Physics

Course List

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Course Description

PHY0211
Physics Problems I
1 U; 1 STOT; 1st term
Tutorial problems primarily related to PHY2001. Prerequisite: permission of the instructor.

PHY0222
Physics Problems II
1 U; 1 STOT; 2nd term
Tutorial problems primarily related to PHY2002 and 2003. Prerequisite: permission of the instructor.

PHY0241
Problems in Quantitative Methods for Basic Physics
1 U; 1 STOT; 1st term
Tutorial problems primarily related to PHY2004. Prerequisite: permission of the instructor.

PHY0411
Seminar
1 U; 1 STOT; 1st term
Small group discussions on topics in modern or contemporary physics. Students are advised to take PHY3041, 3052 and 3202 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY1001
General Physics I
3 U; 3 Lect.; 1st/2nd term
This introductory course discusses the basic principles of mechanics and atomic physics. It is suitable for Secondary 6 entrants in science and engineering. Topics include: particle kinematics, force and motion, work and kinetic energy, potential energy, systems of particles and collisions, rotation, Newton's law of gravitation, fluid statics and dynamics, oscillations, waves, photons, electrons and atoms. (Not for Physics Majors in 3-year system.) Prerequisite: permission of the instructor.

PHY2001
Introduction to Mechanics
4 U; 4 Lect. 1 Tut.; 1st term
Particle kinematics and dynamics. Systems of particles and collisions. Rotational dynamics. Oscillations. Newton's law of gravitation. Fluid statics and dynamics. Wave motion. Prerequisite: permission of the instructor.

PHY2002
Introduction to Thermal Physics
4 U; 4 Lect. 1 Tut.; 2nd term
Temperature and the zeroth law of thermodynamics. Simple thermodynamic systems. Ideal gas. Work. Heat and the first law of thermodynamics. Second law of thermodynamics and entropy. Thermodynamic potentials. Phase diagrams of pure substances. First-order phase transitions, Clausius-Clapeyron equation and applications. Elementary kinetic theory of transport processes. Prerequisite: permission of the instructor.

PHY2003
Introduction to Electricity and Magnetism
4 U; 4 Lect. 1 Tut.; 2nd term
Electrostatics and magnetostatics in free space, conductors, electric current and DC circuits, electromagnetic induction and AC circuits, Maxwell's equations (integral and differential forms). Prerequisite: permission of the instructor.

PHY2004
Quantitative Methods for Basic Physics
3 U; 3 Lect. 1 Tut.; 1st term
Vectors, rates of change and kinematics. Methods for solving ordinary differential equations in mechanics and electric circuits. Line integral and multiple integrals in mechanics. Partial differentiation and its applications in mechanics and thermodynamics. Methods of vector calculus used in electromagnetism. Applications of series and systems of linear equations in physics. Prerequisite: permission of the instructor.

PHY2351
Basic Computational Physics
3 U; 2 Lect. 1 Tut. 3 Lab.; 1st term
Basic computer concepts. Programming languages and scientific applications. Algorithms. Optimization techniques. Computational laboratories for practice, demonstration and illustration of the subject matter. Prerequisite: permission of the instructor.

PHY2400
Topics in Contemporary Physics
3 U; 3 Lect.; 2nd term
Topics of contemporary interest will be selected both from fundamental physics (e.g., black holes, pulsars) and from physics with important applications to technology (e.g., laser, superconductivity). Each will be treated qualitatively and phenomenologically. The objectives are to introduce students to the frontiers of physics, and at the same time to develop skills in heuristic understanding and explanation. Students taking this course are expected to have knowledge in Physics at the level of PHY2001. Prerequisite: permission of the instructor.

PHY2601
Methods in Theoretical Physics I
3 U; 3 Lect. 1 Tut.; 1st term
This course provides a survey of various analytical techniques commonly used to solve problems in theoretical physics. The following physical problems are used as examples: the vibrating string, waves, electrostatics, heat conduction and coupled oscillators. Students are advised to take PHY2001, 2002, and 2003 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY2811
Physics Laboratory I
2 U; 3 Lab.; 1st term
Laboratory experiments to illustrate the principles taught in the courses at the 2000-level. Prerequisite: permission of the instructor.

PHY2822
Physics Laboratory II
1 U; 3 Lab.; 2nd term
Laboratory experiments to illustrate the principles taught in the courses at the 2000-level. Prerequisite: permission of the instructor.

PHY3011
Mechanics
3 U; 3 Lect. 1 Tut.; 1st term
Calculus of variation. Lagrangian and Hamiltonian mechanics. Central force motion. Motion of a system of particles. Coupled oscillations. Elementary dynamics of rigid bodies. Moving coordinate systems. Students are advised to take PHY2001 before taking this course. Prerequisite: permission of the instructor.

