PHI 390 Topics in Philosophy
Semester supplements to this Bulletin contain specific descriptions when course is offered. May be repeated for credit as the topic changes. Prerequisites: One PHI course; one WST course. Consent of Research Track faculty
3 credits

PHI 391-G Topics in Philosophy
Semester supplements to this Bulletin contain specific descriptions when course is offered. Past topics have included Introduction to Indian Philosophy, and Bergson. Semester supplements to this Bulletin contain specific descriptions when course is offered. May be repeated for credit as the topic changes. Designed for upper-division students, this course provides an in-depth study of a specific topic within humanities disciplines such as music, art, literature, religion, and philosophy. Students will be expected to demonstrate knowledge of the conventions and methods used in the humanities discipline(s) studied. May be repeated for credit as the topic changes. Prerequisites: Two courses in philosophy
3 credits

PHI 400-G Individual Systems of the Great Philosophers (I)
A detailed study of the works of a single great philosopher. Semester Supplements to this Bulletin contain description when course is offered. May be repeated as the topic changes. Prerequisite: One of the following: PHI 300, 304, 306, 308, 309, 310, or 312
3 credits

PHI 401-G Individual Systems of the Great Philosophers (II)
A detailed study of the works of a single great philosopher. Semester Supplements to this Bulletin contain description when course is offered. May be repeated as the topic changes. Prerequisite: One of the following: PHI 300, 304, 306, 308, 309, 310, or 312
3 credits

PHI 402-G Analysis of Philosophic Texts (I)
Detailed analysis of a major philosophic text. Semester Supplements to this Bulletin contain description when course is offered. May be repeated as the topic changes. Prerequisite: One of the following: PHI 300, 304, 306, 308, 309, 310, or 312
3 credits

PHI 420 Advanced Topics in Philosophy (I, II, III)
An advanced course treating a specialized issue or topic in philosophy or in philosophy and another discipline. The content of the course is announced before the start of the term. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes. Prerequisite: U4 standing or five courses in philosophy
3 credits

PHI 421 Research Tracks in Philosophy (I, II, III)
A survey of recent literature necessary to prepare a team of students in a Research Track for two additional semesters of collaborative research. Prerequisite: Consent of Research Track faculty
3 credits
PHY 116 Electromagnetism, Wave and Radiation for Sports Science Laboratory
Laboratory component of PHY 114. Experiments are designed to help students better understand the physics of sports. Knowledge of first-year college-level mathematics is recommended but most necessary information is taught in class as needed. May be taken concurrently or after PHY 114.
Prerequisite: PHY 113 and 115
Pre-or Corequisite: PHY 114
1 credit

PHY 119-E Physics for Environmental Studies
The principles of physics as they apply to environmental issues. A review of mathematics is followed by a discussion of Newton’s laws, conservation principles, topics in fluids and wave motion, optical instruments, and radioactivity. Three lectures and one laboratory session per week. This course is offered as both ENS 119 and ENS 119-E.
Prerequisite: MAT 123; CHE 131
3 credits

PHY 121-E Physics for the Life Sciences I
First part of a calculus-based introduction to physics with applications to biology, primarily for students majoring in biological sciences or pre-clinical programs. Topics include mechanics, fluid mechanics, and thermodynamics. Three lecture hours and one recitation hour per week. Laboratory component, PHY 121, must be taken concurrently. A common grade for both courses will be assigned. PHY 121 may not be taken for credit in addition to PHY 125, 131, or 141.
Prerequisite: MAT 125 or 131 or 141 or AMS 151; CHE 132 or 142
Corequisite: PHY 123
3 credits

PHY 122-E Physics for the Life Sciences II
Second part of a calculus-based introduction to physics with applications to biology, primarily for students majoring in biological sciences or pre-clinical programs. Topics include electromagnetic, optics, acoustics, and radiation phenomena. Three lecture hours and one recitation hour per week. Laboratory component, PHY 124, must be taken concurrently; a common grade for both courses will be assigned. PHY 124 may not be taken for credit in addition to PHY 125, 127, 132, or 142.
Prerequisite: PHY 121/123
Corequisite: PHY 124
3 credits

