

Physics

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Credit Limitations: Phys 100 carries no credit after 111 or 211; Phys 111 carries no credit after 211; 112 carries no credit after 212.

Phys 100 Fundamentals of Physics (4 cr)

May be used as core credit in J-3-b. For students in nontechnical fields. Conceptual study of laws of nature and their application, including mechanics, heat, electricity and magnetism, light, and modern physics. Three lec and one 2-hr lab a wk. (Spring only)

Phys 103 General Astronomy (3 cr)

May be used as core credit in J-3-b. Descriptive and physical astronomy; development of astronomical thought; properties and evolution of the solar system, stars, galaxies, and the universe. (Fall only)

Phys 104 Astronomy Lab (1 cr)

May be used as core credit in J-3-b. Naked eye, telescopic, and photographic observations of constellations, stars, and planets. One 2-hr lab a wk; some evening meetings.

Prereq or Coreq: Phys 103

Phys 111 General Physics I (4 cr)

May be used as core credit in J-3-b. Kinematics, forces and dynamics, conservation laws, thermodynamics, waves. Three lec, one recitation, and one 2-hr lab a wk.

Prereq: Math 143

Phys 112 General Physics II (4 cr)

May be used as core credit in J-3-b. Electricity, magnetism, optics, and modern physics. Three lec, one recitation, and one 2-hr lab a wk.

Prereq: Phys 111

Phys 200 (s) Physics Seminar (1 cr, max 8)

Introductory-level discussion of topics in modern physics; introduction to physics research topics and scientific information search techniques; written and/or oral reports of a pertinent topic in current physics. (Fall only)

Phys 211 Engineering Physics I (4 cr)

May be used as core credit in J-3-b. Kinematics and dynamics, Newton's laws, work and energy, rotational dynamics, linear and angular momentum, collisions, static equilibrium, oscillations, gravity and central forces. Three lec, one recitation, and one 2-hr lab a wk.

Prereq or Coreq: Math 170

Phys 212 Engineering Physics II (4 cr)

May be used as core credit in J-3-b. Electric fields and potentials, magnetic fields, capacitance and inductance, DC and AC circuits, electromagnetic waves. Three lec, one recitation, and one 2-hr lab a wk.

Prereq: Phys 211

Prereq or Coreq: Math 175

Phys 213 Engineering Physics III (4 cr)

Fluid dynamics, waves in elastic media, sound waves, temperature, heat and thermodynamics, kinetic theory, geometric and physical optics. Three lec, one recitation, and one 2-hr lab a wk. (Spring only)

Prereq: Phys 211

Prereq or Coreq: Math 175

Phys 301 Junior Physics Lab (2 cr)

Experimental techniques in modern physics, including optics, atomic, nuclear, and solid state physics; computer uses, error analysis, and scientific literature searches. One 1-hr lec and one 3-hr lab a wk. (Spring only)

Prereq: Phys 213 or Permission

Phys 305 Modern Physics (3 cr)

Quantum and relativity theories with applications to atomic, solid state, nuclear, and elementary particle physics. (Spring only)

Prereq: Phys 212

Coreq: Math 275 and Phys 213

Phys 321 Analytical Mechanics (3 cr)

Kinematics and dynamics of particles; Lagrange's and Hamilton's equations; Rigid body motion.

Prereq: 213 and Math 275

Phys 322 Analytical Mechanics (3 cr)

Principle of least action, dynamics of systems of particles, theory of oscillations, mechanics of continuous media.

Prereq: Phys 321

Phys 341 Electromagnetic Fields I (3 cr)

Theory using vector calculus; electrostatics; magnetostatics, electromagnetism, analysis of AC and DC circuits; Maxwell's equations; radiation and propagation of electromagnetic waves.

Prereq: 212 , 213 and Math 275

Phys 342 Electromagnetic Fields II (3 cr)

Theory using vector calculus; electrostatics; magnetostatics, electromagnetism, analysis of AC and DC circuits; Maxwell's equations; radiation and propagation of electromagnetic waves.

