Memory architecture				
BT:	Computer architecture			
RT:	Memory			
	Memory management			



2022 IEEE Thesaurus

<i>Mental illness</i>		BT:	Field effect transistors
USE:	Mental disorders	RT:	MESFET circuits
			MESFET integrated circuits
<i>Mental models</i>			Schottky barriers
USE:	Cognitive science	NT:	Microwave FETs
Mentoring		Mesh generation	
BT:	Career development	BT:	Computer displays
RT:	Training	RT:	Computer graphics
Mercury (metals)		Mesh networks	
UF:	Hg	BT:	Ad hoc networks
BT:	Chemical elements		
	Metals	Mesons	
Mercury (planets)		UF:	Kaons
BT:	Planets		Muons
			Pions
<i>Mergers</i>		BT:	Elementary particles
USE:	Corporate acquisitions	RT:	Cosmic rays
Merging		<i>Mesoporous</i>	
BT:	Data handling	USE:	Mesoporous materials
RT:	Sorting		
MERIS		Mesoporous materials	
UF:	Medium resolution imaging spectrometer	UF:	Mesoporous
BT:	Spectroscopy	BT:	Materials
		RT:	Electrocatalysts
<i>MERIT</i>		Message authentication	
USE:	Magneto electrical resistivity imaging technique	BT:	Data security
		RT:	Cryptography
<i>Merit pay</i>			Digital signatures
USE:	Incentive schemes		Message systems
			Steganography
<i>Mesencephalon</i>		Message passing	
USE:	Midbrain	BT:	Distributed processing
		RT:	Belief propagation
MESFET circuits		Message service	
BT:	FET circuits	UF:	Messaging service
RT:	MESFETs		WeChat
NT:	MESFET integrated circuits	BT:	Web services
MESFET integrated circuits		Message systems	
BT:	FET integrated circuits	BT:	Communications technology
	Integrated circuits	RT:	Cluster computing
	MESFET circuits		Digital signatures
RT:	MESFETs		Message authentication
NT:	Microwave FET integrated circuits	NT:	Electronic mail
			Electronic messaging
MESFETs			Postal services
UF:	Schottky FETs		Publish subscribe systems
			Voice mail



2022 IEEE Thesaurus

Message-oriented middleware

BT: Middleware

Messaging service

USE: Message service

Meta data

USE: Metadata

Meta heuristics

USE: Metaheuristics

Meta search

USE: Metasearch

Meta verse

USE: Metaverse

Meta-modeling

USE: Metamodeling

Meta-search

USE: Metasearch

Metabolic networks

USE: Biochemistry

Metabolism

USE: Biochemistry

Metabolomics

BT: Molecular biomarkers

Metacomputing

BT: Distributed computing

NT: Grid computing

Metadata

UF: Meta data

BT: Data models

RT: Image annotation

Linked data

NT: Annotations

Metaheuristic algorithms

USE: Metaheuristics

Metaheuristics

UF: 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 enclosures

BT: Metal products

Metal foam

BT: Materials

RT: Lightweight structures

Metals

Polymer foams

Metal oxide semiconductor heterojunction FETs

USE: MOSHFETs

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 vapor lasers

USE: Gas lasers

Metal-insulator structures

BT: Insulators

RT: Electrodes

MIS devices

MOS integrated circuits

NT: MIM capacitors

MIM devices

Metal-insulator-metal capacitors

USE: MIM capacitors

Metal-insulator-metal devices

USE: MIM devices

Metal-insulator-semiconductor devices

USE: MIS devices

Metal-oxide semiconductor field effect transistor

USE: MOSFET circuits



2022 IEEE Thesaurus

Metal-oxide semiconductors

USE: MOS devices

Metal-oxide-nitride-oxide-semiconductors

USE: MONOS devices

Metal-oxide-nitride-oxide-silicon

USE: MONOS devices

Metal-oxide-semiconductor devices

USE: MOS devices

Metal-semiconductor interfaces

USE: Semiconductor-metal interfaces

Metallic materials

BT: Materials

RT: Cermet

Metallic superlattices

BT: Superlattices

Metallisation

USE: Metallization

Metallization

UF: Metallisation

BT: Metals

RT: Wiring

NT: Integrated circuit

metallization

Metallurgy

BT: Materials science and technology

RT: Iron alloys
Metals

Metalorganic vapor deposition

USE: MOCVD

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

Metamaterial cloaking

USE: Optical cloaking



2022 IEEE Thesaurus

Metamaterials

UF: Acoustic metamaterials
Left handed materials
Left-handed materials
Microwave metamaterials
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

Metamorphic HEMTs

USE: mHEMTs

Metasearch

UF: Federated search
Federated searching
Meta search
Meta-search
BT: Search methods
RT: Triples (Data structure)
Web search

Metastasis

UF: Metastatic disease
BT: Cancer
RT: Diseases

Metastatic disease

USE: Metastasis

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: Humidity
Lightning
Monsoons
Rain
Snow
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



2022 IEEE Thesaurus

	Voltmeters		Multiprocessor
	Wattmeters	interconnection	
Methane			Open systems
BT:	Natural gas		Protocols
RT:	Carbon emissions		Regional area networks
			Token networks
Methanol		<i>Metropolitan areas</i>	
UF:	Carbinol	USE:	Urban areas
	Methyl alcohol		
	Wood alcohol	<i>MFCC</i>	
	Wood naphtha	USE:	Mel frequency cepstral
	Wood spirits	coefficient	
BT:	Chemical compounds	<i>MFT</i>	
RT:	Anti-freeze	USE:	Mean field theory
	Fuels		
	Solvents	<i>Mg</i>	
Method of moments		USE:	Magnesium
UF:	Galerkin method	<i>MgO</i>	
	Method-of-moments	USE:	Magnesium oxide
	MoM		
	Moment methods	<i>MHD</i>	
BT:	Mathematics	USE:	Magnetohydrodynamics
	Numerical analysis		
RT:	Boundary-element methods	mHEMTs	
	Integral equations	UF:	Metamorphic HEMTs
	Matrices	BT:	HEMTs
<i>Method-of-moments</i>		<i>MIB</i>	
USE:	Method of moments	USE:	Management information
<i>Methyl alcohol</i>		base	
USE:	Methanol	<i>MIC</i>	
<i>Metrics</i>		USE:	Microwave integrated
USE:	Measurement	circuits	
<i>Metro area networks</i>		Mice	
USE:	Metropolitan area networks	UF:	Mouse
		BT:	Animals
Metrology		<i>Mice flows</i>	
BT:	Science - general	USE:	Communication system
NT:	Optical metrology	traffic AND	
			Computer networks
Metropolitan area networks		<i>Micro air vehicles</i>	
UF:	Metro area networks	USE:	Autonomous aerial vehicles
BT:	Communication systems		
	Computer networks	<i>Micro computers</i>	
	Digital systems	USE:	Microcomputers
RT:	Distributed computing	<i>Micro-computers</i>	
	IEEE 802.16 Standard	USE:	Microcomputers
	Internetworking		
	LAN interconnection		
	Media Access Protocol		



2022 IEEE Thesaurus

Micro-electro-mechanical devices

USE: Microelectromechanical devices

Micro-electro-mechanical systems

USE: Microelectromechanical systems

Micro-electromechanical devices

USE: Microelectromechanical devices

Micro-electromechanical systems

USE: Microelectromechanical systems

Micro-hydro

USE: Microhydro power

Micro-optical components

USE: Microoptics

Micro-opticalmechanical devices

USE: Microoptics

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

manufacture

Semiconductor device

Microbial eletrolysis cells

USE: Fuel cells

Microbial fuel cells

USE: Fuel cells

Microbiology

BT: Biology
NT: Electroporation
Virology

Microcavities

BT: Optical resonators
RT: Cavity resonators
Light emitting diodes
Microoptics
Photoluminescence
Spontaneous emission
Whispering gallery modes

Microcell networks

UF: Microcells
Small cell networks
BT: Cellular networks
RT: Ultra-dense networks

Microcells

USE: Microcell networks

Microchannels

BT: Hydraulic diameter

Microchip lasers

BT: Solid lasers

Microchips

USE: Integrated circuits

Microcomputers

UF: Laptops
Micro computers
Micro-computers
Minicomputers
Personal computers
BT: Computers
RT: Consumer electronics
Home computing
Mainframes
Microprocessors
Office automation
NT: Portable computers
Workstations

Microcontact printing

USE: Soft lithography

Microcontrollers

BT: Control equipment
Microprocessors
RT: CMOS technology
Control systems
High-speed integrated

circuits

Neurocontrollers
System-on-chip



2022 IEEE Thesaurus

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

devices

systems

BT: Microelectromechanical

RT: Magnetic particles
Mechanical systems
Mechatronics
Micromachining
Microsensors
NT: Microactuators
Micromotors
Micropumps
Microvalves

Microelectromechanical systems

UF: MEMS
Micro-electro-mechanical systems

systems

systems

systems

BT: Electron devices
RT: Mechatronics
Nanoelectromechanical

systems

devices

NT: Microelectromechanical

devices

Radiofrequency

microelectromechanical systems

Microelectronic implants

BT: Implants

Microelectronic stimulation

USE: Electrical stimulation

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
Biochips
RT: Biomedical engineering
Fluidic microsystems
Hydrodynamics

Micrographs

USE: Photomicrography

Microgrids

BT: Power grids
RT: Distributed power
generation
Power distribution networks
Power generation
Power system management
Power system reliability
Smart grids

Microgrippers

USE: Grippers

Microhydro power

UF: Micro-hydro
BT: Hydroelectric power
generation
RT: Appropriate technology

Microinjection

BT: Biology

Micromachining

BT: Electronic equipment
manufacture
RT: Electrochemical machining
Embossing



2022 IEEE Thesaurus

manufacture
Etching
Integrated circuit
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

Micromechanical systems

USE: Micromechanical devices

Micrometers

UF: Micrometres
Micrometry
Microns
BT: Measurement
RT: Distance measurement
Interferometry
Length measurement
Strain measurement
Thickness measurement

Micrometres

USE: Micrometers

Micrometry

USE: Micrometers

Micromirrors

UF: Digital micromirror devices
BT: Microoptics
Mirrors
RT: Optical arrays
Optical projectors

Micromotors

BT: Microelectromechanical
devices
Motors
Rotating machines

Microns

USE: Micrometers

Microoptical components

USE: Microoptics

Microoptics

UF: Micro-optical components
Micro-opticalmechanical
devices
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: Biological cells
Immune system
Molecular biophysics
NT: Adenoviruses
Viruses (medical)

Microphone arrays

BT: Microphones

Microphones

BT: Audio systems
NT: Microphone arrays

Microphotographs

USE: Photomicrography

Microphotography

USE: Photomicrography

Microprocessor chips

BT: Microprocessors
RT: Flip-chip devices
Substrates
Yield estimation



2022 IEEE Thesaurus

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
<i>Microsatellites</i>	
USE:	Small satellites
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
<i>Microsoft Excel</i>	
USE:	Spreadsheet programs
<i>Microsoft Windows</i>	
USE:	Operating systems
Microstrip	
UF:	Microstrip lines
BT:	Planar transmission lines
RT:	Broadband antennas
NT:	Microstrip components
Microstrip antenna arrays	
UF:	Microstrip arrays
BT:	Antenna arrays
RT:	Antennas
	Aperture coupled antennas
	Microstrip antennas
Microstrip antennas	
BT:	Antennas
RT:	Aperture coupled antennas
	Microstrip antenna arrays
	Patch antennas
<i>Microstrip arrays</i>	
USE:	Microstrip antenna arrays
Microstrip components	
BT:	Microstrip
RT:	Power combiners
	Power dividers
	Thick film inductors
NT:	Microstrip resonators
Microstrip filters	
BT:	Filters
RT:	Microwave communication
<i>Microstrip lines</i>	
USE:	Microstrip
Microstrip resonators	
BT:	Microstrip components
RT:	Resonance
Microstructure	
BT:	Materials science and technology
RT:	Crystal microstructure



2022 IEEE Thesaurus

Microstructured fibers

USE: Photonic crystal fibers

Microstructured fibres

USE: Photonic crystal fibers

Microsurgery

BT: Surgery

Microswitches

UF: MEMS switches

BT: Switches

RT: Microoptics

Microsystems

USE: Micromechanical devices

Microvalves

BT: Microelectromechanical devices
Valves

Microwave amplifiers

BT: Microwave devices

Microwave antenna arrays

BT: Antenna arrays

Microwave antennas

BT: Antennas

Microwave bands

BT: Microwave technology

NT: C-band

K-band

L-band

Microwave circuits

BT: Circuits

Microwave technology

RT: Analog circuits

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 heating

USE: Electromagnetic heating

Microwave imaging

BT: Imaging

RT: Remote sensing

Microwave integrated circuits

UF: MIC

BT: Integrated circuits

RT: Analog integrated circuits

Microwave circuits

NT: MMICs

Microwave lasers

USE: Masers

Microwave magnetics

BT: Magnetics



2022 IEEE Thesaurus

Microwave measurement

BT: Electromagnetic measurements
RT: Microwave technology
NT: Microwave frequencies

Microwave metamaterials

USE: Metamaterials

Microwave oscillators

BT: Oscillators

Microwave ovens

BT: Consumer electronics
Consumer products
Home appliances
Ovens

Microwave photonics

BT: Microwave technology
Photonics
RT: Electro-optic modulators
Elementary particles
Integrated optoelectronics
Microwave circuits
Microwave communication
Microwave devices
Optical modulation

Microwave propagation

BT: Electromagnetic propagation
RT: Broadband antennas
Electromagnetic waveguides

Microwave radar

USE: Radar

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
Mediation
NT: Message-oriented middleware
Web services

Mie scattering

BT: Electromagnetic scattering
RT: Electromagnetic analysis
Electromagnetic fields
Electromagnetic forces
Electromagnetic measurements
Electromagnetic propagation



2022 IEEE Thesaurus

Mil standards

USE: Military standards

Military aircraft

BT: Military equipment
RT: Aircraft
Hyperspectral sensors
Military robotics
NT: Payloads

Military command and control

USE: Command and control systems

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

Milk

USE: Dairy products

Millennial generation

USE: Millennials

Millennials

UF: Generation Y
Millennial generation
BT: Social groups



2022 IEEE Thesaurus

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
 mmwave 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 monolithic integrated circuits

USE: MIMICs

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

Millimeter-wave circuits

USE: Millimeter wave circuits

Millimeter-wave communication

USE: Millimeter wave
 communication

Millimeter-wave devices

USE: Millimeter wave devices

Millimeter-wave integrated circuits

USE: Millimeter wave integrated
 circuits

Millimeter-wave measurements

USE: Millimeter wave
 measurements

Millimeter-wave monolithic integrated circuits

USE: MIMICs

Millimeter-wave propagation

USE: Millimeter wave
 propagation

Millimeter-wave radar

USE: Millimeter wave radar

Millimeter-wave technology

USE: Millimeter wave technology

Millimeter-wave transistors

USE: Millimeter wave transistors



2022 IEEE Thesaurus

Millimicron

USE: Nanometers

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

MIMO systems

USE: MIMO communication

Mind-machine interfaces

USE: Brain-computer interfaces

Mineral processing

USE: Materials processing

Mineral resources

BT: Minerals

Mineralization

BT: Minerals

Minerals

BT: Geology
NT: Mineral resources
Mineralization
Ores

Miniaturized satellites

USE: Small satellites

Minicomputers

USE: Microcomputers

Minimally invasive surgery

UF: Laparoscopic surgery
BT: Surgery
RT: Laparoscopes

Minimax techniques

UF: Minmax techniques
BT: Statistics



2022 IEEE Thesaurus

RT:	Artificial intelligence	BT:	Semiconductor devices
	Game theory	RT:	Metal-insulator structures
	Minimization methods		Semiconductor-insulator
<i>Minimisation</i>		interfaces	
USE:	Minimization	NT:	Charge coupled devices
			MOS devices
<i>Minimisation methods</i>		MISFETs	
USE:	Minimization methods	BT:	Field effect transistors
		RT:	Magnetic field induced
Minimization		strain	
UF:	Minimisation	<i>Misinformation</i>	
BT:	Mathematics	USE:	Fake news
RT:	Optimization		
NT:	Minimization methods	MISO communication	
Minimization methods		UF:	multiple input single-output
UF:	Minimisation methods		multiple-input single output
BT:	Minimization		multiple-input single-output
RT:	Approximation methods	BT:	Communication systems
	Minimax techniques	RT:	MIMO communication
			SIMO communication
<i>Minimum analog-digital integrated circuits</i>			SISO communication
USE:	Analog-digital integrated	Missile control	
circuits		BT:	Control systems
Mining equipment		Missile guidance	
BT:	Production equipment	BT:	Missiles
RT:	Mining industry	RT:	Target recognition
Mining industry		Missiles	
BT:	Industries	UF:	Torpedoes
RT:	Excavation	BT:	Weapons
	Fracking	RT:	Aerospace control
	Fuel processing industries		Ground support
	Geoengineering		Hypersonic vehicles
	Hyperspectral sensors	NT:	Missile guidance
	Mining equipment	Mission critical systems	
	Raw materials	UF:	Mission-critical systems
NT:	Coal mining	BT:	Contingency management
<i>Minimax techniques</i>		<i>Mission-critical systems</i>	
USE:	Minimax techniques	USE:	Mission critical systems
Mirrors		<i>Mitral valves</i>	
BT:	Optical devices	USE:	Heart valves
RT:	Optical materials	<i>Mixed analog digital integrated circuits</i>	
	Optical reflection	USE:	Mixed analog-digital
	Reflection	integrated circuits	
NT:	Distributed Bragg reflectors		
	Micromirrors		
MIS devices			
UF:	Metal-insulator-		
semiconductor devices			



2022 IEEE Thesaurus

Mixed analog-digital integrated circuits

UF: Mixed analog digital
integrated circuits
BT: Analog-digital integrated
circuits
RT: Analog processing circuits
System-on-chip

Mixed convection

USE: Convection

Mixed integer linear programming

UF: Mixed-integer linear
programming
BT: Integer linear programming

Mixed reality

BT: Simulation
RT: Augmented reality
Multimedia systems
Virtual reality

Mixed source separation

USE: Blind source separation

Mixed-integer linear programming

USE: Mixed integer linear
programming

Mixers

BT: Frequency conversion
RT: Demodulation
Modulation
Nonlinear circuits

Mixture models

BT: Statistics
RT: Feature extraction
Image segmentation
Probabilistic logic

MLE

USE: Maximum likelihood
estimation

MLFMA

UF: Multilevel fast multipole
algorithm
BT: Algorithms

MMICs

UF: Monolithic microwave
integrated circuits
BT: Microwave integrated
circuits

Monolithic integrated
circuits
RT: Analog integrated circuits
MIMICs
Radiofrequency integrated
circuits

MMTC

USE: Massive machine type
communications

mmtc

USE: Massive machine type
communications

mmwave communication

USE: Millimeter wave
communication

Mn

USE: Manganese

MNN

USE: Multi-layer neural network

Mobile ad hoc networks

UF: MANET
Wireless ad hoc network
BT: Ad hoc networks

Mobile agents

BT: Knowledge based systems
RT: Computer applications
Distributed computing
Intelligent systems
Learning systems
Mobile computing
Software agents

Mobile antennas

BT: Antennas
Land mobile radio
equipment
RT: Land mobile radio

Mobile application development

USE: Application programming
interfaces

Mobile applications

UF: Mobile apps
BT: Computer applications
RT: Mobile communication
Mobile handsets
Wireless communication



2022 IEEE Thesaurus

Mobile apps

USE: Mobile applications

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

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

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

computing

NT:

computing

Telecommunication

User experience

Multi-access edge

Wireless access points

Mobile device security

USE: Mobile security

Mobile devices

USE: Mobile handsets

Mobile edge computing

USE: Multi-access edge

computing

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 location management

USE: Location awareness

Mobile nodes

BT: Mobile communication

Telecommunication

network management

Mobile office

USE: Teleworking

Mobile payment

USE: Online banking



2022 IEEE Thesaurus

Mobile phones

USE: Mobile handsets

Mobile radio

USE: Land mobile radio

Mobile radio mobility management

USE: Location awareness

Mobile robot sensing systems

USE: Robot sensing systems

Mobile robot vision systems

USE: Robot vision systems

Mobile robots

BT: Robots

RT: Advanced driver assistance

systems

Agricultural robots
Assembly systems
Control systems
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
Stairs
Telerobotics
Vehicles
Vehicular automation
Wearable robots
NT: Climbing robots
Legged locomotion

Mobile security

UF: Mobile device security

BT: Computer security
Mobile communication

Mobile television

USE: TV

Mobile TV

BT: TV

Mobile video

BT: Mobile communication
Streaming media

RT: Video recording

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 predictive control

USE: Predictive control

Model reduction

USE: Reduced order systems

Model-based reasoning

USE: Inference mechanisms

Model-driven development

BT: Software development
management

Model-driven engineering

USE: Model driven engineering

Model-predictive control

USE: Predictive control



2022 IEEE Thesaurus

Modeling

theory	UF:	Modelling
		System modeling
	BT:	Systems engineering and
	RT:	Computer graphics
		Data visualization
		Digital simulation
		Haptic interfaces
		Human in the loop
		Monte Carlo methods
		Numerical simulation
computing		Petri nets
		Plasma simulation
Language		Power system analysis
		Systems Modeling
management	NT:	Time series analysis
		Analytical models
		Atmospheric modeling
		Brain modeling
		Building information
		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
		Metamodeling
		Numerical models
		Object oriented modeling
		Power system modeling
		Process modeling
		Semiconductor device
modeling		
modeling		Semiconductor process
		Signal representation
		Simulation
		Solid modeling
		System identification
		Systems modeling

Modelling

USE: Modeling

Models of emotion

USE: Emotion recognition

Modems

UF: Modulator-demodulators
BT: Communication equipment
Computer peripherals
RT: Data communication
Demodulation
Modulation

Moderate resolution imaging spectroradiometer

USE: MODIS

Moderate-resolution Imaging Spectroradiometer

USE: MODIS

modfet integrated circuits

USE: MODFETs

MODFETs

UF: Heterostructure FETs
SDHTs
Selectively doped

heterojunction transistors

TEGFETs
Two-dimensional electron

gas FETs

BT: modfet integrated circuits
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

Modular multi-level converters

USE: Multilevel converters AND
Voltage-source converters

Modular multilevel converters

USE: Multilevel converters

Modulation

UF: Modulation format
Modulation index



2022 IEEE Thesaurus

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

Modulation coding

BT: Modulation
 RT: Encoding
 Information theory
 NT: Interleaved codes

Modulation format

USE: Modulation

Modulation index

USE: Modulation

Modulation-coding

USE: Modulation

Modulator-demodulators

USE: Modems

Modulators

USE: Modulation

Modules (abstract algebra)

BT: Abstract algebra

Moisture

BT: Geophysics
 RT: Moisture control
 Moisture measurement
 Trees - insulation

Moisture control

BT: Control systems
 RT: 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

Molded-case circuit breakers

USE: Molded case circuit
 breakers

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



2022 IEEE Thesaurus

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 clones

USE: Cloning

Molecular communication (telecommunication)

BT: Biological systems
Communication systems
RT: Nanocommunication

(telecommunication)

Molecular computing

BT: Computers and information
processing
RT: Nanotechnology
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
RT: Adsorption

Molybdenum

BT: Chemical elements

MoM

USE: Method of moments

Moment methods

USE: Method of moments

Money management

USE: Financial management

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

Monolithic integrated circuits

UF: Monolithic integration
BT: Circuits
Integrated circuits
NT: MIMICs
MMICs

Monolithic integration

USE: Monolithic integrated
circuits

Monolithic microwave integrated circuits

USE: 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



2022 IEEE Thesaurus

RT:	Rain Storms	<i>Mortgages</i>	USE:	Loans and mortgages
Monte Carlo methods		MOS capacitors		
UF:	Importance sampling Monte Carlo simulations Monte-Carlo methods Monte-Carlo simulations	BT:	MOS devices	
BT:	Statistical analysis	RT:	Capacitors	
RT:	Computational	MOS devices		
electromagnetics		UF:	Metal-oxide	
	Modeling	semiconductors		Metal-oxide-semiconductor
	Probability	devices		
	Simulated annealing	BT:	MIS devices	
	Simulation	RT:	Semiconductor-insulator	
<i>Monte Carlo simulations</i>		interfaces		
USE:	Monte Carlo methods	NT:	MOS capacitors MOSFET Negative bias temperature	
<i>Monte-Carlo methods</i>		instability		
USE:	Monte Carlo methods	MOS integrated circuits		
<i>Monte-Carlo simulations</i>		BT:	MOSFET circuits	
USE:	Monte Carlo methods	RT:	Metal-insulator structures	
Mood		<i>MOS transistors</i>		
BT:	Psychology	USE:	MOSFET	
Moon		MOSFET		
UF:	Lunar	UF:	MOS transistors nMOSFETs pMOSFETs	
BT:	Satellites	BT:	Field effect transistors MOS devices	
Moore's Law		RT:	CMOS technology Gate drivers TFETs	
BT:	Integrated circuit	NT:	CMOSFETs FinFETs Interface states Junctionless nanowire	
technology		transistors		
<i>Mopeds</i>		MOSFET circuits		
USE:	Motorcycles	UF:	Metal-oxide semiconductor	
<i>Morals</i>		field effect transistor		
USE:	Ethics	BT:	Circuits FET circuits	
Morphological operations		RT:	Active inductors Linearization techniques Operational amplifiers Power dissipation Rail to rail amplifiers Rail to rail operation Threshold voltage CMOSFET circuits	
BT:	Image processing			
RT:	Topology			
Morphology				
BT:	Natural language			
processing				
RT:	Entomology			
Mortar				
BT:	Building materials Chemical products			
RT:	Construction industry			



2022 IEEE Thesaurus

	MOS integrated circuits		Kinetic theory
	Power MOSFET		Motion planning
			Path planning
			Visual servoing
MOSHFETs			
UF:	Metal oxide semiconductor		
heterojunction FETs		Motion detection	
BT:	Field effect transistors	UF:	Motion sensors
		BT:	Signal detection
Motion analysis		RT:	Alarm systems
BT:	Robot kinematics		Corner detection
NT:	Active contours		Image motion analysis
	Motion segmentation		Image sensors
	Robot localization		Infrared detectors
			Mobile robots
Motion artifacts			Motion control
BT:	Biomedical image		Surveillance
processing			Video signal processing
	Video signal processing		Video surveillance
Motion capture		Motion estimation	
BT:	Kinematics	BT:	Parameter estimation
RT:	Animation	RT:	Motion capture
	Biomechanics		Object tracking
	Feature extraction		
	Gait recognition	Motion measurement	
	Image motion analysis	BT:	Mechanical variables
	Image sensors	measurement	
	Motion compensation	RT:	Doppler measurement
	Motion estimation		Gaze tracking
	Object detection		Velocity measurement
	Object tracking	NT:	Tracking
			Tribology
Motion compensation			
BT:	Control systems	Motion pictures	
RT:	Image communication	UF:	Cinema
	Motion capture		Films (Motion pictures)
			Movies
Motion control		BT:	Broadcasting
BT:	Mechanical variables	RT:	Cameras
control			Cinematography
			Entertainment industry
RT:	Aerospace control		Imaging
	Legged locomotion		Optical projectors
	Manipulators		
	Medical robotics	Motion planning	
	Mobile robots	BT:	Motion control
	Motion detection	RT:	Navigation
	Motor coordination		Robot control
	Servosystems		
	Structure from motion	Motion segmentation	
	Trajectory	BT:	Motion analysis
	Trajectory tracking		
	Velocity control	<i>Motion sensors</i>	
NT:	Collision avoidance	USE:	Motion detection
	Collision mitigation		
	Formation control		



2022 IEEE Thesaurus

Motion sickness

BT: Medical conditions

Motor control

USE: Motor drives

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

Motorbikes

USE: Motorcycles

Motorcycles

UF: Mopeds
Motorbikes
Scooters
BT: Road vehicles

Motors

BT: Energy conversion
Machinery
RT: Coils
Motor drives
Sensorless control
NT: AC motors
Brushless motors
Commutation
DC motors
Electric motors
Hysteresis motors
Induction motors
Micromotors
Permanent magnet motors
Servomotors
Traction motors
Universal motors

Moulding equipment

USE: Molding equipment

Mouse

USE: Mice

Mouth

BT: Digestive system
Head
RT: Stomatognathic system
NT: Teeth

Movies

USE: Motion pictures

Moving object databases

USE: Visual databases

Moving picture experts group

USE: MPEG standards

Moving Pictures Experts Group

BT: IEC
ISO

MP3

USE: Digital audio players AND
Portable media players

MPEG

USE: Transform coding

MPEG 1 Standard

BT: MPEG standards

MPEG 2 Standard

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



2022 IEEE Thesaurus

broadcasting	Content management	<i>Multicast addressing</i>
	Digital multimedia	USE: Multicast communication
	Multimedia communication	<i>Multi access edge computing</i>
	Multimedia systems	USE: Multi-access edge computing
MPEG standards		<i>Multi modal integration</i>
UF:	Moving picture experts	USE: Multisensory integration
group		<i>Multi party computation</i>
BT:	IEC Standards	USE: Multi-party computation
	ISO Standards	
RT:	Digital multimedia	<i>Multi sensory integration</i>
broadcasting		USE: Multisensory integration
	Image coding	<i>Multi stage noise shaping</i>
	Streaming media	USE: Multi-stage noise shaping
	Transform coding	
	Video codecs	Multi-access edge computing
	Video coding	UF: Mobile edge computing
	Video signal processing	Multi access edge computing
NT:	MPEG 1 Standard	BT: Edge computing
	MPEG 2 Standard	Mobile computing
	MPEG 21 Standard	
	MPEG 4 Standard	
	MPEG 7 Standard	
<i>MPEG-2</i>		<i>Multi-agent models</i>
USE:	MPEG 2 Standard	USE: Multi-agent systems
<i>MPEG4</i>		Multi-agent systems
USE:	MPEG 4 Standard	UF: Multi-agent models
<i>MPEG7</i>		Multiagent models
USE:	MPEG 7 Standard	Multiagent systems
<i>MPLS</i>		BT: Adaptive systems
USE:	Multiprotocol label	RT: Agent-based modeling
switching		Autonomous vehicles
<i>MPPT</i>		Formation control
USE:	Maximum power point	System analysis and design
trackers		Vehicular automation
<i>MRI</i>		NT: Collaborative intelligence
USE:	Magnetic resonance	<i>Multi-attribute optimization</i>
imaging		USE: Pareto optimization
<i>MRP</i>		<i>Multi-carrier code division multiple access</i>
USE:	Materials requirements	USE: Multicarrier code division multiple access
planning		<i>Multi-cast addressing</i>
<i>Mud</i>		USE: Multicast communication
USE:	Sediments	<i>Multi-casting</i>
<i>Mufflers</i>		USE: Multicast communication
USE:	Exhaust systems	



2022 IEEE Thesaurus

Multi-core processing

USE: Multicore processing

Multi-core processors

USE: Multicore processing

Multi-factor authentication

BT: Access control
Authentication

Multi-hop

USE: Spread spectrum
communication

Multi-layer neural network

UF: MNN
BT: Neural networks

Multi-level converters

USE: Multilevel converters

Multi-level inverters

USE: Multilevel inverters

Multi-level invertors

USE: Multilevel inverters

Multi-modal sensors

USE: Multimodal sensors

Multi-objective programming

USE: Pareto optimization

Multi-party computation

UF: Multi party computation
BT: Cryptography

Multi-resolution

USE: Multiresolution analysis

Multi-robot systems

UF: Multirobot systems
BT: Robotics and automation
NT: Swarm robotics

Multi-stage noise shaping

UF: MASH
Multi stage noise shaping
Multistage noise shaping
BT: Noise shaping

Multi-tasking

USE: Multitasking

*Multi-threaded comput**

USE: Multithreading

Multi-threaded systems

USE: Program processors

Multi-threading systems

USE: Program processors

Multi-user channels

USE: Multiuser channels

Multi-user detection

USE: Multiuser detection

Multi-vibrators

USE: Multivibrators

Multi-wave mixing

USE: Multiwave mixing

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
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



2022 IEEE Thesaurus

Multiaccess systems

USE: Multiaccess communication

Multiagent models

USE: Multi-agent systems

Multiagent systems

USE: Multi-agent systems

Multicarrier code division multiple access

UF: MC-CDMA
MCCDMA
Multi-carrier code division

multiple access

BT: Multiaccess communication
RT: Code division multiplexing
Communication channels
OFDM
Protocols
Spread spectrum

communication

Telecommunications
Time division synchronous

code division multiple access

Multicast algorithms

BT: Algorithms

Multicast communication

UF: Multicast 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

Multicasting

USE: Multicast communication

Multichip modules

BT: Integrated circuit packaging
Packaging

Multiconductor transmission lines

BT: Transmission lines
RT: Coupled mode analysis

Multicore

USE: Multicore processing

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

Multihop

USE: Spread spectrum
communication

Multilayer perceptrons

BT: Feedforward neural
networks

Multilayers

USE: Nonhomogeneous media

Multileaf collimators

USE: Collimators



2022 IEEE Thesaurus

Multilevel converters

UF: Modular multi-level converters
 converters
 Modular multilevel converters
 BT: Multi-level converters
 Converters

Multilevel fast multipole algorithm

USE: MLFMA

Multilevel inverters

UF: Multi-level inverters
 Multi-level invertors
 Multilevel invertors
 BT: Inverters

Multilevel invertors

USE: Multilevel inverters

Multilevel systems

BT: Hierarchical systems

Multilinear systems

USE: Nonlinear 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
 Collaborative work
 Computer graphics
 Computers and information processing
 Content management
 Information systems
 Multimedia communication

Multimedia databases
 Video sequences

Multimedia databases

BT: Database systems
 Databases
 Multimedia systems
 RT: Audio databases
 Huffman coding
 Multimedia computing

Multimedia products

USE: Videos

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 integration

USE: Multisensory integration

Multimodal sensing

USE: Multimodal sensors

Multimodal sensors

UF: Multi-modal sensors
 Multimodal sensing
 BT: Sensors
 RT: Sensor fusion

Multiobjective programming

USE: Pareto optimization

Multipath channels

BT: Communication channels
 RT: Channel estimation
 Diversity methods
 Fading channels
 MIMO communication
 Meteorological factors
 Multiuser detection
 Radio propagation
 Terrain factors
 Ultra wideband

communication

Multiple access interference

BT: OFDM



2022 IEEE Thesaurus

Multiple antenna systems

USE: MIMO communication

Multiple input multiple output

USE: MIMO communication

Multiple input multiple output systems

USE: MIMO communication

multiple input single-output

USE: MISO communication

Multiple sclerosis

BT: Diseases

Multiple signal classification

UF: MUSIC

BT: Noise measurement

Multiple-input multiple-output

USE: MIMO communication

Multiple-input multiple-output systems

USE: MIMO communication

multiple-input single output

USE: MISO communication

multiple-input single-output

USE: MISO communication

Multiple-input-multiple-output

USE: MIMO communication

Multiplexed

USE: Multiplexing

Multiplexing

UF: Multiplexed

BT: Communications

technology

RT: Arrayed waveguide gratings

Multiaccess communication

NT: Code division multiplexing

Demultiplexing

Frequency division

multiplexing

Layered division

multiplexing

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

Multiprocessor scheduling

USE: Processor scheduling

Multiprotocol label switching

UF: Label swapping

MPLS

BT: Communication switching

Packet switching

Protocols

RT: Asynchronous transfer

mode

Internet

Routing protocols



2022 IEEE Thesaurus

Multiresolution analysis

UF: Multi-resolution
BT: Wavelet analysis

Multirobot systems

USE: Multi-robot systems

Multisensor systems

BT: Sensor fusion
RT: Robot sensing systems

Multisensory integration

UF: Multi modal integration
Multi sensory integration
Multimodal integration
BT: Sense organs

Multiskilling

UF: Job rotation
BT: Human resource
management
RT: Industrial training
Job specification
Vocational training

Multispectral imaging

BT: Imaging

Multistage noise shaping

USE: Multi-stage noise shaping

Multistatic radar

BT: Radar
NT: MIMO radar

Multitasking

UF: Multi-tasking
BT: Computers and information
processing
NT: Parametric study

Multithreaded systems

USE: Program processors

Multithreading

UF: Multi-threaded comput*
Multithreading comput*
BT: Parallel processing

Multithreading comput*

USE: Multithreading

Multithreading systems

USE: Program processors

Multiuser channels

UF: Multi-user channels
BT: Communication channels

Multiuser detection

UF: Multi-user detection
BT: Signal detection
RT: Cellular radio
Land mobile radio
Mobile communication
Multipath channels
Spread spectrum

communication

Multivalued logic

UF: Many valued logic
Ternary logic
BT: Logic
RT: Logic functions

Multivariable systems

USE: MIMO communication

Multivariate regression

BT: Regression analysis

Multivibrators

UF: Multi-vibrators
BT: Electronic circuits

Multiwave mixing

UF: Multi-wave mixing
BT: Optical mixing
RT: Four-wave mixing

Munitions

USE: Weapons

Muon colliders

UF: Muon sources
BT: Colliding beam devices
RT: Luminescence
Luminescent devices
Storage rings

Muon sources

USE: Muon colliders

Muons

USE: Mesons

Muscles

BT: Musculoskeletal system
NT: Myocardium
Neuromuscular



2022 IEEE Thesaurus

Musculoskeletal system

BT: Anatomy
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

USE: Multiple signal classification

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

Music recommendation

USE: Recommender systems

Musical

USE: Music

Musical instrument digital interfaces

UF: MDDI
BT: Computer interfaces
Music
RT: Digital communication

Must carry regulations

USE: Must-carry regulations

Must-carry regulations

UF: Must carry regulations
BT: Cable TV
Government policies
RT: Licenses
TV

Mutual conductance

USE: Transconductance

Mutual coupling

BT: Electromagnetic coupling

Mutual funds

BT: Financial management

Mutual information

UF: Transinformation
BT: Information theory

Myelin

BT: Nerve fibers
RT: Axons

Myocardial

USE: Myocardium

Myocardium

UF: Myocardial
BT: Muscles

Myopia

USE: Vision defects

Myspace

USE: Social networking (online)

NACE International

UF: National Association of
Corrosion Engineers
BT: Standards organizations

NACE Standards

BT: Standards publications

Nails

BT: Integumentary system

Naive Bayes algorithms

USE: Naive Bayes methods

Naive Bayes classification

USE: Naive Bayes methods



2022 IEEE Thesaurus

Naive Bayes classifiers

USE: Naive Bayes methods

Nanoparticles

Nanoscale devices

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

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

Nakagami distribution

BT: Probability distribution

NAND flash

USE: Flash memories

Nano biophotonics

USE: Nanobiophotonics

Nano communication

USE: Nanocommunication
(telecommunication)

Nanocommunication (telecommunication)

UF: Nano communication
BT: Communication systems
Nanotechnology
RT: Biomedical communication
Molecular communication
(telecommunication)
Wireless networks
Wireless sensor networks

Nano devices

USE: Nanoscale devices

Nanocomposites

BT: Nanostructured materials
RT: Metamaterials

Nano generators

USE: Nanogenerators

Nanocontacts

BT: Nanoscale devices
RT: Enhanced

Nano packaging

USE: Nanopackaging

magnetoresistance

Magnetoresistance
Nanoelectronics
Nanowires

Nano ribbons

USE: Nanoribbons

Nanoactuators

USE: Actuators AND
Nanoelectronics

Nanocrystal

USE: Nanocrystals

Nanobiophotonics

UF: Nano biophotonics
BT: Nanobiotechnology
Photonics
RT: Biomedical imaging
Biosensors
Lasers

Nanocrystals

UF: Nanocrystal
BT: Crystalline materials
Nanoparticles
RT: Quantum dots
NT: Colloidal nanocrystals

Nanodevices

USE: Nanoscale devices



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2022 IEEE Thesaurus

Nanoelectromechanical systems

UF: NEMS
BT: Nanotechnology
RT: Microelectromechanical

systems

Nanoelectronics

UF: Nanoactuators
BT: Nanotechnology
RT: Graphene devices
Molecular electronics
Nanocontacts
NT: Junctionless nanowire

transistors

Nanofabrication

BT: Nanotechnology

Nanofiltration

USE: Filtration

Nanofluidics

UF: Nanofluids
BT: Fluidics
Nanotechnology
RT: Nanobioscience

Nanofluids

USE: Nanofluidics

Nanogenerators

UF: Nano generators
BT: Energy harvesting
RT: Electric generators
Low-power electronics
Micromechanical devices
Nanowires
Piezoelectric devices
Triboelectricity
Vibrations

Nanoimprint lithography

USE: Nanolithography

Nanolithography

UF: Nanoimprint lithography
BT: Lithography
Nanotechnology
RT: Nanopatterning
Soft lithography

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

Nanometres

USE: Nanometers

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

Nanopores

BT: Nanoscale technology
RT: Nanobiotechnology
Nanoporous materials
Nanostructures

Nanoporous materials

BT: Nanostructured materials
RT: Nanopores

Nanopositioning

BT: Nanotechnology
Position control



2022 IEEE Thesaurus

Nanopowders

USE: Nanoparticles

Nanoribbons

UF: Nano ribbons

BT: Nanostructures

Nanosatellites

USE: Small satellites

Nanoscale devices

UF: Nano devices

Nanodevices

BT: Nanoscale technology

RT: Nanobiophotonics

Single electron devices

NT: 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

NT: Nanocomposites

Nanoporous materials

Nanostructures

BT: Nanotechnology

RT: Nanopores

Nanosensors

NT: Nanoparticles

Nanoribbons

Nanotubes

Nanowires

Semiconductor

nanostructures

Nanotechnology

RT: Atomic force microscopy

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

(telecommunication)

Nanoelectromechanical

systems

Nanoelectronics

Nanofabrication

Nanofluidics

Nanolithography

Nanomaterials

Nanopackaging

Nanopatterning

Nanophotonics

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

NT: Carbon nanotubes

Semiconductor nanotubes

Nanowires

BT: Nanostructures

RT: Junctionless nanowire

transistors

Nanocontacts

Nanogenerators

Wires



2022 IEEE Thesaurus

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 Aeronautics & Space Administration