PHY 123 Physics for Life Sciences Laboratory I
Must be taken concurrently with Lecture component, PHY 121; a common grade for both courses will be assigned. Two hours of laboratory per week.
Corequisite: PHY 121
1 credit

PHY 124 Physics for Life Sciences Laboratory II
Must be taken concurrently with Lecture component, PHY 122; a common grade for both courses will be assigned. Two hours of laboratory per week.
Corequisite: PHY 122
1 credit

PHY 125-E Classical Physics A
First of a three-part sequence intended for physical-sciences or engineering majors. It focuses on the mechanics of rigid bodies, fluids, waves, thermodynamics, and optics. Three lecture hours, one recitation hour, and two laboratory hours per week. Not for credit in addition to PHY 121/123, 131/133, or 141.
Prerequisite: Level 4 on the mathematics placement examination
Corequisite: MAT 125 or 131 or 141 or AMS 151
3 credits

PHY 126-E Classical Physics B
Second of a three-part sequence for physical-sciences or engineering majors. It focuses on the mechanics of rigid bodies, fluids, waves, thermodynamics, and optics. Three lecture hours, one recitation hour, and two laboratory hours per week. Not for credit in addition to PHY 122/124, 132/134, or 142.
Prerequisite: Requires PHY 125 or 131/133 or 141
Corequisite: MAT 126, 132, 142, 171 or AMS 161 or level 7 or higher on math placement exam
3 credits

PHY 127-E Classical Physics C
Third of a three-part sequence for physical-sciences or engineering majors. It focuses on electromagnetism using the concepts of vector fields and scalar potentials, and on DC and AC electric circuits. Calculus is used concurrently with its development in MAT 126. Three lecture hours, one recitation hour, and two laboratory hours per week. Not for credit in addition to PHY 122/124, 132/134, or 142.
Prerequisite: Requires PHY 125 or 131/133 or 141
Corequisite: MAT 126, 132, 142, 171 or AMS 161 or level 7 or higher on math placement exam
3 credits

PHY 131-E Classical Physics I
First part of a two-semester physics sequence for physical-sciences or engineering majors who have a strong mathematics background and are ready for a fast learning pace. It covers mechanics, wave motion, kinetic theory, and thermodynamics. Calculus is used concurrently with its development in MAT 126. Three lecture hours and one recitation hour per week. Laboratory component, PHY 131, must be taken concurrently; a common grade for both courses will be assigned. Not for credit in addition to PHY 121/123, 125, or 141.
Prerequisite: MAT 125 or level 5 on the mathematics placement examination
Corequisite: PHY 131; MAT 126 or 131 or 141 or AMS 151
3 credits

PHY 132-E Classical Physics II
Second part of a two-semester physics sequence for physical-sciences or engineering majors who have a strong mathematics background and are ready for a fast learning pace. It covers electromagnetism, electric circuit theory, and optics. Calculus is used concurrently with its development in MAT 126. Three lecture hours and one recitation hour per week. Laboratory component, PHY 132, must be taken concurrently; a common grade for both courses will be assigned. Not for credit in addition to PHY 122/124, 126, 127, or 142.
Prerequisite: Requires PHY 131/133 or 141
Corequisite: PHY 134; MAT 132 or 142 or 127 or 171 or AMS 161
3 credits

PHY 133 Classical Physics Laboratory I
Must be taken concurrently with Lecture component, PHY 131; a common grade for both courses will be assigned. Two hours of laboratory per week.
Corequisite: PHY 131
1 credit

PHY 134 Classical Physics Laboratory II
Must be taken concurrently with Lecture component, PHY 132; a common grade for both courses will be assigned. Two hours of laboratory per week.
Corequisite: PHY 132
1 credit

PHY 141-E Classical Physics I: Honors
First part of a demanding two-semester sequence for students with the strongest background, interests and abilities in science and mathematics. The topics covered in PHY 141 are similar to those in PHY 131 but are treated in more depth in a small-class setting. Students may transfer to PHY 131 at any time during the first half of each semester without penalty. Three lecture hours, one recitation hour, and one two-hour laboratory per week. PHY 141 may not be taken for credit in addition to PHY 121/123, 125, or 131.
Prerequisite: Level 6 on the Math Placement Exam, or B or higher in MAT 131 or 141 or AMS 151, or B+ or higher in MAT 125, or permission of instructor (priority given to students in Honors or WISE programs)
Corequisite: MAT 131 or 126 or AMS 151
4 credits