PHY3022
Intermediate Mechanics
3 U; 3 Lect. 1 Tut.; 2nd term
Special relativity. Mechanical waves. Fluids. Nonlinear mechanical systems. Students are advised to take PHY3011 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY3041
Electricity and Magnetism
3 U; 3 Lect. 1 Tut.; 1st term
Electrostatics. Magnetostatics. Multipoles and fields in matter. Boundary value problems. Electrodynamics. Maxwell's equations and electromagnetic waves. Students are advised to take PHY2003 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY3052
Thermal Physics
3 U; 3 Lect. 1 Tut.; 2nd term
The laws of thermodynamics. Thermodynamic potentials. Thermodynamics of single-component systems and multi-component systems. Phase equilibria. Phase transitions and critical phenomena. Students are advised to take PHY2002 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY3201
Quantum Physics I
4 U; 4 Lect. 1 Tut.; 1st term
Wave-particle duality. Atomic structure and Bohr's model. Basic quantum mechanics. Quantum theory of hydrogen atom. Many-electron atoms. Atomic spectra. Students are advised to take PHY2001, 2002 and 2003 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY3202
Quantum Physics II
4 U; 4 Lect. 1 Tut.; 2nd term
Atomic nucleus. Nuclear forces and models. Radioactivity and nuclear reactions. Elementary particles. Chemical bonds and molecular structure. Molecular spectra. Bonding in solids. Crystal structure. Band theory of solids. Superconductivity. Students are advised to take PHY3201 before taking this course. Prerequisite: permission of the instructor.

PHY3350
Introduction to Computer Simulations of Physical Systems
3 U; 2 Lect. 1 Tut. 3 Lab.; 2nd term
A project-oriented course on computer simulation, emphasizing the setting up of physical models, the development of algorithms for the models, data analysis and graphical techniques. Topics include the cooling problem, single and many particle dynamics, chaotic dynamics, wave phenomena, and electrostatic problems. Computational laboratories for practice, demonstration and illustration of the subject matter. Students are advised to take PHY3011 and 3041 or their equivalents before taking this course. Prerequisite: PHY2351 or permission of the instructor.

PHY3401
Contemporary Topics in Applied Physics
3 U; 3 Lect. 1 Tut.; 1st term
This course provides students with a broad view and basic understanding of some of the modern topics in applied physics. Topics include: laser applications and principles in fundamental and applied research; advanced ceramic and their applications; superconductivity and devices; magnetic materials, measurements and devices; current methods in non-destructive testing of materials; nanoscience, nanotechnologies and device applications. Students are expected to take PHY2001, 2002 and 2003 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY3402
Applied Solid State Physics
3 U; 3 Lect. 1 Tut.; 2nd term
This course provides an introduction to the physical properties of solids and their applications. Simple models will be used to discuss the solid state physics. Topics include: electrical and optical properties of conductors and insulators, mechanical properties of solids, magnetic materials, superconductors; bonds, free electron and nearly-free electron models of solids, energy bands and gaps, semiconductors, p-n junction, LED, photodetectors, solar cells and diode laser. Students are advised to take PHY3011, 3041 and 3201 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY3412
Electronics
3 U; 3 Lect. 1 Tut.; 2nd term
This course provides an introduction to electronic circuits commonly used in applied physics, with laboratory experiments for practice and illustration of the subject matter. Topics include: circuit analysis, diode circuits, transistor circuits, amplifiers, feedback theory, operational amplifiers, power supplies and logic circuits. Students are advised to take PHY2003 and 2004 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY371S, 372S
Special Experimental Project V, VI
1 U each; 3 Lab.
Student taking this course is required to finish a short experimental project, which illustrates modern physics and/or technique. Prerequisite: permission of the instructor.

PHY3751, 3752
Special Theoretical Projects I, II
1 U each; 3 Tut.; 1st/2nd term
Student taking this course are required to finish a short project or guided study in theoretical physics. Prerequisite: permission of the instructor.

PHY3811
Physics Laboratory III
1 U; 3 Lab.; 1st term
Several Laboratory experiments and one project to illustrate the principles taught in the courses at the 3000-level. Prerequisite: permission of the instructor.

PHY3822
Physics Laboratory IV
1 U; 3 Lab.; 2nd term
Several Laboratory experiments and one project to illustrate the principles taught in the courses at the 3000-level. Prerequisite: permission of the instructor.