USE: NASA

National Aeronautics and Space Administration

USE: NASA

National Association of Corrosion Engineers

USE: NACE International

National Bureau of Standards

USE: NIST

National Electric Code

UF: National electric safety
code

BT: ANSI Standards

National electric safety code

USE: National Electric Code

National Fire Protection Agency

USE: NFPA

National Fire Protection Association

USE: NFPA

National Institute of Standards & Technology

USE: NIST

National Institute of Standards and Technology

USE: NIST

National Institutes of Health

UF: NIH
BT: US Department of Health
and Human Services

National security

BT: Terrorism
RT: Control system security
Cyber warfare

National Society Agreement awards

BT: IEEE Awards activities

National Telecommunications and Information Administration

USE: NTIA

National vocational qualification

USE: Vocational training

Natural fibers

UF: Natural fibres
BT: Textile fibers
RT: Cotton
Wool
NT: Bamboo

Natural fibres

USE: Natural fibers

Natural gas

BT: Fossil fuels
RT: Energy resources
Fracking
Gases
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: Phonetics
Pragmatics
Semantic search
Semantic technology
Semantics
Semiotics
Social robots
Syntactics
NT: Chatbots
Machine translation
Morphology



2022 IEEE Thesaurus

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 response

USE: Transient response

Natural speech

USE: Natural languages

Navier-Stokes equations

BT: Differential equations
Fluid dynamics
RT: Finite volume methods
Viscosity

Navigation

UF: Direction-finding
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

Nb

USE: Niobium

Nb3Sn

USE: Niobium-tin

NBS

USE: NIST

NBTI

USE: Negative bias temperature
instability

NC machines

USE: Computer numerical control

Nd

USE: Neodymium

Nd2O3

USE: Neodymium compounds

Near field communication

UF: NFC
Nearfield communication
BT: Communication standards
Radio communication
RT: Magnetic communication
NT: Mobile communication

Near field radiation pattern

USE: Near-field radiation pattern

Near vertical incidence skywave

USE: NVIS

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

Nearest neighbor searches

USE: Nearest neighbor methods



2022 IEEE Thesaurus

Nearest neighbour methods

USE: Nearest neighbor methods

Nearfield communication

USE: Near field communication

Neck

BT: Body regions

Needles

BT: Mechanical products
RT: Biomedical equipment
Textile machinery

Negative bias temperature instability

UF: NBTI
BT: MOS devices

Negative feedback

BT: Feedback

Negative feedback amplifier

USE: Feedback amplifiers

Negative feedback loops

BT: Feedback loop

NEMA

BT: Standards organizations

NEMS

USE: Nanoelectromechanical systems

Neodymium

UF: Nd
BT: Metals
NT: Neodymium alloys
Neodymium compounds

Neodymium alloys

BT: Neodymium
RT: Alloying

Neodymium compounds

UF: Nd₂O₃
Neodymium oxide
BT: Neodymium

Neodymium oxide

USE: Neodymium compounds

Neon

BT: Chemical elements

Neonatology

BT: Medical specialties
RT: Pediatrics

Neoplasia

USE: Neoplasms

Neoplasms

UF: Neoplasia
BT: Biological tissues
NT: Breast neoplasms
Liver neoplasms
Lung neoplasms
Skin neoplasms

Nephrolithiasis

USE: Kidney stones

Neptunium

BT: Chemical elements

Nerve cells

USE: Neurons

Nerve endings

BT: Nervous system

Nerve fibers

BT: Neurons
NT: Axons
Myelin

Nerve tissues

BT: Nervous system

Nervous system

BT: Anatomy
RT: Bioelectric phenomena
Computational

neuroscience

Neural networks
Neurological diseases
Neurology
Neuromuscular stimulation
Neuropathology
Autonomic nervous system
Brain
Brain mapping
Central nervous system
Cranial
Ganglia
Glial cells
Nerve endings
Nerve tissues
Neural pathways



2022 IEEE Thesaurus

Neuroanatomy
Neurons
Neuroradiology
Neuroscience
Peripheral nervous system
Pituitary gland
Spinal cord
Spine
Synapses

Net neutrality

USE: Network neutrality

Network address translation

BT: Computer network management

Network analysis

USE: Network analyzers

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 control systems

USE: Networked control systems

Network function virtualization

UF: NFV
BT: Computer networks
Network architecture
RT: Application virtualization
Cloud computing
Intrusion detection
Servers
Software defined networking
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 of workstations

USE: Cluster computing

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
Network coding
Network intrusion
NT: Network reconnaissance



2022 IEEE Thesaurus

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: DC distribution systems

Network theory (graphs)

BT: Computer science
Mathematics
Physics
RT: Social sciences

Network throughput

USE: Throughput

Network topology

BT: Communications technology
RT: Overlay networks
Telecommunication
network topology
NT: Complex networks
Computer network reliability
Network architecture

Network traffic

USE: Telecommunication traffic

Network-on-a-chip

USE: Network-on-chip

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 chips

USE: Neural network hardware

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 nets

USE: Neural networks

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
BT: Computational and artificial intelligence
RT: AI accelerators
Adaptive systems



2022 IEEE Thesaurus

	Artificial intelligence	<i>Neuro fuzzy networks</i>	
	Associative memory	USE:	Fuzzy neural networks
	Backpropagation		
	Bio-inspired computing	<i>Neuro imaging</i>	
	Cybernetics	USE:	Neuroimaging
	Deep architecture		
	Dynamic programming	<i>Neuro marketing</i>	
	Fuzzy cognitive maps	USE:	Neuromarketing
	Generative adversarial		
networks		<i>Neuro transmitters</i>	
	Nervous system	USE:	Neurotransmitters
	Neurophysiology		
systems	Nonlinear dynamical	<i>Neuro-feedback</i>	
		USE:	Neurofeedback
	Pattern classification	<i>Neuro-fuzzy networks</i>	
	Reinforcement learning	USE:	Fuzzy neural networks
	Semisupervised learning		
	Soft sensors	<i>Neuro-imaging</i>	
NT:	Systems neuroscience	USE:	Neuroimaging
	Artificial neural networks		
	Biological neural networks	<i>Neuro-transmitters</i>	
	Cellular neural networks	USE:	Neurotransmitters
	Feedforward neural		
networks		Neuroanatomy	
	Graph neural networks	BT:	Anatomy
	Multi-layer neural network		Nervous system
compression	Neural network		
	Neural network hardware	Neurocontrollers	
	Radial basis function	BT:	Intelligent control
networks		RT:	Artificial intelligence
	Recurrent neural networks		Microcontrollers
			Neural network hardware
<i>Neural oscillation</i>		Neurodynamics	
USE:	Neural activity	BT:	Brain
		RT:	Neurophysiology
Neural pathways		<i>Neuroengineering</i>	
BT:	Nervous system	USE:	Neural engineering
<i>Neural prostheses</i>			
USE:	Prosthetics	Neurofeedback	
		UF:	Neuro-feedback
Neural prosthesis		BT:	Feedback
BT:	Neural engineering		
<i>Neural prosthetics</i>		<i>Neuroglia</i>	
USE:	Neuroprostheses	USE:	Glial cells
Neurites		Neuroimaging	
UF:	Neuronal process	UF:	Brain imaging
BT:	Neurons		Neuro imaging
			Neuro-imaging
<i>Neuro engineering</i>		BT:	Biomedical image
USE:	Neural engineering	processing	
			Brain mapping



2022 IEEE Thesaurus

RT: Functional near-infrared spectroscopy

NT: Neuroradiology
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

Neurological disorders

USE: Neurological diseases

Neurology

BT: Medical specialties
RT: Nervous system

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 computing

USE: Neuromorphic engineering

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

Neuronal networks

USE: Biological neural networks

Neuronal process

USE: Neurites

Neurone

USE: Neurons

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



2022 IEEE Thesaurus

	Neurodynamics	Neurosurgery	
	Neuromorphic engineering	BT:	Surgery
	Science - general	NT:	Deep brain stimulation
NT:	Biological neural networks	Neurotechnology	
	Neuroplasticity	BT:	Brain
Neuroplasticity			Technology
UF:	Brain plasticity	<i>Neurotransmission</i>	
	Cortical plasticity	USE:	Neurotransmitters
BT:	Neurophysiology	Neurotransmitters	
Neuroprostheses		UF:	Neuro transmitters
UF:	Neural prosthetics		Neuro-transmitters
	Neuroprosthetics		Neurotransmission
BT:	Brain		Synaptic transmission
	Neuroscience	BT:	Transmitters
	Prosthetics	RT:	Synapses
<i>Neuroprosthetics</i>		<i>Neutrino</i>	
USE:	Neuroprostheses	USE:	Neutrino sources
Neuropsychology		Neutrino sources	
BT:	Brain	UF:	Neutrino
	Psychology		Neutrinos
Neuroradiology		BT:	Elementary particles
BT:	Nervous system	RT:	Radioactive materials
	Radiology	<i>Neutrinos</i>	
RT:	Electromagnetics	USE:	Neutrino sources
	Neuroimaging	<i>Neutron beams</i>	
Neuroscience		USE:	Particle beams
BT:	Nervous system	Neutron capture therapy	
	Science - general	UF:	BNCT
NT:	Clinical neuroscience		Boron neutron capture
	Cognitive neuroscience	therapy	
	Computational	BT:	Medical treatment
neuroscience		RT:	Biological effects of
	Neuroinformatics	radiation	
	Neuromarketing		Dosimetry
	Neuroprostheses	Neutron radiation effects	
	Systems neuroscience	BT:	Radiation effects
	Transcranial direct current	<i>Neutron scattering</i>	
stimulation		USE:	Neutron spin echo
stimulation	Transcranial magnetic	Neutron spin echo	
Neurostimulation		UF:	Neutron scattering
BT:	Neuromodulation	BT:	Spectroscopy
RT:	Deep brain stimulation	Neutron stars	
	Microelectrodes	BT:	Stars
NT:	Transcranial direct current		
stimulation			
stimulation	Transcranial magnetic		



2022 IEEE Thesaurus

Neutrons

BT: Elementary particles
RT: Cosmic rays

New media age

USE: Information age

New Radio

BT: 5G mobile communication
Radio access technologies
RT: 3GPP

Newborns

USE: Pediatrics

Newton Fourier method

USE: Newton method

Newton method

UF: Newton Fourier method
Newton Raphson method
Newton's method
Newton-Fourier method
Newton-Raphson method
Newtons method
BT: Numerical analysis
RT: Optimization methods
Poles and zeros

Newton Raphson method

USE: Newton method

Newton's method

USE: Newton method

Newton-Fourier method

USE: Newton method

Newton-Raphson method

USE: Newton method

Newtons method

USE: Newton method

Next generation network architecture

USE: Next generation networking

Next generation networking

UF: 21CN
21st century networks
NGN
NGNA
Next generation network

architecture

Next generation networks

BT: Next-generation networks
Computer networks
RT: 3G mobile communication
4G mobile communication
5G mobile communication
IP networks
Internet
Packet switching
Pervasive computing
Quality of service
Telecommunications

Next generation networks

USE: Next generation networking

Next-generation networks

USE: Next generation networking

NFB

USE: Feedback amplifiers

NFC

USE: Near field communication

NFPA

UF: National Fire Protection
Agency
National Fire Protection
Association
BT: Standards organizations

NFT

USE: Nonfungible tokens

NFV

USE: Network function
virtualization

NGN

USE: Next generation networking

NGNA

USE: Next generation networking

Ni

USE: Nickel

Nickel

UF: Ni
BT: Metals
NT: Nickel alloys
Nickel compounds



2022 IEEE Thesaurus

Nickel alloys

BT: Nickel
RT: Alloying

Nickel cadmium batteries

UF: Nickel-cadmium batteries
BT: Batteries

Nickel compounds

BT: Nickel

Nickel-cadmium batteries

USE: Nickel cadmium batteries

Night vision

BT: Infrared imaging
RT: Image sensors
Military equipment

NIH

USE: National Institutes of Health

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

NLP

USE: Natural language

processing

nMOSFETs

USE: MOSFET

NMR

USE: Nuclear magnetic

resonance

NMR imaging

USE: Magnetic resonance

imaging

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



2022 IEEE Thesaurus

noise	Gaussian noise	<i>Noise robust</i>	
	Laser noise	USE:	Noise robustness
	Low-frequency noise	Noise robustness	
	Noise cancellation	UF:	Noise robust
	Phase noise	BT:	Noise reduction
	Signal to noise ratio	Noise shaping	
	Superconducting device	UF:	Noise-shaping
		BT:	Noise measurement
	White noise	NT:	Multi-stage noise shaping
<i>Noise abatement</i>		<i>Noise suppression</i>	
USE:	Noise reduction	USE:	Noise reduction
Noise cancellation		<i>Noise-shaping</i>	
UF:	Noise cancellers	USE:	Noise shaping
BT:	Acoustic noise	<i>Noisy</i>	
	Noise	USE:	Noise measurement
RT:	Filtering	NOMA	
<i>Noise cancellers</i>		UF:	Nonorthogonal multiple
USE:	Noise cancellation	access	non-orthogonal multiple
Noise figure		access	
BT:	Noise measurement	BT:	Access protocols
RT:	Signal to noise ratio	RT:	Communication systems
Noise generators			Cellular radio
BT:	Signal generators		Free-space optical
RT:	Noise	communication	
Noise level			MIMO communication
BT:	Acoustic noise		OFDM
Noise measurement			Radio communication
UF:	Noisy		Radiofrequency
BT:	Measurement	interference	
RT:	Distortion measurement	<i>Non fungible tokens</i>	
	Electric variables	USE:	Nonfungible tokens
measurement		<i>Non relational databases</i>	
	Noise	USE:	NoSQL databases
	Packet loss	<i>Non-fungible tokens</i>	
NT:	Multiple signal classification	USE:	Nonfungible tokens
	Noise figure	<i>Non-gyroscopes</i>	
	Noise shaping	USE:	Gyroscopes
Noise reduction		<i>non-orthogonal multiple access</i>	
UF:	Audio enhancement	USE:	NOMA
	De-noising	<i>Non-parametric statistics</i>	
	Denosing	USE:	Nonparametric statistics
	Noise abatement		
	Noise suppression		
BT:	Acoustic noise		
NT:	Active noise reduction		
	Noise robustness		
	Wiener filters		



2022 IEEE Thesaurus

Non-united-states activities

USE: IEEE Professional activities

Non-volatile memory

USE: Nonvolatile memory

Nonconductive adhesives

BT: Adhesives

Nondestructive testing

BT: Materials testing
RT: Acoustic emission
Ultrasonic transducers
NT: Magnetic flux leakage

Nondeterministic polynomial-time hard

USE: NP-hard problem

Nonfungible tokens

UF: NFT
Non fungible tokens
Non-fungible tokens
BT: Authentication
Blockchains
RT: Bitcoin
Cryptocurrency
Distributed ledger

Nongyroscopes

USE: Gyroscopes

Nonhomogeneous media

UF: Composite media
Inhomogeneous media
Layered media
Multilayers
Periodic media
Stratified media
BT: Media
RT: Random media

Noninvasive diagnosis

USE: Noninvasive treatment

Noninvasive measurement

USE: Noninvasive treatment

Noninvasive surgery

USE: Noninvasive treatment

Noninvasive technique

USE: Noninvasive treatment

Noninvasive therapy

USE: Noninvasive treatment

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



2022 IEEE Thesaurus

Nonlinear dynamics

USE: Nonlinear dynamical systems

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
Electro-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

Nonorthogonal multiple access

USE: NOMA

Nonparametric statistics

UF: Non-parametric statistics
BT: Statistics
NT: Nearest neighbor methods

Nonrelational databases

USE: NoSQL databases

Nonuniform electric fields

BT: Electric fields

Nonuniform sampling

BT: Sampling methods

Nonuniform transmission lines

USE: Distributed parameter circuits

Nonvolatile memories

USE: Nonvolatile memory

Nonvolatile memory

UF: Non-volatile memory
Nonvolatile memories
BT: Memory

Normal distribution

USE: Gaussian distribution

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



2022 IEEE Thesaurus

RT:	Big Data Data structures Data warehouses Distributed databases Linked data Query processing	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 Radiation monitoring Radiation safety Reactor instrumentation Scintillation counters Thermionic emission
Notch filters		
UF:	Band-stop filters	
BT:	Filters	
Notice of Violation		
BT:	IEEE publications	
RT:	Intellectual property Plagiarism	(electronics)
<i>Novelty detection</i>		
USE:	Anomaly detection	
<i>NP hard problem</i>		
USE:	NP-hard problem	<i>Nuclear bombs</i>
<i>NP-C</i>		USE: Nuclear weapons
USE:	NP-complete problem	
NP-complete problem		Nuclear electronics
UF:	NP-C	BT: Nuclear and plasma sciences
BT:	Complexity theory	RT: FET circuits High energy physics instrumentation computing
NP-hard problem		<i>Nuclear energy</i>
UF:	NP hard problem Nondeterministic	USE: Nuclear power generation
polynomial-time hard		<i>Nuclear facility licensing</i>
BT:	Complexity theory	USE: Nuclear facility regulation
NT:	Traveling salesman problems	
NTIA		Nuclear facility regulation
UF:	National Telecommunications and Information Administration	UF: Licensing (nuclear facilities) Nuclear facility licensing
BT:	US Department of Commerce	BT: Power industry RT: Radioactive waste
Nuclear and plasma sciences		<i>Nuclear fission</i>
NT:	Biomedical applications of radiation	USE: Fission reactors
	Colliding beam devices Electron emission Elementary particles Fusion power generation Fusion reactors Gamma-rays Gas discharge devices	Nuclear fuels
		BT: Energy resources Fuels Radioactive materials
		RT: Nuclear power generation Radioactive waste
		Nuclear imaging
		UF: Gamma-ray imaging BT: Imaging



2022 IEEE Thesaurus

sciences	Nuclear and plasma	BT:	Nuclear energy
RT:	Nuclear medicine	RT:	Power generation
NT:	Radiography	NT:	Nuclear fuels
	Energy resolution		Atomic batteries
	Ion emission		Fission reactors
			Fusion power generation
Nuclear magnetic resonance		<i>Nuclear reactors (fission)</i>	
UF:	NMR	USE:	Fission reactors
BT:	Magnetic resonance	<i>Nuclear reactors (fusion)</i>	
<i>Nuclear magnetic resonance imaging</i>		USE:	Fusion reactors
USE:	Magnetic resonance	Nuclear thermodynamics	
imaging		BT:	Nuclear physics
Nuclear measurements		RT:	Elementary particles
BT:	Measurement		Entropy
RT:	Atomic measurements		Phase change materials
	CAMAC	<i>Nuclear wastes</i>	
	Position sensitive particle	USE:	Radioactive pollution
detectors		Nuclear weapons	
	Radiation detectors	UF:	Nuclear bombs
	Spectroscopy	BT:	Weapons
NT:	Particle tracking	Null space	
Nuclear medicine		BT:	Kernel
BT:	Engineering in medicine	Null value	
and biology		UF:	Nullvalue
	Nuclear and plasma	BT:	Data structures
sciences		RT:	Programming
RT:	Energy resolution	<i>Nullvalue</i>	
	Gamma-rays	USE:	Null value
	Nuclear imaging	Number portability	
	Positron emission	BT:	Telecommunication
tomography		services	
Nuclear physics		Numerical analysis	
BT:	Nuclear and plasma	BT:	Mathematics
sciences		RT:	Convolution
RT:	Hafnium		Deconvolution
NT:	Alpha particles		Difference equations
	Beta rays		Differential equations
	Ignition		Error analysis
	Ion sources		Integral equations
	Isotopes		Inverse problems
	Nuclear thermodynamics		Matlab
	Relativistic effects		Nonlinear equations
<i>Nuclear Power Generating Stations</i>			Numerical models
USE:	Nuclear power generation		Transforms
Nuclear power generation		NT:	Adaptive mesh refinement
UF:	Atomic energy		
	Nuclear Power Generating		
Stations			



2022 IEEE Thesaurus

[illegible]

2022 IEEE Thesaurus

NT:	Software reusability Dispatching	radiation	Biological effects of
Object recognition			Domestic safety
UF:	Image object recognition		Electric shock
BT:	Machine vision		Employee welfare
RT:	Image matching		Environmental factors
	Image recognition		Ergonomics
	Object tracking		Eye protection
	Robot vision systems		Occupational medicine
NT:	Affordances		Occupational safety
	Target recognition		Pollution
Object segmentation			Protective clothing
BT:	Machine vision		Radioactive materials
NT:	Subspace constraints		Risk analysis
Object tracking		NT:	Safety
BT:	Tracking		Toxicology
RT:	Cinematography		Working environment noise
	Image motion analysis		Occupational stress
	Image segmentation	Occupational medicine	
	Motion capture	BT:	Medical services
	Motion estimation	RT:	Medical diagnosis
	Object recognition		Medical treatment
	Trajectory		Occupational health
	Video signal processing		
<i>Object-oriented programming</i>		<i>Occupational pensions</i>	
USE:	Object oriented	USE:	Pensions
programming		Occupational safety	
Observability		UF:	OSHA
BT:	Control theory	BT:	Health and safety
Observatories		RT:	Accidents
BT:	Astronomy		Domestic safety
RT:	Telescopes		Electric shock
Observers			Employee welfare
BT:	State estimation		Eye protection
RT:	Machine vision		Industrial accidents
NT:	Disturbance observers		Occupational health
	Earth Observing System		Protection
<i>Obstacle avoidance</i>			Protective clothing
USE:	Collision avoidance		Radioactive materials
Occipital Lobe			Risk analysis
BT:	Brain		Working environment noise
Occupational health		Occupational stress	
UF:	Health (occupational)	BT:	Occupational health
BT:	Health and safety	RT:	Employee welfare
RT:	Accidents		Hazards
		<i>OCDM</i>	
		USE:	Code division multiplexing
		<i>Ocean animals</i>	
		USE:	Marine animals



2022 IEEE Thesaurus

Ocean circulation

BT: Oceanography
RT: Ocean waves
Sea level
Tides

Ocean composition

USE: Oceans

Ocean salinity

BT: Oceans
RT: Salinity (geophysical)
NT: SMOS mission

Ocean technology

USE: Marine technology

Ocean temperature

UF: Sea surface temperature
BT: Oceanic engineering and
marine technology
RT: Oceans
Global warming
Land surface temperature

Ocean vegetation

USE: Marine vegetation

Ocean waves

BT: Hydrology
RT: Ocean circulation
NT: Sea state
Wave power

Oceanic engineering and marine technology

NT: Marine navigation
Marine technology
Ocean temperature
Oceanographic techniques
Water pollution

Oceanographic techniques

BT: Oceanic engineering and
marine technology
RT: Acoustic imaging
Hydrologic measurements
Radar applications
Remote sensing

Oceanography

UF: Marine science
Oceanology
BT: Geoscience
RT: Marine robots
Oceans

NT: Ocean circulation

Oceanology

USE: Oceanography

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

OCR

USE: Optical character
recognition software

Octrees

BT: Data structures

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
NT: NOMA
Multiple access interference
OFDM modulation
Partial transmit sequences
Peak to average power

ratio

OFDM modulation

BT: OFDM



2022 IEEE Thesaurus

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 distribution systems

USE: Offshore installations

Offshore installations

UF: Gas platforms
Offshore distribution

systems

Offshore power plants
Oil platforms

BT: Structural engineering

RT: Oil drilling
Petroleum industry
Power industry

Offshore power plants

USE: Offshore installations

OGC

USE: Open Geospatial

Consortium

Ohmic contacts

BT: Contacts

RT: Linear circuits

Ohmmeters

USE: Electrical resistance

measurement

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 filters

USE: Lubricating oils

Oil industry

USE: Petroleum industry

Oil insulation

UF: Transformer oil

BT: Insulation

RT: Oils

NT: Oil filled cables

Oil platforms

USE: Offshore installations

Oil pollution

BT: Pollution

RT: Accidents
Land pollution
Marine pollution
Oils
Petroleum
Petroleum industry

Oil refineries

BT: Petroleum industry

Oil sands

USE: Hydrocarbons

Oil shale

USE: Hydrocarbons

Oil tanks

USE: Fuel storage

Oiling (lubrication)

USE: Lubricating oils

Oils

BT: Materials

RT: Engines



2022 IEEE Thesaurus

transmission		Fats		<i>On demand software</i>	
		Fluids		USE:	Software as a service
		Fractionation			
		Fuel processing industries		On load tap changers	
		Insulation		UF:	Load tap changers
		Marine pollution			On-load tap changers
		Mechanical factors			Onload tap changers
		Mechanical power		BT:	Power transformers
					Tap changers
				RT:	Voltage control
NT:		Oil insulation		On the job training	
		Oil pollution		UF:	On-the-job training
		Petroleum		BT:	Training
		Petroleum industry		RT:	Industrial training
		Pipelines			
		Water pollution		<i>On-chip</i>	
		Lubricating oils		USE:	System-on-chip
		Vegetable oils			
				<i>On-demand software</i>	
				USE:	Software AND
Older adults					Software as a service
	UF:	Elderly		<i>On-line services</i>	
		Senior citizens		USE:	Online services
	BT:	Social groups			
	RT:	Aging		<i>On-load tap changers</i>	
		Alzheimer's disease		USE:	On load tap changers
		Assisted living			
		Assistive robots		<i>On-the-job training</i>	
		Geriatrics		USE:	On the job training
		Gerontology			
OLED				Oncological surgery	
	USE:	Organic light emitting		UF:	Otologic surgery
diodes					Surgery oncology
Olfactory				BT:	Surgery
	BT:	Nose		RT:	Cancer
Olfactory bulb					Oncology
	BT:	Forebrain			
		Sense organs		Oncology	
Oligopoly				BT:	Medical specialties
	BT:	Economics		RT:	Cancer
	RT:	Game theory			Chemotherapy
		Microeconomics			Oncological surgery
Omnidirectional antennas					Tumors
	BT:	Antennas		Online banking	
On board unit				UF:	Digital currency
	BT:	Communication equipment			E-banking
communication	RT:	Dedicated short range			E-currency
					E-wallets
		Vehicle-to-everything			Electronic banking
					Electronic currency
					Electronic wallets
					Internet banking



2022 IEEE Thesaurus

	Mobile payment		<i>ONU</i>		
	Virtual currency			USE:	Optical network units
BT:	Banking				
	Online services		<i>OOO</i>		
RT:	Bitcoin			USE:	Out of order
	Cryptocurrency				
	Electronic commerce		<i>Op amp</i>		
	Open banking			USE:	Operational amplifiers
NT:	Distributed ledger				
<i>Online bullying</i>			Open Access		
USE:	Cyberbullying		BT:		Open systems
					Publishing
<i>Online indexing</i>			NT:		Public domain software
USE:	Indexing				
<i>Online learning</i>			Open area test sites		
USE:	Electronic learning		UF:		OATS
			BT:		Test facilities
			RT:		Electromagnetic
Online services					compatibility and interference
UF:	Inverted classroom				Electromagnetic
	On-line services				interference
	Reverse teaching				Immunity testing
BT:	Information retrieval				Military equipment
RT:	Cloud gaming		Open banking		
	Electronic learning		BT:		Banking
	Internet				Open source software
NT:	Online banking		RT:		Finance
<i>Online shopping</i>					Investment
USE:	Electronic commerce				Online banking
					Open systems
<i>Online social networks</i>			Open data		
USE:	Social networking (online)		BT:		Data handling
			RT:		Electronic publishing
<i>Online voting</i>					Government policies
USE:	Electronic voting				Internet
					Linked data
<i>Onload tap changers</i>					Ontologies
USE:	On load tap changers				Open systems
					Public domain software
Ontologies					Semantic Web
UF:	Ontology		Open Educational Resources		
BT:	Knowledge representation		BT:		Educational courses
RT:	Linked data				Open systems
	Open data				
	Ranking (statistics)		Open Geospatial Consortium		
	Semantic Web		UF:		OGC
	Semantic search		BT:		Standards organizations
	Thesauri				
NT:	Description logic		<i>Open loop control</i>		
<i>Ontology</i>			USE:		Open loop systems
USE:	Ontologies				



2022 IEEE Thesaurus

Open loop systems

UF: Open loop control
BT: Control systems
RT: Feedforward systems
Operational amplifiers

Open source hardware

UF: Opensource hardware
BT: Hardware

Open source software

UF: Open-source
BT: Software
RT: Public domain software
NT: Open banking

Open systems

UF: OSI
BT: Computers and information processing
RT: System analysis and design
(electricity) Common Information Model
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

Open-source

USE: Open source software

Opensource hardware

USE: Open source hardware

Operating cost reduction

USE: Costing

Operating systems

UF: Android (operating system)
Computer operating systems
Executive programs

Microsoft Windows
Robot operating systems
Supervisory programs
BT: System software
RT: Computer security
Cyber-physical systems
Program processors
Software defined
System recovery
NT: Booting
Embedded systems
Input-output programs
Kernel
Network operating systems
System kernels

Operational amplifiers

UF: Op amp
BT: Active circuits
Amplifiers
RT: FET circuits
Linearization techniques
MOSFET circuits
Open loop systems
NT: Feedback amplifiers

Operations research

BT: Business
RT: Linear programming
Management
Optimization methods
Principal component analysis
Resource management
Statistics
TOPSIS
NT: Inventory control
Virtual enterprises

Ophthalmology

BT: Medical specialties
RT: Cornea
Eyes
Iris
Pupils
Retina

Opinion mining

USE: Sentiment analysis

Opportunistic software systems development

BT: Programming



2022 IEEE Thesaurus

Optic flow

USE: Optical flow

Optical add-drop multiplexers

UF: ROADMS

BT: Add-drop multiplexers

Optical amplification

USE: Stimulated emission

Optical amplifiers

BT: Optics

RT: Erbium

NT: Doped fiber amplifiers

Erbium-doped fiber

amplifiers

Semiconductor optical

amplifiers

Optical arrays

BT: Optical devices

RT: Micromirrors

Phased arrays

Optical attenuators

UF: Variable optical attenuators

BT: Attenuators

Optical devices

RT: Optical communication

equipment

Optical losses

Optical beam splitting

BT: Optical beams

Optical beams

BT: Beams

RT: Bragg gratings

Laser beams

Laser theory

NT: Optical beam splitting

Optical bistability

UF: Bistability (optical)

BT: Electro-optic effects

RT: Electro-optic devices

Optical switches

Optical buffering

BT: Optical fiber communication

Optical burst switching

BT: Burst switching

Optical character recognition software

UF: License plate recognition
OCR

BT: Software

Optical cloaking

UF: Metamaterial cloaking

BT: Metamaterials

Optical materials

Optical code division multiplexing

USE: Code division multiplexing

Optical coherence tomography

BT: Tomography

RT: Eyes

Optical collimators

BT: Optical devices

Optical communication

USE: Optical fiber communication

Optical communication equipment

BT: Communication equipment

RT: Biomedical optical imaging

Optical attenuators

Optical switches

NT: Optical transmitters

Optical components

USE: Optical devices

Optical computing

BT: Computers and information
processing

Optical control

BT: Control systems

RT: Optical switches

NT: Lighting control

Optical variables control

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



2022 IEEE Thesaurus

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 device manufacture

USE: Optical device fabrication

Optical devices

UF: Optical components
BT: Optics
RT: Biomedical optical imaging
Endomicroscopy
Gratings
Optical materials
NT: Bragg gratings
Collimators
Displays
Holographic optical

components

Lenses
Lighting
Luminescent devices
Mirrors
Optical arrays
Optical attenuators
Optical collimators
Optical device fabrication
Optical filters
Optical modulators
Optical resonators
Optical sensors
Thermo-optical devices

Optical diffraction

BT: Electromagnetic diffraction
RT: Photonic band gap
NT: Diffraction gratings

Optical distortion

BT: Optics
RT: Lasers
Optical noise
Thermal lensing

Optical distortion measurement

USE: Distortion measurement

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



2022 IEEE Thesaurus

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
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 local area network

USE: Optical fiber LAN

Optical fiber loss

USE: Optical fiber losses

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



2022 IEEE Thesaurus

RT: Optical waveguides
Electromagnetic

waveguides

Optical fiber applications
Optical fiber devices
Optical fiber testing
Optical materials
Optical propagation
Optical waveguide theory
Optical wavelength

conversion

NT: Supercontinuum generation
Temperature sensors
Optical fiber amplifiers
Optical fiber couplers
Optical fiber losses
Optical fiber polarization
Optical fiber theory
Plastic optical fiber
Wavelength conversion

Optical fibre amplifiers
USE: Optical fiber amplifiers

Optical fibre applications
USE: Optical fiber applications

Optical fibre cables
USE: Optical fiber cables

Optical fibre communication
USE: Optical fiber communication

Optical fibre couplers
USE: Optical fiber couplers

Optical fibre devices
USE: Optical fiber devices

Optical fibre dispersion
USE: Optical fiber dispersion

Optical fibre LAN
USE: Optical fiber LAN

Optical fibre local area network
USE: Optical fiber LAN

Optical fibre losses
USE: Optical fiber losses

Optical fibre networks
USE: Optical fiber networks

Optical fibre polarisation
USE: Optical fiber polarization

Optical fibre sensors
USE: Optical fiber sensors

Optical fibre subscriber loops
USE: Optical fiber subscriber loops

Optical fibre testing
USE: Optical fiber testing

Optical fibre theory
USE: Optical fiber theory

Optical fibres
USE: Optical fibers

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 combs
USE: Optical harmonic generation

Optical frequency conversion
BT: Frequency conversion

Optical gratings
USE: Gratings

Optical harmonic generation
UF: Optical frequency combs
BT: Optics

Optical heterodyning
USE: Optical mixing

Optical imaging
BT: Imaging
RT: Infrared imaging
Microscopy



2022 IEEE Thesaurus

NT: Remote sensing
Optical flow
Optical projectors
Talbot effect
Thermoreflectance imaging

Optical interconnections

UF: Optical interconnects
BT: Optical fiber communication

Optical interconnects

USE: Optical interconnections

Optical interferometry

UF: Light interferometry
BT: Interferometry
RT: Optical fiber polarization
Speckle
Talbot effect

Optical lattices

USE: Lattices

Optical links

USE: Optical fiber communication

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

NT: Phase change materials
Photonic crystals
SIMO communication
Colloidal nanocrystals
Optical cloaking
Optical polymers
Optical retarders

Optical superlattices
Photorefractive materials

Optical measurements

USE: Optical variables
measurement

Optical metamaterials

UF: Photonic metamaterials
BT: Metamaterials
RT: Electromagnetic
metamaterials

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 multilayers

USE: Optical superlattices

Optical network units

UF: ONU
BT: Optical fiber networks

Optical networks

USE: Optical fiber networks

Optical noise

BT: Integrated circuit noise
RT: Optical distortion
NT: Speckle



2022 IEEE Thesaurus

Optical packet switching

BT: Optical fiber communication

Optical planar waveguides

BT: Optical waveguides

Optical polarisation

USE: Optical polarization

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 radar

USE: Laser radar

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 regenerators

USE: Repeaters

Optical resonators

BT: Optical devices
RT: Digital filters
Laser cavity resonators
Resonance
Split ring resonators
NT: Microcavities
Optical ring resonators

Optical retarders

UF: Half-wave plates
Quarter-wave plates
BT: Optical materials
Optics
RT: Polarimetry

Optical ring resonators

UF: Ring resonators
BT: Optical resonators



2022 IEEE Thesaurus

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 superlattices

UF: Optical multilayers
BT: Optical materials
Superlattices

Optical surface waves

BT: Optical propagation

Optical switch

USE: Optical switches

Optical switches

UF: Optical switch
BT: Switches
RT: Optical bistability
Optical communication

equipment

Optical control
Photothyristors
Smart pixels
Thermo-optical 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 vortex

USE: Optical vortices

Optical vortices

UF: Optical vortex
Vortices, optical
BT: Physical optics
RT: Laser beams
Optical solitons

Optical waveguide components

BT: Optical waveguides

Optical waveguide theory

BT: Optical waveguides
RT: Optical fibers

Optical waveguides

BT: Optical propagation
Waveguide components



2022 IEEE Thesaurus

components	RT:	Electro-optic modulators	generation	Optical harmonic
		Integrated optics		
		Photonic crystals		
	NT:	Arrayed waveguide gratings		Optical losses
		Electro-optical waveguides		Optical microscopy
		Optical fibers		Optical mixing
		Optical planar waveguides		Optical polarization
		Optical waveguide		Optical pulses
				Optical retarders
				Optical saturation
Optical wavelength conversion		Optical waveguide theory		Optical solitons
				Optical tuning
				Optogenetics
	BT:	Optical fiber communication		Particle beam optics
		Signal processing		Photoluminescence
	RT:	Multicast communication		Physical optics
		Optical fibers		Ray tracing
		Telecommunications		Stray light
				Ultrafast optics
				Whispering gallery modes
<i>Optical-fiber networks</i>				
USE:	Optical fiber networks			
<i>Optical-fibre networks</i>				
USE:	Optical fiber networks			
Optics			Optimal control	
	BT:	Lasers and electrooptics	BT:	Control systems
	RT:	Erbium	RT:	Game theory
		Fourier transforms		H infinity control
		Laser theory	NT:	Bang-bang control
		Magneto-optic effects		Infinite horizon
		Optical materials		
	NT:	Adaptive 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 crosstalk			
	Optical design			
	Optical devices			
	Optical distortion			
	Optical engineering			
	Optical fiber applications			
			Optimal matching	
			BT:	Graph theory
			Optimal scheduling	
			BT:	Optimization
			<i>Optimisation</i>	
			USE:	Optimization
			<i>Optimisation methods</i>	
			USE:	Optimization methods
			<i>Optimised production technology</i>	
			USE:	Optimized production technology
			<i>Optimising compilers</i>	
			USE:	Optimizing compilers
			Optimization	
			UF:	Optimisation
				Performance optimisation
				Performance optimization
			BT:	Mathematics
			RT:	Artificial bee colony
			algorithm	
				Doping profiles



2022 IEEE Thesaurus

approximations	Least squares	<i>Opto-electronic devices</i>
		USE: Optoelectronic devices
NT:	Minimization	<i>Optoacoustic effects</i>
	Parametric study	USE: Photoacoustic effects
	Performance analysis	
	TOPSIS	
	Cost function	Optoelectronic and photonic sensors
	Metaheuristics	BT: Sensors
	Optimal scheduling	
	Optimization methods	Optoelectronic devices
	Trajectory optimization	UF: Opto-electronic devices
		BT: Lasers and electrooptics
Optimization methods		RT: Electro-optic devices
UF:	Optimisation methods	Phototransistors
	Optimization	NT: Charge-coupled image
	Infinite horizon	sensors
	Linear programming	Integrated optoelectronics
	MIMO communication	Light emitting diodes
	Newton method	Photoconducting devices
	Operations research	Photodetectors
	Processor scheduling	Superluminescent diodes
	Response surface	
		Optogenetics
methodology	Search methods	BT: Genetics
	Single machine scheduling	Neuromodulation
	Traveling salesman	Optical control
NT:	Affordances	Optics
	Circuit optimization	<i>Optothermal effects</i>
	Concave programming	USE: Photothermal effects
	Design optimization	
	Fireworks algorithm	<i>Optothyristors</i>
	Gradient methods	USE: Photothyristors
	H infinity control	
	Lagrangian functions	Oral communication
	Mathematical programming	UF: Speech communication
	Optimized production	BT: Professional
technology	Pareto optimization	communication
	Quadratic programming	NT: Public speaking
	Simulated annealing	Speech
		<i>Orange technology</i>
Optimized production technology		USE: Social implications of
UF:	Optimised production	technology
		Orbital calculations
	Optimization methods	BT: Energy states
	Production control	
	Production planning	<i>Orbital debris</i>
RT:	Production systems	USE: Space debris
Optimizing compilers		Orbital robotics
UF:	Optimising compilers	BT: Robots
	Program processors	



2022 IEEE Thesaurus

Orbits

BT: Astrophysics
RT: Geostationary satellites
NT: Orbits (stellar)
Planetary orbits

Orbits (stellar)

BT: Orbits

Ordinance

USE: Weapons

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 FETS

USE: OFETs

Organic field effect transistors

USE: OFETs

Organic field-effect transistors

USE: OFETs

Organic inorganic hybrid materials

UF: Inorganic organic hybrid materials
Inorganic-organic hybrid materials

materials

silicates

BT: Ormosils
RT: Materials
Inorganic compounds
Optical materials

Organic light emitting diodes

UF: OLED
Organic light-emitting

diodes

BT: Polymer led
Diodes
Light emitting diodes
RT: Electroluminescence
Molecular electronics
NT: Active matrix organic light emitting diodes

Organic light-emitting diodes

USE: Organic light emitting

diodes

Organic materials

BT: Materials

Organic semiconductors

BT: Organic compounds
Semiconductor materials
NT: Pentacene

Organic thin film transistors

UF: OTFT
Organic thin-film transistors
BT: Thin film transistors

Organic thin-film transistors

USE: Organic thin film transistors

Organic-inorganic hybrid materials

USE: Organic inorganic hybrid materials

Organically modified silicates

USE: Organic inorganic hybrid materials

Organisational aspects

USE: Organizational aspects

Organisational culture

USE: Organizational aspects



2022 IEEE Thesaurus

Organisational structure

USE: Organizational aspects

Organisms

BT: Biological systems
NT: Algae
Animals
Archaea
Fish
Fungi
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

Organizational communication

USE: Industrial communication

Organizational culture

USE: Organizational aspects

Organizational structure

USE: Organizational aspects

Organizations

BT: Business
RT: Leadership
NT: BNSC
Companies
Decentralized autonomous
organization
European Space Agency
Government
Sociotechnical systems
United Kingdom Space
Agency

Organobromine compounds

USE: Bromine compounds

Organs (biological)

