

# Physics and Astronomy Classification Scheme

*PACS codes adopted by AAPT for their journal indexing.*

01.00.00	<u>COMMUNICATION, EDUCATION, HISTORY AND PHILOSOPHY</u>	02.40.-k	Geometry, differential geometry, and topology
01.10.-m	Announcements, news, and organizational activities	02.50.-r	Probability theory, stochastic processes, and statistics
01.30.-y	Physics literature and publications	02.60.-x	Numerical approximation and analysis
01.30.Bb	Publications of lectures (advanced institutes, summer schools, etc.)	02.70.-c	Computational techniques; simulations
01.30.Cc	Conference proceedings	02.90.+p	Other topics in mathematical methods in physics
01.30.Ee	Monographs and collections	03.00.00	<u>QUANTUM MECHANICS, FIELD THEORIES, AND SPECIAL RELATIVITY</u>
01.30.Kj	Handbooks, dictionaries, tables, and data compilations	03.30.+p	Special relativity
01.30.la	Secondary schools	03.50.-z	Classical field theories
01.30.lb	Undergraduate schools	03.65.-w	Quantum mechanics
	Textbooks	03.70.+k	Theory of quantized fields
01.30.mm	Textbooks for graduates and researchers	04.00.00	<u>GENERAL RELATIVITY AND GRAVITATION</u>
01.30.mp	Textbooks for undergraduates	05.00.00	<u>STATISTICAL PHYSICS, THERMODYNAMICS, AND NONLINEAR DYNAMICAL SYSTEMS</u>
01.30.mr	Textbooks for students in grades 9-12	05.20.-y	Classical statistical mechanics
01.30.mt	Textbooks for students in grades K-8	05.20.Dd	Kinetic theory
01.30.Os	Books of general interest to physics teachers	05.40.-a	Fluctuation phenomena, random processes
01.30.Rr	Surveys and tutorial papers; resource letters	05.45.-a	Chaos; nonlinear dynamics and nonlinear dynamical systems
01.30.Tt	Bibliographies	05.60.-k	Transport processes
01.30.Vv	Book reviews	05.70.-a	Thermodynamics
01.40.-d	Education	05.70.Ce	Thermodynamic functions and equations of state
01.40.Di	Course design and evaluation	06.00.00	<u>METROLOGY, MEASUREMENTS, AND LABORATORY PROCEDURES</u>
	Science in school	06.20.Dk	Measurement and error theory
01.40.eg	Elementary school	06.20.F-	Units and standards
01.40.ek	Secondary school	06.20.fa	Units
01.40.Fk	Research in physics education	06.20.fb	Standards and calibration
01.40.G-	Curricula and evaluation	06.20.Jr	Determination of fundamental constants
01.40.gb	Teaching methods and strategies	06.30.Bp	Spatial dimensions
01.40.gf	Theory of testing and techniques	06.30.Dr	Mass and density
01.40.Ha	Learning theory and science teaching	06.30.Ft	Time and frequency
01.40.J-	Teacher training	06.30.Gv	Velocity, acceleration, and rotation
01.40.jc	Preservice training	06.30.Ka	Basic electromagnetic quantities
01.40.jh	Inservice training	06.60.-c	Laboratory procedures
	Educational aids	07.00.00	<u>INSTRUMENTS, APPARATUS, AND COMPONENTS COMMON TO SEVERAL BRANCHES OF PHYSICS AND ASTRONOMY</u>
01.50.F-	Audio and visual aids	07.05.-t	Computers in experimental physics
01.50.fd	Audio devices	07.05.Kf	Data analysis: algorithms and implementation; data management
01.50.ff	Films; electronic video devices	07.07.Hj	Display and recording equipment
01.50.fh	Posters, cartoons, art, etc.	07.07.Mp	Transducers
	Computers in education	07.07.Tw	Servo and control equipment; robots
01.50.ht	Instructional computer use	07.10.-h	Mechanical instruments and equipment
01.50.hv	Computer software and software reviews	07.20.-n	Thermal instruments and apparatus
01.50.My	Demonstration experiments and apparatus	07.20.Mc	Cryogenics, refrigerators, low temperature detectors
01.50.Pa	Laboratory experiments and apparatus	07.30.-t	Vacuum apparatus