Prereq: Phys 341

Phys 351 Introductory Quantum Mechanics I (3 cr)

One-dimensional theory; free particle, bound states, potential barriers, harmonic oscillator, matrix methods, and Dirac notation; interpretations of quantum theory.

Prereq: Phys 305, 371

Phys 352 Introductory Quantum Mechanics II (3 cr)

Three-dimensional theory; angular momentum, motion in central potential, identical particles and spin, perturbation theory and variational methods.

Prereq: Phys 351

Phys ID371 Mathematical Physics (3 cr) WSU Phys 371

Same as Math 371. Mathematical techniques needed in upper-division physics courses, including vector analysis, matrices, Sturm-Liouville problems, special functions, partial differential equations, complex variables.

Prereq: Phys 212, Math 275

Phys 400 (s) Seminar (cr arr)**Phys 403 (s) Workshop (cr arr)****Phys 404 (s) Special Topics (cr arr)****Phys 411 Physical Instrumentation I (3 cr)**

Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two lec and one 3-hr lab a wk.

Prereq: Phys 212 or 213, and Math 275

Phys 412 Physical Instrumentation II (3 cr)

Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two lec and one 3-hr lab a wk.

Prereq: Phys 411

Phys ID-J425/J525 Relativity (3 cr) WSU Phys 425

Introduction to the Special and General Theories of Relativity. Principle of relativity, Poincare and Lorentz transformations and their consequences. Four-dimensional formulation of relativistic mechanics and electromagnetism. Principle of equivalence and the geometric theory of gravitation. Additional projects/assignments required for graduate credit.

Prereq for 425: Phys 305 and Senior standing

Prereq for 525: Admission to physics graduate program or Permission

Phys ID-J428/J528 Computational Physics (3 cr) WSU Phys 428

Numerical techniques for differentiation, quadrature, and integration of differential equations. Matrix operations. Monte Carlo methods. Applications to physical problems.

Prereq: Phys 305

Phys J433/ID&WS-J533 Thermal and Statistical Physics I (3 cr) WSU Phys 533

Classical thermodynamics, entropy, thermodynamic potentials, kinetic theory, classical and quantum statistical mechanics, ensembles, partition functions, introduction to phase transitions. (Fall only)

Coreq: Phys 351

Phys J443/J543 Optics (3 cr)

Geometrical optics, wave optics and physical optics with emphasis on modern instrumentation and methods of measurement. Additional projects/assignments required for graduate credit.

Prereq for Phys 443: Phys 342

Prereq for Phys 543: Admission to Physics Graduate program or Permission

Phys J444/J544 Quantum Optics (3 cr)

Introduction to the physics of lasers, laser spectroscopy, non-linear optical effects, and the interaction of radiation and matter. Additional projects/assignments required for graduate credit.

Prereq for Phys 444: Phys 212 or 213, Math 175, and Senior standing or Permission

Prereq for Phys 544: Admission to Physics Graduate program or Permission

Phys ID&WS-J463/J563 Solid State Physics(3 cr) WSU Phys 463/563

Phys 563 same as MSE 563. Crystal structure and lattice dynamics including elastic and thermal properties of solids; electron dynamics including band theory, theory of metals and semiconductors, superconductivity, and magnetism; special topics chosen by the instructor. Additional projects/assignments required for graduate credit.

Prereq for 463: Phys 305

Prereq or **Coreq** for 463: Phys 322, Phys 342 and Phys 351

Prereq for Phys 563: Admission to physics graduate program or Permission

Phys ID&WS-J465/ID&WS-J565 Particle and Nuclear Physics (3 cr) WSU Phys 465/565

Particle production and detection, properties and classification of particles, the quark model of hadrons, symmetries and conservation laws, interactions, grand unification, the strong interaction and nuclear forces, models for nuclear structure and reactions. Additional projects/assignments required for graduate credit.

Prereq for 465: Phys 305

Prereq for 565: Admission to physics graduate program or Permission

Phys ID&WS-J484/J584 Astrophysics (3 cr) WSU Astr 435

Celestial mechanics; planets and planetary systems; structure and evolution of stars and star systems; special and general relativity; cosmology. Additional projects/assignments required for graduate credit.