PHY4211
Electromagnetic Theory and Optics
3 U; 3 Lect. 1 Tut.; 2nd term
This is an advanced undergraduate course on the theory of electromagnetism and optics, based on Maxwell's equations. Topics covered include: field energy and momentum, wave equations, macroscopic field equations and boundary conditions, electromagnetic waves in media, reflection and transmission, absorption and dispersion, radiation from accelerated charges and simple applications, Huygen's principle, and interference and diffraction. Student are advised to take PHY3041 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY4221
Quantum Mechanics I
3 U; 3 Lect. 1 Tut.; 1st term
This course provides an exposition of the central concepts and the theoretical framework of non-relastivistic quantum mechanics. Topics covered include: experimental basis, wave mechanics, Schrödinger's equation, one-dimensional potentials, orbital angular momentum, central force problems, matrix representation, spin, and approximation methods. Students are advised to take PHY3201 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY4260
Statistical Mechanics
3 U; 3 Lect. 1 Tut.; 1st term
This course provides an introduction to the statistical mechanics of classical as well as quantum systems via the theory of ensembles. Topics covered include: microcanonical ensemble, canonical ensemble, open systems and grand canonical ensemble, Bose-Einstein and Fermi-Dirac statistics and their applications, properties of quantum ideal gases, and transport phenomena. Prerequisite: permission of the instructor.

PHY4320
Photonics: Materials and Devices
3 U; 3 Lect. 1 Tut.; 2nd term
A broad survey of the materials used and the generation, transmission, modulation and detection of light by optoelectronic devices. Emphases are placed on the operational principles and applications of both devices and materials in communications, data processing and as industrial transducers. Students are advised to take PHY3202 or 3402 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY4330
Instrumentation I
3 U; 2 Lect. 3 Lab.; 2nd term
This course provides an introduction to the working principles and operation techniques of instruments commonly used in experimental physics. Topics covered include: transducers and sensors; signal conditioning, propagation and conversion; noise, signal recovery techniques, computer interface, vacuum techniques, and integrated-circuit instrumentation. This course also includes laboratory experiments for practice and illustration of the subject matter. Prerequisite: permission of the instructor.

PHY4350
Techniques in Materials Characterization
4 U; 3 Lect. 1 Tut. 3 Lab.; 1st term
Principles and operation of materials characterization techniques with electron sources, atom and ion sources, X-ray diffractometry and other techniques. This course also provides experiments on microstructural analysis of materials for practice and illustration of selected subject matters. Prerequisite: permission of the instructor. (Not for students who have taken MSE4010 or 4811.)

PHY4360
Electronic Packaging
3 U; 3 Lect. 1 Tut.
This course provides an overview of concepts and applications of electronic packaging, soldering and materials. Topics include: thick and thin films technologies, polymeric materials in electronic packaging, testing of material properties and electrical performance. Prerequisite: permission of the instructor. (Not for students who have taken MSE4210 .)

PHY4370
Computational Physics
3 U; 3 Lect. 1 Tut. 3 Lab.
This course is intended to provide a solid training in the computational techniques for solving various physical problems. The following topics will be discussed: basic numerical methods, matrix problems in physics, numerical methods for partial differential equations in physics, modelling of continuous systems, and applications of Monte Carlo simulation in statistical physics. Students are advised to take PHY2351 before taking this course. Prerequisite: permission of the instructor.

PHY4410
Modern Optics
3 U; 3 Lect. 1 Tut.
This course provides an overview of the basic principles and applications of various branches of modern optics. Topics covered include: interference and diffraction, Fourier optics, holography, laser physics, polarization and waves in anisotropic media, and introduction to nonlinear optics. Students are advised to take PHY4211 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY4420
Plasma Physics
3 U; 3 Lect. 1 Tut.; 2nd term
This course is intended to introduce the students to the basic properties of plasma. Various important physical processes in plasmas will be discussed. Topics covered include: properties of plasmas, charged particle motions, fluid and kinetic descriptions of plasmas, waves in fluid plasmas, equilibrium and stability, collisions and transport phenomena, and Vlasov theory of electron plasma waves. Prerequisite: PHY3022, 3041 or their equivalents, and permission of the instructor.