USE: Biological systems

Orientation control

USE: Position control

Orientation determination

USE: Position measurement

Orientation measurement

USE: Position measurement

Orifices

BT: Mechanical products

Ormosils

USE: Organic inorganic hybrid materials

Orthogonal frequency division multiple access

USE: OFDM

Orthogonal frequency division multiplexing

USE: OFDM

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

Oscillations

USE: Oscillators

Oscillators

UF: Oscillations
BT: Circuits and systems
RT: Circuits
Damping
Klystrons
Lasers



2022 IEEE Thesaurus

	Resonant frequency	Output feedback	
	Vibrations	BT:	Feedback circuits
NT:	Digital-controlled oscillators	<i>Output power</i>	
	Injection-locked oscillators	USE:	Power generation
	Local oscillators	Outsourcing	
	Microwave oscillators	BT:	Management
	Phase noise	RT:	Crowdsourcing
	Ring oscillators		
	Voltage-controlled		
oscillators		Ovarian cancer	
		BT:	Cancer
Oscilloscopes		Ovens	
UF:	Cathode-ray oscilloscopes	BT:	Home appliances
BT:	Instruments	NT:	Microwave ovens
RT:	Electric variables		
measurement	Test equipment	Over-the-top media services	
		UF:	OTT
<i>OSHA</i>		BT:	Streaming media
USE:	Occupational safety	<i>Overflow oscillations</i>	
		USE:	Finite wordlength effects
<i>OSI</i>		<i>Overhead distribution lines</i>	
USE:	Open systems	USE:	Power distribution lines
Osmium		<i>Overhead transmission lines</i>	
BT:	Chemical elements	USE:	Power transmission lines
Osmosis		Overlay networks	
BT:	Chemical processes	BT:	Computer networks
NT:	Electro-osmosis	RT:	Network topology
			Transport protocols
Osteoarthritis		<i>OWA</i>	
BT:	Bone diseases	USE:	Open wireless architecture
Osteoporosis		OWL	
BT:	Bone diseases	UF:	Web ontology language
RT:	Cancellous bone	BT:	Markup languages
			Semantic Web
<i>OTFT</i>		RT:	Knowledge representation
USE:	Organic thin film transistors	Oxidation	
<i>Otologic surgery</i>		BT:	Chemical processes
USE:	Oncological surgery	RT:	Materials
		NT:	Combustion
<i>OTT</i>			Redox
USE:	Over-the-top media	Oxygen	
services		BT:	Chemical elements
Out of order			Gases
UF:	OOO	RT:	Pulse oximetry
BT:	Instruction sets		
<i>Outlier detection</i>			
USE:	Anomaly detection		



2022 IEEE Thesaurus

Ozonation

UF: Ozone treatment
BT: Wastewater treatment
RT: Environmental factors
Pollution control

Ozone generators

USE: Discharges (electric)

Ozone treatment

USE: Ozonation

Ozonizers

USE: Discharges (electric)

P-I-N

USE: PIN photodiodes

P-i-n diodes

BT: Diodes
Semiconductor devices
Semiconductor diodes
RT: Electro-optic modulators
Vertical cavity surface

emitting lasers

P-n junctions

BT: Junctions
RT: Light emitting diodes
Photodiodes
Semiconductor diodes

P1394

USE: IEEE 1394 Standard

P2MP

USE: Point-to-multipoint
communications

P2P

USE: Peer-to-peer computing

P802.11

USE: IEEE 802.11 Standard

PAAS

USE: Platform as a service

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

USE: Packet radio networks

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

Pacs

USE: Picture archiving and
communication systems

Paediatrics

USE: Pediatrics

Page description languages



2022 IEEE Thesaurus

UF: Postscript
BT: Markup languages
RT: Desktop publishing
High level languages

BT: Palletizing
RT: Materials handling
Containers
Load management

Paging strategies

USE: Paging systems

Paging systems

UF: Paging strategies
BT: Cellular radio
RT: Wireless communication

Pain

BT: Injuries
NT: Ischemic pain
Neuropathic pain

Painting

BT: Surface finishing
Surface treatment
RT: Coatings
Paints
Photorealism

Paints

BT: Chemical products
Coatings
Materials
RT: Ink
Lacquers
Painting

Pair-wise error probability

USE: Pairwise error probability

Pairwise correlations

USE: Pairwise error probability

Pairwise error probability

UF: Pair-wise error probability
Pairwise correlations
BT: Probability

Palladium

BT: Metals

Palletising

USE: Pallets

Palletizing

USE: Pallets

Pallets

UF: Palletising

Palm print recognition

USE: Palmprint recognition

Palmprint identification

USE: Palmprint recognition

Palmprint recognition

UF: Palm print recognition
Palmprint identification
BT: Biometrics (access control)
RT: Identification of persons

Palmtop computers

USE: Personal digital devices

Pancreas

BT: Digestive system

Pandemics

BT: Epidemics
RT: COVID-19
Coronaviruses
Diseases
Influenza

Pansharpened

USE: Pansharpening

Pansharpening

UF: Pansharpened
BT: Image processing
RT: Image quality

Paper electronics

USE: Organic electronics

Paper industry

USE: Pulp and paper industry

Paper making

BT: Pulp and paper industry
Bleaching
RT: Paper making machines
Paper products
Paper pulp
Paper technology
Pulp manufacturing
Spinning machines



2022 IEEE Thesaurus

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: 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

PAPR

USE: Peak to average power ratio

Paraelectric materials

USE: Dielectric materials

Parallel algorithms

BT: Algorithms
Parallel processing

Parallel architectures

BT: Computer architecture
RT: Parallel machines
Parallel processing
NT: Multicore processing

Parallel computing

USE: Parallel 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 processor interconnection

USE: Multiprocessor interconnection

Parallel programming

BT: Programming
RT: Multiprocessing systems
Parallel languages
Parallel processing
VHDL

Parallel robots

BT: Robots

Parallelism

USE: Parallel processing



2022 IEEE Thesaurus

Paralysis

BT: Medical conditions
RT: Motor coordination

Paramagnetic materials

BT: Magnetic materials
RT: Paramagnetic resonance

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

Parameter identification

USE: Parameter estimation

Parameter uncertainty

USE: Uncertain systems

Parametric model

USE: Parametric statistics

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 optimisation

USE: 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

USE: Codes

Parity check codes

UF: LDPC
Ldpc codes
Low density parity check

codes

Parity-check codes
BT: Codes
RT: Decoding
NT: Iterative decoding

Parity-check codes

USE: Parity check codes

Parkinson's disease

BT: Diseases

Parotid

USE: Salivary glands

Partial differential equations

BT: Differential equations
RT: Boundary value problems
Fourier transforms



2022 IEEE Thesaurus

NT:	Boundary-element methods Poisson equations	BT:	Nuclear and plasma sciences
		RT:	Particle beams
Partial discharge measurement			
BT:	Electric variables measurement	Particle beam measurements	
RT:	Electrical safety Insulation life Insulation testing Optical fiber sensors	BT:	Measurement
		RT:	Particle beams
Partial discharges			
BT:	Dielectric breakdown	Particle beam optics	
RT:	Corona	UF:	Ion optics
		BT:	Optics
		RT:	Electrodynamics Particle beams
		NT:	Atom optics Electron optics Stimulated emission
Partial response channels			
BT:	Communication channels	Particle beams	
Partial response signaling			
BT:	Digital modulation	UF:	Accelerator beams Neutron beams Proton beams
Partial transmit sequences			
BT:	OFDM	BT:	Beams Elementary particles
Particle accelerator			
USE:	Linear particle accelerator	RT:	Colliding beam accelerators Laser theory Particle accelerators Particle beam handling Particle beam injection Particle beam
Particle accelerators			
BT:	Nuclear and plasma sciences	measurements	Particle beam optics Storage rings Synchrotrons
RT:	Colliding beam devices Large Hadron Collider Particle beams Voltage multipliers	NT:	Atomic beams Electron beams Ion beams
NT:	Accelerator magnets Colliding beam accelerators Cyclotrons Electron accelerators Ion accelerators Linear accelerators Photon collider Plasma accelerators Proton accelerators Storage rings Synchrocyclotrons Synchrotrons	Particle charging	
		BT:	Electrostatic processes
		RT:	Semiconductor detectors
Particle beam handling			
BT:	Nuclear and plasma sciences	Particle collisions	
RT:	Particle beams	BT:	Elementary particles
Particle beam injection			
UF:	Injected beams	Particle detectors	
		USE:	Radiation detectors
Particle filters			
BT:	Filters	Particle measurements	
		UF:	Particulate measurements
		BT:	Measurement
		RT:	Current density



2022 IEEE Thesaurus

High energy physics
instrumentation computing
Position sensitive particle
detectors

Particle physics

USE: High energy physics

Particle production

BT: Electrostatic processes
RT: Aerosols
Spraying

Particle scattering

BT: Scattering
RT: Scanning electron

microscopy

Particle separators

UF: Separators
BT: Separation processes
RT: Magnetic separation

Particle swarm

USE: Particle swarm optimization

Particle swarm optimization

UF: Particle swarm
Particle-swarm optimization
Swarm intelligence
Swarm optimization
BT: Evolutionary computation
RT: Artificial bee colony

algorithm

Fireworks algorithm
Metaheuristics
Stochastic processes

Particle tracking

BT: Nuclear measurements
RT: High energy physics

instrumentation computing
Tracking

Particle-swarm optimization

USE: Particle swarm optimization

Particles (elementary)

USE: Elementary particles

Particulate measurements

USE: Particle measurements

Partitioning algorithms

BT: Algorithms

Passband

BT: Digital communication
Radio communication
RT: Baseband

Passivation

BT: Surface treatment
RT: Corrosion

Passive circuits

BT: Circuits

Passive filters

BT: Passive networks
RT: Filters

Passive microwave remote sensing

BT: Remote sensing

Passive networks

BT: Telecommunication
network topology
NT: Passive filters

Passive optical networks

UF: PON
Passive-optical-network
BT: Optical fiber networks
RT: EPON

Passive radar

BT: Radar
RT: Radar detection
Radar imaging

Passive RFID tags

BT: RFID tags

Passive-optical-network

USE: Passive optical networks

Passwords

BT: Access control
Computer security
RT: Authentication

Patch antennas

BT: Antennas
RT: Microstrip antennas

Patent law

BT: Law



2022 IEEE Thesaurus

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

USE: Pathology

Pathological processes

BT: Pathology
NT: Cadaver
Death

Pathology

UF: Pathological
BT: Medical specialties
RT: Autopsy
Diseases
NT: Histopathology
Neuropathology
Pathological processes

Patient diagnosis

USE: Medical diagnosis

Patient identification

USE: Medical treatment

Patient monitoring

BT: Monitoring
RT: Assistive robots
Chemotherapy
Electronic medical records
Fall detection
Point of care

Patient rehabilitation

BT: Medical treatment
RT: Assistive robots

Patient treatment

USE: Medical treatment

Pattern analysis

BT: Machine intelligence
RT: Surface reconstruction

Pattern classification

UF: Signal classification
BT: Decision making
RT: Feature extraction
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
Learning systems
Machine vision
Pattern classification



2022 IEEE Thesaurus

analysis	Principal component	control	Proportional derivative
	Publish subscribe systems	control	Proportional plus derivative
	Random forests	control	Proportional-derivative
	Robot vision systems	control	Proportional-integral-
	Shape	derivative	
	Spatiotemporal phenomena	BT:	Control systems
	Statistical learning		
	Symbols		
NT:	Active shape model	<i>PDA</i>	USE: Personal digital devices
	Activity recognition		
	Character recognition		
	Clustering methods	<i>PDF</i>	USE: Portable document format
	Data mining		
	Face recognition		
	Fingerprint recognition		
	Gesture recognition	Peace technology	
	Handwriting recognition	BT:	Social implications of
	Nearest neighbor methods	technology	
	Pattern matching		
	Speech recognition	<i>Peak signal to noise ratio</i>	
	Text recognition	USE:	PSNR
Payloads		<i>Peak signal-to-noise ratio</i>	
BT:	Military aircraft	USE:	PSNR
	Space technology		
NT:	MODIS	Peak to average power ratio	
		UF:	PAPR
<i>Pb</i>			Peak-to-average power
USE:	Lead	ratio	
<i>PCA</i>			
USE:	Principal component	BT:	Peak-to-average ratio
analysis			OFDM
<i>PCC</i>		<i>Peak-to-average power ratio</i>	
USE:	Point cloud compression	USE:	Peak to average power
<i>PCG</i>		ratio	
USE:	Phonocardiography	<i>Peak-to-average ratio</i>	
<i>PCM</i>		USE:	Peak to average power
USE:	Phase change materials	ratio	
<i>PCRAM</i>		Pediatrics	
USE:	Phase change random	UF:	Babies
access memory			Baby
<i>PD</i>			Child
USE:	Personal digital devices		Children
			Infant
			Infants
			Newborns
			Paediatrics
			Toddler
PD control		BT:	Medical specialties
UF:	PID control	RT:	Neonatology
	Proportional + derivative		
control		<i>Peer to peer communications</i>	



2022 IEEE Thesaurus

USE: Peer-to-peer computing

Peer to peer computing

USE: Peer-to-peer computing

Peer to peer exchange

USE: Peer-to-peer computing

Peer to peer network

USE: Peer-to-peer computing

Peer-to-peer communications

USE: Peer-to-peer computing

Peer-to-peer 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: Cluster computing

Decentralized applications

Distributed ledger

Workstations

Peer-to-peer exchange

USE: Peer-to-peer computing

Peer-to-peer network

USE: Peer-to-peer computing

Peltier effect

BT: Thermoelectricity

Pelvic bones

BT: Bones

Pelvis

BT: Body regions

Pen test

USE: Penetration testing

Penetration testing

UF: Pen test

BT: Computer security

Pensions

UF: Occupational pensions

Personal pensions

Stakeholder pensions

State pensions

BT: Remuneration

RT: Employee welfare

Termination of employment

Pentacene

BT: Organic semiconductors

Peptides

BT: Biochemistry

Perfectly matched layers

BT: Propagation

RT: Finite difference methods

Finite element analysis

Maxwell equations

Performance analysis

UF: Dynamic program analysis

Performance index

BT: Programming

RT: Optimization

NT: Performance gain

Performance evaluation

BT: Measurement

RT: Benchmark testing

NT: Key performance indicator

Performance gain

BT: Performance analysis

Performance index

USE: Performance analysis

Performance loss

BT: Computer performance

Performance measurement

USE: Measurement

Performance metrics

USE: Measurement

Performance optimisation

USE: Optimization

Performance optimization

USE: Optimization



2022 IEEE Thesaurus

Performance related pay

USE: Incentive schemes

Perineum

BT: Body regions

Periodic media

USE: Nonhomogeneous media

Periodic structures

BT: Materials science and technology

NT: Gratings
Photonic crystals

Peripheral equipment

USE: Computer peripherals

Peripheral nervous system

BT: Nervous system

Permanent magnet generators

BT: Permanent magnet machines

Permanent magnet machines

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

BT: Permanent-magnet generators

BT: Permanent-magnet motors
Motors
RT: Permanent magnet machines

Permanent magnet synchronous machines

USE: Permanent magnet machines

Permanent magnet synchronous motors

USE: Permanent magnet motors

Permanent magnets

BT: Magnets
RT: Magnetic gears

Magnetic levitation vehicles
Permanent magnet

machines

Remanence

Permanent-magnet generators

USE: Permanent magnet motors

Permanent-magnet motors

USE: Permanent magnet motors

Permeability

UF: Magnetic permeability
BT: Electromagnetic analysis
RT: Magnetic materials
Permeability measurement

Permeability measurement

BT: Magnetic variables
measurement
RT: Permeability

Permission

UF: Access rights
File system permissions
BT: Computer security

Permissioned blockchains

USE: Blockchains

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

Perpendicular recording

USE: Magnetic recording



2022 IEEE Thesaurus

Persistent currents

BT: Current
RT: High-temperature
superconductors
Superconducting magnets

Persistent identifiers

BT: Data structures
RT: Digital systems
Information retrieval

Personal area networks

UF: Piconets
Scatternets
BT: Radio communication
RT: Computer networks
Data communication
Land mobile radio
Personal communication
networks
Wireless LAN
Zigbee
NT: Bluetooth
Body area networks
Body sensor networks
Wireless personal area
networks

Personal communication networks

UF: Personal communication
services
BT: Communication systems
RT: Cellular radio
Digital systems
IEEE 802.15 Standard
Location awareness
Mobile handsets
Personal area networks
Zigbee

Personal communication services

USE: Personal communication
networks

Personal computers

USE: Microcomputers

Personal digital assistants

USE: Personal digital devices

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 pensions

USE: Pensions

Personal protective equipment

BT: Health and safety
RT: Protective clothing

Personalized medicine

USE: Precision medicine

Personnel

BT: Human resource
management
RT: Appraisal
Bring your own device
Education
Employment
Equal opportunities
Management
Productivity
Training
NT: Labor resources

Personnel monitoring

USE: Radiation monitoring

Persuasive systems

BT: Decision making
Social computing
RT: Behavioral sciences
Human factors
Man-machine systems
Psychology

Perturbation methods

UF: Perturbation techniques
BT: Approximation methods
NT: Cavity perturbation
methods

Perturbation techniques

USE: Perturbation methods

Pervasive computing

UF: Everyware
Ubicomp



2022 IEEE Thesaurus

BT: Computers and information
processing

cybernetics Systems, man, and

RT: Artificial intelligence
Context awareness
Next generation networking

NT: Ubiquitous computing
Wearable computers

Pest control

UF: Insect control
Vermin control

BT: Environmental
management

RT: Agriculture
Hazards

PET

USE: Positron emission
tomography

Petascale computing

BT: Computers and information
processing

RT: Supercomputers

Petri nets

BT: System analysis and design
RT: Discrete-event systems
Modeling

Petrochemicals

BT: Chemical products
Materials

RT: Chemical industry
Chemistry
Fuels
Petroleum
Petroleum industry
Plastic products
Plastics

Petrol

USE: Petroleum

Petroleum

UF: Gasoline
Petrol

BT: Chemical products
Fuels

RT: Fuel processing industries
Oil pollution
Oils
Petrochemicals

NT: Petroleum industry
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

PFD

USE: Phase frequency detectors

PGA

USE: Electronics packaging

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



2022 IEEE Thesaurus

Pharynx

BT: Digestive system
RT: Stomatognathic system

Measurement
Voltage
Voltage control

Phase change materials

UF: PCM
BT: Materials
RT: Memory
Nuclear thermodynamics
Optical materials
Phase change memory
Solar heating

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 change memory

BT: Memory
RT: Phase change materials
Resistive RAM
NT: Phase change random
access memory

Phase locked-loops

USE: Phase locked loops

Phase change RAM

USE: Phase change random
access memory

Phase measurement

BT: Measurement
RT: Acoustic measurements
Electric variables
measurement
Optical variables
measurement

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 modulation

BT: Modulation
RT: Demodulation
Electro-optic modulators
NT: Continuous phase
modulation
Cross-phase modulation
Differential phase shift
keying
Phase shift keying

Phase control

UF: Phase-control
BT: Power electronics
RT: Electric variables control
Optical variables control
Phase transformers

Phase noise

BT: Noise
Oscillators
RT: Time-domain analysis

Phase detection

BT: Signal detection
NT: Phase frequency detectors

Phase shift keying

UF: PSK
Phase-shift keying
Phase-shift-keying
QPSK
BT: Phase modulation
NT: Binary phase shift keying
Quadrature phase shift

Phase distortion

BT: Distortion
RT: Delay effects

Phase estimation

BT: Parameter estimation

Phase frequency detectors

UF: PFD
BT: Phase detection
RT: Frequency measurement

keying



2022 IEEE Thesaurus

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

Phase-change RAM

USE: Phase change random access memory

Phase-change random access memory

USE: Phase change random access memory

Phase-control

USE: Phase control

Phase-locked loops

USE: Phase locked loops

Phase-locked-loops

USE: Phase locked loops

Phase-shift keying

USE: Phase shift keying

Phase-shift-keying

USE: Phase shift keying

Phased arrays

UF: Antenna phased arrays
BT: Antenna arrays
RT: Optical arrays
NT: Steerable antennas

Phasor measurement units

UF: PMU
PMUs
BT: Synchrophasors
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

PHM

USE: Prognostics and health management

Phonetics

BT: Linguistics
RT: Natural language processing
NT: Semiotics
Speech processing
Acoustic phonetics

Phonocardiogram

USE: Phonocardiography

Phonocardiography

UF: PCG
Phonocardiogram
BT: Cardiology
RT: Biomedical monitoring
Cardiology
Heart rate measurement

Phonographs

USE: Audio systems

Phonons

BT: Elementary particles
RT: Acoustics
Crystals
Electrons
Indium phosphide

Phosphorescence

BT: Luminescence
RT: Phosphors



2022 IEEE Thesaurus

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

USE: Cathodes

Photochemistry

BT: Chemistry
RT: Water splitting
NT: Photobleaching
Photocatalysis

Photochromism

UF: Photodarkening
BT: Photonics
RT: Color

Photocomposition

USE: Text processing

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

Photoconductors

USE: Photoconducting materials

Photocurrent

USE: Photoconductivity

Photodarkening

USE: Photochromism

Photodetector

USE: Photodetectors

Photodetectors

UF: Photodetector
BT: Optoelectronic devices
Radiation detectors
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
Avalanche photodiodes
PIN photodiodes

Photoelasticity

BT: Mechanical factors
RT: Optical polarization
Piezooptic effects
Stress



2022 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

Photoemission

USE: Photoelectricity

Photoemission electron microscopy

USE: Photoelectron microscopy

Photogalvanic effects

USE: Photovoltaic effects

Photography

BT: Imaging
RT: Cameras
Electrophotography
Image capture
Image storage
Optical filters
NT: Cinematography
Digital photography
Image forensics
Photomicrography
Photorealism

Photoionisation

USE: Ionization

Photoionization

USE: Ionization

Photolithography

USE: Lithography

Photoluminescence

UF: Electrophotoluminescence
BT: Luminescence
Optics
RT: Judd-Ofelt theory
Microcavities

Photomagnetic devices

USE: Magneto optic devices

Photomagnetic effects

USE: Magneto optic effects

Photometry

BT: Geoscience and remote
sensing
Optical variables
measurement
RT: Light sources
Lighting
Radiometry

Photomicrographs

USE: Photomicrography

Photomicrography

UF: Micrographs
Microphotographs
Microphotography
Photomicrographs
BT: Photography

Photomultipliers

BT: Vacuum technology
RT: Avalanche photodiodes
Electron multipliers
Photoelectricity

Photon collider

BT: Particle accelerators

Photon crystal fibers

USE: Photonic crystal fibers

Photon crystal fibres

USE: Photonic crystal fibers

Photonic band gap

UF: Band gap
Band-gap
Bandgap
Photonic bandgap
BT: Photonic crystals
RT: Electromagnetic wave
polarization
Optical diffraction

Photonic bandgap

USE: Photonic band gap



2022 IEEE Thesaurus

Photonic bandgap fibers

UF: Photonic bandgap fibres
BT: Photonic crystal fibers

Photonic bandgap fibres

USE: Photonic bandgap 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 crystal fibres

USE: Photonic crystal fibers

Photonic crystals

UF: 2-D photonic crystals
2D photonic crystals
Photonic crystal fibers
Two dimensional photonic

crystals

crystals

BT: Periodic structures
RT: Microwave devices
Nonlinear optics
Optical materials
Optical waveguides
Spontaneous emission
NT: Photonic band gap
Photonic crystal fibers

Photonic crystal fibers

USE: Photonic crystals

Photonic integrated circuits

BT: Integrated circuits

Photonic metamaterials

USE: Optical metamaterials

Photonic-crystal fibers

USE: Photonic crystal fibers

Photonic-crystal fibres

USE: Photonic crystal fibers

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

Photoresists

USE: Resists

Photothermal effects

UF: Optothermal effects
Thermal wave imaging
BT: Photonics
RT: Photoacoustic effects



2022 IEEE Thesaurus

Photothyristors

UF: Optothyristors
BT: Thyristors
RT: Optical switches

Phototransistors

BT: Photodetectors
Transistors
RT: Optoelectronic devices
Radiation detectors

Phototubes

USE: Photoelectricity

Photovoltaic cells

UF: Solar cells
BT: Electron devices
Energy conversion
RT: Photoelectricity
Photovoltaic effects
Photovoltaic systems
NT: Light trapping

Photovoltaic effects

UF: Photogalvanic effects
BT: Photoelectricity
RT: Photovoltaic cells
Photovoltaic systems
NT: Shunts (electrical)

Photovoltaic power systems

USE: Photovoltaic systems

Photovoltaic systems

UF: Photovoltaic power systems
BT: Solar power generation
RT: Hybrid power systems
Photovoltaic cells
Photovoltaic effects
Water pumps
NT: Building integrated

photovoltaics

Fill factor (solar cell)
Solar panels

Phylogenetic tree

USE: Phylogeny

Phylogenetics

USE: Phylogeny

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 distribution management

USE: Logistics

Physical layer

BT: Open systems
NT: Physical layer security

Physical layer security

BT: Physical layer

Physical optics

BT: Optics
NT: Optical refraction
Optical vortices

Physical theory of diffraction

BT: Electromagnetic diffraction

Physical unclonable function

UF: PUF
Physically unclonable

function

BT: Control system security
Semiconductor device

manufacture

RT: Cryptography
Security
Semiconductor devices
Smart devices

Physical vapor deposition

UF: Ionized jet deposition
Physical vapor transport
Physical vapour deposition
Physical vapour transport
BT: Plasma materials

processing

RT: Sputtering

Physical vapor transport

USE: Physical vapor deposition

Physical vapour deposition

USE: Physical vapor deposition



2022 IEEE Thesaurus

Physical vapour transport

USE: Physical vapor deposition

Physically unclonable function

USE: Physical unclonable function

Physician

USE: Medical services

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

PhysiStimuli

USE: External stimuli

PI control

UF: PI controller

control

controller

derivative control

derivative controller

BT: Control systems

PI controller

USE: PI control

piano mover's problem

USE: Path planning

Pickling

BT: Surface treatment
RT: Chemistry

Pico-hydro

USE: Picohydro power

Picohydro power

UF: Pico-hydro
BT: Hydroelectric power
generation
RT: Appropriate technology

Piconets

USE: Personal area networks

Picture archiving and communication systems

UF: Pacs
BT: Image communication
RT: Biomedical communication
Biomedical computing
Biomedical imaging

Picture phones

USE: Videophone systems

Picture processing

USE: Image processing

Picturephones

USE: Videophone systems

PID control

USE: PD control

Piecewise linear approximation

BT: Piecewise linear techniques



2022 IEEE Thesaurus

Piecewise linear techniques

BT: Mathematics
 RT: Control system analysis
 Control system synthesis
 Difference equations
 Nonlinear control systems
 NT: Piecewise linear
 approximation

Piezoceramics

USE: Piezoelectric materials

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 effects

USE: 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

Piezomagnetic effects

USE: Magnetomechanical effects

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

USE: Piezoresistance

Piezoresistive devices

UF: Piezoresistors
 BT: Semiconductor devices
 RT: Piezoelectric devices
 Piezoresistance
 Pressure measurement

Piezoresistors

USE: Piezoresistive devices

Pigmentation

BT: Color
 Materials science and
 technology
 NT: Pigments



2022 IEEE Thesaurus

Pigments

BT: Pigmentation

PIN diodes

USE: PIN photodiodes

Pin grid arrays

USE: Electronics packaging

PIN photodiodes

UF: P-I-N
PIN diodes
BT: Photodiodes

Pink noise

USE: 1/f noise

Pins

BT: Plugs

Pions

USE: Mesons

Pipeline processing

UF: Computer pipeline processing
BT: Pipelining
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

Pipelining

USE: Pipeline processing

Piracy (software)

USE: Computer crime

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

PLA

USE: Programmable logic arrays

Plagiarism

BT: Professional communication
RT: Copyright protection
Notice of Violation
Publishing

Planar antennas

USE: Planar arrays

Planar array

USE: Planar arrays

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

Planarisation

USE: Planarization



2022 IEEE Thesaurus

Planarization

UF: Chemical mechanical
planarisation
Chemical mechanical
planarization
Planarisation
BT: Surface treatment
RT: Dielectric films
Integrated circuits

Planetary chemistry

USE: Astrochemistry

Planetary composition

USE: Extraterrestrial
measurements AND
Planets

Planetary landers

USE: Land transportation AND
Space vehicles

Planetary oceans

USE: Oceans AND
Planets

Planetary orbits

BT: Orbits

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

Plants (biology)

BT: Organisms
RT: Life sciences
NT: Bamboo

Plants (industrial)

USE: Industrial plants

Plasma accelerators

BT: Particle accelerators
Plasma devices

Plasma applications

BT: Plasmas
RT: Low-temperature plasmas
Plasma materials

processing

NT: Plasma devices
Plasma immersion ion

implantation

Plasma welding
Tokamaks

Plasma chemistry

BT: Plasma properties

Plasma confinement

BT: Plasmas
NT: Inertial confinement
Magnetic confinement

Plasma density

BT: Plasma properties

Plasma devices

BT: Plasma applications
RT: Gas discharge devices
Plasmas
NT: Plasma accelerators
Plasma jets
Tokamaks

Plasma diagnostics

BT: Plasmas
RT: Plasma measurements

Plasma display panel

USE: Flat panel displays



2022 IEEE Thesaurus

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 pressure compaction

USE: Spark Plasma sintering

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
Plasma applications
Plasma confinement
Plasma diagnostics
Plasma properties
Plasma simulation
Plasma sources
Plasma transport processes
Plasma-assisted

combustion

Plasmon

USE: Plasmons

Plasmonic solar cells

USE: Light trapping



2022 IEEE Thesaurus

Plasmonics

USE: Plasmons

Plasmons

UF: Plasmon
Plasmonics
BT: Plasma properties
NT: Surface plasmons

Plastic bottles

USE: Plastic products

Plastic containers

USE: Plastic products

Plastic films

BT: Films
Plastics
RT: Plastic insulation
Plastic insulators

Plastic IC packaging

USE: Plastic integrated circuit packaging

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

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



2022 IEEE Thesaurus

Plethysmography

BT: Biomedical measurement
Medical diagnosis
NT: Photoplethysmography

PLL

USE: Phase locked loops

Plug-in electric vehicles

BT: Electric vehicles

Plug-in hybrid electric vehicles

BT: Hybrid electric vehicles
RT: Charging stations

Plugboard

USE: Breadboard

Plugs

BT: Connectors
NT: Keyways
Pins

Plumbago

USE: Graphite

Pluto

BT: Planets

Plutonium

BT: Chemical elements

pMOSFETs

USE: MOSFET

PMU

USE: Phasor measurement units

PMUs

USE: Phasor measurement units

PNAs

USE: Presence network agents

Pneumatic actuators

BT: Actuators

Pneumatic systems

BT: Control systems
RT: Bellows
Fluidics
Mechanical systems

Pneumology

USE: Pulmonology

Pnictide superconductors

USE: Superconducting materials

Pockels readout optical modulator

USE: Electro-optic modulators

Podcast

USE: Digital audio broadcasting

Poincare group

USE: Poincare invariance

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

Poisons

USE: Toxicology

Poisson equation

USE: Poisson equations

Poisson equations

UF: Poisson equation
BT: Partial differential equations
RT: Electrostatics

Polar codes

BT: Block codes
Linear codes
RT: Channel coding
Error correction codes
Reed-Muller codes



2022 IEEE Thesaurus

Polar cyclones

USE: Cyclones

Polarimetric synthetic aperture radar

BT: Synthetic aperture radar

Polarimetry

UF: Solar polarimetry

BT: Electromagnetic

measurements

RT: Ellipsometry
Optical retarders

Polarisation

USE: Polarization

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

Polarization-maintaining optical fibers

USE: Optical fiber polarization

Polarization-mode dispersion

USE: Polarization mode

dispersion

Poles & zeros

USE: Poles and zeros

Poles and towers

UF: Pylons

Towers

Wood poles

BT: Transmission lines

RT: Power distribution lines

Power transmission lines

NT: Telephone poles

Poles and zeros

UF: Poles & zeros

Roots

Zeros

BT: Transfer functions

RT: Circuits

Control systems

Newton method

Polynomials

Police

USE: Law enforcement

Polishing machines

BT: Production equipment

RT: Deburring

Rough surfaces

Surface finishing

Surface roughness

Pollution

BT: Environmental factors

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



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2022 IEEE Thesaurus

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 coatings

USE: Polymer films

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

Polymer led

USE: Organic light emitting diodes

Polymers

UF: Electroactive polymers
BT: Materials
RT: Colloidal lithography
Plastics
NT: Azobenzene
Biopolymers
Liquid crystal polymers
Optical polymers
Polycaprolactone
Polyethylene
Polyimides

Polynomials

BT: Equations
RT: Poles and zeros

PON

USE: Passive optical networks

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

Portable Multimedia players

USE: Portable media players

Portable PCs

USE: Portable computers

Portable video players

USE: Portable media players

Portals

BT: Management information systems
RT: Information retrieval
Web sites



2022 IEEE Thesaurus

Portfolios

UF: Electronic portfolios
BT: Professional communication

RT: Rail transportation
Feedback
Railway accidents
Railway safety

Ports (computers)

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

Positron emission tomography

UF: PET
BT: Tomography
RT: Biomedical applications of radiation
Medical diagnostic imaging
Nuclear medicine
Phantoms
Tumors
NT: Whole-body PET

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

Positrons

BT: Elementary particles

Possibility theory

BT: Probability
RT: Fuzzy logic
Nonlinear dynamical systems

Post human

USE: Posthuman

Post-filtering algorithm

USE: Filtering algorithms

Post-human

USE: Posthuman

Post-wall waveguides

USE: Substrate integrated waveguides

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

Postal services

UF: Mail
BT: Message systems
RT: Electronic mail

Position sensitive particle detectors

BT: Ionizing radiation sensors
RT: High energy physics
instrumentation computing
Nuclear measurements
Particle measurements
Semiconductor counters

Posthuman

UF: Post human
Post-human
BT: Systems, man, and cybernetics
RT: Artificial intelligence
Transhuman

Postscript

USE: Page description languages

Positive train control

BT: Control systems



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2022 IEEE Thesaurus

Potassium

BT: Chemical elements

Potassium nitrate

USE: Nitrogen compounds

Potential energy

BT: Energy conservation

RT: Kinetic energy
Mechanical energy

Potential transformers

USE: Voltage transformers

Potential well

UF: Potential wells
Quantum confinement

BT: Energy conversion

Potential wells

USE: Potential well

Potentiometers

BT: Meters

RT: Resistors
Voltage measurement

POTS

USE: Landline

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

Standards

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 consumption

USE: Power demand

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
AC-AC converters



2022 IEEE Thesaurus

	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

power	UF:	Distribution of electric
	BT:	Power systems
	RT:	Electricity supply industry
		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

Power distribution networks

BT:	Power distribution
RT:	Microgrids
	Power grids
	Smart grids
NT:	Active distribution networks

Power distribution planning

BT: Power distribution
Power system planning

Power distribution reliability

BT: Power distribution
Power system reliability

Power distribution transformers

USE: Power transformers

Power dividers

BT:	Waveguide components
RT:	Microstrip components
	Power combiners
	Stripline components

Power electronics

UF:	Electric power
RT:	High-voltage techniques
	Matrix converters
	Power conversion
	Power filters
	Pulse width modulation

converters

NT:

- Rectifiers
- Resonant inverters
- Switching converters
- Voltage-source converters
- Converters
- Current limiters
- Gate drivers
- Inverters
- Phase control
- Power conditioning
- Power semiconductor

devices



2022 IEEE Thesaurus

switches	Power semiconductor	<i>Power flow</i>	USE: Load flow
	Snubbers		
	Three-phase electric power	<i>Power flow analysis</i>	USE: Load flow analysis
Power engineering			
energy	BT: Power engineering and	<i>Power flow control</i>	USE: Load flow control
education	RT: Power engineering		
	NT: Ferroresonance	Power generation	UF: Generation of electric
	High-voltage techniques	power	Output power
computing	Power engineering		Power plants
	Power system simulation		Power stations
Power engineering and energy		energy	BT: Power engineering and
	RT: Electrochemical devices		RT: Batteries
	NT: Electric variables control		Fuel cells
	Energy		Generators
	Power engineering		Microgrids
	Power generation		Power generation
	Power systems	economics	Power supplies
Power engineering computing			Pulsed power systems
	BT: Computer applications		Space power stations
	Power engineering		NT: Automatic generation
	RT: Power system analysis	control	Cogeneration
computing	Virtual power plants		Distributed power
Power engineering education		generation	Geothermal power
	BT: Engineering education	generation	Hydroelectric power
	RT: Power engineering	generation	Magnetohydrodynamic
<i>Power exchange</i>		power generation	Nuclear power generation
	USE: Power markets		Power generation control
<i>Power factor</i>			Power generation dispatch
	USE: Reactive power		Power generation planning
Power factor correction			Power generation reliability
	BT: Electric current control		Solar power generation
	Load flow control		Trigeneration
	RT: Power control		Turbomachinery
	Power transmission		Wind energy generation
	Voltage control		Wind power generation
Power filters		Power generation control	
	UF: Power line filters	BT: Automatic control	Power generation
	BT: Filters		
	RT: Power electronics	Power generation dispatch	
	NT: Spurline	BT: Power generation	



2022 IEEE Thesaurus

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: Power distribution networks
Wind energy integration
NT: Microgrids
Smart grids

Power harmonic filters

BT: Power system harmonics

Power harvesting

USE: Energy harvesting

Power industry

UF: Electric utilities
BT: Industries
RT: Offshore installations
Power system faults
Telecontrol equipment
NT: Electrical equipment
industry
Electricity supply industry
Nuclear facility regulation
Power system

interconnection

Power injection molding

USE: Injection molding

Power injection moulding

USE: Injection molding

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 line filters

USE: Power filters

Power management

USE: Power system management

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 outages

USE: Power system reliability

Power overhead lines

BT: Power transmission lines
RT: Railway electrification

Power plants

USE: Power generation

Power pools

USE: Power markets

Power quality

UF: Power supply quality
Voltage sags
BT: Power supplies
RT: Electricity supply industry
Power system harmonics
Power system transients



2022 IEEE Thesaurus

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 spectra

USE: Spectral analysis

Power stations

USE: Power generation

Power stations (space)

USE: Space power stations

Power stations (substations)

USE: Substations

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 supplies to apparatus

USE: Umbilical cable

Power supply industry

USE: Electricity supply industry

Power supply quality

USE: Power quality

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
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



2022 IEEE Thesaurus

Power system interconnection

BT: Power industry
RT: Power systems
Power transmission

RT: Microgrids
Power system stability
Reliability
NT: Power distribution reliability

Power system management

UF: Power management
Telecommunication power management
BT: Power systems
RT: Microgrids
Monitoring
Preventive maintenance
Virtual power plants
NT: Load flow

Power system restoration

BT: Power supplies
RT: Electricity supply industry
Power systems

Power system security

BT: Security
RT: Load flow analysis
Power systems
Reactive power control

Power system measurements

BT: Power systems
RT: Load monitoring
NT: Meter reading

Power system simulation

BT: Power engineering
RT: Power systems

Power system modeling

BT: Modeling
RT: Power systems
NT: Load modeling

Power system stability

BT: Power systems
RT: Power system reliability

Power system planning

BT: Power systems
RT: Demand side management
Electricity supply industry
NT: Power demand
Power distribution planning

Power system transients

BT: Electromagnetic transients
RT: Arresters
Power quality
Power system protection
NT: Transient analysis

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 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
Hybrid power systems
Industrial power systems
PSCAD
Power distribution

Power system relaying

BT: Relays
RT: Power systems
Protective relaying

Power system reliability

UF: Power outages
BT: Power systems



2022 IEEE Thesaurus

computing	Power grids		Magnetic gears
	Power supplies		Power dissipation
	Power system analysis		Power factor correction
measurements	Power system dynamics		Power markets
	Power system economics	interconnection	Power system
	Power system faults	NT: (electricity)	Power transmission lines
systems	Power system harmonics		Common Information Model
	Power system management		DC power transmission
	Power system		Flexible AC transmission
transmission	Power system planning	systems	HVDC transmission
	Power system protection		Inductive power
	Power system reliability	transmission	Static VAr compensators
transmission lines	Power system stability		Transmission lines
	Power transmission	transmission	Wireless power
	Pulsed power systems		
transmission lines	Reactive power		
	Substations		
	Transformers		
transmission lines	Uninterruptible power		
	Wind energy integration		
Power transmission lines			
transmission lines		UF:	Overhead transmission
		BT:	Transmission lines
		RT:	Conductors
transmission lines			DC distribution systems
			Poles and towers
			Power transmission
transmission lines			Superconducting
transmission lines		NT:	Gas insulated transmission
transmission lines			Power cables
			Power overhead lines
Power transformer insulation			
transformers	BT:	Power transformers	
	RT:	Insulation	
Power transformers			
transformers	UF:	Power distribution	
	BT:	Transformers	
	RT:	Transformer cores	
insulation		Windings	
	NT:	On load tap changers	
		Power transformer	
Power transistors			
devices	BT:	Power semiconductor	
	RT:	Driver circuits	
Power transmission			
power	UF:	Transmission of electric	
	BT:	Power systems	
	RT:	Electric current control	
power		Load flow analysis	
Powertrains			
transmission		USE:	Mechanical power
Praseodymium			
transmission		USE:	Praseodymium
Pragmatics			
transmission	BT:	Linguistics	
		Semiotics	
	RT:	Communication symbols	



2022 IEEE Thesaurus

processing
 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

Precision engineering
 BT: Engineering - general
 RT: Industrial engineering
 Mechanical engineering

Precision medicine
 UF: Personalized medicine
 BT: Medical treatment

Precoding
 BT: Encoding

Precollege engineering
 USE: Pre-college engineering

Predator prey systems
 UF: Predator-prey models
 Predator-prey systems
 BT: Biology
 Mathematics
 RT: Chaos
 Differential equations
 Game theory
 Nonlinear dynamical
 systems
 Stability

Predator-prey models
 USE: Predator prey systems

Predator-prey systems
 USE: Predator prey systems

Prediction algorithms
 BT: Algorithms

Prediction methods
 BT: Artificial intelligence
 RT: Estimation
 Forecasting
 Gaussian processes
 Kalman filters
 Prediction theory
 Signal processing
 Spectral analysis
 Speech processing
 NT: Linear predictive coding
 Predictive coding
 Predictive encoding
 Predictive models

Prediction theory
 BT: Statistics
 RT: Artificial intelligence
 Estimation
 Prediction methods

Predictive analysis
 USE: Predictive analytics

Predictive analytics
 UF: Predictive analysis
 BT: Statistical analysis
 RT: Data mining
 Machine learning
 Predictive models

Predictive coding
 BT: Prediction methods

Predictive control
 UF: Model predictive control
 Model-predictive control
 BT: Process control
 RT: Control engineering

Predictive encoding
 BT: Prediction methods

Predictive maintenance
 BT: Maintenance engineering

Predictive models
 BT: Prediction methods
 RT: Predictive analytics

Predistortion
 UF: Inverse distortion
 BT: Power amplifiers
 RT: Nonlinear distortion



2022 IEEE Thesaurus

Prefabricated buildings

USE: Prefabricated construction

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

Pregnancy test

BT: Medical tests

Pregnant

USE: Pregnancy

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

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



2022 IEEE Thesaurus

Print readers

USE: Character recognition

Printed circuit boards

USE: Printed circuits

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
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

Printing presses

USE: Printing machinery

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
Eavesdropping
Internet privacy
Privacy breach