Prereq for Phys 484: Phys 305 or Math 275; or Permission

Prereq for Phys 584: Admission to physics graduate program or Permission

Phys 490 Research (1-6 cr, max 6)

Undergrad thesis.

Prereq: Junior standing in physics and Permission of department

Phys 499 (s) Directed Study (cr arr)**Phys 500 Master's Research and Thesis (cr arr)****Phys 501 (s) Seminar (cr arr)**

Graded Pass/Fail.

Prereq: Permission

Phys 502 (s) Directed Study (cr arr)**Phys 503 (s) Workshop (cr arr)****Phys 504 (s) Special Topics (cr arr)****Phys R510 Radiation Shielding and Design Concepts (3 cr)**

Prereq: Basic differential and integral calculus, and Permission

Phys 511 Techniques of Experimental Physics (3 cr)

Development of experimental techniques and skills in active research fields; foundation for any field of physics. Nine hrs of lab a wk.

Phys 512 Techniques of Experimental Physics (3 cr)

Development of experimental techniques and skills in active research fields; foundation for any field of physics. Nine hrs of lab a wk.

Phys R517 Radiation Dosimetry Instrumentation (3 cr)

Radiation detection methods; stats, instrumentation, and close determination; emphasis on radiation protection.

Phys ID&WS521 Advanced Mechanics (3 cr) WSU Phys 521

Classical mechanics; Lagrange's and Hamilton's principles, two-body problem, rigid body motion, special relativity, canonical transformation, Hamilton-Jacobi theory, small oscillations, and Lagrangian and Hamiltonian formulations for continuous systems and fields.

Prereq: Phys 322

Phys 525 Relativity (3 cr)

See Phys J425/J525.

Phys 528 Computational Physics (3 cr)

See Phys J428/J528.

Phys ID&WS533 Thermal and Statistical Physics I (3 cr) WSU Phys 533

See Phys J433/J533.

Phys ID&WS541 Electromagnetic Theory (3 cr) WSU Phys 541

Includes Maxwell's equations, electrostatics, magnetostatics, currents and their interactions, general theory of emission, propagation and absorption of electromagnetic waves, boundary value problems, relativistic formulation of electrodynamics.

Prereq: Phys 322, 342

Phys ID&WS542 Electromagnetic Theory (3 cr) WSU Phys 542

Includes Maxwell's equations, electrostatics, magnetostatics, currents and their interactions, general theory of emission, propagation and absorption of electromagnetic waves, boundary value problems, relativistic formulation of electrodynamics.

Prereq: Phys 322, 342

Phys 543 Optics (3 cr)

See Phys J443/J543.

Phys 544 Quantum Optics (3 cr)

See Phys J444/J544.

Phys ID&WS550 Quantum Mechanics (3 cr) WSU Phys 550

Physical basis; Schroedinger wave formulation, Heisenberg matrix formulation, transformation theory, approximation methods, radiation theory, theory of scattering; application to atomic systems.

Prereq: Phys 305, Phys 322

Phys ID&WS551 Quantum Mechanics (3 cr) WSU Phys 551

Physical basis; Schroedinger wave formulation, Heisenberg matrix formulation, transformation theory, approximation methods, radiation theory, theory of scattering; application to atomic systems.

Prereq: Phys 305, Phys 322

Phys ID&WS552 Quantum Mechanics (3 cr) WSU Phys 552

Relativistic quantum mechanics, second quantization field theory and application.

Prereq: Phys 551

Phys ID&WS563 Solid State Physics (3 cr) WSU Phys 563

See Phys J463/J563.

Phys ID&WS565 Particle and Nuclear Physics (3 cr)

See Phys J465/J565.

Phys ID&WS571 Mathematical Methods of Physics (3 cr) WSU Phys 571

Methods and problems.

Prereq: Phys 322 or Permission

Phys 584 Astrophysics (3 cr)

See Phys J484/J584.

Phys 600 Doctoral Research and Dissertation (cr arr)