PHY 142-E Classical Physics II: Honors
Second part of a demanding two-semester sequence for students with the strongest background, interests and abilities in science and mathematics. The topics covered in PHY 142 are similar to those in PHY 132, but are treated in more depth in a small-class setting. Students may transfer to PHY 132 at any time during the first half of each semester without penalty. Three lecture hours, one recitation hour, and one two-hour laboratory per week. PHY 142 may not be taken for credit in addition to PHY 122/124, 126, 127, or 132.
Prerequisite: PHY 141 or permission of department
Corequisite: MAT 132 or 142 or 127 or 171 or AMS 161
4 credits

PHY 191 Transitional Study
Laboratory for transfer students to supplement courses taken at another institution. Students take the laboratory portion of a 100-level course for which they have taken the theoretical portion elsewhere.
Prerequisite: Permission of department
1 credit

PHY 192 Transitional Study
Laboratory for transfer students to supplement courses taken at another institution. Students take the laboratory portion of a 100-level course for which they have taken the theoretical portion elsewhere.
Prerequisite: Permission of department
1 credit

PHY 200 Physics Today
Seminar introducing students to the excitement of current topics in physics research. Students are introduced to researchers from the University and Brookhaven National Laboratory who are conducting research at the forefront of a variety of subfields of physics. Literature search and presentation skills are developed. The course is intended for physics majors but is open to any student who has completed the first-year physics sequence.
Prerequisite: PHY 126/127 or 132 or 142
1 credit

PHY 237-H Current Topics in World Climate and Atmosphere
An exploration of current concerns about the greenhouse effect, acid rain, and global ozone loss, in a format accessible to non-science majors. The social and political steps being taken to limit global atmospheric pollution and climate change are discussed. Not for major credit. This course is offered as both ATM 237 and PHY 237.
Prerequisite: One D.E.C. category E course; satisfaction of entry skill in mathematics requirement
3 credits

PHY 251 Modern Physics
A survey of the major physics theories of the 20th century (relativity and quantum mechanics) and their impact on most areas of physics. It introduces the special theory of relativity, the concepts of quantum and wave-particle duality, Schrödinger’s wavefunction equation, and other fundamentals of quantum theory as they apply to nuclei, atoms, molecules, and solids. Three lecture hours and one recitation hour per week.
Prerequisite: PHY 125 or 126 or 132 or 135/134 or 142
Pre- or Corequisite: MAT 203 or 205 or AMS 261
Corequisite for physics majors: PHY 252
3 credits
PHY 252 Modern Physics Laboratory
Open to all students taking PHY 251 and required for physics majors. Students perform some of the pivotal experiments of the 20th century. Must be taken concurrently with lecture component PHY 251; a common grade for both courses will be assigned. Three hours of laboratory per week.
Corequisite: PHY 251
1 credit

PHY 277 Computation for Physics and Astronomy
An introduction to computing on UNIX/Linux computers. Fundamentals of using UNIX/Linux to write computer programs for numerical algorithms to solve computational physics and astronomy problems. Assignments are carried out in a high-level compiler programming language such as Fortran 90 or C++ and require extensive use of SINC site computers outside the classroom. This course is offered as both AST 277 and PHY 277.
Prerequisite: AMS 151 or MAT 126 or 131 or 141
Advisory Prerequisite: AMS 161 or MAT 127 or 132 or 142 or 171
3 credits

PHY 287 Introduction to Research
An opportunity for students, while still early in their studies, to do research commensurate with their level of preparation. Students work alongside faculty, postdoctoral fellows, and graduate students on ongoing research projects. May be repeated up to a total of 3 credits.
Prerequisite: Permission of department
0-3 credits

PHY 291 Transitional Study
A laboratory for transfer students to supplement a course taken at another institution. Students take the laboratory portion of a 200-level course for which they have taken the theoretical portion elsewhere.
Prerequisite: Permission of department
1 credit