Privacy breach

BT: Information security
Privacy
RT: Data breach
Data security

Privacy perserving computation

USE: Homomorphic encryption

Privacy preserving data mining

USE: Data privacy

Privacy-invasive software

UF: Invasive software
BT: Software
RT: Computer crime
Computer security
Unsolicited e-mail
NT: Spyware

Privacy-perserving computation

USE: Homomorphic encryption

Private blockchains

USE: Blockchains

Privatisation

USE: Privatization

Privatization

UF: Privatisation
BT: Macroeconomics
RT: Industrial economics

Probabilistic computing

BT: Computers and information processing

Probabilistic logic

BT: Logic
RT: Mixture models



2022 IEEE Thesaurus

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
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
Log-normal distribution
Maxwell-Boltzmann

distribution

Nakagami distribution

Probes

BT: Instruments

Problem-solving

BT: Cognitive science
RT: Human factors

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
RT: Process design
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

management

Cause effect analysis
Root cause analysis

Processor scheduling

UF: Multiprocessor scheduling
BT: Concurrency control
Multiprocessing systems
RT: Microprocessors



2022 IEEE Thesaurus

NT:	Optimization methods Scheduling algorithms	NT:	Virtual prototyping Graphical user interfaces Product customization Product lifecycle
<i>Processors (program)</i>			
USE:	Program processors	management	Software product lines Time to market
Procurement		Product liability	
BT:	Supply chain management	BT:	Legal factors
RT:	Contracts Logistics Proposals Supply chains	RT:	Consumer products Product safety Quality assurance Quality management
Product codes		NT:	Warranties
BT:	Codes		
RT:	Decoding Error correction QR codes Radiofrequency	<i>Product life cycle management</i>	
identification		USE:	Product lifecycle
NT:	Bar codes	management	
<i>Product customisation</i>		Product lifecycle management	
USE:	Product customization	UF:	Product life cycle
Product customization		management	System lifecycle
UF:	Product customisation	BT:	Product development
BT:	Product development	RT:	Release engineering
RT:	Customer satisfaction Manufactured products Product design	NT:	Prognostics and health
Product design		management	
BT:	Design methodology	Product safety	
RT:	Concurrent engineering Design for disassembly Design for quality Design tools Group technology Manufactured products Process design Product customization Product development Prototypes Requirements engineering	BT:	Safety
		RT:	Accidents Consumer products Product liability
Product development		Product safety engineering	
BT:	Crowdsourcing Engineering management	RT:	Software safety
RT:	Brand management Manufactured products Product design Quality function deployment Rapid prototyping Reverse engineering	NT:	Consumer protection Power system protection Safety Vehicle crash testing
		<i>Product warranties</i>	
		USE:	Warranties
		<i>Product warranty</i>	
		USE:	Warranties
		Production	
		BT:	Industry applications
		RT:	Containers Wheels Wire drawing
		NT:	Ball milling



2022 IEEE Thesaurus

Compression molding			Machinery
Embossing			Materials handling
Food products	equipment		
Group technology			Production engineering
Injection molding	NT:		Applicators
Materials processing			Clamps
Mechanical products			Cutting tools
Process planning			Fixtures
Production control			Machine tools
Production engineering			Mining equipment
Production equipment			Molding equipment
Production facilities			Packaging machines
Production management			Paper making machines
Production materials			Polishing machines
Production systems			Soldering equipment
Productivity			
Shafts			
Springs			
Transfer molding			
Production control		Production facilities	
BT: Industrial control		UF: Factories	
Production		Manufacturing facilities	
RT: Adaptive scheduling		BT: Production	
Cellular manufacturing		RT: Manufacturing	
Group technology		Warehousing	
Inventory control		NT: Foundries	
Manufacturing		Greenhouses	
Process control		Industrial facilities	
Production systems		Industrial plants	
Supply chain management		Machine shops	
NT: Continuous production		Paper mills	
Lot sizing			
Optimized production			
technology		Production management	
Scheduling		UF: Manufacturing	
<i>Production economics</i>		management	
USE: Industrial economics		BT: Management	
Production engineering		Production	
BT: Engineering - general		RT: Continuous improvement	
Production		Continuous production	
RT: Industrial engineering		Industrial engineering	
Inventory management		Inventory control	
Manufacturing		Lean production	
Manufacturing systems		Mass production	
Production equipment		Production engineering	
Production management		Productivity	
Production materials		Research and development	
NT: Production planning			
Production equipment			
BT: Production			
RT: Gears			



2022 IEEE Thesaurus

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

NT: Production control
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: Collaborative work
Cooperative communication
Pragmatics
Semantics
Semiotics
Syntactics
NT: Collaboration
Communication aids
Communication

effectiveness

Communication symbols
Context
Databases
Global communication
Grammar
Information analysis
Information integrity
Information resources
Information retrieval
Information science
Information services
Information systems
Information technology
Manuals
Meetings
Oral communication
Plagiarism
Portfolios
Professional societies
Public speaking
Rhetoric
Writing

Professional societies

BT: Professional
communication

Profit sharing schemes

USE: Incentive schemes

Profitability

BT: Economics
RT: Cost accounting
Econometrics
Financial management
Productivity



2022 IEEE Thesaurus

Progenitor cells

BT: Cells (biology)
RT: Stem cells

Prognostics and health management

UF: PHM
BT: Product lifecycle

management

Program generators

USE: Automatic programming

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

Program profiling

USE: Programming

Programmable circuits

BT: Circuits
NT: Field programmable analog

arrays

Programmable logic arrays
Programmable logic

devices

Programmable control

BT: Digital control
RT: Industrial control
Manufacturing automation
NT: Flow graphs

Programmable logic arrays

UF: PLA
BT: Circuits
Logic arrays
Logic circuits
Programmable circuits
RT: Programmable logic

devices

Programmable logic controllers

USE: Programmable logic
devices

Programmable logic devices

UF: Programmable logic
controllers
BT: Circuits
Logic devices
Programmable circuits
RT: High level synthesis
Programmable logic arrays

Programmable read only memory

USE: PROM

Programme management

USE: Program management

Programmed instruction

USE: Educational technology

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



2022 IEEE Thesaurus

Object oriented methods
Object oriented
programming
systems development
Opportunistic software
Parallel programming
Performance analysis
Programming profession
Robot programming

Programming environments

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

Programming languages

USE: Computer languages

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: Proposals
Turnkey project

Projectiles

BT: Weapons

Projection algorithms

BT: Algorithms

Projective geometry

BT: Geometry

Projective shadowing

USE: Shadow mapping

projectors (optical)

USE: Optical projectors

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

proof-of-work

USE: Proof of Work

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



2022 IEEE Thesaurus

Propagation constant

BT: Electromagnetic propagation

Propagation delay

BT: Delay effects

Propagation loss

USE: Propagation losses

Propagation losses

UF: Propagation loss

BT: Electromagnetic propagation

Propellants

BT: Chemical products

Propellers

BT: Aircraft propulsion

RT: Aircraft
Blades
Engines
Impellers
Marine vehicles
Shafts

Proportional + derivative control

USE: PD control

Proportional + integral control

USE: PI control

Proportional control

BT: Control systems

Proportional derivative control

USE: PD control

Proportional plus derivative control

USE: PD control

Proportional-derivative control

USE: PD control

Proportional-integral control

USE: PI control

Proportional-integral controller

USE: PI control

Proportional-integral-derivative

USE: PD control

Proportional-integral-derivative control

USE: PI control

Proportional-integral-derivative controller

USE: PI control

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

Prosencephalon

USE: Forebrain

Prostate cancer

BT: Cancer

Prosthesis

USE: Prosthetics

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



2022 IEEE Thesaurus

NT:	Wearable robots	Protein sequence	BT:	Proteins
	Artificial biological organs			
	Artificial limbs	Proteins	BT:	Biochemistry
	Neuroprostheses	NT:	Protein sequence	
	Prosthetic hand			
	Prosthetic limbs	Proteomics	BT:	Molecular biomarkers
	Visual prosthesis			
Protection		Protocols	UF:	Communication protocols
BT:	Safety	BT:	Communication systems	
RT:	Circuit breakers	RT:	Ad hoc networks	
	Fuses		Bluetooth	
	Galvanizing		Concurrency control	
	Grounding		Frame relay	
	Hazardous areas		IEEE 802.11 Standard	
	Occupational safety		IEEE 802.11e Standard	
	Security		IEEE 802.11g Standard	
	Uninterruptible power		IEEE 802.11n Standard	
systems			IPTV	
protection	NT:		Internet of Things	
	Electrostatic discharge		Local area networks	
	Explosion protection		Metropolitan area networks	
	Lightning protection		Multicarrier code division	
	Radiation protection			
Protection switching		multiple access		
UF:	Automatic protection		Software defined	
switching	BT:	networking		
	Optical fiber networks		TCPIP	
Protective clothing			Wide area networks	
BT:	Clothing	NT:	Access protocols	
	Safety devices		Asynchronous transfer	
RT:	Clothing industry	mode		
	Eye protection		Consensus protocol	
	Occupational health		Cryptographic protocols	
	Occupational safety		Main-secondary	
	Personal protective		Multicast protocols	
equipment		switching	Multiprotocol label	
	Safety		Proof of Work	
Protective relaying			Routing protocols	
UF:	Distance relays		Smart contracts	
	Protective relays		Transport protocols	
BT:	Relays	protocol	Wireless application	
RT:	Instrument transformers		Zero knowledge proof	
	Power system protection			
	Power system relaying			
<i>Protective relays</i>		Proton accelerators	BT:	Particle accelerators
USE:	Protective relaying		RT:	Ion accelerators
				Protons
Protein engineering		<i>Proton beam effects</i>		
BT:	Biomedical engineering	USE:	Proton effects	



2022 IEEE Thesaurus

Proton beams

USE: Particle beams

RT: Conductors
Lithography

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

Pry and Bean model

USE: Bean model

PSCAD

UF: Power Systems Computer

Aided Design

BT: Design automation

Power systems

Software packages

RT: EMTDC

Pseudobinary semiconductors

USE: Semiconductor materials

Pseudomorphic HEMTs

USE: PHEMTs

Pseudonoise coded communication

USE: Spread spectrum

communication

Pseudonoise coded radar

USE: Spread spectrum radar

Pseudorandom sequences

USE: Random sequences

PSK

USE: Phase shift keying

PSNR

UF: Peak signal to noise ratio

Peak signal-to-noise ratio

BT: Signal to noise ratio

pSPICE

USE: SPICE

PSTN

USE: Communication networks

Psychiatry

BT: Behavioral sciences

RT: Medical treatment

NT: Mental disorders

Psychoacoustic models

BT: Auditory system

NT: Masking threshold



2022 IEEE Thesaurus

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

PTMP

USE: Point-to-multipoint
communications

Public blockchains

USE: Blockchains

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 health

USE: Public healthcare

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
Critical infrastructure

NT:

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 key cryptosystems

USE: Public key cryptography

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 switched telephone network

USE: Communication networks

Public transportation

UF: Subways
Taxi



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2022 IEEE Thesaurus

BT: Trolley cars
Uber
RT: Transportation
Light rail systems
Rail transportation
Urban areas

Publish subscribe systems

UF: Publish-subscribe systems
Publish/subscribe systems
BT: Message systems
RT: Content management
Middleware
Pattern recognition
Queueing analysis

Publish-subscribe

BT: Distributed information
systems

Publish-subscribe systems

USE: Publish subscribe systems

Publish/subscribe systems

USE: Publish subscribe 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

PUF

USE: Physical unclonable
function

Pulleys

BT: Materials handling
equipment
RT: Freight handling
Lifting equipment
Loading

Pulmonary diseases

UF: Lung diseases
Respiratory diseases
BT: Diseases
RT: Lung
Respiratory system

Pulmonary semilunar valves

USE: Heart valves

Pulmonology

UF: Chest medicine
Pneumology
Respiratory medicine
Respirology
BT: Medical specialties
RT: Lung
Respiratory system

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



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2022 IEEE Thesaurus

UF:	Impulse generation		Pulsewidth modulation
	Pulse generators		Pulsewidth-modulation
BT:	Signal generators	BT:	Modulation
NT:	Optical pulse generation	RT:	AC generators
<i>Pulse generators</i>			AC machines
USE:	Pulse generation		AC motors
Pulse inverters			Converters
UF:	Logic inverters		DC generators
BT:	Inverters		DC machines
RT:	Logic circuits		DC motors
			Pulse width modulation
Pulse measurements		converters	
UF:	Impulse measurements	NT:	Pulse width modulation
BT:	Measurement	inverters	
RT:	Electric variables		Space vector pulse width
measurement		modulation	
Pulse modulation		Pulse width modulation converters	
BT:	Modulation	UF:	PWM converters
RT:	Demodulation		PWM converters
			Pulse width modulated
Pulse oximeter		power converters	
BT:	Biomedical equipment		Pulse width modulation
	Biomedical measurement	convertors	
RT:	Noninvasive treatment		Pulsewidth modulation
	Pulse oximetry	converters	
			Pulsewidth modulation
Pulse oximetry		BT:	Converters
BT:	Instrumentation and	RT:	Power conditioning
measurement			Power control
	Noninvasive treatment		Power conversion
RT:	Biomedical measurement		Power electronics
	Oxygen		Pulse width modulation
	Pulse oximeter		Voltage-source converters
	Remote sensing		
<i>Pulse shaping</i>		<i>Pulse width modulation convertors</i>	
USE:	Pulse shaping methods	USE:	Pulse width modulation
Pulse shaping methods		converters	
UF:	Pulse shaping	Pulse width modulation inverters	
BT:	Signal processing	UF:	PWM inverters
NT:	Optical pulse shaping		PWM invertors
			Pulse width modulation
Pulse transformers		invertors	
BT:	Transformers	BT:	Pulse width modulation
		RT:	AC motors
<i>Pulse width modulated power converters</i>			AC-DC power converters
USE:	Pulse width modulation		Converters
converters			DC motors
			DC-DC power converters
Pulse width modulation		<i>Pulse width modulation invertors</i>	
UF:	PWM	USE:	Pulse width modulation
		inverters	



2022 IEEE Thesaurus

Pulsed electric current sintering

USE: Spark Plasma sintering

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

Pulsewidth modulation

USE: Pulse width modulation

Pulsewidth modulation converters

USE: Pulse width modulation converters

Pulsewidth modulation convertors

USE: Pulse width modulation converters

Pulsewidth-modulation

USE: Pulse width modulation

Pump lasers

BT: Lasers

Pumping of lasers

USE: Laser excitation

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

PWM

USE: Pulse width modulation

PWM converters

USE: Pulse width modulation converters

PWM convertors

USE: Pulse width modulation converters

PWM inverters

USE: Pulse width modulation inverters

PWM invertors

USE: Pulse width modulation inverters

Pylons

USE: Poles and towers

Pyroelectric devices

BT: Dielectric devices
RT: Pyroelectricity

Pyroelectricity

BT: Electricity
Ultrasonics, ferroelectrics,
and frequency control
RT: Ferroelectric materials
Piezoelectricity



2022 IEEE Thesaurus

	Pyroelectric devices	QoS	USE:	Quality of service
	Thermal factors			
Python		Qox	USE:	Quality of experience
BT:	Computer languages			
	Public domain software	QPSK	USE:	Phase shift keying
RT:	Functional programming			
	Object oriented	QR codes	UF:	Quick response codes
programming			BT:	Bar codes
	Software libraries		RT:	Product codes
Q factor				
USE:	Q-factor	Quad flat packs	USE:	Electronics packaging
Q learning				
USE:	Q-learning	Quadratic programming	BT:	Optimization methods
Q measurement		Quadrature amplitude modulation	UF:	QAM
BT:	Electric variables		BT:	Amplitude modulation
measurement		Quadrature phase shift keying	BT:	Phase shift keying
RT:	Q-factor		NT:	Differential quadrature
Q-factor		phase shift keying		
UF:	Q factor	Quadrupedal robots	UF:	Quadrupeds
	Quality factor		BT:	Robots
BT:	Electric variables	Quadrupeds	USE:	Quadrupedal robots
RT:	Capacitors			
	Q measurement	Qualifications	BT:	Training
Q-learning			RT:	Continuing professional
UF:	Q learning	development		Standards
BT:	Reinforcement learning	Quality assessment	BT:	Quality management
RT:	Markov processes	Quality assurance	BT:	Quality management
	Stochastic processes		RT:	Consumer protection
QAM				Data integrity
USE:	Quadrature amplitude			Design for quality
modulation				IEEE 802.11e Standard
qbit				Product liability
USE:	Qubit			Quality awards
QCD vacuum				Quality control
USE:	Elementary particle vacuum			Quality function deployment
QFD				
USE:	Quality function deployment			
QFP				
USE:	Electronics packaging			
QoE				
USE:	Quality of experience			



2022 IEEE Thesaurus

	Six sigma	Quality control
	Total quality management	Quality function deployment
NT:	Best practices	Total quality management
Quality awards		Quality of experience
BT:	Quality management	UF: QoE
RT:	Continuous improvement	Qox
	Quality assurance	BT: Communication systems
	Quality function deployment	Customer satisfaction
	Total quality management	RT: Quality of service
		User experience
Quality control		Quality of service
BT:	Quality management	UF: QoS
RT:	Contamination	Quality-of-service
	Coordinate measuring	BT: Communication systems
machines		Customer satisfaction
	Data integrity	RT: Conformance testing
	Design for quality	IEEE 802.11e Standard
	Failure analysis	IP networks
	IEEE 802.11e Standard	Next generation networking
	Quality assurance	Quality of experience
	Quality function deployment	Service level agreements
	Reliability	Spatial diversity
	Six sigma	Telecommunication
	Total quality management	
<i>Quality factor</i>		computing
USE:	Q-factor	NT: Admission control
Quality function deployment		<i>Quality-of-service</i>
UF: QFD		USE: Quality of service
BT: Quality management		<i>Quantisation</i>
RT: Concurrent engineering		USE: Quantization (signal)
Product development		Quantization (signal)
Quality assurance		UF: Quantisation
Quality awards		Quantization effects
Quality control		Quantization errors
Quality management		Signal quantisation
UF: ISO 9000		Signal quantization
BT: Management		BT: Signal processing
RT: Control charts		RT: Analog-digital conversion
Customer relationship		Data compression
management		Digital representation
	Customer satisfaction	Encoding
	Data governance	Finite wordlength effects
	Design for quality	Granular computing
	ISO Standards	Signal sampling
	Pareto analysis	NT: Vector quantization
	Product liability	
	Reliability	<i>Quantization effects</i>
	System improvement	USE: Quantization (signal)
NT: Quality assessment		<i>Quantization errors</i>
Quality assurance		USE: Quantization (signal)
Quality awards		



2022 IEEE Thesaurus

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
NT: Quantum algorithm
Quantum annealing

Quantum cellular automata
Quantum chemistry
Quantum circuit
Quantum networks
Quantum simulation
Qubit

Quantum confinement

USE: Potential well

Quantum cryptography

BT: Cryptography
Quantum mechanics

Quantum dash

USE: Quantum dots

Quantum decoherence

BT: Quantum mechanics
RT: Coherence

Quantum dot lasers

UF: Quantum-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



2022 IEEE Thesaurus

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 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

Quantum radar

BT: Radar
Remote sensing
RT: Lighting
Quantum entanglement

Quantum simulation

BT: Quantum computing
Quantum mechanics
Simulation

Quantum state

BT: Quantum mechanics
RT: Quantum entanglement

Quantum system

BT: Quantum mechanics

Quantum teleportation

USE: Teleportation

Quantum theory

USE: Quantum mechanics

Quantum vacuum

USE: Elementary particle vacuum

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

Quantum-dot

USE: Quantum dots



2022 IEEE Thesaurus

Quantum-dot lasers

USE: Quantum dot lasers

Quantum-dots

USE: Quantum dots

Quantum-well devices

USE: Quantum well devices

Quantum-well lasers

USE: Quantum well lasers

Quantumwell devices

USE: Quantum well devices

Quarter-wave plates

USE: Optical retarders

Quartz crystals

BT: Crystals

Quasi-resonant inverters

USE: Resonant inverters

Quasi-resonant invertors

USE: Resonant inverters

Quaternions

BT: Mathematics

Qubit

UF: qbit
BT: Quantum computing
RT: Coherence time
Quantum channels

Query evaluation

USE: Query processing

Query languages

USE: Database languages

Query optimisation

USE: Query processing

Query optimization

USE: Query processing

Query pipeline

USE: Query processing

Query process

USE: Query processing

Query processing

UF: Query evaluation
Query optimisation
Query optimization
Query pipeline
Query process
Query routing
BT: Database systems
RT: Linked data
NoSQL databases
Semantic search

Query routing

USE: Query processing

Question answering (information retrieval)

BT: Natural language
processing
RT: Chatbots

Queueing analysis

UF: Queueing theory
BT: Traffic control
RT: Publish subscribe systems
Scheduling

Queueing theory

USE: Queueing analysis

Quick response codes

USE: QR codes

R & D management

USE: Research and development
management

R language

BT: Computer languages
Public domain software
RT: Data analysis
Data mining
Data visualization
Statistical analysis

Rabbits

BT: Animals

Rad hardened

USE: Radiation hardening
(electronics)

Rad-hard

USE: Radiation hardening
(electronics)



2022 IEEE Thesaurus

Radar

UF: Microwave radar
BT: Aerospace and electronic

systems

Geoscience and remote

sensing

RT: Microwave technology
Radar detection
Radar scattering
NT: Airborne radar
Bistatic radar
Cognitive radar
Doppler radar
Ground penetrating radar
High frequency radar
Laser radar
Meteorological radar
Millimeter wave radar
Multistatic radar
Passive radar
Quantum radar
Radar applications
Radar clutter
Radar cross-sections
Radar equipment
Radar theory
Spaceborne radar
Spread spectrum radar
Synthetic aperture radar
Ultra wideband radar

Radar antennas

BT: Antennas

Radar applications

BT: Radar
RT: Oceanographic techniques
NT: Radar countermeasures
Radar detection
Radar imaging
Radar measurements
Radar polarimetry
Radar remote sensing
Radar tracking

Radar clutter

BT: Radar
RT: Jamming

Radar countermeasures

BT: Electronic warfare
Radar applications
RT: Adaptive arrays
Electronic countermeasures

Jamming
Spread spectrum radar

Radar cross section

USE: Radar cross-sections

Radar cross sections

USE: Radar cross-sections

Radar cross-section

USE: Radar cross-sections

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 meteorology

USE: Meteorological radar



2022 IEEE Thesaurus

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

Radial basis function neural networks

USE: Radial basis function
networks

Radiation counters

USE: Radiation detectors

Radiation detection

USE: Radiation detectors

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 dosimetry

USE: Dosimetry

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



2022 IEEE Thesaurus

BT: Electronic equipment
manufacture
Nuclear and plasma
sciences
RT: Ionizing radiation
Satellite communication
Total ionizing dose

Radiation imaging

BT: Imaging
RT: Biomedical imaging

Radiation monitoring

UF: Health physics
Personnel monitoring
BT: Monitoring
Nuclear and plasma
sciences
RT: Dosimetry
Radiation detectors
Radiation effects
Radiation protection
Radioactive pollution
Reactor instrumentation
NT: Radiation dosage

Radiation pattern

USE: Antenna radiation patterns

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 shielding

USE: Radiation protection

Radiation therapy

USE: Biomedical applications of
radiation

Radiative recombination

BT: Spontaneous emission
RT: Semiconductor materials

Radiators (automotive)

USE: Automotive components

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

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



2022 IEEE Thesaurus

equipment		Intercell interference		Transponders		
		MIMO communication				
		Mobile communication	Radio control			
		NOMA	BT:	Control systems		
		Radio access networks				
		Radio communication	Radio frequency			
			UF:	RF		
		Radio propagation		Radio-frequency		
		SIMO communication		Radiofrequency		
		SISO communication	BT:	Radio communication		
NT:		Wireless LAN	RT:	Light fidelity		
		Baseband		Wireless fidelity		
		Bluetooth	NT:	High frequency		
		Cellular technology		Radiofrequency exposure		
		Indoor radio communication		Radiofrequency safety		
		Land mobile radio				
		Millimeter wave	Radio frequency exposure			
			USE:	Radiofrequency exposure		
	communication		Near field communication	Radio frequency identification		
			Packet radio networks	Radio frequency identification		
		Passband	USE:	Radiofrequency		
		Personal area networks				
		Radio broadcasting				
		Radio communication	Radio frequency integrated circuits			
			USE:	Radiofrequency integrated		
countermeasures			Radio frequency	circuits		
			Radio links	Radio frequency interference		
			Radio spectrum	USE:	Radiofrequency	
			interference			
		Satellite communication	Radio frequency power amplifiers			
		Satellite ground stations	USE:	Power amplifiers		
		Software radio				
		Zigbee				
	Radio communication countermeasures			Radio frequency safety		
		BT:	Communication system	USE:	Radiofrequency safety	
security			Radio communication	Radio interference		
		RT:	Adaptive arrays	USE:	Electromagnetic	
			Electronic countermeasures		interference	
			Electronic warfare			
			Jamming	Radio interferometry		
			Spread spectrum	UF:	Radiowave interferometry	
		communication			BT:	Interferometry
				Radio LAN		
				USE:	Wireless LAN	
Radio communication equipment				Radio links		
	BT:		Communication equipment	BT:	Radio communication	
	RT:		Antennas	RT:	Transport protocols	
			Radio communication			
			Telephone equipment			
	NT:			Base stations		
			Ham radios			
			Land mobile radio	Radio navigation		
				UF:	Loran	
				BT:	Navigation	
equipment			Radio transceivers			



2022 IEEE Thesaurus

RT: Air traffic control
Indoor navigation
Satellite navigation systems
Transponders

Radio networks

BT: Radio broadcasting

Radio propagation

BT: Electromagnetic
propagation
RT: Fading channels
Multipath channels
Radio communication
Radiowave propagation
Rayleigh channels

Radio receivers

USE: Receivers

Radio resource management

USE: Resource management

Radio spectrum management

UF: Frequency allocation
Spectrum management
BT: Radio communication
RT: Communication standards
NT: Direct sequence spread
spectrum communication
White spaces

Radio telescopes

USE: Radio astronomy

Radio transceivers

BT: Radio communication
equipment
Transceivers
NT: Dynamic spectrum access

Radio transmitters

BT: Transmitters

Radio-frequency

USE: Radio frequency

Radio-frequency identification

USE: Radiofrequency
identification

Radio-frequency interference

USE: Radiofrequency
interference

Radio-frequency safety

USE: Radiofrequency safety

Radioactive decay

BT: Radioactive materials

Radioactive label

USE: Radiotracer

Radioactive materials

UF: Alphavoltaic power sources
Betavoltaic power sources
Radioisotopes
BT: Materials
RT: Isotopes
Neutrino sources
Occupational health
Occupational safety
Radioactive pollution
Safety
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 tracer

USE: Radiotracer

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



2022 IEEE Thesaurus

Radioactive waste disposal

BT: Radioactive waste
Waste disposal
RT: Incineration
Materials handling
Radioactive pollution
Vitrification
Waste handling

Radiofrequency

USE: Radio frequency

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 micro-electro-mechanical systems

USE: Radiofrequency
microelectromechanical systems

Radiofrequency micro-electromechanical systems

USE: Radiofrequency
microelectromechanical systems

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 power amplifiers

USE: Power amplifiers AND
Radiofrequency amplifiers

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



2022 IEEE Thesaurus

Radioisotopes

USE: Radioactive materials

Radiological protection

USE: Radiation protection

Radiology

BT: Biomedical image

processing

NT: Neuroradiology

Radiometers

BT: Meters

Radiometry

NT: Spectroradiometers

Radiometry

BT: Electromagnetic

measurements

Geoscience and remote

sensing

RT: Imaging

Photometry

Remote sensing

Temperature measurement

NT: Microwave radiometry

Radiometers

Radiomics

BT: Biomedical image

processing

RT: Machine learning

Radiotracer

UF: Radioactive label

Radioactive tracer

BT: Chemical compounds

Radiowave interferometry

USE: Radio interferometry

Radiowave propagation

BT: Electromagnetic

propagation

RT: Radio propagation

NT: NVIS

Radium

BT: Chemical elements

Radomes

BT: Antenna accessories

Radon

BT: Chemical elements

Rail guns

USE: Railguns

Rail line

USE: Rail transportation

Rail lines

USE: Rail transportation

Rail to rail amplifiers

BT: Rail to rail operation

RT: Amplifiers

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 traffic

USE: Rail transportation

Rail transportation

UF: Rail line

Rail lines

Rail traffic

Rail ways

Railways

BT: Land transportation

RT: Block signalling

Land vehicles

Magnetic levitation

Public transportation

NT: High-speed rail

transportation

Light rail systems

Magnetic levitation vehicles



2022 IEEE Thesaurus

	Positive train control		<i>Rain fades</i>	
	Railway communication		USE:	Rain fading
	Railway electrification			
<i>Rail ways</i>			Rain fading	
USE:	Rail transportation		UF:	Rain fades
			BT:	Interference
Railguns			RAKE receivers	
UF:	Rail guns		BT:	Receivers
BT:	Electromagnetic launching		RT:	Signal to noise ratio
RT:	Rails			
Rails			<i>Raleigh fading</i>	
BT:	Structural shapes		USE:	Rayleigh channels
RT:	Flanges			
	Railguns		<i>Raleigh fading channels</i>	
			USE:	Rayleigh channels
Railway accidents			<i>RAM</i>	
UF:	Derailments		USE:	Random access memory
BT:	Accidents			
RT:	Positive train control		<i>Raman effect</i>	
	Railway engineering		USE:	Raman scattering
	Railway safety			
<i>Railway bridges</i>			Raman scattering	
USE:	Structural panels		UF:	Raman effect
				Raman spectroscopy
Railway communication			BT:	Electromagnetic scattering
BT:	Rail transportation			Nonlinear optics
	Telecommunications			
NT:	Block signalling		<i>Raman spectroscopy</i>	
	GSM-R		USE:	Raman scattering
Railway electrification			<i>RAN</i>	
BT:	Rail transportation		USE:	Radio access networks
RT:	Power overhead lines		AND	
				Regional area networks
Railway engineering			<i>Random access communication</i>	
BT:	Civil engineering		USE:	Multiaccess communication
RT:	Railway accidents			
NT:	Railway safety		Random access memory	
Railway safety			UF:	RAM
BT:	Railway engineering			Random access storage
RT:	Positive train control		BT:	Memory
	Railway accidents		RT:	Buffer storage
	Safety devices		NT:	DRAM chips
				Phase change random
<i>Railways</i>			access memory	
USE:	Rail transportation			Resistive RAM
				SDRAM
Rain				SRAM cells
BT:	Meteorology			SRAM chips
RT:	Floods		<i>Random access storage</i>	
	Monsoons		USE:	Random access memory



2022 IEEE Thesaurus

Random forests

BT: Machine learning
Random processes
RT: Decision trees
Pattern recognition
Regression analysis

Random media

UF: Turbulent media
BT: Media
RT: Chaos
Nonhomogeneous media

Random number generation

BT: Cryptography
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
Random forests

Random sequences

UF: Pseudorandom sequences
BT: Sequences
RT: Cryptography
Random number

generation

Random variables

BT: Probability
RT: Stochastic processes
Stochastic systems

Ranging

USE: Distance measurement

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: CAD/CAM
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

Rare-earth metals

USE: Rare earth metals

Rate distortion

USE: Rate-distortion

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

Ratemeters

USE: Radiation detectors



2022 IEEE Thesaurus

Rats

BT: Animals

Raw materials

BT: Materials

RT: Mining industry

Ray tracing

UF: Ray-tracing

BT: Geometrical optics
Optics

RT: Computer graphics
Stray light

Ray-tracing

USE: Ray tracing

Rayleigh channels

UF: Raleigh fading
Raleigh fading channels
Rayleigh-fading

BT: Fading channels

RT: Radio propagation

Rayleigh scattering

BT: Electromagnetic scattering

Rayleigh-Benard convection

USE: Convection

Rayleigh-fading

USE: Rayleigh channels

RBF networks

USE: Radial basis function

networks

RDF

USE: Resource description

framework

Re-configurable devices

USE: Reconfigurable devices

Reachability analysis

BT: Graph theory

Reactive power

UF: Power factor
VAR

BT: Power systems

RT: Reactive power control
Static VAR compensators

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

Reactors

USE: Inductors

Read only memory

UF: ROM

BT: Memory

RT: Read-write memory

NT: PROM

Read-write memory

BT: Memory

RT: Read only memory

Readability formulas

USE: Readability metrics

Readability metrics

UF: Readability formulas

Readability tests

BT: Writing

Readability tests

USE: Readability metrics

Readout electronics

BT: Displays

RT: Detectors

SQUIDS

Real time

USE: Real-time systems

Real time control

USE: Real-time systems

Real time monitoring

USE: Real-time systems

Real time processing

USE: Real-time systems

Real time systems

USE: Real-time systems



2022 IEEE Thesaurus

Real-time control

USE: Real-time systems

Real-time monitoring

USE: Real-time systems

Real-time processing

USE: Real-time systems

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

instrumentation computing

NT: High energy physics
Networked control systems
Telexistence
WebRTC

Reasoning

USE: Cognition AND
Cognitive systems

reasoning about programs

USE: Commonsense reasoning

Rebreathers

USE: Rebreathing equipment

Rebreathing equipment

UF: Rebreathers
BT: Underwater equipment

Receive antennas

USE: Receiving antennas

Received signal strength indicator

UF: RSSI
BT: Communication system

signaling

Signal processing

Receivers

UF: Radio receivers
BT: Communication equipment
RT: Demodulation
Signal detection
NT: Optical receivers
RAKE receivers
Receiving antennas

Receiving antennas

UF: Receive antennas
BT: Antennas
Receivers
RT: Spatial diversity
Transmitting antennas

Receptor (biochemistry)

BT: Biochemistry

Recommender systems

UF: Music recommendation
BT: Information filtering
RT: Collaborative filtering

Reconfigurable architectures

BT: Computer architecture
NT: Reconfigurable intelligent

surfaces

Reconfigurable devices

UF: Re-configurable devices
BT: Hardware
RT: Field programmable gate

arrays

Reconfigurable intelligent surfaces

BT: Reconfigurable

architectures

RT: Wireless communication

Reconfigurable logic

BT: Logic design

Reconfigurable radio

USE: Software radio

Reconnaissance

BT: Military communication
Security
RT: Remote sensing
Surveillance

Reconstruction algorithm

USE: Reconstruction algorithms



2022 IEEE Thesaurus

Reconstruction algorithms

UF: Reconstruction algorithm
Reconstruction methods
BT: Tomography
RT: Image processing
Three-dimensional displays

Reconstruction methods

USE: Reconstruction algorithms

Recording

BT: Signal processing
RT: Memory
NT: Audio recording
Digital recording
Disk recording
Magnetic recording
Optical recording
Video recording

Recruitment

BT: Human resource
management
RT: Equal opportunities
Job specification
Labor resources

Rectangular waveguides

BT: Electromagnetic
waveguides
RT: Planar waveguides

Rectennas

BT: Antennas
Microwave communication
RT: Converters

Rectifiers

BT: Circuits
RT: Bridge circuits
Power electronics
Voltage multipliers

Rectifying circuits

BT: AC-DC power converters

Recurrent neural nets

USE: Recurrent neural networks

Recurrent neural networks

UF: RNN
Recurrent neural nets
BT: Neural networks
RT: Deep learning
NT: Hopfield neural networks

Recursive estimation

BT: Bayes methods
RT: Least squares
approximations

Recycle

USE: Recycling

Recycling

UF: Recycle
BT: Environmental
management
RT: Food waste

Red blood cells

BT: Blood

Reddit

USE: Social networking (online)
AND Web sites

Redox

UF: Reduction-oxidation
BT: Chemical reduction
Oxidation

Reduced instruction set computing

UF: RISC
BT: Instruction sets

Reduced order model

USE: Reduced order systems

Reduced order systems

UF: Model reduction
Reduced order model
Reduced-order model
Reduced-order systems
BT: Systems engineering and
theory
RT: Estimation
Simulation

Reduced-order model

USE: Reduced order systems

Reduced-order systems

USE: Reduced order systems

Reduction-oxidation

USE: Redox

Redundancy

BT: Fault tolerance



2022 IEEE Thesaurus

RT:	Codes Reliability	Sonar detection Telecommunications
<i>Redundancy (employment)</i>		
USE:	Termination of employment	
<i>Reed Solomon codes</i>		
USE:	Reed-Solomon codes	
Reed-Muller codes		
BT:	Error correction codes	
RT:	Polar codes	
Reed-Solomon codes		
UF:	Reed Solomon codes	
BT:	Error correction codes	
Refining		
BT:	Materials processing	
RT:	Chemical technology Cleaning Purification Smelting Sugar refining	
<i>Reflectance</i>		
USE:	Reflectivity	
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	
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	
<i>Refractivity</i>		
USE:	Refractive index	
<i>Refracting</i>		
USE:	Code refracting	
Refrigerants		
BT:	Coolants	
RT:	Heat pumps Space cooling Liquid nitrogen	
NT:		
Refrigeration		
BT:	Cooling	
Refrigerators		
BT:	Home appliances Home automation	



2022 IEEE Thesaurus

Refuse

USE: Waste materials

Refuse incineration

USE: Incineration

Regeneration engineering

BT: Tissue engineering

Regional area networks

UF: RAN
BT: Communication systems
RT: IEEE 802.22 Standard
Local area networks
Metropolitan area networks
Wireless communication
NT: WRAN

Registers

BT: Memory
NT: Shift registers

Regression analysis

BT: Statistical analysis
RT: Correlation coefficient
Econometrics
Nearest neighbor methods
Random forests
NT: Linear regression
Multivariate regression

Regression tree analysis

BT: Decision trees

Regulation

BT: Government policies
NT: Tariffs

Regulators

BT: Control equipment
RT: Current control
Electric variables control
Power conversion
Voltage control

Rehabilitation robotics

USE: Assistive robots

Rehabilitation robots

USE: Assistive robots

Reinforcement learning

BT: Machine learning
RT: Artificial intelligence
Bayes methods

Deep learning
Neural networks
Pattern classification
Semisupervised learning
Support vector machines
Unsupervised learning
Q-learning

NT:

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

Relaxor ferroelectrics

BT: Ferroelectric materials

Relay networks (telecommunication)

BT: Communication networks
Relays

Relays

BT: Switchgear
RT: Switching circuits
NT: Digital relays
Microrelays
Power system relaying
Protective relaying
Relay networks

(telecommunication)

Road side unit

Release engineering

UF: Releng
BT: Software engineering



2022 IEEE Thesaurus

RT: Product lifecycle
management
Software development
management
Source coding

Releng

USE: Release engineering

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 management

USE: Management AND
Reliability

Reliability theory

BT: Reliability

Reluctance generators

BT: Synchronous generators

Reluctance machines

BT: Rotating machines
Synchronous machines
NT: Reluctance motors

Reluctance motors

BT: Reluctance machines
Synchronous motors
NT: Switched reluctance motors

REM sleep

USE: Rapid eye movement sleep

Remaining life assessment

BT: Testing
RT: Failure analysis
Maintenance engineering

Remanence

BT: Magnetism
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

Remote handling equipment

BT: Materials handling

equipment

RT: Remote handling
Telerobotics
Waste handling equipment

Remote laboratories

BT: Laboratories



2022 IEEE Thesaurus

Remote learning

USE: Distance learning

Remote monitoring

BT: Monitoring
Remote sensing
RT: Internet of Medical Things
Machine-to-machine

communications

Remote piloted aircraft

USE: Remotely piloted aircraft

Remote sensing

BT: Geoscience and remote
sensing
RT: Atmospheric
measurements
techniques

Earth
Geologic measurements
Geophysical measurement
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

Remotely controlled aerial vehicles

USE: Remotely piloted aircraft

Remotely controlled vehicles

USE: Remotely guided vehicles

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 operated automobiles

USE: Remotely guided vehicles

Remotely operated cars

USE: Remotely guided vehicles

Remotely operated vehicles

USE: Remotely guided vehicles

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

Renal calculi

USE: Kidney stones

Rendering (computer graphics)

BT: Computer graphics
RT: Image synthesis

Renewable energy

USE: Renewable energy sources

Renewable energy resources

USE: Renewable energy sources



2022 IEEE Thesaurus

Renewable energy sources

UF:	Renewable energy
resources	Renewable energy
	Renewable-energy
	Renewables
BT:	Energy conservation
management	Environmental
RT:	Low-carbon economy
	Wave power
NT:	Biomass
<i>Renewable-energy</i>	
USE:	Renewable energy sources
<i>Renewables</i>	
USE:	Renewable energy sources
<i>Repair</i>	
USE:	Maintenance engineering

Repeaters

UF:	Optical regenerators
BT:	Communication equipment

Replica molding

USE:	Soft lithography
------	------------------

Replica moulding

USE:	Soft lithography
------	------------------

Replicability

BT:	Measurement
-----	-------------

Report writing

USE:	Writing
------	---------

Representation learning

UF:	Feature learning
BT:	Machine learning

Representational state transfer

BT:	Software architecture
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Reproducibility of results

UF:	Reproducible research
BT:	Measurement

Reproducible research

USE:	Reproducibility of results
------	----------------------------

Reproductive cloning

USE:	Cloning
------	---------

Requirements engineering

BT:	Systems engineering and theory
RT:	Product design
	Project management
	Requirements management
	Software engineering
	Stakeholders
NT:	Technical requirements

Requirements management

BT:	Management
	Systems engineering and theory
RT:	Project management
	Requirements engineering

ReRAM

USE:	Resistive RAM
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Rescue robots

BT:	Robots
RT:	Emergency services
	Hazards
	Marine robots

Research & development

USE:	Research and development
------	--------------------------

Research and development

UF:	Research & development
BT:	Engineering - general
RT:	Electrical engineering
	Engineering profession
	Industrial engineering
	International collaboration
	Laboratories
	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