PHY4440
Laser Principles and Applications
3 U; 3 Lect. 1 Tut.; 1st term
This course provides an exposition of the basic principles as well as the applied aspects of laser. Topics covered include: electromagnetic theory, ray tracing in optical systems, propagation of laser beams, resonant cavities, laser oscillators and amplifiers, quantum treatment of two-level system, and laser applications. Students are advised to take PHY 3041 and 3202 or 3402, or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY4450
Solid State Physics
3 U; 3 Lect. 1 Tut.; 2nd term
This course aims at providing students with the essential concepts of modern solid state physics. The thermal, electrical, and magnetic properties of solids will be discussed via microscopic models. Topics covered include: survey of crystal lattices, elastic scattering of waves, atomic vibrations, electrons in crystals, thermodynamics of phonons and electrons, electrical and thermal conduction, magnetic properties, and superconductivity. Students are advised to take PHY3202 or its equivalent before taking this course or permission of the instructor.

PHY4460
Relativity
3 U; 3 Lect. 1 Tut.
This course serves as an introduction to the central ideas of the theory of special relativity and general relativity. Topics in the theory of special relativity include: Lorentz transformation, relativistic kinematics and collisions, covariant formulation of electrodynamics. Elements of differential geometry such as metric, vectors, covariant differentiation and curvature will also be introduced. Topics in the general theory of relativity include: gravity as spacetime curvature, geodesic equation, Einstein's equations, Schwarzschild metric, black holes, Robertson-Walker metric, and cosmology. Students are advised to take PHY3022 and 3041 or their equivalents before taking this course. Prerequisite: permission of the instructor.

PHY4510
Selected Topics (Thematic Melodies of 20th Century Theoretical Physics)
2 U; 2 Lect.; 1st term
Different topics illustrating important ideas in 20th century theoretical physics will be discussed. Topics covered will include: quantization, phase factor, path integral, symmetry, symmetry and groups in physics, modern developments and gauge theory. Prerequisite: permission of the instructor.

PHY4520
Selected Topics (Visual Exploration in Physics)
3 U; 2 Lect. 1 Tut. 3 Lab.
The course aims at introducing presentation techniques for physical concepts and phenomena, as well as the use of graphical and real time animation skills, in teaching and learning of physics. Modern apparatus and programming methods will be introduced. Attention will be paid to the advantages of these tools over traditional programming, their capabilities in solving physical problems analytically, in multilingual and audio-visual presentation, and in the delivery of physical knowledge over the cyber world. Exercises all based on physical systems and existing algorithms are designed to provide students with hands-on experience, and to consolidate their physical concepts and mathematical skills. Students are advised to take PHY2351 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY4530
Selected Topics (Astrophysics)
3 U; 3 Lect. 1 Tut.; 2nd term
This course provides an introduction to modern astronomy and cosmology. Topics covered include: star formation and pre-main sequence evolution, main sequence stars, post main sequence evolution: red giants, supernovae, white dwarfs, neutron stars and black holes. Prerequisite: students must have passed in PHY3022, 3201, 3202 or their equivalents or permission of the instructor.

PHY4540, 4550
Selected Topics
3 U each; 3 Lect. 1 Tut.
Different topics may be offered from year to year, depending on available expertise and current developments. Prerequisite: permission of the instructor.

PHY4560, 4570, 4580, 4590
Selected Topics in Applied Physics
3 U each; 3 Lect. 1 Tut.
Courses on selected topics in applied physics may be offered from year to year, depending on available expertise. Prerequisite: permission of the instructor.

PHY4610/4620
Project I/II
3/3 U; 3 Tut. 6 Lab.; 2-term
A project in experimental or theoretical physics, either in research or in reviewing the literature. These two courses should normally be taken as a sequence. Prerequisite: permission of the instructor.

PHY4700
Selected Topics in Nanoscience and Technology
3 U; 3 Lect. 1 Tut.; 1st term
This course covers the theories and applications of materials with a length-scale of nanometers. The selected topics in nanoscience and technology, focusing on materials such as semiconductors, metals, polymers, etc., may differ from year to year, depending on available expertise. Growth and fabrication of nano-size materials and other related science and technology will also be discussed. Prerequisite: permission of the instructor.

PHY4711, 4721
Special Experimental Project I, II
1 U each; 3 Lab.; 1st term
Student taking this course is required to finish a short experimental project, which illustrates modern physics and/or technique. Prerequisite: permission of the instructor. (For undergraduates only.)

PHY4712, 4722
Special Experimental Project III, IV
1 U each; 3 Lab.; 2nd term
Student taking this course is required to finish a short experimental project, which illustrates modern physics and/or technique. Prerequisite: permission of the instructor. (For undergraduates only.)

PHY4751, 4752
Special Theoretical Projects III, IV
1 U each; 3 Tut.; 1st/2nd term
Students taking this course are required to finish a short project or guided study in theoretical physics. Prerequisite: permission of the instructor.

PHY4910
Advanced Laboratory
3 U; 6 Lab.
Experiments on physics and materials science. Prerequisite: permission of the instructor.