PHY 300 Waves and Optics
The physics of oscillations and waves, from mechanical waves to light waves to electron waves. Topics include resonance and normal modes of coupled oscillators, the wave equation and wave propagation, interference and diffraction, polarization and imaging, coherence, and lasers. Three lecture hours and one three-hour laboratory per week.
Prerequisite: PHY 122/124 or 142 or 126/127
Corequisite: MAT 203 or 205 or AMS 261
4 credits

PHY 301 Electromagnetic Theory I
The application of Maxwell’s equations to solve time-independent boundary-value problems and to study the interactions of electric and magnetic fields with bulk matter.
Prerequisite: PHY 251 or permission of department
Advisory Corequisite: MAT 341
3 credits

PHY 302 Electromagnetic Theory II
A study of time-dependent electric and magnetic fields as derived from Maxwell’s equations. Topics include the interrelations of electric and magnetic fields and their potentials; energy and momentum associated with electromagnetic fields and the Maxwell vacuum and matter; waveguides and transmission lines; special relativity for electromagnetism; retarded potentials for time-varying sources; and radiation of electromagnetic waves.
Prerequisite: PHY 301
3 credits

PHY 303 Mechanics
An in-depth study of classical mechanics, from the Newtonian to the Lagrangian and Hamiltonian formulations. First, Newtonian mechanics is reviewed and applied to more advanced problems than those considered in PHY 131 or 141. The Lagrangian and Hamiltonian methods are then derived from the Newtonian treatment and applied to various problems.
Prerequisite: PHY 251 or permission of department; MAT 303 or 365 or AMS 361
3 credits

PHY 306 Thermodynamics, Kinetic Theory, and Statistical Mechanics
A study of the laws that govern physical systems in thermal equilibrium. In the first part, the concepts of temperature, internal energy, and entropy are analyzed and the first and second laws of thermodynamics are used to connect various properties that are independent of the microscopic details of the system. The second part is devoted to a microscopic study of a system in thermal equilibrium, from the kinetic theory of gases to statistical mechanics and the relation between entropy and probability, with application to simple examples in classical and quantum statistics.
Prerequisites: PHY 251 and PHY 300
3 credits

PHY 308 Quantum Physics
The concepts, historical development, and mathematical methods of quantum mechanics. Topics include Schrödinger’s equation in time-dependent and time-independent forms; one- and three-dimensional solutions, including the treatment of angular momentum and spin. Applications to simple systems, especially the hydrogen atom, are stressed.
Prerequisite: PHY 300, 301, and 303
3 credits

PHY 310 Probability and Statistics for Experimental Physics
Statistical techniques used for data analysis in experimental physics, including standard analytic techniques and modern computational extensions such as random number generation, Monte Carlo methods and ensemble tests. The probability theory basis underlying all methods is studied.
Prerequisite: PHY 277 or MAT 331; PHY 303
3 credits

PHY 311 Connections in Science
A selection of the interrelations between physics and other scientific and technological fields, using modern examples from engineering, medicine, and applied mathematics, among others. The course is taught as a seminar and includes guest lecturers, tours of laboratories, and discussion of classic and current research projects. Appropriate for physics and non-physics majors alike.
Prerequisite: PHY 122/124 or 127 or 132/134 or 142
1 credit

PHY 313-H Mystery of Matter
Exploration of our understanding of the basic constituents of matter, the forces that understanding and the tools developed to study them affect aspects of contemporary society. Historical discoveries and their place in social and political institutions of the time are considered, along with issues of government funding and the cost to society. Includes a discussion of developments at Brookhaven National Laboratory and their scientific and social impact.
Prerequisites: Us or U4 standing; one D.E.C. category E course
3 credits

PHY 335 Electronics and Instrumentation Laboratory
An intensive laboratory-based course covering modern electronic circuits and the theory behind them. Topics include AC circuits, digital techniques, and computer interfacing involving both internet hardware and programming in a high-level language such as BASIC or Pascal. Two three-hour laboratories per week.
Prerequisite: PHY 251
3 credits

PHY 390 Special Topics in Physics
Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit once as the topic changes.
Prerequisite: Permission of department
3 credits

PHY 403 Nonlinear Dynamics
One-dimensional dynamical systems with an emphasis on the development of perturbative sections that are valid for long periods of time. An introduction to bifurcations and chaos is included through a study of the logistic map and Lorenz equations.
Prerequisite: PHY 303
3 credits