2022 IEEE Thesaurus

	Project management		Resistance	
	Research and development		BT:	Electric variables
	Technology management		RT:	Electrical resistance
	Venture capital		measurement	
NT:	Innovation management			Resistance heating
Research initiatives				Skin effect
BT:	Engineering management	NT:		Electric resistance
Reservoirs				Piezoresistance
BT:	Water resources			Surface resistance
	Water storage			Thermal resistance
RT:	Dams			Viscosity
	Lakes		Resistance heating	
	Land use planning		UF:	Electric heating
	Water		BT:	Heating systems
			RT:	Electrothermal actuators
<i>Residual networks</i>				Resistance
USE:	Residual neural networks		Resistive RAM	
Residual neural networks			UF:	RRAM
UF:	Residual networks			ReRAM
BT:	Artificial neural networks	BT:		Random access memory
		RT:		Memristors
<i>Residual stress</i>				Phase change memory
USE:	Residual stresses		Resistive transducers	
Residual stresses			BT:	Transducers
UF:	Residual stress		<i>Resistivity</i>	
BT:	Stress	USE:		Conductivity
Resilience			<i>Resistivity measurement</i>	
UF:	Resiliency	USE:		Conductivity measurement
	Resilient systems		Resistors	
BT:	Material properties		BT:	Electronic components
<i>Resiliency</i>			RT:	Electrical ballasts
USE:	Resilience			Potentiometers
<i>Resilient systems</i>			NT:	Memristors
USE:	Resilience			Switched capacitor
<i>Resin transfer molding</i>			networks	
USE:	Transfer molding			Varistors
<i>Resin transfer moulding</i>			Resists	
USE:	Transfer molding		UF:	Photoresists
Resins			BT:	Materials
BT:	Materials		Resonance	
RT:	Plastics		RT:	Cavity resonators
	Polymer foams			Dielectric resonator
NT:	Epoxy resins		antennas	
				Film bulk acoustic
			resonators	
				Microstrip resonators
				Optical resonators



2022 IEEE Thesaurus

	Resonant inverters	<i>Resonant-tunneling devices</i>	
	Resonant tunneling devices	USE:	Resonant tunneling devices
	Resonator filters		
	Resonators	<i>Resonant-tunnelling devices</i>	
	Vibrations	USE:	Resonant tunneling devices
NT:	Ferroresonance		
	Magnetic resonance	Resonator filters	
	Resonance light scattering	BT:	Filters
	Stochastic resonance	RT:	Resonance
<i>Resonance frequency</i>		Resonators	
USE:	Resonant frequency	BT:	Amplifiers
Resonance light scattering		RT:	Acoustics
BT:	Resonance		Resonance
	Spectroscopy		Ring oscillators
RT:	Light scattering		Tuners
		NT:	Cavity resonators
<i>Resonant circuits</i>			Split ring resonators
USE:	RLC circuits	<i>Resource allocation</i>	
Resonant converters		USE:	Resource management
BT:	Converters	Resource description framework	
Resonant frequency		UF:	RDF
UF:	Resonance frequency	BT:	Semantic Web
BT:	Frequency	<i>Resource distribution</i>	
RT:	Oscillators	USE:	Resource management
	Quantum mechanics	Resource management	
NT:	Magnetic resonance	UF:	Allocation
Resonant inverters			Radio resource
UF:	Quasi-resonant inverters	management	Resource allocation
	Quasi-resonant invertors		Resource distribution
	Resonant invertors		Resource sharing
BT:	Inverters		Resource utilisation
RT:	Power electronics		Resource utilization
	Resonance		Resources management
<i>Resonant invertors</i>		BT:	Management
USE:	Resonant inverters	RT:	Business process
Resonant tunneling devices		integration	Business process
UF:	Resonant tunnelling	management	Business process
devices			Cluster computing
	Resonant-tunneling devices		Environmental engineering
	Resonant-tunnelling		Forestry
devices			Operations research
BT:	Tunneling		System integration
RT:	Quantum well devices	NT:	Elastic computing
	Resonance		Network resource
	Single electron devices	management	Resource virtualization
<i>Resonant tunnelling devices</i>			Serverless computing
USE:	Resonant tunneling devices		



2022 IEEE Thesaurus

Resource sharing

USE: Resource management

Resource utilisation

USE: Resource management

Resource utilization

USE: Resource management

Resource virtualization

BT: Resource management

Resources management

USE: Resource management

Respiratory diseases

USE: Pulmonary diseases

Respiratory medicine

USE: Pulmonology

Respiratory system

UF: Asthma
Bronchi
BT: Anatomy
RT: Intubation
Pulmonary diseases
Pulmonology
Ventilators
NT: Larynx
Lung

Respirology

USE: Pulmonology

Response surface methodology

BT: Surface fitting
RT: Optimization methods

Restful API

BT: Application programming
interfaces
Software architecture

Resumes

BT: Writing

Retail price index

USE: Economic indicators

Retardants

BT: Production materials
RT: Inhibitors
NT: Flame retardants

Retina

UF: Retinal
BT: Eyes
RT: Ophthalmology
NT: Retinal vessels

Retinal

USE: Retina

Retinal vessels

BT: Retina

Retinopathy

BT: Diseases

Retirement

BT: Human resource
management

Reverberation

BT: Acoustics

Reverberation chambers

BT: Electromagnetic
compatibility

Reverse engineering

BT: Engineering - general
RT: Product development
Research and development

Reverse logistics

BT: Logistics

Reverse osmosis

BT: Chemical processes
RT: Desalination

Reverse teaching

USE: Education AND
Online services

Reversible computing

BT: Computational modeling
Time complexity

Reviews

BT: Writing

RF

USE: Radio frequency

RF exposure

USE: Radiofrequency exposure



2022 IEEE Thesaurus

RF interference

USE: Electromagnetic interference

RF micro-electro-mechanical systems

USE: Radiofrequency microelectromechanical systems

RF microelectromechanical systems

USE: Radiofrequency microelectromechanical systems

RF safety

USE: Radiofrequency safety

RF signals

BT: Signal processing

RFIC

USE: Radiofrequency integrated circuits

RFID

USE: Radiofrequency identification

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

Rhombencephalon

USE: Hindbrain

Rhythm

BT: Music

Ribonucleic acid

USE: RNA

Ribs

BT: Thorax

Riccati equations

BT: Equations

Rician channels

UF: Rician fading
Rician fading channels
BT: MIMO communication

Rician fading

USE: Rician channels

Rician fading channels

USE: Rician channels

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

Ring resonators

USE: Optical ring resonators

RISC

USE: Reduced instruction set computing

Risk analysis

BT: Management
RT: Accident prevention
Accidents
Decision making
Occupational health



2022 IEEE Thesaurus

	Occupational safety		<i>RNN</i>		
	Reliability		USE:	Recurrent neural networks	
	Safety				
	Technology social factors		Road accidents		
	Venture capital		BT:	Accidents	
NT:	Fault trees		RT:	Road safety	
	Risk management			Road vehicles	
	Threat assessment				
<i>Risk assessment</i>			<i>Road bridges</i>		
USE:	Risk management		USE:	Structural panels	
<i>Risk handling</i>			Road safety		
USE:	Risk management		BT:	Roads	
			RT:	Automated highways	
				Automotive engineering	
Risk management				Lane detection	
UF:	Risk assessment			Road accidents	
	Risk handling			Vehicle-to-everything	
	Risk minimization		NT:	Lane departure warning	
	Risk mitigation		systems		
	Risk reduction				
BT:	Risk analysis		Road side unit		
RT:	Contract management		BT:	Relays	
				Vehicular ad hoc networks	
<i>Risk minimization</i>			Road traffic control		
USE:	Risk management		BT:	Road transportation	
<i>Risk mitigation</i>				Traffic control	
USE:	Risk management		RT:	Automotive control	
<i>Risk reduction</i>			Road transportation		
USE:	Risk management		UF:	Highways	
			BT:	Land transportation	
Rivers			RT:	Civil engineering	
BT:	Geoscience			Global Positioning System	
RT:	Excavation		NT:	Road traffic control	
	Floods			Roads	
	Lakes			Traffic congestion	
	Sediments				
	Water		Road vehicles		
	Water pollution		BT:	Land vehicles	
	Water resources		RT:	Automotive control	
	Wetlands			Road accidents	
				Roads	
RLC circuits			NT:	Automobiles	
UF:	Resonant circuits			Motorcycles	
BT:	Circuits				
	Tunable circuits and		Roadmaps (technology planning)		
devices			BT:	Strategic planning	
				Technology forecasting	
RNA			<i>ROADMS</i>		
UF:	Ribonucleic acid		USE:	Optical add-drop	
BT:	Biological cells		multiplexers		



2022 IEEE Thesaurus

Roads

BT: Road transportation
 RT: Civil engineering
 Excavation
 Road vehicles
 NT: Road safety

Roaming

BT: Wireless communication
 RT: Dual band
 GSM

Robot automobiles

USE: Autonomous automobiles

Robot cars

USE: Autonomous automobiles

Robot control

UF: Robotic control
 BT: Control systems
 Robots
 RT: Force control
 Formation control
 Motion planning
 Trajectory tracking
 NT: Robot motion

Robot kinematics

BT: Robots
 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

Robot operating systems

USE: Operating systems

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: Robot vision systems
 Simultaneous localization
 and mapping
 Tactile sensors

Robot sensor networks

USE: Robot sensing systems

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

Robot-assisted surgery

USE: Surgery

Robotic assembly

UF: Assembly robots
 BT: Assembly systems
 RT: Robotics and automation

Robotic control

USE: Robot control

Robotic motion

USE: Robot motion

Robotic process automation

USE: Intelligent automation

Robotic programming

USE: Robot programming

Robotics and automation

RT: Image motion analysis
 Industrial Internet of Things



2022 IEEE Thesaurus

Robots	NT:	Robotic assembly	Robust control	UF:	Active disturbance rejection			
		Animatronics						
		Automation						
		Autonomous systems						
		Multi-robot systems						
			Robots					
	BT:	Robotics and automation	Robust stability	BT:	Stability			
		RT:				Assembly systems		
		Botnet				Robustness	BT:	Reliability
		Control equipment						
Control systems								
Cybernetics								
Industrial control								
control		Manufacturing automation			Control systems			
		Materials handling						
		Mechanical variables						
						Rockets	BT:	Propulsion
	NT:	Mechatronics				Ground support		
		Nonlinear systems						
Servosystems								
Agricultural robots								
Androids								
		Aquatic robots						
		Automata						
		Autonomous robots						
		Bio-inspired robotics						
		Cognitive robotics						
		Computer vision						
		Educational robots						
		Evolutionary robotics						
		Humanoid robots						
		Intelligent robots						
		Manipulators						
		Marine robots						
		Medical robotics						
		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						



2022 IEEE Thesaurus

Roof mounted photovoltaics

USE: Building integrated photovoltaics

Roof mounted solar cell arrays

USE: Building integrated photovoltaics

Root cause analysis

BT: Process planning
RT: Failure analysis

Root kit

USE: Rootkit

Root mean square

UF: Root mean square error
Root mean square value
BT: Mathematics
Statistics

Root mean square error

USE: Root mean square

Root mean square value

USE: Root mean square

Rootkit

UF: Root kit
BT: Malware

Roots

USE: Poles and zeros

Rotating machines

BT: Electric machines
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

Rotation representation

USE: Rotation measurement

Rotational measurement

USE: Velocity control

Rotational speed

USE: Velocity control

Rotors

BT: Electric machines
Machine components

Rough sets

BT: Set theory

Rough surfaces

BT: Surfaces
RT: Polishing machines
Surface roughness
Terrain factors
NT: Corrugated surfaces

Round robin

BT: Scheduling algorithms

Roundoff errors

BT: Finite wordlength effects
RT: Error analysis
Noise

Routing

BT: Communication systems
RT: Multicast communication
Routing protocols
Soft switching
Virtual links
NT: Wavelength routing

Routing protocols

BT: Protocols
RT: Internet
Land mobile radio
Mobile communication
Multicast protocols
Multiprotocol label

switching

Routing
Wireless access points
NT: Virtual links



2022 IEEE Thesaurus

<i>RPA</i>	USE:	Remotely piloted aircraft	Rural areas	BT:	Geography
				RT:	Macrocell networks
<i>RPI</i>	USE:	Economic indicators			Public infrastructure
<i>RRAM</i>	USE:	Resistive RAM	Ruthenium	BT:	Chemical elements
<i>RRI</i>	USE:	Rail to rail inputs	Rydberg atoms	UF:	Rydberg sensors
<i>RRO</i>	USE:	Rail to rail outputs		BT:	Electric variables
<i>RSSI</i>	USE:	Received signal strength	measurement		Physics
indicator			<i>Rydberg sensors</i>	USE:	Rydberg atoms
Rubber	BT:	Insulators	<i>S parameters</i>	USE:	Scattering parameters
	RT:	Rubber industry			
		Rubber products	<i>S-parameters</i>	USE:	Scattering parameters
Rubber industry	BT:	Manufacturing industries	<i>S/N</i>	USE:	Signal to noise ratio
	RT:	Chemical industry	<i>SaaS</i>	USE:	Software as a service
		Rubber			
		Rubber products	Safety	BT:	Industry applications
Rubber products	BT:	Manufactured products		RT:	Product safety engineering
	RT:	Hoses			Alarm systems
		Rubber			Control system security
		Rubber industry			Electric shock
		Wastewater treatment			Environmental factors
	NT:	Tires			Explosions
Rubidium	BT:	Chemical elements			Eye protection
<i>Rule based systems</i>	USE:	Knowledge based systems			Fires
Runtime	BT:	Software engineering			Hazardous areas
	RT:	Programming			Occupational health
	NT:	Dynamic compiler			Preventive maintenance
		Runtime environment			Protective clothing
Runtime environment	BT:	Runtime			Radiation effects
Runtime library	BT:	Formal languages			Radioactive materials
					Radioactive pollution
					Risk analysis
				NT:	Aerospace safety
					Domestic safety
					Emergency services
					Explosion protection
					Fire safety
					Hazards
					Health and safety
					Marine safety



2022 IEEE Thesaurus

	Product safety	NT:	Samarium alloys
	Protection		Samarium compounds
	Radiation safety		
	Safety devices	Samarium alloys	
	Safety management	UF:	Samarium cobalt
	Vehicle safety	BT:	Samarium
Safety devices		<i>Samarium cobalt</i>	
BT:	Safety	USE:	Samarium alloys
RT:	Accident prevention		
	Alarm systems	Samarium compounds	
	Railway safety	BT:	Samarium
	Smoke detectors		
NT:	Eye protection	Sampled data circuits	
	Fire extinguishers	UF:	Sampled-data circuits
	Protective clothing	BT:	Circuits
<i>Safety in the home</i>		Sampled data systems	
USE:	Domestic safety	BT:	Discrete-time systems
Safety management		<i>Sampled-data circuits</i>	
BT:	Management	USE:	Sampled data circuits
	Safety		
RT:	Dependability management	Sampling methods	
<i>SAGIN</i>		BT:	Statistics
USE:	Space-air-ground	RT:	Signal sampling
integrated networks		NT:	Compressed sensing
			Nonuniform sampling
Sagnac interferometers		<i>SAN</i>	
BT:	Interferometry	USE:	Storage area networks
<i>Sales promotion</i>		Sandblasting	
USE:	Promotion - marketing	BT:	Surface treatment
		RT:	Surface roughness
Saliency detection		Sandwich structures	
BT:	Image processing	BT:	Structural shapes
RT:	Feature detection	RT:	Honeycomb structures
	Feature extraction		Lightweight structures
	Visual systems		Sheet materials
Salinity (geophysical)			Structural panels
BT:	Soil measurements		Thin wall structures
RT:	Geochemistry	Sanitary engineering	
	Ocean salinity	BT:	Engineering - general
	Sea measurements	RT:	Environmental
	Sea surface salinity	management	
Salivary glands			Sewage treatment
UF:	Parotid		Waste disposal
BT:	Glands		Waste management
	Stomatognathic system		Waste materials
			Wastewater
Samarium			Wastewater treatment
BT:	Metals		Water pollution



2022 IEEE Thesaurus

SAR			Satellite communication
AND	USE:	Specific absorption rate	RT: Communication equipment
		Synthetic aperture radar	
SAR imaging			Satellite navigation systems
USE:	Radar polarimetry		BT: Navigation
			RT: Radio navigation
			Time dissemination
SAS			NT: Global Positioning System
USE:	Synthetic aperture sonar	system	Global navigation satellite
			Satellite constellations
Satellite antennas			
BT:	Antennas		Satellites
Satellite born radar			BT: Solar system
USE:	Spaceborne radar		RT: Artificial satellites
			NT: Geostationary satellites
Satellite borne radar			Moon
USE:	Spaceborne radar		Small satellites
Satellite broadcasting			<i>Saturation detection</i>
UF:	DBS		USE: Feedback
	Direct broadcast satellites		
	Satellite broadcasts		<i>Saturation magnetisation</i>
BT:	Broadcasting		USE: Saturation magnetization
	Satellite communication		
RT:	Global Positioning System		Saturation magnetization
Satellite broadcasts			UF: Saturation magnetisation
USE:	Satellite broadcasting		BT: Magnetization processes
			RT: Magnetic fields
			Magnets
Satellite communication			
UF:	Communication satellites		Saturn
BT:	Communication systems		BT: Planets
	Radio communication		
RT:	Artificial satellites		SAW filters
	Convolutional codes		BT: Electromechanical devices
	Global Positioning System		
	Handover		Sawing
	Radiation hardening		BT: Machining
(electronics)			RT: Sawing machines
	Space-air-ground		
integrated networks			Sawing machines
	Transponders		BT: Machine tools
	Downlink		RT: Sawing
NT:	Satellite broadcasting		
	Satellite ground stations		SCADA systems
	Uplink		UF: Supervisory control and
Satellite constellations			data acquisition systems
BT:	Satellite navigation systems		Supervisory control and
			data-acquisition systems
Satellite ground stations			BT: Control systems
BT:	Communication systems		Power system control
	Radio communication		Supervisory control
			RT: Load monitoring
			Substation automation



2022 IEEE Thesaurus

Scalability

BT: System analysis and design

Scalp

BT: Head

Scandium

BT: Chemical elements

Scanning electron microscopy

UF: SEM

BT: Electron microscopy

RT: 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

Scatternets

USE: Personal area networks

Scene analysis

USE: Image analysis

Scene classification

USE: Image analysis

Schedules

BT: Planning

RT: Scheduling

Scheduling

BT: Organizational aspects
Production control
Project engineering
Materials requirements

planning

Queueing analysis
Schedules
Statistics
Synchronization
Adaptive scheduling
Dynamic scheduling
Job shop scheduling
Single machine scheduling

NT:

Scheduling algorithms

BT: Optical fiber communication
Processor scheduling

NT: Round robin

Scholarships

BT: Educational programs

Schools

USE: Educational institutions

Schottky barriers

UF: Schottky contacts

BT: Semiconductor-metal

interfaces

RT: MESFETs
Schottky diodes

Schottky contacts

USE: Schottky barriers

Schottky diode

USE: Schottky diodes

Schottky diodes

UF: Schottky diode
Diodes
Semiconductor devices
Semiconductor diodes
Schottky barriers
Semiconductor-metal

interfaces



2022 IEEE Thesaurus

Schottky FETs

USE: MESFETs

Schottky gate FET

USE: Schottky gate field effect transistors

Schottky gate field effect transistors

UF: Schottky gate FET

BT: Field effect transistors

Schrodinger equation

BT: Quantum mechanics

RT: Electrons

Science - general

RT: Econophysics
Neurophysiology
Research and development
STEM

NT: Astronomy
Biology
Chemistry
Electricity
Epidemiology
Geoscience
Life sciences
Metrology
Neuroscience
Physics
Social sciences
Thermodynamics

science technology engineering and math

USE: STEM

Science technology engineering mathematics

USE: STEM

science, technology, engineering, and math

USE: STEM

Scientific computing

UF: Computational science

BT: Computer applications

Scientific publishing

BT: Publishing

Scintillation counters

BT: Measurement
Nuclear and plasma

sciences

NT: Solid scintillation detectors

Scintillators

BT: Radiation effects

RT: Luminescence

SCM supply chains

USE: Supply chain management

Scooters

USE: Motorcycles

SCR

USE: Thyristors

Screws

USE: Fasteners

Scrubbers

USE: Materials handling

Scrum (Software development)

BT: Agile software development

RT: Feedback
Project management
Software development

management

SDH

USE: Synchronous digital

hierarchy

SDHTs

USE: MODFETs

SDN

USE: Software defined

networking

SDRAM

UF: Synchronous DRAM
Synchronous dynamic

random access memory

BT: Random access memory

Sea animals

USE: Marine animals

Sea coast

BT: Oceans

Sea floor

UF: Seafloor

BT: Oceans

RT: Sediments

NT: Bathymetry

Sea floor roughness



2022 IEEE Thesaurus

Sea floor roughness

BT: Sea floor

Sea ice

BT: Ice

RT: Oceans

Sea level

BT: Oceans

RT: Ocean circulation

Sea measurements

(water) UF: Current measurement

BT: Geophysical measurements

RT: Oceans

Remote sensing

Salinity (geophysical)

Sonar measurements

NT: Geoacoustic inversion

Sea ports

USE: Seaports

Sea state

BT: Measurement

Ocean waves

RT: Marine navigation

Sea surface roughness

Sea surface

BT: Oceans

RT: Surface waves

Wind

NT: Sea surface roughness

Sea surface salinity

Sea surface roughness

BT: Sea surface

RT: Sea state

Sea surface salinity

BT: Sea surface

RT: Salinity (geophysical)

Sea surface temperature

USE: Ocean temperature

Sea vegetation

USE: Marine vegetation

Seafloor

USE: Sea floor

Sealants

USE: Sealing materials

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: 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

Seat belts

USE: Belts

Sebaceous glands

USE: Sebaceous glands



2022 IEEE Thesaurus

Sebaceous glands

UF: Sebaceous glands
BT: Glands
Skin

Reconnaissance
Security management
Terrorism
Watermarking

Second Life

BT: Social networking (online)

Security management

BT: Management
Security

Secondary cells

USE: Batteries

Security of data

USE: Data security

Secondary electron emission

USE: Electron emission

Sediments

UF: Mud
BT: Geoscience
RT: Lakes
Rivers
Sea floor
Soil

Secondary generated hot electron injection

UF: Secondary generated hot-electron injection
BT: Hot carrier injection

Seebeck effect

USE: Thermoelectricity

Secondary generated hot-electron injection

USE: Secondary generated hot electron injection

Secondary ion emission

USE: Ion emission

Seeds (agriculture)

BT: Crops
RT: Agriculture
Botany
Ecology
Food products
Genetic engineering
Soil

Secure storage

BT: Material storage
RT: Security

Seismic measurements

UF: Seismic visualization
BT: Geophysical measurements
RT: Acoustic measurements
Seismology

Security

BT: Industry applications
RT: Anti-virus software
Biometrics (access control)
Bring your own device
Business continuity
Identification of persons
Malware
Physical unclonable

Seismic retrofitting

USE: Earthquake engineering

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
Information security
Network security
Power system security

Seismic visualization

USE: Seismic measurements

Seismic waves

BT: Waves
RT: Acoustic waves
Earthquakes
Elastodynamics
Explosions
Seismology
Shock waves



2022 IEEE Thesaurus

Seismology

BT: Geophysics
RT: Earthquake engineering
Earthquakes
Seismic measurements
Seismic waves
Well logging

Selective laser sintering

USE: Laser sintering

Selectively doped heterojunction transistors

USE: MODFETs

Selenium

BT: Chemical elements

Self managing systems

USE: Autonomous systems

Self organising feature maps

USE: Self-organizing feature

maps

Self organizing feature maps

USE: Self-organizing feature

maps

Self organizing maps

USE: Self-organizing feature

maps

Self organizing networks

USE: Self-organizing networks

Self replicating machines

USE: Self-replicating machines

Self supervised learning

USE: Self-supervised learning

Self testing

USE: Automatic testing

Self-assembly

BT: Nanotechnology
RT: Biological cells
Programming
Semiconductor device

manufacture

NT: Thin films
Electrostatic self-assembly

Self-aware

BT: Cognition

Self-consistent field theory

USE: Mean field theory

Self-driving automobiles

USE: Autonomous automobiles

Self-driving car

USE: Autonomous automobiles

Self-dynamic voltage scaling

USE: Dynamic voltage scaling

Self-managing systems

USE: Autonomous systems

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 maps

USE: Self-organizing feature

maps

Self-organizing networks

UF: Self organizing networks

BT: Wireless networks

Self-replicating machines

UF: Self replicating machines

BT: Nanotechnology

Self-study courses

BT: Educational programs

Self-supervised learning

UF: Self supervised learning

BT: Learning systems

RT: Supervised learning

Unsupervised learning

Self-testing

USE: Built-in self-test



2022 IEEE Thesaurus

Self-tuning regulators

USE: Adaptive control

SEM

USE: Scanning electron microscopy

Semantic search

BT: Search methods
Semantics

RT: Context awareness
Natural language

processing

Ontologies
Query processing
Semantic Web

Semantic technology

BT: Information technology
Semantics

RT: Data models
Encoding
Natural language

processing

Semantic Web

Semantic triple

USE: Triples (Data structure)

Semantic Web

BT: Internet
RT: Artificial intelligence
Content management
Data models
Distributed computing
Document handling
Knowledge management
Linked data
Markup languages
Ontologies
Open data
Ranking (statistics)
Semantic search
Semantic technology
NT: OWL
Resource description

framework

Semantics

BT: Semiotics
RT: Natural language

processing

Professional

communication

Sign language

NT: Semantic search
Semantic technology

Semi-duplex systems

USE: Half-duplex system

Semi-insulating materials

USE: Semiconductor materials

Semi-supervised learning

USE: Semisupervised learning

Semiconductivity

BT: Conductivity
Electron devices

RT: Charge carriers

Semiconductor alloys

USE: Semiconductor materials

Semiconductor charge carriers

USE: Charge carrier processes

Semiconductor controlled rectifiers

USE: Thyristors

Semiconductor counters

UF: Junction detectors
BT: Semiconductor devices
RT: Position sensitive particle

detectors

Semiconductor detectors

BT: Detectors
Semiconductor devices
RT: Absorption
Particle charging

Semiconductor device breakdown

BT: Failure analysis
RT: Semiconductor device

reliability

Semiconductor device

testing

Tolerance analysis

Semiconductor device doping

UF: Semiconductor doping
BT: Semiconductor device

manufacture

RT: Doping
Semiconductor materials



2022 IEEE Thesaurus

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 models

USE: Semiconductor device modeling

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



2022 IEEE Thesaurus

	MIS devices		Semiconductor films
	MONOS devices	BT:	Films
	P-i-n diodes	RT:	Buffer layers
	Piezoresistive devices		Dielectric thin films
	Power semiconductor		Magnetic field induced
devices		strain	
	Power semiconductor		Semiconductor growth
switches			Semiconductor materials
	Quantum dots		Thick films
	Quantum well lasers		Thin films
	SONOS devices		
	Schottky diodes	Semiconductor growth	
	Semiconductor counters	BT:	Semiconductor device
	Semiconductor detectors	manufacture	
	Semiconductor device	RT:	Buffer layers
modeling			Crystal growth
	Semiconductor device		Epitaxial layers
noise			Semiconductor films
	Semiconductor diodes		Semiconductor materials
	Semiconductor lasers		
	Semiconductor waveguides	Semiconductor impurities	
	Semiconductor-insulator	BT:	Impurities
interfaces		RT:	Charge carrier processes
	Silicon devices		Plasma immersion ion
	Superluminescent diodes	implantation	
	Surface emitting lasers		Semiconductor materials
	Thermistors		
	Transistors	<i>Semiconductor industry</i>	
		USE:	Electronics industry
Semiconductor diodes		Semiconductor laser arrays	
BT:	Semiconductor devices	BT:	Semiconductor lasers
RT:	Diodes		
	Magnetic field induced	Semiconductor lasers	
strain		UF:	Injection lasers
	P-n junctions		Junction lasers
NT:	P-i-n diodes		Laser diodes
	Schottky diodes	BT:	Diodes
	Semiconductor-metal		Lasers
interfaces			Semiconductor devices
	Superluminescent diodes		Solid lasers
	Varactors	RT:	Molecular beam
<i>Semiconductor doping</i>		applications	
USE:	Semiconductor device		Optical transmitters
doping			Refractive index
		NT:	Laser tuning
<i>Semiconductor electronics industry</i>			Quantum dot lasers
USE:	Electronics industry		Quantum well lasers
			Semiconductor laser arrays
Semiconductor epitaxial layers			Semiconductor optical
UF:	Silicon epitaxial layers	amplifiers	
BT:	Semiconductor device		Surface emitting lasers
manufacture			
RT:	Bipolar transistors		



2022 IEEE Thesaurus

Semiconductor manufacturing

USE: Semiconductor device manufacture

Semiconductor materials

UF: Pseudobinary semiconductors

BT: Semi-insulating materials
Semiconductor alloys
Materials
RT: Acoustoelectric effects
Charge carriers
Conducting materials
Crystals
Excitons
High-k dielectric materials
Photoconducting materials
Radiative recombination
Semiconductor device

doping

NT: Semiconductor films
Semiconductor growth
Semiconductor impurities
Semiconductor thin films
Silicon compounds
Tunneling
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
Wide band gap

semiconductors

Semiconductor memory

UF: Semiconductor storage
BT: Memory
RT: Integrated circuits
NT: Integrated memory circuits

Semiconductor nanostructures

BT: Nanostructures

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 quantum wells

USE: Quantum wells

Semiconductor radiation detectors

BT: Radiation detectors

Semiconductor storage

USE: Semiconductor memory

Semiconductor superlattices

BT: Semiconductor materials
Superlattices

Semiconductor thin films

BT: Thin films
RT: Epitaxial growth
Gallium
Germanium
Semiconductor materials
Silicon

Semiconductor waveguides

BT: Semiconductor devices

Semiconductor-insulator interfaces

BT: Semiconductor devices
RT: CMOSFETs
MIM devices
MIS devices
MOS devices
Silicon-on-insulator

Semiconductor-insulator-semiconductor devices

USE: Semiconductor devices

Semiconductor-metal interfaces

UF: Metal-semiconductor interfaces



2022 IEEE Thesaurus

strain
BT: Semiconductor diodes
RT: Magnetic field induced

NT: Schottky diodes
Schottky barriers

Semicustom integrated circuits

USE: Application specific
integrated circuits

Semilunar valves

USE: Heart valves

Seminars

BT: Educational programs
NT: Webinars

Semiology

USE: Semiotics

Semiosis

USE: Semiotics

Semiotic studies

USE: Semiotics

Semiotics

UF: Semiology
Semiosis
Semiotic studies
BT: Communication symbols
RT: 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

Senior citizens

USE: Older adults

Sense and avoid

USE: Collision avoidance

Sense organs

BT: Anatomy
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



2022 IEEE Thesaurus

	NT:	Activity recognition Gunshot detection systems			Soft sensors Thermal sensors Thick film sensors Thin film sensors Vision sensors Wearable sensors
	Sensor systems and applications				
	BT:	Sensors			
	NT:	Detectors Electric sensing devices Leak detection Radiofrequency		<i>Sensors (image)</i> USE:	Image sensors
identification		Robot sensing systems Sensor arrays Sensor systems		Sensory aids BT: RT:	Medical services Assistive technologies Biomedical equipment Orthotics Prosthetics Hearing aids
	Sensorless control				
	BT:	Control systems			
	RT:	AC machines DC machines Drives Induction motors Inductive power		NT:	
transmission		Motor drives Motors		Sentiment analysis UF: BT:	Opinion mining Computational linguistics Natural language
			processing	RT:	Anxiety disorders Emotion recognition Information analysis
	Sensors				
	UF:	Sun sensors			
	RT:	Capacitive transducers Magnetostriuctive devices Wireless sensor networks		Separation processes BT:	Materials science and technology
	NT:	Acoustic sensors Chemical and biological		NT:	Fractionation Particle separators
sensors		Electromechanical sensors Force sensors Glucose sensors Inertial sensors Infrared sensors Intelligent sensors Intracranial pressure		<i>Separators</i> USE:	Particle separators
sensors		Ionizing radiation sensors Magnetic sensors Mechanical sensors Multimodal sensors Nanosensors Optical sensors Optoelectronic and		Sepsis BT: RT:	Medical conditions Immune system
photonic sensors		Pressure sensors Sensor phenomena and		<i>September 11</i> USE:	Terrorism
characterization		Sensor placement Sensor systems and		<i>Sequence analysis</i> USE:	Sequences
applications				Sequences UF: BT: RT: NT:	Digital sequences Sequence analysis Mathematics Codes Binary sequences Random sequences



2022 IEEE Thesaurus

Sequencing

USE: Sequential analysis

Sequential analysis

UF: Sequencing
BT: System analysis and design
NT: Zero correlation zone

Sequential circuits

UF: Sequential logic circuits
BT: Circuits

Sequential diagnosis

BT: System analysis and design

Sequential logic circuits

USE: Sequential circuits

Sequential production

USE: Flow production systems

Serious games

BT: Games
Simulation

Serverless computing

BT: Cloud computing
Resource management
Servers

Servers

BT: Client-server systems
RT: Network function

virtualization

NT: Serverless computing
Web servers

Service composability

USE: Interoperability

Service computing

BT: Information technology
RT: Business
Cloud computing
Process design
Service-oriented

architecture

Service-oriented systems

engineering

Web services
NT: Service level agreements

Service function chaining

UF: Service function chains
BT: Software defined

networking

Service function chains

USE: Service function chaining

Service level agreements

UF: SLA
BT: Contracts
Service computing
RT: Internet
Quality of service

Service oriented architecture

USE: Service-oriented
architecture

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 architectures

USE: Service-oriented

architecture

Service-oriented systems engineering

UF: SOSE
BT: Systems engineering and

theory

RT: Formal specifications
Service computing
Service-oriented

architecture

Software engineering

Servo control

USE: Servosystems



2022 IEEE Thesaurus

Servo-control

USE: Servosystems

Servomechanisms

BT: Servomotors
RT: Actuators
Manipulators

Servomotors

UF: Servos
BT: Motors
Rotating machines
Servosystems
NT: Servomechanisms

Servos

USE: Servomotors

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

SEU

USE: Single event upsets

Sewage treatment

BT: Waste handling
RT: Pollution
Pollution control
Sanitary engineering
Sludge treatment
Water pollution

SF6

USE: Sulfur hexafluoride

SGML

UF: Standard Generalized
Markup Language
BT: Markup languages

Shadow mapping

UF: Projective shadowing
Shadowing
BT: Computer graphics
RT: Three-dimensional displays

Shadowing

USE: Shadow mapping

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

Shape memory material

USE: Smart materials

Shape memory technology

USE: Smart materials



2022 IEEE Thesaurus

Share prices

BT: Economic indicators

Shared ledger

USE: Distributed ledger

Sharing economy

BT: Economics

Shearing

BT: Materials processing
RT: 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

Shewhart charts

USE: Control charts

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

Ships

USE: Marine vehicles

Shock

USE: Electric shock

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

Shoe manufacture

USE: Footwear industry

Shoes

USE: Footwear

Short circuit currents

USE: Short-circuit currents

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

Shortest-path-problem

USE: Shortest path problem

Shoulder

BT: Extremities
NT: Axilla

Shunts (electrical)

BT: Electric current control
Photovoltaic effects

Si

USE: Silicon

SiC

USE: Silicon carbide

Sick pay

USE: Employee welfare



2022 IEEE Thesaurus

Side channel attacks

USE: Side-channel attacks

Side-channel attacks

UF: Side channel attacks
BT: Cryptography

SiGe

USE: Silicon germanium

Sigma delta

USE: Sigma-delta modulation

Sigma-delta modulation

UF: Delta sigma
Sigma delta
BT: Delta modulation

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
Spectral analysis

Signal classification

USE: Pattern classification

Signal constellation

USE: Constellation diagram

Signal de-noising

USE: Signal denoising

Signal decomposition

USE: Signal resolution

Signal denoising

UF: Signal de-noising
BT: Signal reconstruction
RT: Signal resolution
Signal restoration
Signal to noise ratio

Signal design

BT: Signal processing

Signal detection

UF: Detection (signal)
BT: Signal processing
RT: Blind source separation
Channel estimation
Correlators
Decision making
Demodulation
Pattern clustering
Receivers
Signal resolution
Source separation
Time of arrival estimation
NT: Acoustic signal detection
Motion detection
Multiuser detection
Optical signal detection
Phase detection
Radar detection

Signal estimation

USE: Estimation

Signal flow graphs

USE: Flow graphs

Signal generators

UF: Function generators
Waveform generators
BT: Signal processing
NT: Noise generators
Pulse generation

Signal integrity

BT: Signal processing

Signal mapping

BT: Signal analysis

Signal processing

UF: Vibrational signal
processing
RT: Analog processing circuits
Antennas and propagation
Band-pass filters



2022 IEEE Thesaurus

decomposition	Bandwidth	conversion	Optical wavelength
	Biomedical computing		Phase locked loops
	Bit rate		Pulse compression
	Correlators		Pulse shaping methods
	Data processing		Quantization (signal)
	Decoding		RF signals
	Deconvolution		Radar signal processing
	Digital signal processors		Received signal strength
	Discrete Fourier transforms		
	Empirical mode		
analysis	Encoding	indicator	Recording
	Estimation		Signal analysis
	Estimation theory		Signal design
	Feature extraction		Signal detection
	Fourier series		Signal generators
	Gaussian noise		Signal integrity
	Independent component		Signal reconstruction
			Signal resolution
			Signal restoration
			Signal sampling
NT:	Matrix decomposition	Signal processing algorithms	Signal synthesis
	Pattern clustering		Source separation
	Prediction methods		Spectrogram
	Random processes		Tracking loops
	Rate distortion theory		
	Stability analysis		
	Structure from motion		
	Synapses		
	System-on-chip		
	Transforms		
NT:	Transversal filters	BT: Algorithms	
	Vectors		
	Wavelet transforms		
	Acoustic signal processing		
	Adaptive signal processing		
	Amplifiers		
	Array signal processing		
	Attenuators		
	Chirp		
	Convolution		
processing	Decorrelation	Signal quantisation	
	Digital signal processing		
	Dispersion		
	Distortion		
	Error correction		
	Fading channels		
	Filters		
	Frequency locked loops		
	Geophysical signal		
processing	Limiting	USE: Quantization (signal)	
	Modulation		
	Multidimensional signal		
	Noise		
	Optical signal processing		
processing		Signal quantization	
		USE: Quantization (signal)	
		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	



2022 IEEE Thesaurus

NT:	Spectral analysis Diversity reception	<i>Signature verification</i>	USE:	Handwriting recognition
Signal restoration		<i>Silica</i>	USE:	Silicon compounds
BT:	Signal processing	Silicidation	BT:	Semiconductor device manufacture
RT:	Deconvolution Distortion Signal denoising			
Signal sampling		Silicides	BT:	Silicon compounds
BT:	Signal processing			
RT:	Quantization (signal) Sampling methods Signal reconstruction	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
<i>Signal separation</i>				
USE:	Source separation			
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	Silicon alloys	BT:	Silicon
<i>Signal-to-noise ratio</i>			RT:	Alloying
USE:	Signal to noise ratio		NT:	Germanium silicon alloys
<i>Signal-to-noise-ratio</i>		Silicon carbide	UF:	SiC
			BT:	Silicon compounds
<i>Signaling block systems</i>		Silicon compiler	BT:	Computer aided manufacturing
USE:	Block signalling		RT:	Integrated circuit manufacture
<i>Signaling systems</i>		Silicon compounds	UF:	Silica Silicon dioxide BT: Compounds RT: Semiconductor materials NT: Silicides Silicon carbide Silicon nitride
signaling	Communication system			
<i>Signalling block systems</i>				
USE:	Block signalling			
<i>Signature detection</i>		<i>Silicon controlled rectifiers</i>	USE:	Thyristors
USE:	Handwriting recognition			



2022 IEEE Thesaurus

Silicon devices

BT: Semiconductor devices
RT: Doping
Photonics
Silicon

Silicon dioxide

USE: Silicon compounds

Silicon epitaxial layers

USE: Semiconductor epitaxial layers

Silicon germanium

UF: SiGe
BT: Semiconductor materials
RT: Germanium
Silicon
Silicon-on-insulator
Substrates
Transistors

Silicon materials

USE: Silicon

Silicon nitride

BT: Nitrogen
Silicon compounds

Silicon on insulator

USE: Silicon-on-insulator

Silicon on insulator technology

USE: Silicon-on-insulator

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

technology

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

Silicon-on-insulator technology

USE: Silicon-on-insulator

Silicon-on-sapphire

USE: Silicon on sapphire

Silicon-oxide-nitride-oxide-silicon

USE: SONOS devices

Siliconization

USE: Silicon

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



2022 IEEE Thesaurus

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

Simulation Program with Integrated Circuit Emphasis

USE: SPICE

Simulation results

USE: 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 atom lasers

USE: Atom lasers

Single electron devices

BT: Circuits and systems
Electron devices
RT: Nanoscale devices
Nanotechnology

NT: Resonant tunneling devices
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 input multiple output systems

USE: SIMO communication

Single input single output systems

USE: SISO communication

Single machine scheduling

BT: Scheduling
RT: Optimization methods

single photon avalanche diodes

USE: Single-photon avalanche

diodes

Single photon emission computed tomography

UF: SPECT
BT: Computed tomography
RT: Cancer
Collimators
Phantoms
Tumors

Single-electron transistors

USE: Single electron transistors

Single-photon avalanche diodes

UF: SPAD
single photon avalanche

diodes

BT: Avalanche photodiodes



2022 IEEE Thesaurus

Single-wall carbon nanotubes

USE: Carbon nanotubes

Singular value decomposition

BT: Matrices

Sintering

UF: Fritting

BT: Manufacturing processes

NT: Spark Plasma sintering

Siri

USE: Virtual assistants

SIS devices (semiconductor)

USE: Semiconductor devices

SIS devices (superconductor)

USE: Superconducting devices

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

UF: Basal cell carcinoma

BT: Cancer

NT: Melanoma

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

SLA

USE: Service level agreements

Slabs

BT: Structural shapes

Slag

BT: Industrial waste

RT: Fly ash

Waste disposal

Waste management

SLAM

USE: Simultaneous localization and mapping

SLD

USE: Superluminescent diodes

Sleep

BT: Brain

NT: Rapid eye movement sleep

Sleep apnea



2022 IEEE Thesaurus

Sleep apnea

UF: Sleep apnoea
Snore activity
Snore signals
Snoring
BT: Medical conditions
Sleep

Sleep apnoea

USE: Sleep apnea

Slideways (mechanical)

USE: Mechanical guides

Sliding mode control

UF: Sliding-mode control
BT: Control systems

Sliding-mode control

USE: Sliding mode control

Slot antennas

BT: Antennas

Slot line components

UF: Slotline components
BT: Slot lines

Slot lines

UF: Slotline
BT: Planar transmission lines
NT: Slot line components

Slotline

USE: Slot lines

Slotline components

USE: Slot line components

Slow light

BT: Light sources
RT: Velocity measurement

Sludge treatment

UF: Activated sludge process
BT: Waste handling
RT: Pollution control
Sewage treatment
Wastewater
Wastewater treatment