PHY5410
Quantum Mechanics II
3 U; 3 Lect. 1 Tut.; 2nd term
This course will discuss various theoretical topics of non-relativistic quantum mechanics at the graduate level. The quantum mechanics of many-body systems will also be introduced. Topics covered include: operator methods in quantum mechanics, addition of angular momenta, variational method, stationary perturbation theory, time-dependent perturbation theory, scattering theory, and introduction to the quantum theory of many-body systems. Prerequisite: permission of the instructor.

PHY5420
Classical Electrodynamics
3 U; 3 Lect. 1 Tut.
This course is intended to provide an introduction to the theory of classical electrodynamics at the graduate level. The emphasis is on the problems of electromagnetic radiation and the covariant formulation of electrodynamics. Selected topics of current research interest will also be discussed. Prerequisite: permission of the instructor.

PHY5430
Solid State Theory
3 U; 3 Lect. 1 Tut.
This course serves as an introduction to the quantum theory of solid state physics at the graduate level. Topics covered include: band theory of electron in a periodic potential, semiclassical theory of electron dynamics, quantum theory of lattice dynamics, electron-phonon interaction, transport properties of solids, superconductivity, and selected topics of current research interest. Prerequisite: PHY4221 or their equivalents, and permission of the instructor.

PHY5440
Astrophysics
3 U; 3 Lect. 1 Tut.
This course is intended to provide an introduction to contemporary theoretical astrophysics. Topics covered include: tools for probing astrophysical phenomena, structure and evolution of stars, introduction to the general theory of relativity and cosmology, and relativistic astrophysics. Prerequisite: permission of the instructor.

PHY5450
Introduction to Soft Matter Physics
3 U; 3 Lect. 1 Tut.; 2nd term
The aim of this course is to provide students the basic concepts and research methods in soft matter physics. Topics covered include: structural, thermodynamic and dynamical properties of macromolecules, gels, colloids, amphiphilic molecules, membranes and liquid crystals. Principles for some of the major experimental techniques used in soft matter research will also be discussed. Students who take this course are expected to have a good knowledge of thermodynamics and statistical mechanics. Prerequisite: permission of the instructor.

PHY5460
Instrumentation II
3 U; 2 Lect. 4 Lab.; 1st term
Principles, instrumentation, experiments and data interpretation of spectroscopy, thermal nalysis, microscopy and other instrumentation. Laboratory experiments for practice and illustration of the subject matter. Prerequisite: PHY4330 or its equivalent or special permission of the instructor.

PHY5510
Topics in Theoretical Physics (Advanced Statistical Mechanics)
3 U; 3 Lect. 1 Tut.; 1st term
This course provides an introduction to the major ideas and methods in equilibrium statistical mechanics as well as in nonequilibrium statistical physics. Topics will be selected from: the statistical mechanics of magnetic systems, interacting fluids and soft matter, theory of critical phenomena and the renormalization group, stochastic dynamics and nonequilibrium processes, introduction to quantum statistical mechanics, and other topics of current interest in statistical physics. Prerequisite: PHY4260 or its equivalent or permission of the instructor.

PHY5520
Topics in Theoretical Physics (Introduction to Many-body Theory)
3 U; 3 Lect. 1 Tut.
This course provides an introduction to the basic concepts and theoretical techniques of the quantum theory of many-body systems at zero-temperature as well as at finite temperature. Topics covered include: second quantization, Green's functions at zero-temperature, Green's functions at finite temperature, perturbation theory and Feynman diagram, equations of motion of the Green's functions, linear response theory, and applications of many-body theory in condensed matter physics. Prerequisite: permission of the instructor.

PHY5530
Topics in Theoretical Physics (Introduction to Particle Physics)
3 U; 3 Lect. 1 Tut.
An introductory survey of major ideas and important results in particle physics. Topics include symmetries, relativistic quantum mechanics, perturbation theory, quantum electrodynamics, the Standard Model, and the relationship between particle physics and cosmology. Prerequisite: PHY5410 or its equivalent or permission of the instructor.

PHY5540
Topics in Theoretical Physics (Advanced Computational Physics)
3 U; 3 Lect. 1 Tut.
This course is intended to provide a solid training in the advanced techniques of contemporary computational physics. Topics covered include: classical Monte Carlo method and applications, quantum Monte Carlo techniques and applications, exact diagonalization technique for quantum many-body systems, random systems, molecular dynamics and classical fluids, and selected topics of current interest in computational physics. Prerequisite: permission of the instructor.