PHY 405 Advanced Quantum Physics
Study of quantitative methods of quantum mechanics, including perturbation theory and the WKB approximation, scattering theory, and elements of quantum-information theory. Symmetry principles are stressed and advanced mathematical techniques are used throughout the course.
Prerequisite: PHY 303 and 308; MAT 341
3 credits

PHY 407 Physics of Continuous Media
An introduction to the dynamic properties of fluids, of special interest to those attracted to astrophysics, geophysics, and plasma physics. Topics covered include compressible fluids, viscosity, and irrotational flow; conducting fluids; wave motion in gases; and magnetohydrodynamic waves.
Prerequisite: PHY 303 and 306
3 credits

PHY 408 Relativity
A development of the special theory of relativity leading to general relativity with applications to cosmology.
Prerequisite: PHY 302 and 305
3 credits

PHY 431 Nuclear and Particle Physics
An introduction to the physics of the nucleus and elementary particles, stressing their quantum-mechanical properties and the role of symmetry principles. Topics include nuclear structure, nuclear reactions, nuclear forces, the interaction of radiation with matter, radiation detectors, accelerators, and the properties of elementary particles and resonances.
Prerequisite: PHY 308
3 credits

PHY 445 Senior Laboratory
A selection of historically important experiments from atomic and nuclear spectroscopy, particle physics, solid-state and low-temperature physics, and astrometry performed with modern instrumentation. Each student does three experiments, usually with a partner. As students progress, they are encouraged to pursue independent projects, without rigid formats or procedures. The emphasis is on the development of experimental skills and on professionally acceptable analysis and presentation of results, both orally and in writing. Two three-hour laboratory sessions per week.
Prerequisite: PHY 308 and 335
3 credits

PHY 447 Tutorial in Advanced Topics
Selected readings on advanced topics for upper-division students of unusual ability and substantial accomplishments. Prior to the beginning of the semester, the topic to be studied is selected by the supervising member of the faculty and a reading assignment is planned. Weekly conferences with this faculty member are devoted to discussion of material, resolution of problems encountered, and assessment of the student’s progress. May be repeated up to a total of 6 credits.
Prerequisite: Permission of department
1-6 credits

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PHY 452 Lasers
Introduction to the theory of lasers using elementary quantum mechanics. It includes a study of resonance conditions, normal modes, and optical cavities; a description of the various types of lasers, their methods of control and their limitations; and an introduction to their applications to research, medicine, communication, and computing.
Prerequisites: PHY 251 and 300
3 credits

PHY 472 Solid-State Physics
A study of the different types of solids, with emphasis on their thermal, electrical, and optical properties. It introduces the concepts of phonons and electronic bands, and applications to metals, semiconductors, superconductors, and magnetism.
Prerequisite: PHY 306 and 308
3 credits

PHY 475 Undergraduate Teaching Practicum
An opportunity for selected undergraduates to collaborate with the faculty in teaching at the introductory level. In addition to working as tutors and as laboratory assistants, students meet once a week with a faculty supervisor to discuss problems they have encountered and to plan future activities. Students are generally assigned to assist in courses they have completed and in which they have excelled. Not for major credit and not repeatable. Can be repeated up to a maximum of 6 credits with a maximum of 3 credits per course taught. Prerequisite: Permission of department
Prerequisite: Permission of department
0-3 credits, S/U grading

PHY 487 Research
An opportunity for students to conduct faculty-supervised research for academic credit. Research proposals must be prepared by the student and submitted for approval by the supervising faculty before the beginning of the credit period. An account of the work and the results achieved is submitted to the supervisor before the end of the credit period. May be repeated, up to a total of 6 credits.
Prerequisite: Permission of department
0-6 credits

POLO5-F84 Honors Introduction to American Government
An enriched introduction to American government. Topics covered include political participation, public opinion, voting and elections, parties, interest groups, federalism, Congress, the Presidency, the bureaucracy, the judiciary, and public policy formation. This course requires more reading and more written work than does POL 102. May not be taken for credit in addition to POL 102.
Prerequisite: Permission of department; priority given to students in the University’s honors programs
3 credits