Slurries

BT: Waste materials
RT: Industrial waste

Small business technology transfer

BT: Technology transfer

Small cell networks

USE: Microcell networks

Small satellites

UF: Microsatellites
Miniaturized satellites
Nanosatellites
Smallsats
BT: Satellites
NT: CubeSat

Smallsats

USE: Small satellites

SMAP mission

UF: Soil Moisture Active
Passive mission
BT: Soil moisture

Smart actuators

USE: Intelligent actuators

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



2022 IEEE Thesaurus

Smart cities

BT: Intelligent structures
Urban areas
RT: Buildings
Construction industry
Cyber-physical systems
Energy informatics

BT: Power grids
RT: Cyber-physical systems
Energy informatics
Microgrids
Power distribution networks
Smart meters
Transactive energy
NT: Vehicle-to-grid

Smart clothing

USE: Smart textiles

Smart health

USE: Smart healthcare

Smart contracts

BT: Contracts
Protocols
RT: Decentralized applications

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

Smart devices

BT: Electronic equipment
Wireless communication
RT: Fourth Industrial Revolution
Physical unclonable

function

Smart healthcare
Smart manufacturing
Tactile Internet
Virtual assistants
Wearable Health Monitoring

Systems

Systems

NT: Smart charging
Smart glasses
Smart lighting

Smart homes

BT: Buildings
Home automation

Smart lighting

BT: Lighting
Smart devices

Smart elastomers

USE: Dielectric elastomers

Smart manufacturing

UF: Smart factories
BT: Manufacturing
RT: Fourth Industrial Revolution
Intelligent manufacturing

Smart fabrics

USE: Smart textiles

systems

Smart devices
Smart materials

Smart factories

USE: Smart manufacturing

Smart materials

UF: Shape memory material
Shape memory technology
BT: Materials
RT: Austenite
Azobenzene
Dielectric elastomers
Martensite
Metamaterials
Polycaprolactone
Smart manufacturing
Smart transportation
NT: Biomimetic materials
Smart textiles

Smart farming

USE: Smart agriculture

Smart garments

USE: Smart textiles

Smart glasses

UF: Smartglasses
BT: Smart devices
Wearable computers

Smart grids

UF: Smart microgrids
Smart power grids



2022 IEEE Thesaurus

Smart medical services

USE: Smart healthcare

Smart meters

BT: Meter reading
RT: Automatic meter reading
Smart grids

Smart microgrids

USE: Smart grids

Smart phones

UF: Smartphones
BT: Mobile handsets
RT: Bring your own device

Smart pixels

BT: Image processing
RT: Integrated optoelectronics
Optical switches

Smart power grids

USE: Smart grids

Smart sensors

USE: Intelligent sensors

Smart spaces

BT: Ergonomics
Sociotechnical systems

Smart structures

USE: Intelligent structures

Smart textiles

UF: Electronic textiles
Smart clothing
Smart fabrics
Smart garments
BT: Smart materials
RT: Wearable computers

Smart transportation

BT: Transportation
RT: Automated highways
Intelligent transportation

systems

Intelligent vehicles
Smart materials

Smart TV

BT: TV
RT: Internet

Smartglasses

USE: Smart glasses

Smartphones

USE: Smart phones

Smartwatch

USE: Wearable Health Monitoring

Systems

Smelting

BT: Materials processing
RT: Blast furnaces
Heat treatment
Melt processing
Metals industry
Refining

SMES

USE: Superconducting magnetic
energy storage

Smoke detectors

BT: Alarm systems
RT: Domestic safety
Fires
Ionization chambers
Safety devices
Zigbee

Smoothed particle hydrodynamics

USE: Fluid flow AND
Hydrodynamics

Smoothing methods

BT: Mathematics

SMOS mission

UF: Soil moisture and ocean
salinity

Soil moisture and ocean

salinity mission

BT: Ocean salinity
Soil moisture

SMPS

USE: Switched mode power
supplies

SMPTE

UF: Society of Motion Picture
and Television Engineers

BT: Standards organizations



2022 IEEE Thesaurus

SMPTE Standards

BT: Standards publications

Sn

USE: Tin

Snake bots

USE: Snake robots

Snake robots

UF: Snake bots

Snakebots

BT: Robots

Snakebots

USE: Snake robots

Snore activity

USE: Sleep apnea

Snore signals

USE: Sleep apnea

Snoring

USE: Sleep apnea

Snow

BT: Meteorology

RT: Ice

SNR

USE: Signal to noise ratio

SNS devices

USE: Superconducting devices

Snubbers

BT: Power electronics

SOA

USE: Semiconductor optical

amplifiers AND

Service-oriented

architecture

SOAP

USE: Simple object access

protocol

SOC

USE: System-on-chip

Soccer

USE: Sports

Social computing

BT: Collaborative work
Internet

RT: Behavioral sciences
Crowdsourcing
Social computing
Social networking (online)
NT: Cyberbullying
Persuasive systems
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
Food security
Governmental factors
International collaboration
International relations
Philosophical

considerations

(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



2022 IEEE Thesaurus

considerations	International relations	<i>Social networking services</i>
	Peace technology	USE: Social networking (online)
	Philosophical	
	Social factors	<i>Social networks</i>
	Sustainable development	USE: Social networking (online)
	Technology	
Social intelligence		Social robots
BT:	Behavioral sciences	BT: Human-robot interaction
	Social computing	Robots
	Sociology	RT: Assistive robots
RT:	Cultural differences	Assistive technologies
	Digital intelligence	Educational robots
	Social factors	Emotion recognition
<i>Social media</i>		Humanoid robots
USE:	Social networking (online)	Mobile robots
Social network theory		Natural language
BT:	Sociotechnical systems	processing
RT:	Complex networks	technology
	Social networking (online)	
<i>Social networking</i>		Social sciences
USE:	Social networking (online)	BT: Humanities
Social networking (online)		Science - general
UF:	Facebook	RT: Complex networks
	Linkedin	Graph drawing
	Myspace	Network theory (graphs)
	Online social networks	NT: Behavioral sciences
	Reddit	Psychology
	Social media	Sociology
	Social networking	
	Social networking services	<i>Social-networks</i>
	Social networks	USE: Social networking (online)
	Social-networks	
	Twitter	<i>Society of Motion Picture and Television Engineers</i>
	WeChat	USE: SMPTE
BT:	Information retrieval	<i>Socio-technical systems</i>
RT:	Blogs	USE: Sociotechnical systems
	Crowdsourcing	
	Electronic mail	Sociology
	Internet	BT: Social sciences
	Journalism	RT: Collective intelligence
	Social computing	NT: Digital divide
	Social network theory	Social groups
	Web sites	Social intelligence
NT:	Computer mediated	
communication	Cyberbullying	Sociotechnical systems
	Second Life	UF: Socio-technical systems
		BT: Organizations
		NT: Smart spaces
		Social network theory
		Sockets
		BT: Connectors



2022 IEEE Thesaurus

Sodium

BT: Chemical elements

Sodium chloride

USE: Chlorine compounds

Sodium nitrate

USE: Nitrogen compounds

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

Soft robots

USE: Soft robotics

Soft sensing

USE: Soft sensors

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 switch

USE: Soft switching

Soft switching

UF: Soft switch

Softswitch

BT: Telecommunication

computing

RT: Routing

Softening

UF: Softening (metallurgical)

BT: Materials processing

RT: Annealing

Softening (metallurgical)

USE: Softening

Softswitch

USE: Soft switching

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

Embedded software

Freeware

Malware

Middleware

Open source software

Optical character

recognition software

Privacy-invasive software

Public domain software

Soft sensors

Software agents

Software as a service

Software debugging

Software maintenance

Software packages

Software performance



2022 IEEE Thesaurus

	Software quality	BT:	Computer networks
	Software reusability	RT:	Application programming
	Software safety	interfaces	
	Software systems		Cloud computing
	Software tools		Computer network
	System software	management	
			Distributed processing
Software agents			Intelligent networks
BT:	Software		Mobile computing
RT:	Artificial intelligence		Network function
	Computer applications	virtualization	
	Distributed computing		Network operating systems
	Intelligent systems		Operating systems
	Knowledge based systems		Protocols
	Learning systems		Virtual machining
	Mobile agents		Virtualization
NT:	Agent-based modeling	NT:	Service function chaining
	Autonomous agents		Virtual LAN
	Botnet		
	Intelligent agents		
Software algorithms		<i>Software defined networks</i>	
BT:	Algorithms	USE:	Software defined
		networking	
Software architecture		<i>Software defined radio</i>	
BT:	Software engineering	USE:	Software radio
RT:	Distributed computing		
NT:	Client-server systems	Software design	
	Deep architecture	BT:	Software debugging
	Dew computing	RT:	Web design
	Microarchitecture	NT:	Model driven engineering
	Representational state		Usability
transfer		Software development management	
	Restful API	UF:	Github
		BT:	Engineering management
Software as a service		RT:	Release engineering
UF:	On demand software		Scrum (Software
	On-demand software	development)	
	SaaS		Software product lines
	Software-as-a-service	NT:	Agile software development
BT:	Software		Model-driven development
RT:	Cloud computing		
	Information processing	<i>Software documentation</i>	
Software debugging		USE:	Documentation
BT:	Software		
RT:	Programming	Software engineering	
	Programming environments	BT:	Computers and information
NT:	Software design	processing	
Software defined networking		RT:	Code refractoring
UF:	SDN		Functional point analysis
	Software defined networks		Rapid prototyping
	Software-defined		Requirements engineering
networking		engineering	Service-oriented systems
			Software



2022 IEEE Thesaurus

Language	Static analysis	Software protection	BT:	Copyright protection
	Systems Modeling		RT:	Legal factors
NT:	Visual BASIC		RT:	Digital rights management
	Capability maturity model			Intellectual property
engineering	Computer aided software	Software prototyping		Software
	Formal verification		BT:	System analysis and design
	Programming environments	Software quality	BT:	Software
	Release engineering		RT:	Algorithmic efficiency
	Runtime	Software radio	UF:	Reconfigurable radio
	Software architecture			Software defined radio
	Software libraries		BT:	Software-defined radio
	Software product lines		BT:	Mobile communication
Software libraries			RT:	Radio communication
	BT:			Cellular radio
	Libraries			Code division multiplexing
	Software engineering			Land mobile radio
RT:	Algorithms			Telecommunication
	Matlab			
programming	Object oriented	computing		Transceivers
	Python			
	Software reusability	Software reliability	BT:	Reliability
Software maintenance		Software reusability	UF:	Software reuse
	BT:		BT:	Software
	Software		RT:	Capability maturity model
	RT:			Object oriented
	Software product lines	programming		Software libraries
Software measurement		<i>Software reuse</i>	USE:	Software reusability
	BT:			
	Measurement	Software reviews	BT:	IEEE indexing
Software packages		Software safety	BT:	Software
	BT:		RT:	Product safety engineering
	Software	<i>Software sensors</i>		
	RT:		USE:	Soft sensors
	Computer applications			
	Power system analysis			
computing				
	NT:			
	EMTDC	Software performance	BT:	Software
	PSCAD		RT:	Algorithmic efficiency
	SPICE			Capability maturity model
		<i>Software piracy</i>	USE:	Computer crime
Software product lines				
	BT:	Software product lines	BT:	Product development
	Software engineering		RT:	Software development
	RT:	management		
	Software development			
	Software maintenance			



2022 IEEE Thesaurus

Software standards

BT: Standards categories
RT: ISO
ISO Standards
Software

Software systems

BT: Software

Software testing

BT: Testing
NT: Combinatorial testing
Fuzzing

Software tools

BT: Software
RT: Computer aided software engineering
Programming
Programming environments
Visual BASIC
NT: Authoring systems

Software-as-a-service

USE: Software as a service

Software-defined networking

USE: Software defined networking

Software-defined radio

USE: Software radio

SOI

USE: Silicon-on-insulator

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 Moisture Active Passive mission

USE: SMAP mission

Soil moisture and ocean salinity

USE: SMOS mission

Soil moisture and ocean salinity mission

USE: SMOS mission

Soil pollution

BT: Land pollution
RT: Agriculture
Soil

Soil properties

BT: Soil

Soil texture

BT: Soil

Solar cells

USE: Photovoltaic cells

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 generation

USE: Solar power generation

Solar heating

BT: Energy conversion
Heating systems
RT: Phase change materials
Solar energy
Space heating

Solar panels

BT: Photovoltaic systems
Solar power generation



2022 IEEE Thesaurus

Solar polarimetry

USE: Polarimetry

Joining processes

Soldering

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

Soldering irons

USE: Soldering equipment

Solderless breadboard

USE: Breadboard

Solenoids

BT: Magnetic devices
RT: Switches
Transducers

Solid lasers

UF: Color center lasers
Solid state lasers
Solid-state lasers
BT: Lasers
RT: Thermal lensing
Thermo-optical devices
NT: Microchip lasers
Quantum well lasers
Semiconductor lasers
Surface emitting lasers

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

Solid modeling

BT: Modeling
RT: Solid-state physics
Virtual reality

Solid oxide electrolyzer cells

USE: Fuel cells

Solder joints

USE: Soldering

Solid scintillation detectors

BT: Scintillation counters
RT: Energy resolution
Medical diagnostic imaging
Spectroscopy

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

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

Soldering equipment

UF: Soldering irons
BT: Production equipment
RT: Joining materials

Solid state circuits

UF: Solid-state circuits
RT: Circuits and systems
Solid state drives
NT: Circuit subsystems
Circuit theory



2022 IEEE Thesaurus

	FET circuits		Solitons	
	Gate leakage		BT:	Waves
	Solid state circuit design		NT:	Optical solitons
	Transistors			Skyrmions
Solid state drives			Solution design	
UF:	Solid-state drives		BT:	Systems engineering and
BT:	Digital storage		theory	
RT:	DRAM chips		Solvents	
	Flash memories		BT:	Chemical processes
	Integrated memory circuits		RT:	Methanol
	Solid state circuits			
<i>Solid state lasers</i>			<i>SOM</i>	
USE:	Solid lasers		USE:	Self-organizing feature
Solid state lighting			maps	
UF:	Solid-state lighting		Soma	
BT:	Lighting		UF:	Somata
			BT:	Neurons
<i>Solid waste</i>			RT:	Brain
USE:	Waste materials		<i>Somata</i>	
<i>Solid-state batteries</i>			USE:	Soma
USE:	Solid state batteries			
<i>Solid-state circuit design</i>			Sonar	
USE:	Solid state circuit design		BT:	Aerospace and electronic
<i>Solid-state circuits</i>			systems	
USE:	Solid state circuits		RT:	Acoustic arrays
<i>Solid-state drives</i>				Chirp modulation
USE:	Solid state drives			Ultrasonic transducers
<i>Solid-state lasers</i>			NT:	Sonar applications
USE:	Solid state drives			Sonar equipment
<i>Solid-state lighting</i>				Synthetic aperture sonar
USE:	Solid state lighting			
Solid-state physics			Sonar applications	
BT:	Physics		BT:	Sonar
RT:	Materials science and		RT:	Sonar navigation
technology			NT:	Sonar detection
	Quantum mechanics			Sonar measurements
	Solid modeling			
Solids			Sonar detection	
BT:	Materials		BT:	Acoustic signal detection
RT:	Crystals			Sonar applications
	Materials science and		RT:	Reflectivity
technology			Sonar equipment	
NT:	Young's modulus		UF:	Hydrophones
			BT:	Sonar
			Sonar measurements	
			BT:	Sonar applications
			RT:	Remote sensing
				Sea measurements



2022 IEEE Thesaurus

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

SOS (*silicon on sapphire*)

USE: Silicon-on-insulator

SOSE

USE: Service-oriented systems
engineering

Sound systems

USE: Audio systems

Source coding

BT: Data compression
Encoding
Information theory
RT: Rate distortion theory
Release engineering

Source location

USE: Position measurement

Source separation

UF: Signal separation
BT: Signal processing
RT: Adaptive signal detection
Array signal processing
Signal detection
NT: Blind source separation

Source signal equalizers

USE: Blind equalizers

South America

BT: Continents

South Pole

BT: Antarctica

Space based radar

USE: Spaceborne radar

Space born radar

USE: Spaceborne radar

Space charge

BT: Charge carrier processes
Electrostatic processes
RT: Pulsed electroacoustic
methods
Vacuum technology

Space communications

BT: Telecommunications
NT: Deep-space
communications

Space cooling

BT: Cooling
RT: Buildings
Coolants
Refrigerants

Space debris

UF: Orbital debris
Space junk
Space waste
BT: Space technology

Space diversity

USE: Spatial diversity

Space division multiplexing

UF: Space-division multiplexing
Spatial division multiplexing
Spatial multiplexing
BT: Multiplexing



2022 IEEE Thesaurus

Space exploration

UF: Space travel
BT: Space technology
RT: NASA
NT: Interplanetary exploration
Space missions

BT: Aerospace engineering
RT: Artificial satellites
Extraterrestrial phenomena
Field programmable analog

Space habitats

USE: Buildings AND
Space technology

arrays
NASA
Space vehicles
NT: Payloads
Space debris
Space exploration

Space heating

BT: Heating systems
RT: Building services
Gas appliances
Solar heating
Temperature control
Vents

Space travel

USE: Space exploration

Space vector pulse width modulation

UF: SVPWM
BT: Pulse width modulation
RT: AC motors
Converters
DC motors

Space junk

USE: Space debris

Space vehicle electronics

USE: Aerospace electronics

Space measurements

USE: Extraterrestrial
measurements

Space vehicle instrumentation

USE: Aerospace electronics

Space missions

BT: Space exploration
RT: Interplanetary exploration
NASA

Space vehicle navigation

USE: Space vehicles

Space phenomena

USE: Extraterrestrial phenomena

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 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 waste

USE: Space debris

Space stations

BT: Artificial satellites
NT: International Space Station
Space power stations

Space-air-ground integrated networks

UF: SAGIN
BT: 6G mobile communication
RT: Satellite communication

Space technology

UF: Space habitats



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2022 IEEE Thesaurus

Space-division multiplexing

USE: Space division multiplexing

Space-time codes

BT: Codes
RT: Channel coding
Decoding

Spaceborn radar

USE: Spaceborne radar

Spaceborne radar

UF: Satellite born radar
Satellite borne radar
Space based radar
Space born radar
Spaceborn radar
BT: Radar
RT: Radar remote sensing
Synthetic aperture radar

Spacecraft materials

USE: Aerospace materials

Spacial indices

USE: Spatial indexes

SPAD

USE: Single-photon avalanche

diodes

Spam

USE: Unsolicited e-mail

Spamming

USE: Unsolicited e-mail

Spark gaps

BT: Electromagnetic analysis
RT: Air gaps
Electrodes
Insulation
Sparks
Switches

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

Sparse matrix

USE: Sparse matrices

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 division multiplexing

USE: Space division multiplexing

Spatial filters

BT: Filters

Spatial indexes

UF: Spacial indices
BT: Indexes

Spatial multiplexing

USE: Space division multiplexing

Spatial resolution

BT: Image resolution
RT: Image quality

Spatial temporal resolution

UF: Spatial-temporal resolution
Spatio temporal resolution
BT: Spatiotemporal phenomena



2022 IEEE Thesaurus

Spatial-temporal resolution

USE: Spatial temporal resolution

Spatio temporal resolution

USE: Spatial temporal resolution

Spatio-temporal phenomena

USE: 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

USE: Special issues and sections

Special issues and sections

UF: Special issues
Special sections
BT: IEEE indexing

Special sections

USE: Special issues and sections

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

SPECT

USE: Single photon emission
computed tomography

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 domain

USE: Spectral analysis

Spectral efficiency

UF: Bandwidth efficiency
BT: Channel allocation
Measurement
RT: Bandwidth
Information processing

Spectral shape

BT: Acoustics

Spectral waterfall

USE: Spectrogram

Spectral-domain

USE: Spectral analysis

Spectrogram

UF: Spectral waterfall
Voice print
Voicegram
Voiceprint
BT: Signal processing
RT: Sonogram



2022 IEEE Thesaurus

Spectrometry

USE: Spectroscopy

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

spectroscopy

resonance

spectroscopy

spectroscopy

Electrochemical impedance

Electron paramagnetic

Fourier transform infrared

Functional near-infrared

Kirchhoff's Law

MERIS

Mass spectroscopy

Neutron spin echo

Photoacoustic effects

Resonance light scattering

Spectrum analysis

USE: Spectral analysis

Spectrum estimation

USE: Spectral analysis

Spectrum management

USE: Radio spectrum
management

Speech

BT: Oral communication
RT: Speaker recognition
NT: Hate speech

Speech activity detection

USE: Voice activity detection

Speech analysis

BT: Speech recognition
RT: Cepstral analysis
Frequency estimation
Signal analysis
Spectral analysis
Speech coding
Speech synthesis

Speech codecs

BT: Codecs
Communication equipment
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 communication

USE: Oral communication

Speech detection

USE: Voice activity detection

Speech enhancement

BT: Speech processing
RT: Hearing aids
Speech recognition

Speech processing

BT: Acoustic signal processing
RT: Delay estimation
Phonetics
Prediction methods
NT: Human voice
Speech enhancement
Speech synthesis
Voice activity detection

Speech recognition

UF: Voice recognition
BT: Identification of persons
Pattern recognition
RT: Cepstral analysis
Emotion recognition
Feature extraction



2022 IEEE Thesaurus

NT: Speaker recognition
Speech enhancement
Voice activity detection
Automatic speech
recognition

Speech analysis

Speech synthesis

UF: Synthetic speech
Voice response systems
BT: Speech processing
RT: Biomedical equipment
Signal synthesis
Speech analysis
Voice activity detection
NT: Chatbots

Speechmaking

USE: Public speaking

Speed control

USE: Velocity control

Speed measurement

USE: Velocity measurement

SPICE

UF: Simulation Program with
Integrated Circuit Emphasis
pSPICE
BT: Software packages
RT: Circuit analysis
Design automation
Integrated circuits

Spin electronics

USE: Spintronics

Spin injection

USE: Spin polarized transport

Spin polarised transport

USE: Spin polarized transport

Spin polarized transport

UF: Spin injection
Spin polarised transport
BT: Magnetoelectronics
RT: Magnetic tunneling
Magnetoresistance

Spin systems

BT: Magnetism

Spin valves

BT: Magnetic sensors
RT: Hysteresis

Spin-dependent tunneling

USE: Magnetic tunneling

Spin-dependent tunnelling

USE: Magnetic tunneling

Spinal cord

BT: Nervous system
NT: Cerebrospinal fluid
Spinal cord injury

Spinal cord injuries

USE: Spinal cord injury

Spinal cord injury

UF: Spinal cord injuries
BT: Spinal cord
RT: Neurological diseases

Spinal cord stimulation

USE: Electrical stimulation

Spindle bearings

USE: Machine tool spindles

Spine

BT: Nervous system
Skeleton

Spinelectronics

USE: Spintronics

Spinning

BT: Textile technology
RT: Spinning machines
Textile fibers

Spinning machines

BT: Textile machinery
RT: Paper making
Paper making machines
Paper mills
Pulp and paper industry
Spinning
Textile industry
Textiles



2022 IEEE Thesaurus

Spintronics

UF: Fluxtronics
Spin electronics
Spinelectronics
BT: Magnetoelectric effects

Spirals

BT: Mathematics

Splicing

UF: Cable splicing
Fusion splicing
BT: Joining processes
RT: Optical fiber cables
Transmission lines

Spline functions

USE: Splines (mathematics)

Splines (mathematics)

UF: B-Spline
Spline functions
BT: Numerical analysis
RT: Curve fitting

Split gate flash memory cells

UF: Split-gate flash memory
cells
BT: Flash memory cells

Split ring resonators

BT: Resonators
RT: Electromagnetic
metamaterials
Metamaterials
Optical resonators
Terahertz metamaterials

Split-gate flash memory cells

USE: Split gate flash memory
cells

SPO

USE: Triples (Data structure)

Spontaneous emission

UF: Superradiance
BT: Photonics
RT: Microcavities
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
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



2022 IEEE Thesaurus

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

Spur gears

USE: Gears

Spurline

BT: Power filters
RT: Planar transmission lines
NT: Spurline components

Spurline components

BT: Spurline

Sputter deposition

USE: Sputtering

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

USE: Structured Query Language

SQL injection

BT: Computer crime
Information security

SQUID magnetometers

BT: Magnetometers
RT: Magnetic fields

SQUIDs

UF: Superconducting quantum interference devices
BT: Superconducting devices
RT: Readout electronics

Sr

USE: Strontium

SRAM

USE: SRAM chips

SRAM cells

BT: Random access memory

SRAM chips

UF: SRAM
BT: Random access memory
RT: CMOS memory circuits

Stability

BT: Reliability
RT: Asymptotic stability
Control systems
Damping
Lyapunov methods
Predator prey systems
Robustness
Time invariant systems
NT: Circuit stability
Robust stability
Stability analysis
Thermal stability

Stability analysis

BT: Stability
RT: Algorithms
Differential equations
Laser stability
Plasma properties
Signal processing



2022 IEEE Thesaurus

Stability criteria	NT:	System analysis and design Stability criteria	Standards categories	BT:	Standards
	BT:	Stability analysis		NT:	Communication standards International Atomic Time Measurement standards Military standards Power and energy
Stacking	BT:	Material storage	standards		Software standards
	RT:	Containers Materials handling Warehousing			
Stairs	BT:	Construction	Standards organizations	BT:	Standards
	RT:	Elevators Escalators Legged locomotion Mobile robots		NT:	3GPP ANSI ASA CSA Group ETSI IEC IEEE Standards
<i>Stakeholder pensions</i>	USE:	Pensions	Association		ISO ITU NACE International NEMA NFPA NIST Open Geospatial
Stakeholders management	BT:	Customer relationship	Consortium		SMPTE W3C
	RT:	Organizational aspects Decision making Requirements engineering Strategic planning			
<i>Standard Generalized Markup Language</i>	USE:	SGML	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
Standardization	BT:	Engineering - general			
	RT:	IEC ISO ISO Standards			
	NT:	Formal specifications Guidelines Standards			
Standards	BT:	Standardization	Standby generators	UF:	Emergency power
	RT:	Conformance testing IEC ISO International collaboration Open systems Qualifications		BT:	Generators Rotating machines
	NT:	Standards categories Standards organizations Standards publications	generators	RT:	Emergency power supplies



2022 IEEE Thesaurus

Standby power supplies

USE: Emergency power supplies

Stark effect

BT: Electro-optic effects

Stars

BT: Astronomy

NT: Neutron stars

Starter motors (automotive)

USE: Automotive components

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 pensions

USE: Pensions

State space theory

USE: State-space methods

State-space methods

UF: State space theory

State-space model

BT: Control system analysis

RT: Time-domain analysis

State-space model

USE: State-space methods

Static analysis

UF: Static projection

Statis scoring

BT: Statistical analysis

System analysis and design

RT: Model checking

Software engineering

Static compensator

USE: STATCOM

Static converters

USE: Static power converters

Static induction transistors

BT: Transistors

Static power converters

UF: Static converters

BT: Converters

Static projection

USE: Static analysis

Static VAR compensators

UF: SVC

BT: Power transmission

RT: Reactive power

NT: STATCOM

Stationary state

UF: Ground state

BT: Quantum mechanics

Statis scoring

USE: Static analysis

Statistical analysis

UF: Statistical testing

BT: Statistics

RT: Measurement errors

Nearest neighbor methods

Probability

R language

Random processes

Technology acceptance

model

NT: Time series analysis

Analysis of variance

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

NT: Distribution functions

Gaussian distribution

Weibull distribution



2022 IEEE Thesaurus

Statistical learning

BT: Machine learning
RT: Decision theory
Pattern recognition

Statistical testing

USE: Statistical analysis

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
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
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

USE: Steady-state

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 points

USE: Steiner trees

Steiner trees

UF: Steiner points
Steiner vertices
BT: Combinatorial mathematics



2022 IEEE Thesaurus

Steiner vertices

USE: Steiner trees

Stellar dynamics

BT: Astrophysics

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 cell research

USE: Stem cells

Stem cells

UF: Stem cell research
BT: Biological cells
RT: Cloning
Progenitor cells

Stereo image processing

UF: Stereoscopic
BT: Stereo vision

Stereo vision

UF: Three-dimensional vision
BT: Imaging
RT: Image matching
Machine vision
Robot vision systems
NT: Stereo image processing

Stereolithography

BT: Lithography
RT: Laser applications
Laser sintering
Lasers
Layered manufacturing
Manufacturing
Prototypes

Stereophonic systems

USE: Audio systems

Stereoscopic

USE: Stereo image processing

Sternum

BT: Thorax

Stethoscope

BT: Biomedical equipment

Stimulated emission

UF: Optical amplification
BT: Particle beam optics
RT: Lasers
Masers

Stirling engines

BT: Heat engines

Stochastic distribution

USE: Stochastic processes

Stochastic prediction

USE: Stochastic processes

Stochastic processes

UF: Stochastic distribution
Stochastic prediction
Stochastic theory
BT: Mathematics
RT: Computational
electromagnetics
Diffusion processes
Mean field theory
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



2022 IEEE Thesaurus

Stochastic theory

USE: Stochastic processes

Stock exchanges

USE: Stock markets

Stock markets

UF: Stock exchanges

BT: Economics

Stokes parameters

BT: Optical polarization

Stomach

BT: Digestive system

Stomatognathic system

UF: stomognathic system

BT: Anatomy

RT: Faces

Lips

Mouth

Pharynx

Tongue

NT: Masticatory muscles

Salivary glands

stomognathic system

USE: Stomatognathic system

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 batteries

USE: Batteries

Storage battery

USE: Batteries

Storage management

BT: Capacity planning

Management

RT: Memory management

NT: Digital storage

Storage rings

BT: Particle accelerators

RT: Ions

Muon colliders

Particle beams

Stored energy

USE: Energy storage

Storm systems

USE: Tropical cyclones

Storms

BT: Meteorology

RT: Lightning

Monsoons

NT: Geomagnetic storms

Strain

UF: Deformation

BT: Mechanical factors

RT: Elasticity

Elongation

Strain control

Strain measurement

NT: Tensile strain

Uniaxial strain

Strain based sensors

USE: Capacitive sensors

Strain control

UF: Friction stir processing

BT: Mechanical variables

control

RT: Strain

Strain gauges

USE: Strain measurement

Strain measurement

UF: Strain gauges

BT: Mechanical variables

measurement

RT: Micrometers

Strain

Strain sensors

USE: Capacitive sensors

Strategic planning

BT: Planning

RT: Analytic hierarchy process

Business intelligence

Decision making



2022 IEEE Thesaurus

Information systems
Stakeholders
NT: Roadmaps (technology planning)

Stratified media
USE: Nonhomogeneous media

Stratosphere
USE: Terrestrial atmosphere

Stray light
BT: Light sources
Optics
RT: Ray tracing

Streaming media
UF: Media streaming
Video streaming
BT: Communication system
software
RT: Data compression
IEEE 802.11e Standard
IPTV
Internet
MPEG 4 Standard
MPEG standards
Multimedia communication
Unicast
Video coding
Video signal processing
NT: Mobile video
Over-the-top media
services
Video on demand

Streetcars
USE: Light rail systems

Stress
UF: Mechanical stress
BT: Mechanical factors
RT: Magnetomechanical effects
Photoelasticity
Piezoelectricity
Piezooptic effects
Piezoresistance
Stress control
Stress measurement
NT: Compressive stress
Internal stresses
Residual stresses
Tensile stress
Wind stress

Stress (psychological)
USE: Human factors

Stress control
BT: Mechanical variables
control
RT: Stress
Surface stress

Stress measurement
BT: Mechanical variables
measurement
RT: Stress

String theory
BT: Physics
RT: Quantum mechanics

String vacuum
USE: Elementary particle vacuum

Stripboard circuit
UF: Veroboard
BT: Electronic circuits

Stripline
BT: Planar transmission lines
Transmission lines
NT: Stripline components

Stripline components
BT: Stripline
RT: Power combiners
Power dividers

Strips
BT: Structural shapes

Stroke (medical condition)
BT: Medical conditions

Strontium
UF: Sr
BT: Metals
NT: Strontium compounds

Strontium compounds
BT: Strontium
RT: Alloying

Structural beams
UF: Cantilever beams
Girders
BT: Structural shapes
RT: Building materials



2022 IEEE Thesaurus

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 parameter

USE: Structural engineering

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

Structural stability

USE: Structural engineering

Structure from motion

BT: Image processing
RT: Motion control
Signal processing
Three-dimensional displays
Two dimensional displays

Structured Query Language

UF: SQL
BT: Database languages
RT: Programming
Relational databases

Student engineers

USE: Engineering students

Student experiments

BT: Engineering education
RT: Laboratories

Style sheet languages

BT: Computer languages
NT: Cascading style sheets

Sub-mm wave filters

USE: Submillimeter wave filters

Sub-sea cables

USE: Underwater cables



2022 IEEE Thesaurus

Subcontracting

BT: Contracts

Subject predicate object

USE: Triples (Data structure)

Submarine cables

USE: Underwater cables

Submarine technology

USE: Underwater technology

Submarines

USE: Underwater vehicles

Submersible cables

USE: Underwater cables

Submersibles

USE: Underwater vehicles

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 systems

USE: Submillimeter wave devices

Submillimeter wave technology

BT: Microwave theory and
techniques
RT: Submillimeter wave
measurements
NT: Submillimeter wave circuits
Submillimeter wave
communication
Submillimeter wave devices
Submillimeter wave
integrated circuits

Submillimetre wave filters

USE: Submillimeter wave filters

Subroutines

USE: Algorithms

Subscriber loops

BT: Communication systems
Multiaccess communication

Subscriber sets

USE: Telephone sets

Subsea cables

USE: Underwater cables

Subspace constraints

BT: Object segmentation

Substation automation

BT: Substations



2022 IEEE Thesaurus

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 hot-electron injection

USE: Substrate hot electron
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 conduction

USE: Subthreshold current

Subthreshold current

UF: Subthreshold conduction
Subthreshold drain current
Subthreshold leakage
BT: Threshold voltage

Subthreshold drain current

USE: Subthreshold current

Subthreshold leakage

USE: Subthreshold current

Subtraction techniques

BT: Image analysis

RT: Biomedical image
processing

Subways

USE: Public transportation

Sucrose

USE: Sugar

Sufficient conditions

BT: Logic

Sugar

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

Sulphur

USE: Sulfur

Sulphur compounds

USE: Sulfur compounds



2022 IEEE Thesaurus

Sum product algorithm

UF: Sum-product algorithm
BT: Iterative algorithms

Sum product message passing

USE: Belief propagation

Sum-product algorithm

USE: Sum product algorithm

Summing circuits

BT: Circuits
RT: Analog computers

Sun

BT: Solar system
NT: Solar eclipses

Sun sensors

USE: Sensors

Super earths

USE: Extrasolar planets

Super hi-vision

USE: UHDTV

Super intelligence

USE: Hyper-intelligence

Super-resolution

USE: Superresolution

Supercapacitors

UF: Electrical double layer capacitors
BT: Ultracapacitors
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
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



2022 IEEE Thesaurus

Superconducting filters

BT: Filters
RT: Radiofrequency

interference

Superconducting infrared detectors

USE: Superconducting

photodetectors

Superconducting integrated circuits

BT: Integrated circuits
Superconductivity

Superconducting junction devices

USE: Josephson junctions

Superconducting logic circuits

BT: Logic circuits

Superconducting magnet energy storage

USE: Superconducting magnetic
energy storage

Superconducting magnetic energy storage

UF: SMES
Superconducting magnet

energy storage

BT: Energy storage
Superconductivity

Superconducting magnets

BT: Electromagnets
Superconducting devices
RT: Magnetic levitation vehicles
Persistent currents
Superconducting cables
Superconducting coils

Superconducting materials

UF: Pnictide superconductors
BT: Materials
Superconductivity
RT: Critical current density
Cryogenic electronics
Superconducting epitaxial

layers

NT: Thermal factors
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 quantum interference devices

USE: SQUIDs

Superconducting tapes

USE: Superconducting films

Superconducting thin films

BT: Superconducting films
RT: Thin films

Superconducting transition temperature

BT: Superconductivity
RT: High-temperature

superconductors

Superconducting transmission lines

BT: Transmission lines
RT: Power transmission lines
NT: Superconducting cables

Superconducting ultraviolet detectors

USE: Superconducting

photodetectors

Superconducting wires

BT: Superconducting materials
RT: Superconducting coils
NT: Multifilamentary

superconductors

Superconductive tunneling

UF: Superconductive tunnelling
BT: Superconductivity
Tunneling

Superconductive tunnelling

USE: Superconductive tunneling



2022 IEEE Thesaurus

Superconductivity

NT: Bean model
Critical current density
Flux pinning
Superconducting devices
Superconducting films
Superconducting integrated

circuits

energy storage

temperature

Superconductor-insulator-superconductor devices

USE: Superconducting devices

Superconductor-normal-superconductor devices

USE: Superconducting devices

Superconductors (high temperature)

USE: High-temperature
superconductors

Supercontinuum generation

BT: Nonlinear optics
RT: Laser beams
Light sources
Optical fibers

Superintelligence

USE: Hyper-intelligence

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

Superposition calculus

BT: Mathematics

Superradiance

USE: Spontaneous emission

Superresolution

UF: Super-resolution
BT: Image resolution

Supersonic flow

BT: Fluid flow

Superstring vacuum

USE: Elementary particle vacuum

Supervised learning

BT: Learning systems
RT: Deep learning
Naive Bayes methods
Self-supervised learning
Semisupervised learning
NT: Boosting

Supervisory control

BT: Control systems
NT: SCADA systems

Supervisory control and data acquisition systems

USE: SCADA systems

Supervisory control and data-acquisition systems

USE: SCADA systems

Supervisory programs

USE: Operating systems

Supply and demand

BT: Economics
RT: Microeconomics
Utility theory

Supply chain management

UF: SCM supply chains
BT: Management
RT: Business process

integration

management

management

systems

Business process

Capacity planning
Customer relationship

Electronic commerce
Food security
Management information



2022 IEEE Thesaurus

planning	Materials requirements	RT:	Semiconductor device
	Production control	manufacture	Surface contamination
	Supply chains		
NT:	Procurement	Surface contamination	
Supply chains		BT:	Contamination
BT:	Logistics	RT:	Semiconductor device
RT:	Materials requirements	manufacture	Surface cleaning
planning			Surface treatment
	Procurement		
	Supply chain management	Surface cracks	
NT:	Distribution networks	BT:	Mechanical factors
Support vector machine classification		Surface discharges	
BT:	Support vector machines	BT:	Dielectric breakdown
		RT:	Insulator testing
Support vector machines		Surface emitting lasers	
UF:	SVM	BT:	Lasers
	Support vector regression		Semiconductor devices
BT:	Computation theory		Semiconductor lasers
RT:	Artificial intelligence		Solid lasers
	Feedforward neural	RT:	Laser cavity resonators
networks			Quantum well lasers
	Naive Bayes methods		Quantum wells
	Pattern classification	NT:	Vertical cavity surface
	Reinforcement learning	emitting lasers	
	Relevance vector machines	Surface engineering	
NT:	Support vector machine	BT:	Materials science and
classification		technology	
<i>Support vector regression</i>		RT:	Surface treatment
USE:	Support vector machines	Surface finishing	
Surface acoustic wave devices		BT:	Finishing
BT:	Acoustic devices	RT:	Lapping
RT:	Acoustoelectric devices		Polishing machines
	Piezoelectric devices	NT:	Burnishing
Surface acoustic waves			Deburring
UF:	Acoustic surface waves		Painting
BT:	Acoustic waves		Spraying
	Surface waves	Surface fitting	
	Waves	BT:	Numerical analysis
Surface charging		RT:	Computational geometry
BT:	Electrostatic processes		Computer graphics
RT:	Spraying		Curve fitting
NT:	Triboelectricity		Interpolation
Surface cleaning		NT:	Response surface
BT:	Cleaning	methodology	
	Surface treatment		



2022 IEEE Thesaurus

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

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

Surface-mount technology

USE: Surface mount technology

Surfaces

BT: Materials science and
technology
NT: Corrosion
Corrugated surfaces
Metasurfaces
Rough surfaces
Surface impedance
Surface morphology



2022 IEEE Thesaurus

	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				
<i>Surgery oncology</i>					
USE:	Oncological surgery				
Surges					
BT:	Electromagnetic transients				
RT:	Surge protection				
NT:	Inrush current				
Surgical instruments					
BT:	Biomedical equipment				
NT:	Laparoscopes				
<i>Surgical robots</i>					
USE:	Medical robotics				
<i>Surround sound</i>					
USE:	Spatial audio				
		Surveillance			
		BT:	Monitoring		
		RT:	Conformance testing		
			Hazardous areas		
			Motion detection		
			Reconnaissance		
			Remote sensing		
			Security		
			Terrorism		
		NT:	Infrared surveillance		
			Video surveillance		
		<i>Suspension bridges</i>			
		USE:	Structural panels		
		Suspensions (mechanical systems)			
		BT:	Mechanical systems		
		RT:	Automotive components		
			Springs		
		NT:	Shock absorbers		
		<i>Sustainability</i>			
		USE:	Sustainable development		
		<i>Sustainable design</i>			
		USE:	Green design		
		Sustainable development			
		UF:	Sustainability		
		BT:	Environmental		
		management			
			Social implications of		
		technology			
		RT:	Food security		
			Green computing		
		SVC			
		USE:	Static VAr compensators		
		SVM			
		USE:	Support vector machines		
		SVPWM			
		USE:	Space vector pulse width		
		modulation			
		Swaging			
		BT:	Materials processing		
		RT:	Metal products		
		<i>Swarm intelligence</i>			
		USE:	Particle swarm optimization		
		<i>Swarm optimization</i>			
		USE:	Particle swarm optimization		



2022 IEEE Thesaurus

Swarm robotics

UF: Swarm robots
BT: Multi-robot systems
RT: Consensus control

Swarm robots

USE: Swarm robotics

Sweat glands

BT: Glands
Skin

Swimming

USE: Sports

Swimming robots

USE: Aquatic robots

SWIPT

USE: Simultaneous wireless
information and power transfer

Switch on surge

USE: Inrush current

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

USE: Switched mode power
supplies

Switched mode power supplies

UF: SMPS
Switched mode power
BT: Power supplies

Switched reluctance motors

BT: Reluctance motors
RT: Brushless motors

Switched systems

BT: Time-varying systems
RT: Control systems
Power conversion

Switched-capacitor circuit

USE: Switched capacitor circuits

Switched-capacitor networks

USE: Switched capacitor
networks

Switches

BT: Control equipment
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 convertors

