MichiganTech

Graduate Course Descriptions Effective Fall 2007
https://www.banweb.mtu.edu/pls/owa/stu_ctg_utils.p_online_all_courses_gr

Physics

PH 5010 - Graduate Journal Club
Presentation and discussion of current issues in physics and recent research by departmental faculty and others. One credit in journal club is required for all graduate degrees in physics.
Credits: 1.0
Lec-Rec-Lab: (0-1-0)
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5090 - Special Topics in Physics
The subject matter may vary from term to term and year to year depending on the needs of advanced students.
Credits: variable to 3.0; May be repeated
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5110 - Classical Mechanics
Lagrangian methods, symmetries and conservation laws, variational formulation, small oscillations, Hamilton's equations, contact transformations, Poisson brackets, Hamilton-Jacobi theory, Lorentz-invariant formulation.
Credits: 2.0
Lec-Rec-Lab: (2-0-0)
Semesters Offered: Fall, Spring - Offered alternate years beginning with the 2002-2003 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5210 - Electrodynamics I
Electrostatics and magnetostatics, boundary value problems, multipoles, Maxwell's equations, time-dependent fields, propagating wave solutions, radiation.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PH 5320

PH 5211 - Electrodynamics II
Scattering and diffraction, special relativity, relativistic particle dynamics, Lorenz transformation, 4-vectors, transformation of fields, charges and currents, Thomas precession, retarded potentials, radiation from moving charges.
Credits: 2.0
Lec-Rec-Lab: (2-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2006-2007 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PH 5210

PH 5310 - Statistical Mechanics
Ensembles, partition functions and distributions, thermodynamic potentials, quantum statistics, ideal and nonideal gases, interacting systems. Applications may include classical and quantum liquids, phase transitions and critical phenomena, correlation functions, linear response and transport theory, or other topics.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2003-2004 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5320 - Mathematical Physics
Partial differential equations of physics, separation of variables, boundary value problems, Sturm-Liouville theory, Legendre and Bessel functions, inhomogeneous partial differential equations, Green's functions. Fourier series, Fourier and Laplace transforms, complex variables, evaluation of integrals by contour integration, linear algebra, matrix methods with emphasis on numerical applications.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5410 - Quantum Mechanics I
Study of the postulates of quantum mechanics framed in Dirac notation, the Heisenberg uncertainty relations, simple problems in one dimension, the harmonic oscillator, the principles of quantum dynamics, rotational invariance and angular momentum, spherically symmetric potentials including the hydrogen atom, and spin.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5411 - Quantum Mechanics II
Continuation of PH5410. Includes the study of symmetries and their consequences, the variational method, identical particles, the Hartree-Fock approximation time-independent perturbation theory, time-dependent perturbation theory, diatomic molecules with applications to H2+, many-body perturbation theory, and the Dirac equation.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PH 5410

PH 5510 - Theory of Solids
Free electron theory, Bloch's theorem, electronic band structure theory, Fermi surfaces, electron transport in metals and semiconductors. Lattice vibrations and phonons, other topics as time permits.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2000-2001 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PH 5320 and PH 5410

PH 5520 - Materials Physics
Materials classification and structures; phase diagrams; lattice imperfections; quasiparticles; boundaries and interfaces; mechanical, electronic, optical, magnetic and superconducting properties of materials.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2001-2002 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5530 - Selected Topics in Nanoscale Science and Technology
Presentation and discussion of selected topics in nanoscale science and engineering. Topics include growth, properties, applications, and societal implication of nanoscale materials. Evaluation: attendance and assignment.
Credits: 2.0
Lec-Rec-Lab: (2-0-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

PH 5610 - High Energy Astrophysics
An introduction to the ideas and results of astrophysics and high energy physics.
Credits: 2.0
Lec-Rec-Lab: (2-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5640 - Atmospheric Physics
Essential elements of atmospheric physics, including thermodynamics (e.g. adiabatic processes, phase transformations, stratification), aerosol and cloud physics (e.g. nucleation, Kohler theory, growth by condensation and collection), and radiative transfer (e.g. Beer's law, transfer equations with and without scattering.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2008-2009 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PH 2300 and MA 3530

PH 5680 - Atmospheric Fluid Dynamics
Fundamental forces and conservation laws that govern fluid flow; applications to the atmosphere, including balanced flow (pressure gradient and Coriolis force), vorticity dynamics, turbulence, waves, and boundary layers.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2007-2008 academic year
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): PH 2300 and MA 3530

PH 5920 - Scientific Instrument Fabrication
Project-oriented introduction to scientific instrument design and machine shop techniques. The course introduces proper use and application of shop machinery, including lathe, drill press, band saw, mill, torch, and woodworking tools. Instrument design, bench layout, and drafting standards are included as well as laboratory safety training.
Credits: 2.0
Lec-Rec-Lab: (0-0-4)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5999 - Master's Research
Master's-level research conducted under the direction of a graduate faculty advisor.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer
Restrictions: Permission of instructor and department required; Must be enrolled in one of the following Level(s): Graduate

PH 6999 - Doctoral Research
Independent research conducted in partial fulfillment of the requirements for the PhD degree. Scheduled by arrangement.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer
Restrictions: Permission of instructor and department required; Must be enrolled in one of the following Level(s): Graduate

For more information, contact
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