PHY5550
Topics in Theoretical Physics (Quantum Optics)
3 U; 3 Lect. 1 Tut.; 2nd term
Concept of photons, properties and applications of nonclassical light, photo-detection of optical coherence, photon-atom interaction models, quantum theory of damping, laser theory, atom coherence effects and an introduction to quantum communication. Students are advised to take PHY4221 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY5560
Topics in the Frontiers of Physics
3 U; 3 Lect. 1 Tut.
Topics of contemporary interest will be selected both from fundamental physics and from physics with important applications to technology. The objective is to introduce students to the frontiers of physics. The level of presentation assumes basic understanding of undergraduate physics. Prerequisite: permission of the instructor.

PHY5570
Methods in Theoretical Physics II
3 U; 3 Lect. 1 Tut.; 1st term
The aim of the course is to provide students with the essential mathematical physics background needed for carrying out postgraduate studies in physics. Topics will be selected from complex analysis including analytic functions, Laurent series, Cauchy-Riemann conditions, residue theorem and its applications; ordinary differential equations including the Frobenius method, Green's functions, special functions and their applications; partial differential equations including Green's functions, eigenfunction expansions and boundary-value problems; perturbation theory and its application in physics; probability and statistics with applications in physics; and other topics of relevance to physics. Students are expected to have taken PHY2601 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY5580
Physics of Quantum Information and Quantum Computation
3 U; 3 Lect. 1 Tut.
This course provides an introduction to the basic concepts and applications of quantum information and quantum computation. Topics covered include: key concepts of quantum mechanics, single qubit transformations, quantum circuits, quantum algorithms, quantum communication, and quantum information theory. Students are advised to take PHY4221 or its equivalent before taking this course. Prerequisite: permission of the instructor.

PHY5620
Topics in Experimental Physics (Thin Film Physics and Technology)
3 U; 3 Lect.; 1st term
This course provides an introduction to the physical properties as well as the methods of preparation of thin films. Topics covered include: vacuum science and technology, thin film deposition techniques, growth processes and modes, characterization, epitaxy, lattice engineering, metastable phases, artificial structures, novel properties in thin films: superconductivity, giant-magnetoresistance and colossal magnetoresistance effects, modulation doping and quantum wells, superhard coatings, and transparent conducting coatings. Prerequisite: permission of the instructor.

PHY5630,5640,5650
Topics in Experimental Physics
3 U each; 3 Lect. 1 Tut.
Topics of current interest in experimental physics, depending on available expertise and current developments. Prerequisite: permission of the instructor.

MSE5080
Surface Science
3 U; 2 Lect. 3 Lab; 2nd term
This course serves as an introduction to surface science. Major topics are: vacuum technology, electron-surface interactions, photon-surface interactions, ion-surface interactions, scanning probe microscopy and case studies in surface science. Prerequisite: permission of the instructor.

Study Scheme

1. Major Programme

A. Applicable to students admitted in 2006-07 and thereafter

There are three streams of specialization: *Physics Stream*, *Enrichment Stream in Applied Physics*, and *Enrichment Stream in Theoretical Physics*. All students are initially under Physics Stream. Students with cumulative Major GPA of at least 3.0, or with the permission of the Department, may apply at their fourth term of attendance or thereafter (for Secondary 6 entrants, at their sixth term of attendance or thereafter) to specialize in the *Enrichment Stream in Applied Physics* or the *Enrichment Stream in Theoretical Physics* and select certain courses as prescribed below.

Courses Required of All. (Please see Note): PHY0211, 0222, 0411, 2001, 2002, 2003, 2004, 2351, 2811, 2822, 3011, 3041, 3201	34 units
	Total: 34 units

Physics Stream

(i)	Required Courses: PHY3202, 3811	5 units
(ii)	24 units of Elective Courses from Group A and B with at least 15 units from Group A: Group A PHY3022, 3350, 4211, 4221, 4260, 4320, 4330, 4700	24 units

Group B
PHY2400, 2601, 371S, 372S, 3401, 3402, 3412, 3822, 4350, 4360, 4370, 4410, 4420, 4440, 4450, 4460, 4520, 4530, 4540, 4550, 4560, 4570, 4580, 4590, 4610, 4620, 4711, 4712, 4721, 4722, 5410, 5420, 5430, 5440, SCI2400#

Total: 63 units

to be included in the Major GPA as well.

