PHI 400-G, 401-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 specific 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 per course

PHI 402-G Analysis of Philosophic Texts (I)
Detailed analysis of a major philosophic text. Semester Supplements to this Bulletin contain specific 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

PHI 435 Senior Seminar
An intensive study of an issue, topic, figure, or historical period in philosophy intended to provide both a culminating experience and final integration for senior philosophy majors. This seminar emphasizes careful reading, rigorous discussion, and extensive writing at an advanced level. The content of the seminar is announced before the start of the term, and students are consulted on the content as it proceeds.
Prerequisite: U4 standing; six courses in philosophy; satisfaction of upper-division writing requirement for the philosophy major 3 credits

PHI 475, 476 Undergraduate Teaching Practica I, II
Work with a faculty member as an assistant in one of the faculty member's regularly scheduled courses. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course. In PHI 476, students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.
Prerequisite: PHI 475; prior preparation in subject field; permission of instructor and director of undergraduate studies 3 credits per course, S/U grading

PHI 487 Readings and Research in Philosophy (II)
Advanced-level inquiry with individualized instruction in one particular philosophical style of reasoning. Consult undergraduate advisor for specific details. May be repeated.
Prerequisite: U4 standing in philosophy major; permission of department 0-6 credits

PHI 489 Readings and Research in the History of Philosophy (I)
Advanced-level inquiry with individualized instruction in the great philosophies of the past. Consult undergraduate advisor for specific details. May be repeated.
Prerequisite: U4 standing in philosophy major; permission of department 0-6 credits

PHI 490 Readings and Research in Philosophical Investigations of Other Disciplines (III)
Advanced-level inquiry with individualized instruction in the application of philosophical tools to one of the special disciplines. Consult undergraduate advisor for specific details. May be repeated.
Prerequisite: U4 standing in philosophy major; permission of department 0-6 credits

PHY 104 Opportunities in Physics
An introduction to current activities of physicists on Long Island. Stony Brook faculty, alumni and other physicists discuss their current projects and their careers, and relate their activities both to basic undergraduate physics and to areas of ongoing research, such as the unification of the fundamental forces, the search for the quark-gluon plasma, and coherent states of atoms trapped at low temperature. Tours of university, industry, and government lab facilities are included, as well as interaction with physicists in non-traditional areas such as medicine, finance, and the media.
Prerequisite: PHY 125 or 131/133 or 141 Corequisite: PHY 126 or 127 or 152/134 or 142 1 credit

PHY 112-E Light, Color, and Vision
An introduction to the modern understanding of light, color, and vision, primarily for non-science majors and especially beneficial to students majoring in visual arts or theatre. Topics include the nature of light; the human eye and vision; illusions, color perception, and color theory; optical instruments; the camera and photography; optical phenomena; and color in the atmosphere (mirages, rainbows, halos); and light in modern physics (relativity, lasers). Not for major credit.
Prerequisite: Satisfaction of entry skill in mathematics requirement (Skill I) or satisfactory completion of D.E.C. C 3 credits

PHY 113-E Physics of Sports
First part of an introduction to physics from the perspective of sports, especially designed for non-science majors. Basic concepts in classical mechanics and fluid dynamics are used to analyze particular actions in football, baseball, soccer, track and field, and other sports. Students learn, for example, about the knuckle ball in baseball and why it is so hard to hit, and why quarterbacks throw a football in a spiral. The concepts of heat, energy, and calories are also discussed. The laboratory component, PHY 115, may be taken concurrently with or after PHY113. Prerequisite: PHY 113 3 credits

PHY 115 Physics of Sports Laboratory
Laboratory component of PHY 113. Experiments are designed to help students better understand the physics aspects of sports. Students work in groups and conduct experiments indoors and outdoors. Knowledge of first-year college-level mathematics is recommended but most necessary information is taught in class as needed. May be taken concurrently with or after PHY 113. Pre- or corequisite: PHY 113 1 credit

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 aspects 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 with or after PHY 114. Prerequisites: PHY 115 and 116 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 CNS 119 and PHY 119. Prerequisites: MAT 125; 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 123, 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. Prerequisites: 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 electromagnetism, 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 122 may not be taken for credit in addition to PHY 126, 127, 132, or 142. Prerequisite: PHY 121/123 Corequisite: PHY 124 3 credits

PHY 123 Physics for Life Sciences Laboratory
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

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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 point particles and simple oscillators, and emphasizes motion in one and two dimensions and the concepts of momentum and energy. Calculus is used concurrently with its development in MAT 125. 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  
4 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, spatial 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: PHY 125 or 131/133 or 141  
Corequisite: MAT 126 or 132 or 142 or AMS 161 or level 7 or higher on the math placement exam  
4 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: PHY 125 or 131/133 or 141  
Corequisite: MAT 126 or 132 or 142 or AMS 161 or level 7 or higher on the math placement exam  
4 credits

PHY 131-E Classical Physics I  
First part of a two-semester physics sequence for physics majors 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 131. Three lecture hours, 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 121/123, 125, or 141.  
Prerequisite: PHY 125 or level 5 on the mathematics placement examination  
Corequisite: PHY 133, 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 132. Three lecture hours and one recitation hour per week. Laboratory component, PHY 134, 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: PHY 131/133 or 141  
Corequisite: PHY 134, MAT 132 or 142 or 127 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 Mathematics 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 141 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 121/123, 126, 127, or 132.  
Prerequisite: PHY 141 or permission of department  
Corequisite: MAT 132 or 142 or 127 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.  
Prerequisites: 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 122 or 126 or 127 or 132/134 or 142  
Corequisite: PHY 205 or 265 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 Computing for Physics and Astronomy Majors  
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  
1 credit

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, post-doctoral fellows, and graduate students on ongoing research projects. May be repeated up to a total of three 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 mecha- nical 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 132/134 or 142 or 126/127  
Corequisite: MAT 203 or 205 or AMS 261  
3 credits

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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.
Prerequisites: 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.
Prerequisites: PHY 251 or permission of department; MAT 303 or 355 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 foundations 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.
Prerequisites: 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.
Prerequisites: 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. Applicable for physics and non-physics majors alike.
Prerequisites: 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, and of how that understanding and the tools developed to study them have affected 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 development of experiments at Brookhaven National Laboratory and their scientific and social impact.
Prerequisites: U3 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 interface 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 series 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.
Prerequisites: 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 magneto-hydrodynamic waves.
Prerequisites: 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.
Prerequisites: PHY 302 and 303
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 astronomy 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.
Prerequisites: PHY 308 and 335
3 credits

PHY 447 Tutorial in Advanced Topics
Selected readings in 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 six credits.
Prerequisite: Permission of the department
1-6 credits

PHY 452 Lasers
Introduction to the theory of lasers using elementary quantum mechanics. It includes a study of 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.
Prerequisites: 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.
Prerequisite: Permission of department
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 six credits.
Prerequisites: Permission of department
0-6 credits

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