01.50.Qb	Laboratory course design, organization, and evaluation	07.35.+k	High-pressure apparatus; shock tubes; diamond anvil cells
01.50.Rt	Physics tournaments and contests	07.50.-e	Electrical and electronic instruments and components
01.50.Wg	Physics of toys	07.55.-w	Magnetic instruments and components
01.50.Zv	Errors in physics classroom materials	07.57.Ty	Infrared spectrometers, auxiliary equipment, techniques
01.55.+b	General physics	07.60.-j	Optical instruments and equipment
01.60.+q	Biographies, tributes, personal notes, and obituaries	07.68.+m	Photography, photographic instruments; xerography
01.65.+g	History of science	07.75.+h	Mass spectrometers
01.70.+w	Philosophy of science		
01.75.+m	Science and society		
01.80.+b	Physics of games and sports		
01.85.+f	Careers in physics and science		
01.90.+g	Other topics of general interest		
02.00.00	<u>MATHEMATICAL METHODS IN PHYSICS</u>		
02.10.-v	Logic, set theory, and algebra		

07.77.-n	Atomic, molecular, and charged-particle sources and detectors	42.66.-p	Physiological optics
07.78.+s	Electron, positron, and ion microscopes; electron diffractometers	42.68.-w	Atmospheric and ocean optics
07.81.+a	Electron and ion spectrometers	42.70.-a	Optical materials
07.85.-m	X- and gamma-ray instruments	42.72.-g	Optical sources and standards
07.90.+c	Other topics in metrology, measurements, and laboratory procedures	42.79.-e	Optical elements, devices, and systems
		42.79.Bh	Lenses, prisms, and mirrors
		42.90.+m	Other topics in optics
10.00.00	<u>THE PHYSICS OF ELEMENTARY PARTICLES AND FIELDS</u>	43.00.00	Acoustics
11.00.00	General theory of fields and particles	43.28.+h	Aeroacoustics and atmospheric sound
12.00.00	Specific theories and interaction models; particle systematics	43.30.+m	Underwater sound
13.00.00	Specific reactions and phenomenology	43.35.+d	Ultrasonics, quantum acoustics, and physical effects of sound
14.00.00	Properties of specific particles	43.38.+n	Transduction: acoustical devices for the generation and reproduction of sound
20.00.00	<u>NUCLEAR PHYSICS</u>	43.40.+s	Structural acoustics and vibrations
21.00.00	Nuclear structure	43.50.+y	Noise: its effects and control
23.00.00	Radioactive decay and in-beam spectroscopy	43.55.+p	Architectural acoustics
24.00.00	Nuclear reactions: general	43.58.+z	Acoustical measurements and instrumentation
25.00.00	Nuclear reactions: specific reactions	43.60.+d	Acoustic signal processing
27.00.00	Properties of specific nuclei listed by mass ranges	43.64.+r	Physiological acoustics
28.00.00	Nuclear engineering and nuclear power studies	43.66.+y	Psychological acoustics
30.00.00	<u>ATOMIC AND MOLECULAR PHYSICS</u>	43.70.+i	Speech production
31.00.00	Electronic structure of atoms and molecules: theory	43.71.+m	Speech perception
32.00.00	Atomic properties and interactions with photons	43.72.+q	Speech processing and communication systems
33.00.00	Molecular properties and interactions with photons	43.75.+a	Music and musical instruments
34.00.00	Atomic and molecular collision processes and interactions	43.80.+p	Bioacoustics
36.00.00	Exotic atoms and molecules; macromolecules; clusters	43.90.+v	Other topics in acoustics
40.00.00	<u>ELECTROMAGNETISM, OPTICS, ACOUSTICS, HEAT TRANSFER, CLASSICAL MECHANICS, AND FLUID DYNAMICS</u>	44.00.00	Heat Transfer
41.00.00	Electromagnetism; electron and ion optics	44.10.+i	Heat conduction
41.20.-q	Applied classical electromagnetism	44.25.+f	Natural convection
41.20.Cv	Electrostatics; Poisson and Laplace equations, boundary-value problems	44.27.+g	Forced convection