Recommended course pattern

First Year of Attendance
1st term : PHY0211, 2001, 2004, 2351, 2811 — 13 units
2nd term: PHY0222, 2002, 2003, 2822, elective course — 13 units
Second Year of Attendance
1st term : PHY3011, 3041, 3201, 3811 — 11 units
2nd term : PHY3202, elective course(s) — 7-10 units
Third Year of Attendance
1st term : PHY0411, elective courses — 10 units
2nd term: elective courses — 9 units

Total: 63 units

Enrichment Stream in Applied Physics

(i) Required Courses: — 17 units
PHY3401, 3402, 3412, 3811, 4330, 4350

(ii) At least 14 units of Elective Courses (at most 8 units from Group B): — 14 units
Group A:
PHY3022, 3202, 371S, 372S, 4320, 4420, 4440, 4560, 4570, 4580, 4590, 4610 or 4620, 4700, 4711, 4712, 4721, 4722, 5620, MSE5080#
Group B:
ACE3200#*, ELE3010#§, 3240#*, 3520#*, 4310#, 4320#, 4430#, PHY4360

Total: 65 units

to be included in the Major GPA as well.
* *students are advised to take PHY4330 before taking ACE3200 or ELE3240.*
§ *students who have taken (or intend to take) PHY4320 or 4440 are not allowed to take ELE3010.*
❖ *students are advised to take PHY3412 before taking ELE3520.*

Recommended course pattern

First Year of Attendance
1st term : PHY0211, 2001, 2004, 2351, 2811 — 13 units
2nd term : PHY0222, 2002, 2003, 2822 — 10 units
Second Year of Attendance
1st term : PHY3011, 3041, 3201, 3401, 3811 — 14 units
2nd term : PHY3402, 3412, elective course(s) — 9-10 units

Third Year of Attendance

1st term :	PHY0411, 4350, elective course(s)	8-12 units
2nd term :	PHY4330, elective courses	6-10 units
		Total: 65 units

Enrichment Stream in Theoretical Physics

(i)	Required Courses: PHY2601, 3022, 3202, 4211, 4221, 4260	19 units
(ii)	At least 12 units of Elective Courses: PHY3350, 4420, 4450, 4460, 4530, 4610 or 4620, 5410, 5420, 5570	12 units
		Total: 65 units

[#] *to be included in the Major GPA as well.*

Recommended course pattern

First Year of Attendance

1st term :	PHY0211, 2001, 2004, 2351, 2811	13 units
2nd term :	PHY0222, 2002, 2003, 2822	10 units

Second Year of Attendance

1st term :	PHY2601, 3011, 3041, 3201	13 units
2nd term :	PHY3022, 3202, elective course(s)	10-13 units

Third Year of Attendance

1st term :	PHY0411, 4221, 4260, elective course	10 units
2nd term :	PHY4211, elective courses	9 units
		Total: 65 units

The Major Programme requirement for second-year entrants can be viewed on the homepage of the Academic Affairs Section, <http://www.cuhk.edu.hk/aas/>.

B. Applicable to students admitted in 2004-05 and 2005-06

There are three streams of specialization: *Physics Stream, Enrichment Stream in Applied Physics*, and *Enrichment Stream in Theoretical Physics*. All students are initially under Physics Stream. Students with cumulative Major GPA of at least 3.0, or with the permission of the Department, may apply at their fourth term of attendance or thereafter (for Secondary 6 entrants, at their sixth term of attendance or thereafter) to specialize in the *Enrichment Stream in Applied Physics* or the *Enrichment Stream in Theoretical Physics* and select certain courses as prescribed below.

Courses Required of All. (Please see Note): PHY0211, 0222, 0411, 2001, 2002, 2003, 2004, 2351, 2811, 2822, 3011, 3041, 3052, 3201	37 units
	Total: 37 units

Physics Stream

(i)	Required Courses: PHY3202, 3811	5 units
(ii)	24 units of Elective Courses from Group A and B with at least 15 units from Group A: Group A PHY3022, 3350, 4211, 4221, 4260, 4320, 4330, 4700 Group B PHY2400, 2601, 371S, 372S, 3401, 3402, 3412, 3822, 4350, 4360, 4370, 4410, 4420, 4440, 4450, 4460, 4520, 4530, 4540, 4550, 4560, 4570, 4580, 4590, 4610, 4620, 4711, 4712, 4721, 4722, 5410, 5420, 5430, 5440, SCI2400[#]	24 units
		Total: 66 units

[#] *to be included in the Major GPA as well.*

Recommended course pattern

First Year of Attendance	
1st term : PHY0211, 2001, 2004, 2351, 2811	13 units
2nd term: PHY0222, 2002, 2003, 2822, elective course	13 units
Second Year of Attendance	
1st term : PHY3011, 3041, 3201, 3811	11 units
2nd term : PHY3052, 3202, elective course	10 units
Third Year of Attendance	
1st term : PHY0411, elective courses	10 units
2nd term: elective courses	9 units
Total:	66 units