USE: Converters



2022 IEEE Thesaurus

Switching frequency

BT: Switching systems

Switching loss

UF: Switching losses

BT: Switching systems

Switching losses

USE: Switching loss

Switching systems

BT: Communication systems

RT: Communication switching

NT: Electronic switching

systems

Switching frequency

Switching loss

Telecommunication

switching

Symbiosis

UF: Symbiotic relationships

BT: Biological processes

Symbiotic relationships

USE: Symbiosis

Symbols

BT: Graphics

RT: Huffman coding

Information retrieval

Pattern recognition

NT: CAPTCHAs

Communication symbols

Symmetric matrices

UF: Symmetric matrix

BT: Numerical analysis

Symmetric matrix

USE: Symmetric matrices

Sympathetic nervous system

UF: Sympathetic outflow

BT: Autonomic nervous system

Sympathetic outflow

USE: Sympathetic nervous

system

Symposia

USE: Conferences

Synapses

BT: Nervous system

RT: Artificial intelligence

Artificial neural networks

Brain

Communication channels

Computational intelligence

Electrochemical devices

Integrated optics

Neuroinformatics

Neuromorphic engineering

Neurons

Neurotransmitters

Organic electronics

Photonics

Signal processing

Synaptic transmission

USE: Neurotransmitters

Sync

USE: Synchronization

Synchrocyclotrons

BT: Particle accelerators

Synchronisation

USE: Synchronization

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 DRAM

USE: SDRAM



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Synchronous dynamic random access memory

USE: SDRAM

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

Synchronous optical network

USE: SONET

Synchrophasors

USE: Phasor measurement units

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

communication

Syntax

USE: Syntactics

Synthesis gas

USE: Syngas

Synthesisers

USE: Synthesizers

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 imaging

USE: Radar polarimetry

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



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2022 IEEE Thesaurus

Synthetic fibers

UF: Artificial fibers
Artificial fibres
Nylon fiber
Synthetic fibres
BT: Textile fibers

Synthetic fibres

USE: Synthetic fibers

Synthetic gas

USE: Syngas

Synthetic life research

USE: Synthetic biology

Synthetic speech

USE: Speech synthesis

SYSML

USE: Systems Modeling
Language

System analysis

USE: System analysis and design

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
NT: Asymptotic stability
Control system analysis
Diakoptics
Distributed processing
Fault detection
Fault tolerant systems
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 availability

USE: Availability

System buses

BT: Computer interfaces

System design

USE: System analysis and design

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 in package

USE: System-in-package



2022 IEEE Thesaurus

System integration

theory BT: Systems engineering and
planning RT: Enterprise resource
systems Integrated manufacturing

Project management
Resource management

System kernels

BT: Kernel
Operating systems

System level design

USE: System-level design

System life cycle management

USE: Technical management

System lifecycle management

USE: Product lifecycle
management

System metrics

USE: System analysis and design

System modeling

USE: Modeling

System of systems

theory BT: Systems engineering and
RT: Complex networks
Emergent phenomena
Networked control systems
NT: Cyber-physical systems

System on chip

USE: System-on-chip

System performance

UF: Cooperative cache
BT: System analysis and design
NT: Cooperative caching

System planning

USE: Planning

System privacy management

USE: Data security

System realization

theory BT: Systems engineering and

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 reliability

USE: Reliability

System resilience

USE: Fault tolerance

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: System improvement
NT: Model checking

System validation

theory BT: Systems engineering and
RT: System analysis and design
NT: System testing

System verification

theory BT: Systems engineering and
RT: System analysis and design
NT: System testing

System-in-package

UF: System in package
BT: Chip scale packaging
System-on-chip

System-level design

UF: System level design
BT: System analysis and design



2022 IEEE Thesaurus

System-on-a-chip

USE: System-on-chip

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

Systems engineering

USE: Systems engineering and

theory

Systems engineering and theory

UF: Systems engineering

RT: Aerospace and electronic

systems

Business process

integration

Business process

management

NT: Adaptive systems

Capability engineering

Complex systems

Configuration management

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

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



2022 IEEE Thesaurus

RT:	System analysis and design Technical management	Tactile Internet	BT:	Haptic interfaces Internet of Things
Systems support			RT:	5G mobile communication Human-robot interaction Information exchange Machine-to-machine
BT:	Maintenance engineering Systems engineering and theory		communications	Man-machine systems Smart devices Tactile sensors
Systems thinking				
BT:	Systems engineering and theory			
RT:	Systems, man, and cybernetics	Tactile sensors	UF:	Tactile feedback Touch sensors
Systems, man, and cybernetics			BT:	Robot sensing systems
RT:	Systems thinking		RT:	Braille Pressure measurement Tactile Internet Touch sensitive screens Wearable sensors
NT:	Behavioral sciences Biological control systems Computational linguistics Cybernetics Ergonomics Human factors Identification of persons Man-machine systems Pervasive computing Posthuman Teleworking Transhuman User interfaces	Tag clouds	UF:	Word cloud
			BT:	Tagging
Systolic arrays		Tagging	UF:	Hashtag
BT:	Multiprocessing systems		BT:	Information retrieval
RT:	Pipeline processing		RT:	Indexing
			NT:	Internet of Things Tag clouds
Table lookup		<i>TAI</i>	USE:	International Atomic Time
UF:	LUT Look-up table Lookup table	Tail	BT:	Animal structures
BT:	Data structures Image processing	Takagi-Sugeno model		
Tablet computers		BT:	Fuzzy logic	
UF:	Tablet PC	RT:	Fuzzy control Fuzzy systems	
BT:	Computers	NT:	Takagi-Sugeno-Kang	
RT:	Mobile handsets Portable media players	model		
<i>Tablet PC</i>		Takagi-Sugeno-Kang model	BT:	Takagi-Sugeno model
USE:	Tablet computers	Talbot effect	BT:	Optical imaging
Tachometers			RT:	Interferometry Optical interferometry
BT:	Meters			
<i>Tactile feedback</i>				
USE:	Tactile sensors			



2022 IEEE Thesaurus

TAM

USE: Technology acceptance
model

Tantalum

BT: Chemical elements

Tap changers

BT: Transformers
NT: On load tap changers

Tape casting

BT: Casting
RT: Ceramics

Target detection

USE: Object detection

Target recognition

BT: Object recognition
RT: Missile guidance

Target tracking

BT: Tracking
RT: Control systems
Radar tracking

Targeted drug delivery

BT: Drug delivery

Tariffs

BT: Regulation
RT: Trade agreements

Task analysis

BT: Business process
management
System analysis and design
Systems engineering and
theory

Taste buds

BT: Sense organs

Taxes

USE: Finance

Taxi

USE: Public transportation

Taxonomy

BT: Information retrieval

Taylor expansion

USE: Taylor series

Taylor series

UF: Taylor expansion
BT: Mathematics

TCP/IP

USE: TCPIP

TCP/IP protocol suite

USE: TCPIP

TCPIP

UF: TCP/IP
TCP/IP protocol suite
Transmission control
protocol-internet protocol
Transmission control
protocol/internet protocol
BT: IP networks
RT: Computer networks
Data communication
Digital communication
Internet
Protocols
Transport protocols

TDM

USE: Time division multiplexing

TDSCDMA

USE: Time division synchronous
code division multiple access

Teaching

USE: Education

Teaching machines

USE: Computer aided instruction

Team work

USE: Teamwork

Team working

USE: Teamwork

Teamwork

UF: Team work
Team working
BT: Collaboration
RT: Organizational aspects

Technetium

BT: Chemical elements

Technical assessment

USE: Technical management



2022 IEEE Thesaurus

Technical communication

USE: Professional communication

Technical data management

USE: Database systems AND Technical management

Technical drawing

BT: Design methodology
RT: Engineering drawings Graphics

Technical management

UF: System life cycle 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 manuals

USE: Manuals

Technical meetings

USE: Meetings

Technical planning

BT: Planning
Technical management

Technical proposals

USE: Proposals

Technical reports

USE: Writing

Technical requirements

BT: Requirements engineering
RT: Proposals

Technical risk management

USE: Technical management

Technical textiles

USE: Textile products

Technical writing

USE: Writing

Technician training

USE: Training

Technique for order of preference by similarity to ideal solution

USE: TOPSIS

Technological forecasting

USE: Technology forecasting

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



2022 IEEE Thesaurus

User centered design		<i>Telecom channels</i>	
User experience		USE:	Communication channels
Technology forecasting		<i>Telecom computing</i>	
UF:	Futurism	USE:	Telecommunication
	Technological forecasting	computing	
BT:	Forecasting	<i>Telecom congestion control</i>	
RT:	Technology	USE:	Telecommunication
	Technology social factors	congestion control	
NT:	Roadmaps (technology	<i>Telecom control</i>	
planning)		USE:	Telecommunication control
Technology management		<i>Telecom network management</i>	
BT:	Management	USE:	Telecommunication
RT:	Data processing	network management	
	Innovation management	<i>Telecom network reliability</i>	
	Production management	USE:	Telecommunication
	Project management	network reliability	
management	Research and development	<i>Telecom network topology</i>	
	Technology transfer	USE:	Telecommunication
Technology planning		network topology	
BT:	Planning	<i>Telecom services</i>	
RT:	Social factors	USE:	Telecommunication
	Technology	services	
Technology social factors		<i>Telecom signaling</i>	
BT:	Social factors	USE:	Communication system
	Technology	signaling	
RT:	Philosophical	<i>Telecom switching</i>	
considerations	Risk analysis	USE:	Telecommunication
	Technological innovation	switching	
	Technology forecasting	<i>Telecom system signaling</i>	
NT:	Privacy	USE:	Communication system
Technology transfer		signaling	
BT:	Technology	<i>Telecom traffic</i>	
RT:	Technology acceptance	USE:	Telecommunication traffic
model	Technology management	<i>Telecommunication channels</i>	
	Small business technology	USE:	Communication channels
transfer		Telecommunication computing	
Teeth		UF:	Communications computing
UF:	Tooth		Telecom computing
BT:	Mouth	BT:	Computer applications
			Telecommunications
<i>TEGFETs</i>		RT:	3G mobile communication
USE:	MODFETs		4G mobile communication
<i>Telecom</i>			
USE:	Telecommunications		



2022 IEEE Thesaurus

networking	Information-centric	Telecommunication
	Mobile computing	Telecommunication
	Quality of service	Telecommunication traffic
	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:	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		
network topology		
RT:	Telecommunication	
network performance		
NT:	Diversity schemes	
Telecommunication network reliability		
UF:	Communication network	
reliability		
BT:	Telecom network reliability	
	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:	Intelligent networks	
	Link aggregation	
	Passive networks	
	Telecommunication	
congestion control		
	Telecommunication	
network management		
	Telecommunication	
network reliability		
	Telecommunication traffic	
<i>Telecommunication power management</i>		
USE:	Power system management	
<i>Telecommunication security</i>		
USE:	Communication system	
security		
Telecommunication services		
UF:	Telecom services	
BT:	Telecommunications	
RT:	Radio access networks	
	Telecommunication	
network performance		
NT:	Acoustic communication	
(telecommunication)		
	Number portability	



2022 IEEE Thesaurus

Telecommunication signalling

USE: Communication system
signaling

Telecommunication standards

USE: Communication standards

Telecommunication switching

UF: Telecom switching
BT: Switching systems

Telecommunication traffic

UF: Network traffic
Telecom traffic
Traffic load
BT: Telecommunication
network topology
RT: 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

Telecommuting

USE: Teleworking

Teleconferencing

UF: Videoconferencing
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

Telehealthcare

USE: Telemedicine

Telematics

BT: Information technology
Telecommunications
RT: Cyberspace

Telemedicine

UF: 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



2022 IEEE Thesaurus

NT:	Telephony Cellular phones Landline Telephone sets Vocoders	Telescopes BT: Instruments RT: Astronomy Observatories Radio astronomy NT: Gamma-ray telescopes X-ray telescopes
Telephone poles BT: Poles and towers		<i>Telesurgical robotics</i> USE: Telerobotics
Telephone sets UF: Handsets Subscriber sets BT: Telephone equipment RT: Telephony NT: Mobile handsets		Teletext BT: Communication systems Information services RT: Data communication Videotex
Telephony BT: Communication systems RT: Telecommunication computing	Telephone equipment Telephone sets Videophone systems	<i>Teletype</i> USE: Teleprinting
Teleportation UF: Quantum teleportation BT: Quantum mechanics RT: Information theory Quantum communication Quantum entanglement		<i>Television</i> USE: TV
Telepresence BT: Human computer interaction RT: Technology Telemedicine		Teleworking UF: Mobile office Telecommuting Virtual office BT: Systems, man, and cybernetics
Teleprinting UF: Teletype BT: Communication systems Data communication Printing RT: Digital communication		Teleexistence BT: Human computer interaction Real-time systems Technology
Telerobotics UF: Telesurgical robotics BT: Robots RT: Delay systems Human factors Manipulators Medical robotics Mobile robots Remote handling equipment NT: Teleoperators		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



2022 IEEE Thesaurus

Temperature

BT: Thermal factors
RT: Temperature control
Temperature measurement
NT: 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

Tennis

USE: Sports

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: Terahertz wave absorption
NT: Terahertz metamaterials

Terahertz metamaterials

BT: Electromagnetic
metamaterials
RT: Terahertz materials
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



2022 IEEE Thesaurus

Terminology

UF: Definitions
Glossaries
BT: Information retrieval
NT: Dictionaries

Ternary logic

USE: Multivalued logic

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
Surveillance
Threat assessment
US Department of
Homeland Security
Weapons

NT: Bioterrorism
Cyber terrorism
National security

Terrorist

USE: Terrorism

Test data compression

BT: Data compression

Test equipment

BT: Testing
RT: Oscilloscopes
NT: Automatic test equipment

Test facilities

BT: Testing
NT: Anechoic chambers
Laboratories
Large Hadron Collider
Open area test sites
TEM cells
Wind tunnels

Test generation

USE: Test pattern generators

Test pattern generators

UF: Test generation
BT: Automatic test pattern
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



2022 IEEE Thesaurus

testing	Frequency response	Textile fibers	UF:	Fibers
	Impulse testing			Textile fibres
	Insulator testing			
	Integrated circuit testing		BT:	Textiles
	Life testing		RT:	Cotton
	Materials testing			Spinning
	Optical fiber testing			Textile products
	Remaining life assessment			Textile technology
	Ring generators			Weaving
	Semiconductor device			Wool
			NT:	Natural fibers
				Synthetic fibers
				Yarn
	Software testing			
	System testing			
	Test equipment			
	Test facilities	<i>Textile fibres</i>		
		USE:	Textile fibers	
Text analysis				
	BT:	Data mining	Textile industry	
	RT:	Annotations		
		Naive Bayes methods		
	NT:	Text categorization		
Text categorization				
	UF:	Text classification		
	BT:	Text analysis		
	RT:	Data analysis		
<i>Text classification</i>				
	USE:	Text categorization		
<i>Text messaging</i>				
	USE:	Electronic messaging		
Text mining				
	BT:	Data mining		
	RT:	Triples (Data structure)		
Text processing				
	UF:	Photocomposition	Textile machinery	
		Word processing		
	BT:	Data processing		
	RT:	Desktop publishing		
		Document handling		
		Office automation		
		Publishing		
		Text recognition		
	NT:	Typesetting		
Text recognition				
	BT:	Pattern recognition		
	RT:	Character recognition		
		Text processing		



2022 IEEE Thesaurus

Textiles

BT: Materials
RT: Spinning machines
Textile machinery
Textile products
Textile technology
Weaving
NT: Cotton
Fabrics
Textile fibers
Wool

TFETs

UF: Tunnel field effect
transistors
BT: Field effect transistors
RT: MOSFET

TFT

USE: Thin film transistors

Thalamus

BT: Brain

Thallium

BT: Chemical elements

Theodolites

BT: Instruments
RT: Geodesy
Geologic measurements
Geophysical measurement

techniques

Theoretical neuroscience

USE: Computational
neuroscience

Therapy

USE: Medical treatment

Thermal analysis

BT: Thermal variables control
NT: Thermomechanical
processes

Thermal conductivity

BT: Thermal factors
RT: Grain boundaries
Thermal resistance
NT: Heat transfer

Thermal decomposition

BT: Thermolysis

Thermal degradation

BT: Thermolysis

Thermal energy

BT: Heating systems
RT: Energy
Kinetic energy
Thermal engineering

Thermal engineering

BT: Engineering - general
RT: Cooling
Heat recovery
Heating systems
Thermal energy
Thermal factors
Thermal variables control
Thermal variables

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



2022 IEEE Thesaurus

Thermal lensing

BT: Thermo-optic 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 plumes

USE: Thermal pollution

Thermal pollution

UF: Heat islands
Thermal plumes
Urban heat islands
BT: Pollution
RT: Air pollution
Global warming
Industrial pollution
Marine pollution
Waste heat
Water pollution

Thermal quenching

BT: Cooling

Thermal resistance

BT: Resistance
RT: Thermal conductivity

Thermal sensors

BT: Sensors
NT: Electrothermal actuators
Temperature sensors

Thermal shock

BT: Shock (mechanics)
Thermal stresses

Thermal spraying

BT: Spraying

Thermal stability

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

Thermal wave imaging

USE: Photothermal effects

Thermionic emission

BT: Nuclear and plasma
sciences
RT: Electron emission
Ion emission
Transmission electron
microscopy
Vacuum arcs

Thermionic valves

USE: Electron tubes

Thermistors

BT: Semiconductor devices
RT: Temperature measurement
Thermoresistivity



2022 IEEE Thesaurus

Thermo-mechanics

USE: Thermomechanical processes

Thermo-optic effects

USE: Thermo-optic effects

Thermo-optical devices

USE: Thermo-optical devices

Thermochromism

BT: Thermo-optic effects

Thermocouples

BT: Temperature sensors

Thermodynamics

BT: Science - general
NT: Adiabatic processes
Enthalpy
Isobaric processes
Isothermal processes

Thermoelasticity

BT: Thermal factors

Thermoelectric devices

BT: Thermoelectricity

Thermoelectric effect

USE: 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
Thermomechanics
BT: Thermal analysis

Thermomechanics

USE: Thermomechanical processes

Thermometers

BT: Temperature sensors

Thermonuclear fusion

USE: Fusion reactors

Thermo-optic effects

UF: Thermo-optic effects
BT: Thermal factors
RT: Birefringence
Optical propagation
Optical reflection
Optical refraction
Thermo-optical devices
NT: Thermal lensing
Thermochromism
Thermoreflectance

Thermo-optical devices

UF: Thermo-optical devices
BT: Optical devices
RT: Integrated optics
Optical switches
Solid lasers
Thermo-optic effects

Thermoplastic polyethylene

BT: Polyethylene
NT: UHMWPE

Thermoreflectance

BT: Thermo-optic effects

Thermoreflectance imaging

BT: Optical imaging
RT: Spectroscopy

Thermoresistivity

BT: Thermal factors
RT: Temperature measurement
Thermistors



2022 IEEE Thesaurus

Thermostats

BT: Control equipment

RT: Micrometers
Size measurement

Thesauri

UF: Thesaurus
BT: Knowledge representation
Writing
RT: Ontologies

Thigh

BT: Extremities

Thesaurus

USE: Thesauri

Thin film circuits

BT: Circuits
Integrated circuits
RT: Hybrid integrated circuits
Silicon-on-insulator
Thin film devices
Thin film inductors

Thick film circuits

BT: Circuits
Integrated circuits
RT: Hybrid integrated circuits
Thick film devices
Thick film inductors

Thin film deposition

USE: Sputtering

Thick film devices

BT: Electron devices
RT: Thick film circuits
Thick films
NT: Thick film inductors

Thin film devices

BT: Electron devices
RT: Amorphous semiconductors
Doping profiles
Giant magnetoresistance
Thin film circuits
Thin films
NT: Film bulk acoustic

Thick film inductors

BT: Inductors
Thick film devices
RT: Microstrip components
Thick film circuits
Thick films

resonators
Thin film inductors
Thin film transistors

Thick film sensors

UF: Thick-film sensors
BT: Sensors

Thin film inductors

BT: Inductors
Thin film devices
RT: Thin film circuits
Thin films

Thick films

BT: Films
RT: Dielectric films
Semiconductor films
Superconducting films
Thick film devices
Thick film inductors

Thin film sensors

BT: Sensors

Thick-film sensors

USE: Thick film 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

Thickness control

BT: Mechanical variables
control
RT: Size control

Thin films

BT: Films
RT: Diamond-like carbon
Dielectric films
Epitaxial layers
Magnetic films
Metasurfaces

Thickness measurement

BT: Mechanical variables
measurement



2022 IEEE Thesaurus

[illegible]

2022 IEEE Thesaurus

	MOSFET circuits		<i>Tianwen-1</i>	
	Transistors		USE:	Interplanetary exploration
NT:	Subthreshold current			
Thresholding (Imaging)			Tides	
BT:	Image processing		BT:	Oceans
RT:	Image edge detection		RT:	Ocean circulation
Thrombosis			Tiles	
BT:	Medical conditions		BT:	Building materials
			RT:	Ceramic products
				Ceramics
				Floors
Through-silicon vias			Timbre	
UF:	TSV		BT:	Music
BT:	Integrated circuits			
Throughput			Time complexity	
UF:	Network throughput		BT:	Computational complexity
BT:	Communication channels		RT:	Computational modeling
			NT:	Reversible computing
<i>Throughput (communication systems)</i>			<i>Time delay</i>	
USE:	Information rates		USE:	Delay effects
Thulium			Time difference of arrival	
BT:	Chemical elements		UF:	Time-difference-of-arrival
			BT:	Object detection
Thumb			Time dissemination	
BT:	Fingers		BT:	Time measurement
			RT:	Satellite navigation systems
Thyratrons				Synchronization
BT:	Electron tubes			
RT:	Gas discharge devices			
Thyristor circuits			<i>Time division multiaccess</i>	
BT:	Circuits		USE:	Time division multiple access
RT:	Thyristors			
Thyristors			Time division multiple access	
UF:	Diacs		UF:	Time division multiaccess
	SCR		BT:	Multiaccess communication
	Semiconductor controlled			
rectifiers			<i>Time division multiplexed</i>	
	Silicon controlled rectifiers		USE:	Time division multiplexing
	Triacs			
BT:	Power semiconductor		Time division multiplexing	
switches			UF:	TDM
	Thyristor circuits			Time division multiplexed
	Photothyristors		BT:	Multiplexing
Thyroid			Time division synchronous code division multiple access	
BT:	Glands		UF:	TDSCDMA
			BT:	Multiaccess communication
<i>Ti</i>			RT:	3G mobile communication
USE:	Titanium			4G mobile communication



2022 IEEE Thesaurus

multiple access
communication

Cellular radio
Multicarrier code division
Spread spectrum

Time domain analysis

USE: Time-domain analysis

Time factors

BT: System analysis and design
RT: Bang-bang control
NT: Continuous time systems
Discrete-time systems
Time invariant systems
Time-varying systems

Time frequency analysis

USE: Time-frequency analysis

Time invariant systems

BT: Time factors
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

BT: Time-sharing systems
Computers and information

processing

RT: Mainframes

Time to market

BT: Design methodology
Product development
RT: Concurrent engineering

Time varying circuits

BT: Circuits

Time varying systems

USE: Time-varying systems

Time warp simulation

BT: Discrete event simulation

Time-difference-of-arrival

USE: Time difference of arrival

Time-domain analysis

UF: FDTD
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-of-arrival estimation

USE: Time of arrival estimation

time-series analysis

USE: Time series analysis



2022 IEEE Thesaurus

Time-sharing computer systems

USE: Time sharing computer systems

Time-sharing systems

USE: Time sharing computer systems

Time-varying channels

BT: Communication channels
RT: Mobile communication
Wireless LAN

Time-varying systems

UF: Time varying systems
BT: Time factors
RT: Control systems
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

RT: Rubber products
Automobile manufacture
Automotive components
Vehicles
Wheels
NT: Tire pressure

Tissue damage

BT: Lesions

Tissue engineering

UF: Tissue scaffolds
BT: Biomedical engineering
RT: Biological materials
Colloidal lithography
Diamond-like carbon
Genetic engineering
NT: Regeneration engineering

Tissue scaffolds

USE: Tissue engineering

Tissues

USE: Biological tissues

Titanates

USE: Titanium compounds

Titania

USE: Titanium dioxide

Titanium

UF: Ti
BT: Chemical elements
Metals
NT: Titanium alloys
Titanium compounds
Titanium dioxide
Titanium nitride

Titanium alloys

BT: Titanium
RT: Alloying

Titanium compounds

UF: Titanates
BT: Titanium

Titanium dioxide

UF: Titania
BT: Titanium



2022 IEEE Thesaurus

Titanium nitride

BT: Titanium

TMR

USE: Tunneling
magnetoresistance

TOA estimation

USE: Time of arrival estimation

Toddler

USE: Pediatrics

Tokamak devices

BT: Tokamaks
RT: Magnetic confinement
Toroidal magnetic fields

Tokamaks

BT: Fusion reactors
Plasma applications
Plasma devices
RT: Magnetic confinement
Plasma simulation
NT: Tokamak devices

Token networks

BT: Communication systems
Computer networks
Digital systems
RT: 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

Tolerating problems

USE: Tolerance analysis

Tomographic

USE: Tomography

Tomography

UF: Tomographic
BT: Imaging
RT: Biomedical imaging
Geophysical measurement

techniques

NT: Image reconstruction
Computed tomography
Electrical capacitance

tomography

Electrical impedance

tomography

Magnetic particle imaging
Optical coherence

tomography

Positron emission

tomography

Reconstruction algorithms

Tomosynthesis

USE: Biomedical imaging

Tongue

BT: Digestive system
RT: Stomatognathic system

Tools

BT: Manufactured products
NT: Hand tools

Tooth

USE: Teeth

Topography (earth)

USE: Terrain mapping

Topological insulators

BT: Insulators

Topology

BT: Mathematics
RT: Graph theory
Morphological operations

TOPSIS

UF: Technique for order of
preference by similarity to ideal solution
BT: Decision theory
RT: Decision making
Fuzzy set theory
Operations research
Optimization



2022 IEEE Thesaurus

Tornado

USE: Tornadoes

Tornadoes

UF: Tornado
Tornados
BT: Geoscience

Tornados

USE: Tornadoes

Toroidal magnetic fields

BT: Magnetic fields
RT: Tokamak devices

Torpedoes

USE: Missiles

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 convertors

USE: Torque converters

Torque measurement

UF: Torque ripple
BT: Mechanical variables
measurement
RT: Pressure gauges
Torque
NT: Dynamometers

Torque ripple

USE: Torque measurement

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 screens

USE: Touch sensitive screens

Touch sensitive screens

UF: Touch screens
touchscreens
BT: Computer displays
RT: Haptic interfaces
Tactile sensors

Touch sensors

USE: Tactile sensors

touchscreens

USE: Touch sensitive screens

Tourism industry

BT: Industries

Towers

USE: Poles and towers

Town gas

USE: Coal gas

Toxic chemicals

BT: Chemical hazards
Toxicology



2022 IEEE Thesaurus

Toxicology

UF: Poisons
BT: Hazards
RT: Chemical hazards
Hazardous materials
Occupational health
Pollution
NT: Toxic chemicals

Toy industry

BT: Industries

Toy manufacturing industry

UF: Toys
BT: Manufacturing industries
RT: Electronics industry

Toys

USE: Toy manufacturing industry

TQM

USE: Total quality management

Tracheal intubation

USE: Intubation

Tracking

BT: Motion measurement
RT: Iterative learning control
Maximum likelihood

estimation

Particle tracking
Position measurement
Tracking loops
Velocity measurement
NT: Object tracking
Target tracking
Trajectory tracking
Underwater tracking
Video tracking

Tracking loops

UF: Delay lock loops
BT: Linear feedback control

systems

RT: Signal processing
Modulation
Synchronization
Tracking

Traction motors

BT: Motors
RT: Battery powered vehicles
Fuel cell vehicles
Hybrid electric vehicles

Propulsion
Solar powered vehicles

Traction power supplies

BT: Power supplies

Tractors

USE: Agricultural machinery

Trade

USE: Business

Trade (international)

USE: International trade

Trade agreements

UF: Free trade
GATT
General agreement on

tariffs and trade

BT: Economics
RT: Globalization
International collaboration
International trade
Tariffs

Trade unions

USE: Industrial relations

Trademarks

BT: Law
Legal factors
RT: Copyright protection

Traffic congestion

BT: Road transportation
RT: Traffic control

Traffic control

UF: Traffic pattern
Traffic simulation
BT: Control systems
RT: Communication systems
Computer network

management

NT: Traffic congestion
Advanced driver assistance

systems

Queueing analysis
Road traffic control
Vehicle routing

Traffic load

USE: Telecommunication traffic



2022 IEEE Thesaurus

Traffic pattern

USE: Traffic control

Traffic simulation

USE: Traffic control

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

Trajectory

BT: Path planning
RT: Motion control
Object tracking
NT: Trajectory optimization

Trajectory optimization

BT: Optimization
Trajectory

Trajectory planning

BT: Path planning

Trajectory tracking

BT: Path planning
Tracking
RT: Motion control
Robot control

Trans human

USE: Transhuman

Trans-human

USE: Transhuman

Transaction databases

BT: Databases
NT: Itemsets

Transactive control

USE: Transactive energy

Transactive energy

UF: Transactive control
BT: Energy management
RT: Power distribution
Power markets
Power system economics
Smart grids

Transceivers

BT: Communication equipment
RT: Land mobile radio

equipment

Mobile communication
Mobile handsets
Software radio
NT: Radio transceivers

Transcoding

BT: Encoding
RT: Data compression
Image coding
Multimedia communication
Video coding

Transconductance

UF: Mutual conductance
BT: Conductivity
RT: Transconductors

Transconductors

BT: CMOS integrated circuits
RT: Transconductance

Transcranial direct current stimulation

BT: Neuroscience
Neurostimulation

Transcranial magnetic stimulation

BT: Neuroscience
Neurostimulation

Transducers

BT: Electronic components
RT: Electric variables

measurement

Measurement
Mechanical variables

measurement



2022 IEEE Thesaurus

	Solenoids		Transformers
	Temperature sensors		
	Thermal variables	<i>Transformer oil</i>	
measurement		USE:	Oil insulation
NT:	Acoustic transducers		
	Biomedical transducers	<i>Transformer windings</i>	
	Capacitive transducers	USE:	Windings
	Chemical transducers		
	Inductive transducers	Transformers	
	Piezoelectric transducers	BT:	Power systems
	Resistive transducers	RT:	Coils
	Ultrasonic transducer		Core loss
arrays			Inductive power
<i>Transfer function</i>		transmission	
USE:	Transfer functions		Transformer cores
			Voltage multipliers
Transfer functions		NT:	Windings
UF:	Transfer function		Baluns
BT:	Differential equations		Current transformers
RT:	Control systems		Flyback transformers
	Damping		High-frequency
	Linear systems	transformers	
NT:	Poles and zeros		Instrument transformers
			Phase transformers
Transfer learning			Power transformers
BT:	Machine learning		Pulse transformers
			Tap changers
Transfer molding		Transforms	
UF:	Resin transfer molding	BT:	Mathematics
	Resin transfer moulding	RT:	Numerical analysis
	Transfer moulding		Signal processing
BT:	Production		Spectral analysis
		NT:	Discrete transforms
<i>Transfer moulding</i>			Empirical mode
USE:	Transfer molding	decomposition	
			Fourier transforms
<i>Transferred electron devices</i>			Karhunen-Loeve transforms
USE:	Gunn devices		Poincare invariance
			Wavelet transforms
Transform coding		Transgender issues	
UF:	JPEG	BT:	Gender issues
	JPEG2000	RT:	Gender equity
	MPEG		
BT:	Data compression	Transhuman	
RT:	Digital photography	UF:	Trans human
	MPEG standards		Trans-human
	Principal component		Transhumanism
analysis			Systems, man, and
	Vector quantization	BT:	
		cybernetics	
Transformer cores		RT:	Posthuman
BT:	Magnetic cores		
	Magnetic devices	<i>Transhumanism</i>	
RT:	Power transformers	USE:	Transhuman



2022 IEEE Thesaurus

Transient analysis

UF: Transients
BT: Power system transients
RT: Electromagnetic transients
Signal analysis
Steady-state

Transient gratings

USE: Gratings

Transient response

UF: Natural response
BT: Propagation
RT: Damping

Transients

USE: Transient analysis

Transinformation

USE: Mutual information

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

Translational medicine

USE: Translational research

Translational research

UF: Bench to bedside
Translational medicine
Translational science
BT: Biomedical engineering
Research and development
RT: Medical diagnosis
Medical services

Translational science

USE: Translational research

Transmembrane potential

USE: Membrane potentials

Transmissible disease

USE: Infectious diseases

Transmission control protocol-internet protocol

USE: TCPIP

Transmission control protocol/internet protocol

USE: TCPIP

Transmission electron microscopy

BT: Electron microscopy
RT: Electron beams
Thermionic emission

Transmission line antennas

BT: Antennas
RT: Transmission lines

Transmission line circuits

USE: Distributed parameter circuits

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



2022 IEEE Thesaurus

	Splicing	Satellite communication
	Transmission line antennas	
	Transmission line	
measurements		Transport protocols
NT:	Cables	BT: Protocols
	Electromagnetic	RT: IP networks
waveguides		Overlay networks
		Radio links
lines	Multiconductor transmission	SONET
		Synchronous digital
	Planar transmission lines	hierarchy
	Poles and towers	TCPIP
	Power line communications	
	Power transmission lines	Transportation
	Stripline	BT: Intelligent transportation
	Superconducting	
transmission lines		RT: Bridges
	Transmission line	Freight containers
discontinuities		NT: Air transportation
	Transmission line theory	Escalators
		Green transportation
<i>Transmission of electric power</i>		Land transportation
USE:	Power transmission	Public transportation
		Seaports
<i>Transmission-line</i>		Smart transportation
USE:	Transmission lines	Vehicles
<i>Transmit antennas</i>		Transportation industry
USE:	Transmitting antennas	BT: Industries
Transmitters		Transversal filters
BT:	Communication equipment	BT: Filters
RT:	Linearization techniques	RT: Digital filters
	Modulation	Filtering theory
	SISO communication	Signal processing
NT:	Auxiliary transmitters	
	Diversity methods	<i>Transverse electromagnetic cells</i>
	Neurotransmitters	USE: TEM cells
	Optical transmitters	
	Radio transmitters	<i>Traveling salesman</i>
	Transmitting antennas	USE: Traveling salesman
		problems
Transmitting antennas		
UF:	Transmit antennas	Traveling salesman problems
BT:	Antennas	UF: Traveling salesman
	Transmitters	Travelling salesman
RT:	Receiving antennas	
		problem
<i>Transplants</i>		BT: NP-hard problem
USE:	Organ transplantation	RT: Optimization methods
		Shortest path problem
Transponders		Traveling wave tubes
BT:	Communication equipment	UF: Travelling wave tubes
	Radio communication	BT: Electron tubes
equipment		
RT:	Radio navigation	



2022 IEEE Thesaurus

Travelling salesman problem

USE: Traveling salesman problems

Travelling wave tubes

USE: Traveling wave tubes

Tree data structures

BT: Data structures

NT: Binary trees

Tree graphs

BT: Graph theory

RT: Circuit topology

Tree searching

USE: Decision trees

Trees (botanical)

USE: Vegetation

Trees - insulation

UF: Water trees

BT: Insulators

RT: Humidity
Insulation life
Moisture

Trellis codes

USE: Convolutional codes

Triacs

USE: Thyristors

Triboelectricity

BT: Electricity
Electrostatic processes
Surface charging

RT: Electrostatic discharge

protection

Nanogenerators

Tribology

BT: Motion measurement

Tricuspid valves

USE: Heart valves

Trigen

USE: Trigenation

Trigenation

UF: CHCP

Combined heat, cooling
and power

and power

Combined heat, cooling,

BT: Trigen
Cooling

RT: Heating systems
Power generation
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

Triplestore

USE: Triples (Data structure)

Trojan horses

UF: Trojans
BT: Malware
RT: Cyber espionage

Trojans

USE: Trojan horses

Trolley cars

USE: Public transportation

Tropical cyclones

UF: Cyclonic storms
Storm systems
Tropical depressions
Tropical storms
BT: Cyclones

Tropical depressions

USE: Tropical cyclones

Tropical storms

USE: Tropical cyclones

Troposphere

USE: Terrestrial atmosphere



2022 IEEE Thesaurus

Truncation errors

USE: Finite wordlength effects

Trust management

BT: Decision making
Information security
RT: Access control
Computer security
Cryptography
Privacy
NT: Trusted computing

Trusted computing

BT: Computer security
Trust management

Tsunami

BT: Geoscience

TSV

USE: Through-silicon vias

Tubes

USE: Electron tubes

Tumor

USE: Tumors

Tumor cells

USE: Tumors

Tumor detection

USE: Tumors

Tumors

UF: Tumor
Tumor cells
Tumor detection
Tumours
BT: Medical conditions
RT: Cancer
Medical diagnostic imaging
Oncology
Positron emission

tomography

Single photon emission

computed tomography

NT: Benign tumors
Breast tumors
Colonic polyps
Lesions
Malignant tumors

Tumours

USE: 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

Tuning forks

USE: Vibrations

Tunnel effect

USE: Tunneling

Tunnel field effect transistors

USE: TFETs

Tunneling

UF: Tunnel effect
BT: Electron devices
Quantum mechanics
RT: Quantum well devices
Semiconductor materials
NT: Gate leakage
Josephson effect
Magnetic tunneling
Resonant tunneling devices
Superconductive tunneling



2022 IEEE Thesaurus

magnetoresistance	Tunneling	<i>Turbulent media</i>	USE:	Random media	
Tunneling magnetoresistance	UF:	TMR	Turing machines	BT:	Automata
		Tunnelling		RT:	Digital computers
magnetoresistance	BT:	Magnetoresistance	Turning	BT:	Machining
		Tunneling		RT:	Boring
	RT:	Magnetoresistive devices			Machine tools
<i>Tunnelling magnetoresistance</i>			Turnkey project		
USE:	Tunneling		BT:	Project engineering	
magnetoresistance				Project management	
Turbines			Tutorials		
	BT:	Turbomachinery		BT:	Educational programs
	RT:	Aircraft propulsion			IEEE indexing
		Boilers			
		Compressors	TV		
		Turbogenerators		UF:	Mobile television
		Wind energy			TV broadcasting
	NT:	Hydraulic turbines			Television
		Wind turbines		BT:	Communications
Turbo codes			technology		
	BT:	Channel coding		RT:	Closed captioning
	RT:	Error correction			Electronic learning
		Viterbi algorithm			Entertainment industry
<i>Turbo generators</i>					Flat panel displays
USE:	Turbogenerators				HbbTV Standards
Turbogenerators					Image communication
	UF:	Turbo generators			Must-carry regulations
	BT:	Turbomachinery			TV equipment
	RT:	Turbines	computing		Telecommunication
		Wind power generation			
<i>Turbomachine blades</i>				NT:	UHDTV
USE:	Turbomachinery				Visual communication
Turbomachinery					Analog TV
	UF:	Turbomachine blades			Cable TV
	BT:	Power generation			Color TV
	RT:	Blades			Digital TV
		Compressors	television		Mobile TV
		Engines			Smart TV
		Machine components			Three-dimensional
		Mechanical systems			
		Pumps	<i>TV broadcasting</i>		
	NT:	Turbines	USE:	TV	
		Turbogenerators	TV equipment		
			BT:	Communication equipment	
			RT:	TV	
				Video equipment	



2022 IEEE Thesaurus

NT:	Large screen displays TV receivers	Typesetting	BT: Text processing RT: Printing
TV interference	BT: Interference RT: Echo interference Gaussian noise	<i>Tyres</i>	USE: Tires
TV receivers	BT: TV equipment	<i>UAV</i>	USE: Autonomous aerial vehicles
<i>Twitter</i>	USE: Blogs AND Social networking (online)	<i>Uber</i>	USE: Public transportation
Two dimensional displays	UF: 2-D displays 2D displays Two-dimensional displays BT: Displays RT: Sprites (computer) Structure from motion	<i>Ubicom</i>	USE: Pervasive computing
Two dimensional hole gas	UF: 2-d hole gas 2d hole gas BT: Quantum well devices RT: Quantum well lasers Quantum wells	Ubiquitous computing	UF: Ubiquitous wireless* BT: Pervasive computing RT: Ambient intelligence NT: Context-aware services
<i>Two dimensional photonic crystals</i>	USE: Photonic crystals	<i>Ubiquitous wireless*</i>	USE: Ubiquitous computing
<i>Two-dimensional displays</i>	USE: Two dimensional displays	<i>UDN</i>	USE: Ultra-dense networks
<i>Two-dimensional electron gas FETs</i>	USE: MODFETs	<i>UHD</i>	USE: UHDTV
<i>Two-dimensional photonic crystals</i>	USE: Photonic crystals	UHDTV	UF: 4K UHD 8K UHD Super hi-vision UHD Ultra HD Ultra HD TV Ultra-high definition TV Ultra-high definition
Two-term control	BT: Process control	television	BT: HDTV RT: ITU Standards TV
Type II superconductors	BT: Superconducting materials RT: Flux pinning Niobium	UHF antennas	BT: Antennas UHF technology RT: UHF devices
<i>Type testing</i>	USE: Conformance testing	UHF circuits	UF: Ultra-high-frequency circuits BT: Circuits UHF technology



2022 IEEE Thesaurus

RT:	Analog circuits	UHMWPE	
NT:	UHF integrated circuits	UF:	Ultra high molecular weight polyethylene
UHF communication		BT:	Thermoplastic polyethylene
UF:	Ultra-high-frequency communication	<i>UK Space Agency</i>	
BT:	Communication systems	USE:	United Kingdom Space Agency
RT:	Mobile handsets	<i>UKSA</i>	
UHF devices		USE:	United Kingdom Space Agency
UF:	Ultra-high-frequency devices	<i>ULSI</i>	
BT:	UHF technology	USE:	Ultra large scale integration
RT:	UHF antennas	<i>Ultra HD</i>	
	UHF integrated circuits	USE:	UHDTV
UHF integrated circuits		<i>Ultra HD TV</i>	
UF:	Ultra-high-frequency integrated circuits	USE:	UHDTV
BT:	Circuits	<i>Ultra high molecular weight polyethylene</i>	
	Integrated circuits	USE:	UHMWPE
	UHF circuits	Ultra large scale integration	
	UHF technology	UF:	ULSI
RT:	Analog integrated circuits	BT:	Circuits
	UHF devices		Integrated circuits
UHF measurements			Large scale integration
UF:	Ultra-high-frequency measurements	<i>Ultra low power*</i>	
BT:	Measurement	USE:	Low-power electronics
RT:	UHF technology	Ultra reliable low latency communication	
UHF propagation		UF:	URLLC
UF:	UHF radio propagation		Ultra-reliable low latency communication
	Ultra-high-frequency propagation		Ultra-reliable low-latency communication
BT:	Electromagnetic propagation	BT:	Low latency communication
RT:	Broadband antennas	<i>Ultra violet</i>	
<i>UHF radio propagation</i>		USE:	Ultraviolet sources
USE:	UHF propagation	<i>Ultra wide-band</i>	
UHF technology		USE:	Ultra wideband technology
UF:	Ultra-high-frequency technology	<i>Ultra wideband</i>	
BT:	Communications technology	USE:	Ultra wideband technology
RT:	UHF measurements	Ultra wideband antennas	
NT:	UHF antennas	UF:	UWB antennas
	UHF circuits		Ultrawideband antennas
	UHF communication	BT:	Broadband antennas
	UHF devices		
	UHF integrated circuits		