41.20.Gz	Magnetostatics; magnetic shielding; magnetic induction, boundary-value problems	44.90.+c	Other topics in heat transfer
41.20.Jb	Electromagnetic wave propagation; radiowave propagation	45.00.00	Classical Mechanics of Discrete Systems
41.60.-m	Radiation by moving charges	45.20.D-	Newtonian mechanics
41.75.Ak	Positive-ion beams	45.20.da	Forces and torques
41.75.Cn	Negative-ion beams	45.20.dc	Rotational dynamics
41.75.Fr	Electron and positron beams	45.20.df	Momentum conservation
41.75.Ht	Relativistic electron and positron beams	45.20.dg	Mechanical energy, work, and power
41.85.-p	Beam optics	45.20.dh	Energy conservation
41.90.+e	Other topics in electromagnetism	45.40.-f	Dynamics and kinematics of rigid bodies
42.00.00	Optics	45.40.Aa	Translation kinematics
42.15.Dp	Wave fronts and ray tracing	45.40.Bb	Rotational kinematics
42.25.Bs	Wave propagation, transmission and absorption	45.50.Tn	Collisions
42.25.Dd	Wave propagation in random media	46.00.00	Continuum mechanics of solids
42.25.Fx	Diffraction and scattering	46.25.-y	Static elasticity
42.25.Gy	Edge and boundary effects; reflection and refraction	46.35.+z	Viscoelasticity, plasticity, viscoplasticity
42.25.Hz	Interference	46.40.-f	Vibrations and mechanical waves
42.25.Ja	Polarization	46.55.+d	Tribology and mechanical contacts
45.25.Kb	Coherence	47.00.00	Fluid Dynamics
42.25.Lc	Birefringence	47.10.-g	General theory
42.30.-d	Imaging and optical processing	47.15.-x	Laminar flows
42.40.-i	Holography	47.20.-k	Flow instabilities
42.55.-f	Lasers	47.27.-i	Turbulent flows
		47.32.-y	Vortex dynamics; rotating fluids
		47.35.-i	Hydrodynamic waves; free surface flows
		47.40.-x	Compressible flows; shock waves
		47.45.-n	Rarefied gas dynamics
		47.55.-t	Multiphase and stratified flows
		47.65.-d	Magnetohydrodynamics and electrohydrodynamics
		47.70.-n	Reactive and radiative flows

47.80.-v	Instrumentation and measurement methods	78.66.-w	Optical properties of specific thin films
47.90.+a	Other topics in fluid dynamics	78.90.+t	Other topics in optical properties, condensed matter spectroscopy and other interactions of particles and radiation with condensed matter
50.00.00	<u>PHYSICS OF GASES, PLASMAS, AND ELECTRIC DISCHARGES</u>	80.00.00	<u>INTERDISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY</u>
51.00.00	Physics of gases	81.00.00	Materials science
51.10.+y	Kinetic and transport theory of gases	82.00.00	Physical chemistry and chemical physics
51.20.+d	Viscosity, diffusion, and thermal conductivity	82.47.-a	Applied electrochemistry
51.30.+i	Thermodynamic properties, equations of state	82.60.-s	Chemical thermodynamics
51.40.+p	Acoustical properties	84.00.00	Electronics; radiowave and microwave technology; direct energy conversion and storage
51.50.+v	Electrical properties (ionization, breakdown, etc.)	84.30.-r	Electronic circuits
51.60.+a	Magnetic properties	84.30.Bv	Circuit theory
51.70.+f	Optical and dielectric properties	84.32.Dd	Connectors, relays, and switches
51.90.+r	Other topics in the physics of gases	84.32.Ff	Conductors, resistors
52.00	Physics of plasmas and electric discharges	84.32.Hh	Inductors and coils; wiring
60.00.00	<u>CONDENSED MATTER: STRUCTURAL, MECHANICAL AND THERMAL PROPERTIES</u>	84.40.Az	Waveguides, transmission lines, striplines
62.00.00	Mechanical and acoustical properties of condensed matter	84.40.Ba	Antennas: theory, components and accessories
62.10.+s	Mechanical properties of liquids	84.47.+w	Vacuum tubes
62.20.-x	Mechanical properties of solids	84.60.-h	Direct energy conversion and storage