Enrichment Stream in Applied Physics

(i)	Required Courses: PHY3401, 3402, 3412, 3811, 4330, 4350	17 units
(ii)	At least 14 units of Elective Courses (at most 8 units from Group B): Group A: PHY3022, 3202, 371S, 372S, 4320, 4420, 4440, 4560, 4570, 4580, 4590, 4610 or 4620, 4700, 4711, 4712, 4721, 4722, 5620, MSE5080[#] Group B: ACE3200[#*], ELE3010[#§], 3240[#*], 3520[#❖], 4310[#], 4320[#], 4430[#], PHY4360	14 units
		Total: 68 units

[#] *to be included in the Major GPA as well.*

[*] *students are advised to take PHY4330 before taking ACE3200 or ELE3240.*

[§] *students who have taken (or intend to take) PHY4320 or 4440 are not allowed to take ELE3010.*

[❖] *students are advised to take PHY3412 before taking ELE3520.*

Recommended course pattern

First Year of Attendance
1st term : PHY0211, 2001, 2004, 2351, 2811 — 13 units
2nd term : PHY0222, 2002, 2003, 2822 — 10 units
Second Year of Attendance
1st term : PHY3011, 3041, 3201, 3401, 3811 — 14 units
2nd term : PHY3052, 3402, 3412, elective course — 12-13 units
Third Year of Attendance
1st term : PHY0411, 4350 elective course(s) — 8-12 units
2nd term : PHY4330, elective courses — 6-10 units

Total: 68 units

Enrichment Stream in Theoretical Physics

(i) Required Courses: — 19 units
PHY2601, 3022, 3202, 4211, 4221, 4260

(ii) At least 12 units of Elective Courses: — 12 units
PHY3350, 4420, 4450, 4460, 4530, 4610 or 4620, 5410, 5420, 5570

Total: 68 units

[#] *to be included in the Major GPA as well.*

Recommended course pattern

First Year of Attendance
1st term : PHY0211, 2001, 2004, 2351, 2811 — 13 units
2nd term : PHY0222, 2002, 2003, 2822 — 10 units
Second Year of Attendance
1st term : PHY2601, 3011, 3041, 3201 — 13 units
2nd term : PHY3022, 3052, 3202, elective course — 13 units
Third Year of Attendance
1st term : PHY0411, 4221, 4260, elective course — 10 units
2nd term : PHY4211, elective courses — 9 units

Total: 68 units

Note: Students should obtain Grade "D" or above in each of the courses of PHY2001, 2002 and 2003. Otherwise, they are required to repeat the course(s). Students who cannot meet the Grade "D" requirement in any one of the courses mentioned above after two attempts will be required to withdraw from the University. Please refer to Reg. 15.2(e) of the General Regulations Governing Full-time Undergraduate Studies.

The Major Programme requirement for second-year entrants can be viewed on the homepage of the Academic Affairs Section, <http://www.cuhk.edu.hk/aas/>.

2. Minor Programme

Applicable to students admitted in 2004-05 and thereafter

Students are required to complete a minimum of 18 units from the following courses and other elective courses as approved by the Department. The completed courses must include at least 6 units of PHY courses at 3000 or above level. (Please see Notes 1-3):
PHY2001, 2002, 2003, 2351, 2400, 2601, 3011, 3022, 3041, 3052, 3201, 3202, 3350, 3402, 3412, 4211, 4221, 4260, 4320, 4330, 4350, 4360, 4370, 4410, 4420, 4440, 4450, 4460, 4520, 4530, 4540, 4550, 4700

Notes: 1. Electronics Engineering Majors are not allowed to select PHY3412 to fulfil the Minor Programme requirements.
2. Mathematics Majors are not allowed to select PHY2601 to fulfil the Minor Programme requirements.
3. Computer Science and Computer Engineering Majors are not allowed to select PHY2351 to fulfil the Minor Programme requirements.

3. Course Exemptions

Physics Majors

Substitute Courses
Students who fail no more than one required course may be allowed to substitute it by another elective course at PHY3000 or above level as approved by the Department, provided that: 1) the course is failed in the final two terms of attendance before graduation, and 2) the students concerned satisfy all other graduation requirements.

Physics Minors

Certain prerequisite/co-requisite conditions for registering for the courses may be waived; intending Minor students should consult the Department of Physics individually.

4. Faculty Language Requirement

(Please refer to “Faculty Language Requirement” of Faculty of Science for details.)

5. Major/Faculty Requirement for S6 Entrants

(Please refer to “Major/Faculty Requirement for S6 Entrants” of Faculty of Science for details.)