2022 IEEE Thesaurus

	RT:	Ultra wideband technology Ultra wideband radar	<i>Ultra-high-frequency circuits</i> USE: UHF circuits
Ultra wideband communication	UF:	UWB communication Ultrawideband	<i>Ultra-high-frequency communication</i> USE: UHF communication
communication	BT:	Ultra wideband technology	<i>Ultra-high-frequency devices</i> USE: UHF devices
	RT:	Broadband communication Military communication Multipath channels Spread spectrum	<i>Ultra-high-frequency integrated circuits</i> USE: UHF integrated circuits
communication			<i>Ultra-high-frequency measurements</i> USE: UHF measurements
Ultra wideband radar	UF:	UWB radar Ultrawideband radar	<i>Ultra-high-frequency propagation</i> USE: UHF propagation
	BT:	Radar Ultra wideband technology	<i>Ultra-high-frequency technology</i> USE: UHF technology
	RT:	Ground penetrating radar Radar detection Radar imaging Synthetic aperture radar Ultra wideband antennas	<i>Ultra-low power*</i> USE: Low-power electronics
Ultra wideband technology	UF:	UWB technology Ultra wide-band Ultra wideband Ultra-wide-band Ultra-wideband Ultrawideband Ultrawideband technology	<i>Ultra-reliable low latency communication</i> USE: Ultra reliable low latency communication
technology	BT:	Communications	<i>Ultra-reliable low-latency communication</i> USE: Ultra reliable low latency communication
	NT:	Ultra wideband antennas Ultra wideband	<i>Ultra-violet</i> USE: Ultraviolet sources
communication		Ultra wideband radar	<i>Ultra-wide-band</i> USE: Ultra wideband technology
Ultra-dense networks	UF:	UDN	<i>Ultra-wideband</i> USE: Ultra wideband technology
	BT:	Cellular networks Mobile communication	<i>Ultracapacitors</i> USE: Supercapacitors
	RT:	5G mobile communication Microcell networks	Ultracold atoms BT: Atoms Cooling RT: Laser cooling Magnetooptic effects
<i>Ultra-high definition television</i> USE: UHDTV			Ultrafast electronics BT: High-speed electronics
<i>Ultra-high definition TV</i> USE: UHDTV			
Ultra-high definition video BT: High definition video			



2022 IEEE Thesaurus

Ultrafast optics

BT: Optics

Ultrasonic applications

USE: Acoustic applications

Ultrasonic devices

USE: Acoustic devices

Ultrasonic imaging

UF: Ultrasonic techniques
Ultrasound

BT: Ultrasonics, ferroelectrics,
and frequency control

RT: Amniocentesis
Biomedical imaging

NT: Ultrasonography

Ultrasonic techniques

USE: Ultrasonic imaging

Ultrasonic transducer arrays

BT: Transducers

Ultrasonic transducers

BT: Ultrasonics, ferroelectrics,
and frequency control

RT: Nondestructive testing
Piezoelectricity
Sonar

Ultrasonic variables measurement

BT: Measurement

Ultrasonics

USE: Acoustics

Ultrasonics, ferroelectrics, and frequency control

NT: Ferroelectric materials
Frequency control
Piezoelectricity
Pyroelectricity
Ultrasonic imaging
Ultrasonic transducers

Ultrasonography

BT: Biomedical image
processing

NT: Ultrasonic imaging
Sonogram

Ultrasound

USE: Ultrasonic imaging

Ultraviolet sources

UF: UV sources

Ultra violet

Ultra-violet

BT: Light sources

RT: Lamps

Lasers

Ultrawideband

USE: Ultra wideband technology

Ultrawideband antennas

USE: Ultra wideband antennas

Ultrawideband communication

USE: Ultra wideband
communication

Ultrawideband radar

USE: Ultra wideband radar

Ultrawideband technology

USE: Ultra wideband technology

Umbilical cable

UF: Power supplies to
apparatus

BT: Power supplies

UML

USE: Unified modeling language

UMTS

USE: 3G mobile communication

Uncertain systems

UF: Parameter uncertainty

BT: Mathematics

RT: Control systems
Linear matrix inequalities
Robustness
Uncertainty

Uncertainty

BT: Probability

RT: Cognitive science

Fuzzy sets

Nonlinear dynamical

systems

Uncertain systems

NT: Evidence theory

Forecast uncertainty

Uncrewed

USE: Autonomous vehicles



2022 IEEE Thesaurus

Underarm

USE: Axilla

Underground communication cables

USE: Communication cables

Underground object detection

USE: Buried object detection

Underground objects

USE: Buried object detection

Underground power cables

BT: Power cables

Undersea communication

USE: Underwater communication

Underwater acoustics

BT: Acoustics

Underwater autonomous vehicles

USE: Autonomous underwater vehicles

Underwater cables

UF: Marine cables
Sub-sea cables
Submarine cables
Submersible cables
Subsea cables
BT: Cables
Marine technology

Underwater communication

UF: Undersea communication
BT: Communication systems
Marine technology
Underwater technology

Underwater drones

USE: Autonomous underwater vehicles

Underwater equipment

UF: Diving equipment
Flotation devices
BT: Marine technology
Underwater technology
RT: Underwater vehicles
NT: Rebreathing equipment

Underwater exploration robots

USE: Autonomous underwater vehicles

Underwater robots

USE: Autonomous underwater vehicles

Underwater sensor networks

USE: Wireless sensor networks

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



2022 IEEE Thesaurus

Unified messaging

BT: Electronic mail
Electronic messaging

Unified modeling language

UF: UML
BT: Specification languages
RT: Client-server systems
Common Information Model

(electricity)

Uniform Resource Identifier

USE: Uniform resource locators

Uniform resource locators

UF: URL
Uniform Resource Identifier
Uniform resource name
BT: Web sites

Uniform resource name

USE: Uniform resource locators

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

Units (measurement)

USE: Measurement units

Universal mobile telecommunication service

USE: 3G mobile communication

Universal motors

BT: Motors

Universal Serial Bus

UF: USB
BT: Communication standards
Information technology

Universities

USE: Educational institutions

Unmanned aerial vehicles

USE: Autonomous aerial vehicles

Unmanned air vehicles

USE: Autonomous aerial vehicles
AND Remotely piloted aircraft

Unmanned airborne vehicles

USE: Autonomous aerial vehicles

Unmanned automobiles

USE: Autonomous automobiles

Unmanned autonomous cars

USE: Autonomous automobiles

Unmanned autonomous vehicles

USE: Autonomous vehicles

Unmanned underwater vehicles

USE: Autonomous underwater vehicles

Unmanned vehicles

USE: Autonomous vehicles

Unpiloted aerial vehicles

USE: Autonomous aerial vehicles

Unpiloted air vehicles

USE: Autonomous aerial vehicles

Unsolicited e-mail

UF: Junk e-mail
Junk email
Spam
Spamming
Unsolicited electronic e-mail

mail

Unsolicited electronic email
Unsolicited email
BT: Electronic mail
RT: Computer crime
Cyberbullying
Office automation
Privacy-invasive software

Unsolicited electronic e-mail

USE: Unsolicited e-mail

Unsolicited electronic email

USE: Unsolicited e-mail

Unsolicited email

USE: Unsolicited e-mail



2022 IEEE Thesaurus

Unsupervised learning

BT: Learning systems
RT: Deep learning
Formal concept analysis
Generative adversarial

networks

Reinforcement learning
Self-supervised learning
Semisupervised learning
Competitive learning

NT:

Uplink

BT: Satellite communication

Upper bound

BT: Boundary conditions

Uranium

BT: Chemical elements

Urban areas

UF: Cities and towns
City
Metropolitan areas
Urban environments
BT: Geography
RT: Public infrastructure
Public transportation
NT: Smart cities
Urban planning

Urban environments

USE: Urban areas

Urban heat islands

USE: Thermal pollution

Urban modeling

USE: Urban planning

Urban planning

UF: City planning
Urban modeling
BT: Urban areas
RT: Public infrastructure
NT: Urban policy

Urban policy

BT: Urban planning

Urban pollution

BT: Pollution

Urinary calculosis

USE: Kidney stones

URL

USE: Uniform resource locators

URLLC

USE: Ultra reliable low latency communication

Urogenital system

BT: Anatomy
NT: Bladder
Kidney

US activities

USE: IEEE United States activities

US Department of Agriculture

BT: US Government

US Department of Commerce

BT: US Government
NT: NIST
NTIA

US Department of Defense

UF: DoD
BT: US Government

US Department of Energy

UF: DoE
BT: US Government

US Department of Health and Human Services

BT: US Government agencies
NT: National Institutes of Health

US Department of Homeland Security

BT: US Government
RT: Cyberattack
Terrorism

US Department of Transportation

UF: DOT
BT: US Government

US Government

BT: Government
NT: US Department of Agriculture
US Department of Commerce
US Department of Defense
US Department of Energy



2022 IEEE Thesaurus

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

USB

USE: Universal Serial Bus

User centered design

UF: User-centered design
User-centred design
BT: Design methodology
RT: Technology acceptance

model

User computer interfaces

USE: User interfaces

User experience

BT: Ergonomics
RT: Affective computing
Human computer

interaction

Human factors
Metaverse
Mobile computing
Quality of experience
Technology acceptance

model

NT: User interfaces
Cyberbullying

User friendliness

USE: Human computer

interaction

User generated content

USE: User-generated content

User interfaces

UF: Man-machine interfaces
User computer interfaces
User-computer interfaces
Systems, man, and

BT: 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-centered design

USE: User centered design

User-centred design

USE: User centered design

User-computer interfaces

USE: User interfaces

User-created content

USE: User-generated content

User-generated content

UF: Consumer-generated

media

User generated content
User-created content
Data acquisition

BT:

Utility programs

BT: System software



2022 IEEE Thesaurus

Utility theory

BT: Mathematics
RT: Supply and demand

UV sources

USE: Ultraviolet sources

UWB antennas

USE: Ultra wideband antennas

UWB communication

USE: Ultra wideband communication

UWB radar

USE: Ultra wideband radar

UWB technology

USE: Ultra wideband technology

V2G

USE: Vehicle-to-grid

V2I

USE: Vehicle-to-infrastructure

V2V

USE: Vehicular ad hoc networks

V2X

USE: Vehicle-to-everything

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

Vacuum energy

USE: Elementary particle vacuum

Vacuum plating

USE: Vapor deposition

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

Vacuum tubes

USE: Electron tubes

VAD

USE: Voice activity detection

Valuation

USE: Cost accounting

Valves

BT: Fluid flow
Hydraulic equipment
Machine components
RT: Fluid flow control
Manifolds
NT: Microvalves

Vanadium

BT: Chemical elements

Vanes

USE: Blades

VANET

USE: Vehicular ad hoc networks

Vapor deposition

UF: Vacuum plating
Vapour deposition
BT: Materials processing
Surface treatment
RT: Coatings
Electrochemical deposition
MOCVD



2022 IEEE Thesaurus

Pulsed laser deposition
Substrates
Thin films

Vapour deposition
USE: Vapor deposition

VAR
USE: Reactive power

Varactors
BT: Capacitors
Semiconductor diodes

Variable frequency drives
USE: Variable speed drives

Variable optical attenuators
USE: Optical attenuators

Variable selection
USE: Input variables

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

Vascular system
USE: Circulatory system

VCO
USE: Voltage-controlled
oscillators

VCR
USE: Video recording

VCSEL
USE: Vertical cavity surface
emitting lasers

Vector optimization
USE: Pareto optimization

Vector processors
BT: Microprocessors

Vector quantisation
USE: Vector quantization

Vector quantization
UF: 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



2022 IEEE Thesaurus

Vehicle driving

BT: Automotive engineering
NT: Autonomous driving

Vehicle dynamics

BT: Automotive engineering
RT: Hardware-in-the-loop

simulation

NT: Vehicles
Rollover

Vehicle routing

BT: Traffic control
RT: Intelligent vehicles
Path planning

Vehicle safety

BT: Automotive engineering
Safety
RT: Vehicle-to-everything
NT: Advanced driver assistance

systems

systems

Lane departure warning

Lane detection

Vehicle to vehicle communication

USE: Vehicular ad hoc networks

Vehicle-to-everything

UF: V2X
BT: Communication systems
Intelligent vehicles
RT: Advanced driver assistance

systems

NT: On board unit
Road safety
Vehicle safety
Vehicular ad hoc networks
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

Vehicle-to-vehicle

USE: Vehicular ad hoc networks

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

BT: Vehicle-to-vehicle
Ad hoc networks
RT: Dedicated short range

communication

NT: Internet of Vehicles
Mobile communication
Vehicle-to-everything
Vehicles
Vehicular automation
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



2022 IEEE Thesaurus

	Intelligent vehicles		Ventricle system	
	Mechatronics		BT:	Brain
	Mobile robots			
	Multi-agent systems		Vents	
	Vehicular ad hoc networks		BT:	Mechanical products
			RT:	Air conditioning
<i>Vehicular technologies</i>				Buildings
USE:	Vehicular and wireless			Ducts
technologies				Space heating
				Ventilation
				Windows
Veins				
BT:	Blood vessels			
Velocity control			Venture capital	
UF:	Rotational measurement		BT:	Economics
	Rotational speed			Financial management
	Speed control		RT:	Business continuity
BT:	Mechanical variables			Enterprise resource
control			planning	
				Research and development
			management	
				Risk analysis
			Venus	
			BT:	Planets
			<i>Vermin control</i>	
			USE:	Pest control
Velocity measurement			<i>Veroboard</i>	
UF:	Speed measurement		USE:	Stripboard circuit
BT:	Mechanical variables			
measurement			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
<i>Vented</i>				P-i-n diodes
USE:	Ventilators		<i>Vertical cavity surface-emitting lasers</i>	
			USE:	Vertical cavity surface
Ventilation			emitting lasers	
BT:	Cooling		<i>Vertical recording</i>	
RT:	Air conditioning		USE:	Perpendicular magnetic
	HVAC		recording	
	Temperature control		<i>Vertical-cavity surface-emitting lasers</i>	
	Vents		USE:	Vertical cavity surface
NT:	Fans		emitting lasers	
Ventilators				
UF:	Vented			
BT:	Biomedical equipment			
RT:	Intubation			
	Respiratory system			



2022 IEEE Thesaurus

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

Very long instruction word

USE: VLIW

Very-high-frequency circuits

USE: VHF circuits

Very-high-frequency devices

USE: VHF devices

Very-large-scale-integration

USE: Very large scale integration

Very-long-instruction-word

USE: VLIW

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

VHSIC

USE: Very high speed integrated
circuits

VHSIC Hardware Description Language

USE: VHDL

Vibrating bodies

USE: Vibrations

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

Vibrational signal processing

USE: Signal processing

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 analytics

USE: Visual analytics

Video annotation

USE: Image annotation



2022 IEEE Thesaurus

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 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

USE: Games

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 sequence

USE: Video sequences

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
Video coding
Video compression

Video streaming

USE: Streaming media

Video surveillance

BT: Surveillance
RT: Motion detection

Video tracking

BT: Image motion analysis
Tracking



2022 IEEE Thesaurus

video-game

USE: Games

Videocoding

USE: Video coding

Videoconferences

BT: Collaborative tools

Videoconferencing

USE: Teleconferencing

Videophone systems

UF: Picture phones
Picturephones
BT: Communication systems
RT: Image communication
Telephony
Visual communication

Videos

UF: Multimedia products
BT: Video equipment
Video recording
NT: Deepfakes
Video description

Videotex

UF: Viewdata
BT: Communication systems
Information services
RT: Data communication
Teletext

Viewdata

USE: Videotex

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: Smart devices

Virtual colonoscopy

BT: Colonoscopy

Virtual currency

USE: Online banking

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 factories

USE: Virtual manufacturing

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 learning

USE: Electronic learning

Virtual links

BT: Communication networks
Routing protocols
Telecommunication control
Virtual environments
RT: Ethernet
Routing



2022 IEEE Thesaurus

Virtual local area network

USE: Virtual LAN

computing

Power engineering

Power system control

Power system management

Virtual machine monitors

UF: Hypervisors
VMMs

BT: Computers and information
processing

RT: Platform virtualization

Virtual machines

USE: Virtual machining

Virtual machining

UF: Virtual machines
BT: Machining
Virtual manufacturing
RT: Software defined

networking

Virtual prototyping

Virtual reality

Virtual manufacturing

UF: Digital factories
Virtual factories
BT: Computer applications
RT: CAD/CAM
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 office

USE: Teleworking

Virtual power plants

BT: Distributed power

generation

RT: Cloud computing

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 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



2022 IEEE Thesaurus

Virtual sensing

USE: Soft sensors

Virtual sensors

USE: Soft sensors

Virtual teams

USE: Virtual groups

Virtualization

BT: Virtual environments

RT: Software defined

networking

Virtual reality

Viruses (computer)

USE: Computer viruses

Viruses (medical)

BT: Microorganisms

RT: COVID-19

Virology

NT: Coronaviruses

Influenza

Viruses (microorganisms)

USE: Microorganisms

Visa gold

USE: Credit cards

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 (biological)

USE: Visual systems

Vision Based Robot Control

USE: Visual servoing

Vision defects

UF: Amblyopia

Color blindness

Myopia

BT: Visual systems

RT: Visual impairment

Vision impairment

USE: Visual impairment

Vision sensors

BT: Sensors

RT: Image processing

Vision systems (nonbiological)

USE: Machine vision

Visual

USE: Visualization

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

Vision defects



2022 IEEE Thesaurus

Visual odometry

BT: Computer vision
Robots

Visual perception

BT: Visual systems

Visual prostheses

USE: Visual prosthesis

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

Visualisation

USE: Visualization

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

Vivaldi-antennas

USE: Vivaldi antennas

VLAN

USE: Virtual LAN

VLC

USE: Visible light communication

VLIW

UF: Very long instruction word
Very-long-instruction-word
BT: Central Processing Unit

VLSI

USE: Very large scale integration

VMMs

USE: Virtual machine monitors

Vocabulary

BT: Information retrieval
RT: Ranking (statistics)

Vocational training

UF: NVQ
National vocational

qualification

BT: Training
RT: Industrial training
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: Speech coding



2022 IEEE Thesaurus

	Speech recognition	NT:	Volcanic activity
	Speech synthesis		Volcanic ash
Voice mail		Voltage	
BT:	Message systems	BT:	Electric variables
RT:	Electronic mail	RT:	Automatic voltage control
	Office automation		Capacitance-voltage
<i>Voice over Internet protocol</i>		characteristics	
USE:	Internet telephony		Electrophysiology
<i>Voice over IP</i>			Phase frequency detectors
USE:	Internet telephony		Voltage control
<i>Voice print</i>			Voltage measurement
USE:	Spectrogram	NT:	Breakdown voltage
<i>Voice recognition</i>			Dynamic voltage scaling
USE:	Speech recognition		Threshold voltage
<i>Voice response systems</i>			Voltage fluctuations
USE:	Speech synthesis	<i>Voltage breakdown</i>	
<i>Voice tract</i>		USE:	Dielectric breakdown
USE:	Larynx	Voltage control	
<i>Voice-over-Internet protocol</i>		UF:	Voltage mode control
USE:	Internet telephony		Voltage regulation
<i>Voicegram</i>			Voltage-mode control
USE:	Spectrogram	BT:	Electric variables control
<i>Voiceprint</i>		RT:	Electric current control
USE:	Spectrogram		Limiting
<i>VOIP</i>			Motor drives
USE:	Internet telephony		On load tap changers
Volatile organic compounds			Phase frequency detectors
BT:	Organic compounds		Power distribution control
Volcanic activity			Power factor correction
BT:	Volcanoes		Reactive power control
Volcanic ash			Regulators
BT:	Volcanoes		Three-phase electric power
RT:	Ash		Voltage
<i>Volcano</i>			Voltage multipliers
USE:	Volcanoes	NT:	Automatic voltage control
Volcanoes		<i>Voltage controlled oscillators</i>	
UF:	Volcano	USE:	Voltage-controlled
BT:	Geoscience	oscillators	
		Voltage fluctuations	
		BT:	Voltage
		RT:	Power systems
		Voltage measurement	
		BT:	Electric variables
		measurement	
		RT:	Automatic voltage control
			Potentiometers
			Voltage
			Voltage transformers
			Voltmeters



2022 IEEE Thesaurus

NT:	Low voltage Medium voltage	<i>Voltage-source convertors</i>	USE:	Voltage-source converters
<i>Voltage mode control</i>		Voltmeters	BT:	Meters
USE:	Voltage control	RT:		Voltage measurement
Voltage multipliers		<i>Volume estimation</i>	USE:	Volume measurement
BT:	Circuits	Volume measurement	UF:	Volume estimation
RT:	AC-DC power converters Charge pumps Particle accelerators Rectifiers Transformers Voltage control	BT:		Mechanical variables measurement
NT:	Capacitors Diodes	RT:		Size measurement
<i>Voltage regulation</i>		Volume relaxation	BT:	Mechanical factors
USE:	Voltage control	<i>Volunteer computing</i>	USE:	Computer applications AND Distributed processing
<i>Voltage sags</i>		<i>Vortices, optical</i>	USE:	Optical vortices
USE:	Power quality	Voting	BT:	Government
Voltage source inverters		NT:		Electronic voting
BT:	Inverters	<i>VPN</i>	USE:	Virtual private networks
Voltage transformers		<i>VPU</i>	USE:	Graphics processing units
UF:	Potential transformers	<i>VSC</i>	USE:	Voltage-source converters
BT:	Instrument transformers	<i>VTR</i>	USE:	Video recording
RT:	Voltage measurement	W3C	UF:	World Wide Web
Voltage-controlled oscillators		Consortium	BT:	Standards organizations
UF:	VCO Voltage controlled	W3C Standards	BT:	Standards publications
oscillators		Wafer bonding	BT:	Bonding processes Semiconductor device manufacture
BT:	Oscillators			
RT:	Ring oscillators			
<i>Voltage-mode control</i>				
USE:	Voltage control			
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				



2022 IEEE Thesaurus

Wafer level packaging

USE: Wafer scale integration

Wafer scale integration

UF: Wafer level packaging
Wafer-level packaging
BT: Circuits
Integrated circuits
Large scale integration

Wafer-level packaging

USE: Wafer scale integration

Walking

USE: Legged locomotion

WAMS

USE: Wide area measurements

WAN

USE: Wide area networks

WANs

USE: Wide area networks

WAP

USE: Wireless access points

AND

Wireless application
protocol

Warehousing

BT: Material storage
RT: Production facilities
Stacking
Storage automation

Warning systems

USE: Alarm systems

Warranties

UF: Product warranties
Product warranty
BT: Product liability

Washing machines

BT: Electric machines
Electrical products
Home appliances
Home automation

Waste compaction

USE: Waste reduction

Waste disposal

BT: Waste management
RT: Effluents
Pollution
Radioactive waste
Sanitary engineering
Slag
NT: Incineration
Radioactive waste disposal

Waste electrical and electronic equipment

USE: Electronic waste

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 incineration

USE: Incineration

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



2022 IEEE Thesaurus

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: 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
RT: Pollution
Effluents
Industrial pollution
Lakes
Oils
Rivers
Sanitary engineering
Sewage treatment



2022 IEEE Thesaurus

	Thermal pollution	<i>Water trees</i>	
	Waste materials	USE:	Trees - insulation
	Wastewater		
	Wastewater treatment	<i>Water-storage</i>	
	Water	USE:	Water storage
	Water quality		
	Water resources	<i>Watermark</i>	
NT:	Marine pollution	USE:	Watermarking
Water pumps		Watermarking	
BT:	Pumps	UF:	Audio watermarking
RT:	Automotive components		Digital watermarking
	Cooling		Image watermarking
	Hydraulic equipment		Watermark
	Irrigation	BT:	Security
	Photovoltaic systems	RT:	Copyright protection
	Wastewater		Embossing
			Internet of Things
Water quality		<i>Watt hour meters</i>	
BT:	Water	USE:	Watthour meters
RT:	Water pollution		
<i>Water recycling</i>		<i>Watt-hour meters</i>	
USE:	Water conservation	USE:	Watthour meters
Water resources		Watthour meters	
BT:	Environmental	UF:	Watt hour meters
management			Watt-hour meters
RT:	Lakes	BT:	Wattmeters
	Remote sensing	RT:	Energy measurement
	Rivers		
	Water	Wattmeters	
	Water conservation	BT:	Meters
	Water pollution	RT:	Power measurement
NT:	Desalination	NT:	Watthour meters
	Reservoirs		
	Water monitoring	<i>WAVE</i>	
Water splitting		USE:	Wireless Access in
BT:	Chemical processes		Vehicular Environments
RT:	Chemical reactions	<i>Wave diffraction</i>	
	Hydrogen	USE:	Diffraction
	Photochemistry		
	Water	Wave energy conversion	
Water storage		UF:	Wave energy converters
UF:	Water-storage	BT:	Energy conversion
BT:	Material storage		Hydroelectric power
RT:	Crops	generation	
	Lakes	<i>Wave energy converters</i>	
	Land use planning	USE:	Wave energy conversion
	Water		
	Water conservation	<i>Wave equations</i>	
NT:	Dams	USE:	Propagation
	Reservoirs		



2022 IEEE Thesaurus

Wave functions

BT: Waves
 RT: Conformal mapping
 Elementary particle
 exchange interactions
 NT: Functional analysis
 Wavelet analysis
 Wavelet domain

Wave power

BT: Energy resources
 Ocean waves
 RT: Renewable energy sources

Wave propagation

USE: Propagation

Wave scattering

USE: Scattering

Waveform analysis

USE: Signal analysis

Waveform generators

USE: Signal generators

Waveguide components

BT: Electromagnetic
 waveguides
 RT: Circulators
 Conformal mapping
 Gap waveguide
 Helical antennas
 Waveguide theory
 NT: Optical waveguides
 Power combiners
 Power dividers

Waveguide discontinuities

UF: Irises
 Waveguide obstacles
 BT: Transmission line
 discontinuities
 RT: Electromagnetic
 waveguides
 Loaded waveguides
 Waveguide theory
 NT: Reflection coefficient
 Waveguide transitions

Waveguide junctions

BT: Junctions

Waveguide lasers

BT: Electromagnetic
 waveguides
 RT: Lasers
 NT: Substrate integrated
 waveguides

Waveguide obstacles

USE: Waveguide discontinuities

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 convertors

USE: Wavelength converters

Wavelength division multiplexed

USE: Wavelength division
 multiplexing

Wavelength division multiplexing

UF: WDM
 Wavelength division
 multiplexed
 Wavelength-division
 multiplexing
 BT: Multiplexing



2022 IEEE Thesaurus

RT:	Bragg gratings		Acoustic scattering
	Multicast communication		Electromagnetic
NT:	WDM networks	propagation	
Wavelength measurement			Electromagnetic radiation
BT:	Measurement		Electromagnetic scattering
RT:	Acoustic measurements	NT:	Time-domain analysis
	Electromagnetic		Atmospheric waves
measurements			Berry phase
	Frequency measurement		Doppler effect
	Hyperspectral sensors		Electrodynamics
	Optical variables		Magnetostatic waves
measurement			Matter waves
			Plasma waves
Wavelength routing			Propagation
BT:	Routing		Reflectivity
			Seismic waves
<i>Wavelength-division multiplexing</i>			Shock waves
USE:	Wavelength division		Solitons
multiplexing			Surface acoustic waves
			Wave functions
Wavelet analysis		<i>WDM</i>	
BT:	Wave functions	USE:	Wavelength division
RT:	Wavelet transforms	multiplexing	
NT:	Multiresolution analysis		
Wavelet coefficients		WDM networks	
BT:	Wavelet transforms	BT:	Wavelength division
		multiplexing	
Wavelet domain		Weapons	
BT:	Wave functions	UF:	Bomb
			Munitions
<i>Wavelet neural networks</i>			Ordinance
USE:	Neural networks	BT:	Military equipment
		RT:	Defense industry
Wavelet packets			Electronic countermeasures
BT:	Wavelet transforms		Military systems
			Terrorism
Wavelet transforms		NT:	Guns
BT:	Transforms		Missiles
RT:	Harmonic analysis		Nuclear weapons
	Signal analysis		Projectiles
	Signal processing		
	Signal representation		
	Wavelet analysis		
NT:	Biorthogonal modulation		
	Continuous wavelet		
transforms			
	Discrete wavelet transforms		
	Wavelet coefficients		
	Wavelet packets		
Waves		Wearable computers	
BT:	Physics	UF:	Body borne computers
RT:	Acoustic propagation		Wearable computing
			Wearable devices
			Wearable electronics
			Wearables
		BT:	Computers
			Pervasive computing
		RT:	Fall detection
			Internet of Medical Things
			Smart textiles
			Soft electronics



2022 IEEE Thesaurus

NT:	Smart glasses	Wireless sensor networks
	Wearable Health Monitoring	
Systems		<i>Wearables</i>
		USE: Wearable computers
<i>Wearable computing</i>		<i>Weather</i>
USE: Wearable computers		USE: Meteorology
<i>Wearable devices</i>		Weather forecasting
USE: Wearable computers		UF: Weather prediction
<i>Wearable electronics</i>		BT: Meteorology
USE: Wearable computers		NT: Wind forecasting
Wearable Health Monitoring Systems		<i>Weather prediction</i>
UF: Apple watch		USE: Weather forecasting
	Fitbit	
	Smartwatch	Weaving
	WHMS	BT: Textile technology
BT: Smart healthcare		RT: Cotton
	Wearable computers	Fabrics
RT: Electronic healthcare		Textile fibers
	Smart devices	Textile industry
		Textiles
Wearable robots		Web 2.0
UF: Hardsuit		BT: Internet
	Powered armor	
	Powered exoskeleton	Web and internet services
BT: Robots		UF: Baidu
RT: Assistive technologies		Internet services
	Biomechanics	BT: Web services
	Human-robot interaction	
	Medical robotics	<i>Web browsers</i>
	Military equipment	USE: Browsers
	Military robotics	
	Military systems	<i>Web cams</i>
	Mobile robots	USE: Webcams
	Orthotics	
	Prosthetics	Web design
	Service robots	UF: Web site design
	Wearable sensors	BT: Web sites
		RT: Authoring systems
Wearable sensors		Content management
BT: Sensors		Software design
RT: Biosensors		User interfaces
	Body sensor networks	NT: Web page design
	Image sensors	Web pages
	Infrared detectors	
	Magnetic sensors	<i>Web filters</i>
	Nanosensors	USE: Information filters
	Optical sensors	
	Pressure sensors	Web mining
	Sensor arrays	BT: Data mining
	Sensor fusion	
	Tactile sensors	
	Wearable robots	



2022 IEEE Thesaurus

Weibull fading channels

BT: Fading channels

Automotive components

Automotive engineering

Axles

Flanges

Machine components

Manufacturing

Production

Steering systems

Structural plates

Tires

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

Whispering gallery modes

UF: Whispering-gallery modes
BT: Optics
RT: Microcavities

Whispering-gallery modes

USE: Whispering gallery modes

White blood cells

BT: Blood

White matter

BT: Central nervous system
RT: Action potentials
Axons
Brain
Learning systems

Well logging

BT: Geophysics
Petroleum industry
RT: Oil drilling
Seismology

Wet etching

BT: Etching

Wetlands

BT: Ecosystems
Geoscience
RT: Hydrology
Lakes
Rivers
Water

White noise

BT: Noise
RT: AWGN channels
Music
Random number

generation

NT: AWGN

Whale optimization algorithms

BT: Algorithms
RT: Biomimetics

White spaces

BT: Radio spectrum
management

WHMS

USE: Wearable Health Monitoring
Systems

Whales

BT: Marine animals

Whole body imaging

BT: Biomedical image
processing

WhatsApp

USE: Freeware AND
Internet telephony

Wheelchairs

BT: Assistive technologies

Whole-body PET

BT: Positron emission
tomography

Wheels

BT: Mechanical products
RT: Automobile manufacture

wi-fi

USE: Wireless fidelity



2022 IEEE Thesaurus

Wi-Fi 6

USE: IEEE 802.11ax Standard

Wi-Max

USE: WiMAX

Wide area measurement systems

USE: Wide area measurements

Wide area measurements

UF: WAMS
Wide area measurement

systems

systems

Wide-area measurement
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

Wide-area measurement systems

USE: Wide area measurements

Wide-area measurements

USE: Wide area measurements

Wideband

BT: Bandwidth
Communication systems
RT: Narrowband

Wideband amplifiers

USE: Broadband amplifiers

Wideband antennas

USE: Broadband antennas

Wiener filters

BT: Noise reduction

wifi

USE: Wireless fidelity

Wiggler magnets

USE: Undulators

WiGig

USE: IEEE 802.11 Standard

Wild fires

USE: Fires

Wildfires

USE: Fires

Wildlife

BT: Animals

WiMax

USE: WiMAX

Wimax

USE: WiMAX

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



2022 IEEE Thesaurus

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 farm

USE: Wind farms

Wind farms

UF: Wind farm
BT: Energy resources

Wind forecasting

BT: Weather forecasting
Wind
RT: Wind energy
Wind energy generation
Wind turbines

Wind integration

USE: Wind energy integration

Wind power

USE: Wind power generation

Wind power generation

UF: Wind power
BT: Power generation
RT: Turbogenerators
Wind
Wind energy
NT: Wind energy conversion

Wind power grid integration

USE: Wind energy integration

Wind speed

BT: Wind
RT: Wind stress

Wind stress

BT: Stress
Wind
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

Wind-energy

USE: Wind energy

Windings

UF: Transformer windings
BT: Electromagnetic fields
RT: AC machines
Coils
Electric machines
Magnetic circuits
Power transformers
Rotating machines
Transformers
NT: Machine windings

Windows

BT: Building materials
Manufactured products
RT: Glass products
Vents

Windscreens wipers

USE: Automotive components

Windscreens

USE: Automotive components

Windshield wipers

USE: Automotive components



2022 IEEE Thesaurus

Windshields

USE: Automotive components

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 networks

USE: Wireless networks

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 ad hoc network

USE: Mobile ad hoc networks

Wireless application protocol

UF: WAP
BT: Protocols
Wireless communication

Wireless cellular systems

BT: Wireless networks

Wireless charging

USE: Inductive charging

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
Reconfigurable intelligent

surfaces

Regional area networks
Wireless LAN
Wireless fidelity
Cognitive radio
Cooperative communication
Dedicated short range

NT:

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 digital devices

USE: Personal digital devices

Wireless energy transmission

USE: Wireless power transfer

Wireless fidelity

UF: wi-fi
wifi
BT: Wireless LAN
RT: IEEE 802.11 Standard
Light fidelity
Radio frequency



2022 IEEE Thesaurus

	Wireless access points	Wireless Access in
	Wireless communication	Vehicular Environments
		Wireless cellular systems
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	
<i>Wireless local area networks</i>		
USE:	Wireless LAN	
Wireless mesh networks		
BT:	Communication systems	
RT:	Wireless sensor networks	
<i>Wireless Metropolitan Area Networks</i>		
USE:	Wireless LAN	
Wireless networks		
UF:	Wireless access networks	
BT:	Wireless communication	
RT:	Acoustic communication	
(telecommunication)		
	IEEE 802.11p Standard	
	IEEE 802.22 Standard	
	Nanocommunication	
(telecommunication)		
	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
		<i>Wireless regional area networks</i>
		USE:
		WRAN
		<i>Wireless security</i>
		USE:
		Communication system
		security
		Wireless sensor networks
		UF:
		Underwater sensor
		networks
		BT:
		Communication systems
		Vehicular and wireless
		technologies
		RT:
		Ad hoc networks
		Cyber-physical systems
		Edge computing
		Internet of Things
		Machine-to-machine
		communications
		Microsensors
		Nanocommunication
		(telecommunication)
		Sensors
		Wearable sensors
		Wireless LAN
		Wireless mesh networks
		NT:
		Body sensor networks
		Event detection
		<i>Wireless systems</i>
		USE:
		Wireless communication



2022 IEEE Thesaurus

Wires

BT: Structural shapes
RT: Nanowires
Spirals
NT: Wire drawing

Wiring

BT: Electric variables
RT: Building services
Cables
Conductors
Layout
Metallization
Printed circuits
Wire

WLAN

USE: Wireless LAN

Wolfram

USE: Tungsten

Women's issues

USE: Gender issues

Wood alcohol

USE: Methanol

Wood industry

BT: Industries
RT: Forestry
Pulp and paper industry
Pulp manufacturing

Wood naphtha

USE: Methanol

Wood poles

USE: Poles and towers

Wood spirits

USE: Methanol

Wool

BT: Agricultural products
Textiles
RT: Clothing
Fabrics
Natural fibers
Textile fibers
Yarn

Word cloud

USE: Tag clouds

Word processing

USE: Text processing

Work-place

USE: Employment

Workability

BT: Mechanical factors

Workflow management software

UF: Workflow management
system
BT: Office automation

Workflow management system

USE: Workflow management
software

Working conditions

USE: Employee welfare

Working environment noise

UF: Environmental noise
BT: Acoustic noise
RT: Ergonomics
Hazards
Occupational health
Occupational safety

Workplace

USE: Employment

Workshops

USE: Conferences

Workstation clusters

USE: Cluster computing

Workstations

BT: Microcomputers
RT: Cluster computing
Computer displays
Computer graphics
Peer-to-peer computing

World Wide Web

UF: WWW
BT: Computer applications
RT: Cyberspace
Internet
Web sites
NT: Bot (Internet)
Mashups



2022 IEEE Thesaurus

World Wide Web Consortium

USE: W3C

Worldwide Interoperability for Microwave Access

USE: WiMAX

Worm gears

USE: Gears

Worms

USE: Grippers

Worms (computer)

USE: Computer worms

Wounds

BT: Injuries

Woven fabric composites

USE: Fabrics

WP-BPEL

USE: Business Process

Execution Language

WPAN

USE: Wireless personal area

networks

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

Written character recognition

USE: Handwriting recognition

Written characters

USE: Handwriting recognition

Written-character recognition

USE: Handwriting recognition

WWW

USE: World Wide Web

WWW robot

USE: Bot (Internet)

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



2022 IEEE Thesaurus

	X-ray detectors				X-ray tomography
	X-ray imaging				
X-ray detectors		X3D			
BT:	Ionizing radiation sensors	BT:		Computer graphics	
RT:	Crystallography	RT:		Three-dimensional displays	
	Electromagnetic radiation			ISO Standards	
	Gamma-ray detectors	Xenon			
	Radiation detectors	BT:		Gases	
	X-ray detection	<i>Xerography</i>			
	X-ray imaging	USE:		Electrophotography	
	X-rays				
X-ray diffraction		XML			
BT:	Electromagnetic diffraction	UF:		Automatic Test Markup	
		Language			
X-ray imaging				Extensible Markup Language	
BT:	X-ray applications	BT:		Markup languages	
RT:	Gamma-ray detectors				
	Phantoms	<i>XPM</i>			
	Radiography	USE:		Cross-phase modulation	
	X-ray detection				
	X-ray detectors	<i>XR</i>			
NT:	Plasma x-ray sources	USE:		X reality	
X-ray lasers		<i>XRD</i>			
BT:	Lasers	USE:		X-ray scattering	
	X-ray applications				
RT:	Plasma x-ray sources	<i>XSS</i>			
	X-rays	USE:		Cross-site scripting	
X-ray lithography		<i>Y-Ba-Cu-O</i>			
BT:	Lithography	USE:		Yttrium barium copper oxide	
X-ray scattering		<i>Yachts</i>			
UF:	XRD	USE:		Boats	
BT:	X-rays				
X-ray telescopes		Yagi-Uda antennas			
BT:	Telescopes	BT:		Antennas	
	X-rays				
RT:	Aerospace electronics	Yarn			
	X-ray applications	BT:		Textile fibers	
	X-ray astronomy	RT:		Wool	
X-ray tomography		<i>YBa2Cu3O7</i>			
BT:	X-rays	USE:		Yttrium barium copper oxide	
		<i>YBCO</i>			
X-rays		USE:		Yttrium barium copper oxide	
BT:	Medical services	<i>Yield estimate</i>			
RT:	Collimators	USE:		Yield estimation	
	Electromagnetic radiation				
	Synchrotron radiation	Yield estimation			
	Undulators	UF:		Yield estimate	
	X-ray detectors	BT:		Estimation	
	X-ray lasers	RT:		Circuit analysis	
NT:	X-ray applications			Crops	
	X-ray astronomy			Microprocessor chips	
	X-ray detection	<i>Young modulus</i>			
	X-ray scattering	USE:		Young's modulus	
	X-ray telescopes				



2022 IEEE Thesaurus

Young's modulus

UF: 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
RT: Yttrium compounds
Barium compounds

Yttrium compounds

BT: Yttrium
RT: Alloying
NT: Yttrium barium copper oxide

ZCS

USE: Zero current switching

Zero correlation zone

BT: Codes
Multiaccess communication
Sequential analysis

Zero current switching

UF: ZCS
Zero-current switching
BT: Switching circuits
RT: Inverters
Switching converters

Zero knowledge proof

BT: Cryptography
Protocols

Zero voltage switching

UF: ZVS
Zero-voltage switching
BT: Switching circuits
RT: Inverters
Switching converters

Zero-current switching

USE: Zero current switching

Zero-voltage switching

USE: Zero voltage switching

Zeros

USE: Poles and zeros

Zigbee

BT: Radio communication
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

ZINDO

USE: Computational modeling

Zip fasteners

USE: Fasteners

Zirconium

BT: Chemical elements

Zn

USE: Zinc

ZnO

USE: Zinc oxide

Zoology

BT: Biology
NT: Animals
Entomology

ZVS

USE: Zero voltage switching