POL 201-C Introduction to Statistical Methods in Political Science
Elementary statistical methods in empirical political science, focusing on the analysis of public opinion, survey research designs, sampling, and probability. The course considers the application of descriptive and inferential statistics to testing hypotheses on various political issues. May not be taken for credit after AMS 102, ECO 220, PSY 201, or SOC 202.
Prerequisite: Satisfaction of entry skill in mathematics requirement; Advisory Prerequisite: POL 101 or 102 or 103 or 105
3 credits

POL 214-J Modern Latin America
From independence to the present: the evolution of 19th and 20th-century Latin America. Emphasis on current social, economic, and political issues. This course is offered as both HIS 214 and POL 214.
Advisory Prerequisite: LAC 200
3 credits

POL 216-J History of U.S.-Latin American Relations
An examination of the impact of U.S. economic and political relations with Latin America from the mid-19th century to the present. The course considers changes in American policy toward Latin America, as well as the varying responses of Latin American nations to U.S. intervention and influence. This course is offered as both HIS 216 and POL 216.
Advisory Prerequisite: One HIS course
3 credits

POL 287 Introductory Research in Political Science
May be repeated up to a limit of 12 credits, but only six credits may count for major or minor requirements in political science.
Prerequisite: Permission of departmental research coordinator
0-3 credits, S/U grading

POL 305-I Government and Politics of the United Kingdom
Examination of the political system of Great Britain and Northern Ireland, including the Constitution, parliament, cabinet, political parties, and the policy-making process.
Prerequisite: POL 102; U3 or U4 standing
2 credits

POL 307-I Politics in Germany
An examination of governmental institutions and policy-making in Germany with special emphasis on the development of democracy, the process of national unification, political culture, citizen politics, party government, and Germany’s role within the European Community and the North Atlantic Treaty Organization.
Prerequisite: U3 or U4 standing
Advisory Prerequisite: POL 103
3 credits

POL 309-I Politics in the European Union
Why the European Union was created, how its institutions have evolved over time, and where the union is going.
Prerequisite: U3 or U4 standing
Advisory Prerequisite: POL 101 and 103
3 credits

POL 311 Introduction to International Law
Casebook approach to standard introductory course in international law, including the following topics: state jurisdiction and responsibility, individuals, international organization, and use of force.
Prerequisite: U3 or U4 standing;
Advisory Prerequisite: POL 101
3 credits

POL 313-F Problems of International Relations
Analysis of the international system, its characteristic forms, and the principal forces making for conflict and adjustment. Examination of some prevalent analytical concepts, of major current problems and developments, and of prospects and alternatives for the future.
Prerequisite: POL 101; U3 or U4 standing.
Advisory Prerequisite: POL 201 or any other course satisfying the major’s methodology requirement
3 credits

POL 316-F Federalism and Intergovernmental Relations
Examination of the primary structure of American politics. The historical foundation and evolution of American federalism and the effects of a federal structure on civil rights and liberties, economic developments, political representation, and public policy. Discussion of current topics in federalism and intergovernmental relations.
Prerequisite: POL 102 or POL 105
3 credits

POL 317-F American Election Campaigns
The politics of presidential nominations through primaries, caucuses, and conventions; the conduct of presidential general election campaigns; mass media coverage and opinion polling; the citizen’s involvement in campaign politics; voter attitudes toward parties, candidates, and issues; and the interpretation of electoral outcomes.
Prerequisite: U3 or U4 standing
Advisory Prerequisite: POL 102 or 105
3 credits

POL 318-F Voters and Elections
An examination of how citizens make electoral decisions, including the decision to participate at all in elections. The course compares models of voter behavior and probes the influence of such factors as party identification, opinions on issues, ideological orientations, and candidate evaluations. In addition, the social and economic context of voting is explored, as is the importance of elections for policy making and the functioning of the political system.
Prerequisite: U3 or U4 standing;
Advisory Prerequisite: POL 102 or 105; POL 201 or any other course satisfying the major’s methodology requirement
3 credits

POL 319 Business Law
A study of the legal environment of business operations, covering such topics as the principles of contracts, commercial papers, partnerships, corporations, real property, estates, bankruptcy, antitrust laws, and environmental and civil rights regulations.
Prerequisite: U3/U4 standing or New Transfer student
3 credits