62.20.Dc	Elasticity, elastic constants	85.00.00	Electronic and magnetic devices; microelectronics
62.30.+d	Mechanical and elastic waves; vibrations	85.25.-j	Superconducting devices
62.60.+v	Acoustical properties of liquids	85.30.-z	Semiconductor devices
62.65.+k	Acoustical properties of solids	85.50.-n	Dielectric, ferroelectric, and piezoelectric devices
62.90.+k	Other topics in mechanical and acoustical properties of condensed matter	85.60.-q	Optoelectronic devices
63.00	Lattice dynamics	85.70.-w	Magnetic devices
64.00	Equations of state, phase equilibria, and phase transitions	85.80.-b	Thermoelectromagnetic and other devices
65.00.00	Thermal properties of condensed matter	85.90.+h	Other topics in electronic and magnetic devices and microelectronics
65.20.+w	Thermal properties of liquids: heat capacity, thermal expansion	87.00.00	Biological and medical physics
	Thermal properties of crystalline solids	89.00.00	Other areas of applied and interdisciplinary physics
65.40.Ba	Heat capacity	89.20.Bb	Industrial and technological research and development
65.40.De	Thermal expansion; thermomechanical effects	89.30.-g	Energy resources
65.40.Gr	Entropy and other thermodynamical properties	89.40.-a	Transportation
65.90.+i	Other topics in thermal properties of condensed matter	89.60.-k	Environmental studies
66.00.00	Transport properties of condensed matter (nonelectronic)	89.65.Lm	Urban planning and construction
67.00.00	Quantum fluids and solids; liquid and solid helium	89.70+c	Information theory and communication theory
68.00.00	Surfaces and interfaces; thin films and low-dimensional systems (structure and nonelectronic properties)	91.00.00	Solid Earth Physics
72.00.00	Electronic transport in condensed matter	92.00.00	Hydrospheric and atmospheric geophysics
73.00.00	Electronic structure and electrical properties of surfaces, interfaces, thin films and low-dimensional structures	93.00.00	Geophysical observations, instrumentation, and techniques
73.20.-r	Electron states at surfaces and interfaces	94.00.00	Physics of the ionosphere and magnetosphere
74.00	Superconductivity	95.00.00	Fundamental astronomy and astrophysics; instrumentation, techniques, and astronomical observations
75.00	Magnetic properties and materials	95.10.-a	Fundamental astronomy
76.00	Magnetic resonances and relaxations in condensed matter, Mossbauer effect	95.30.-k	Fundamental aspects of astrophysics
77.00.00	Dielectrics, piezoelectrics, and ferroelectrics and their properties	95.40.+s	Artificial Earth satellites
77.65.-j	Piezoelectricity and electromechanical effects	95.45.+i	Observatories and site testing
78.00.00	Optical Properties, Condensed Matter Spectroscopy and Other Interactions of Radiation and Particles With Condensed Matter	95.55.-n	Astronomical and space-research instrumentation
78.20.-e	Optical properties of bulk materials and thin films	95.75.-z	Observation and data reduction techniques; computer modeling and simulation
78.40.-q	Absorption and reflection spectra: visible and ultraviolet	95.80.+p	Astronomical catalogs, atlases, sky surveys, databases, retrieval systems, archives, etc.
		95.85.-e	Astronomical observations
		95.90.+v	Historical astronomy and archaeoastronomy and other topics in fundamental astronomy and astrophysics; instrumentation, techniques, and astronomical observations
		96.00.00	Solar System; planetology
		97.00.00	Stars
		98.00.00	Stellar systems; interstellar medium; galactic and extragalactic objects and systems; the Universe
		99.10.-x	Errata and other corrections