2009

Physics (PHYS)

Montclair State University

		graduate students who have indicated a potential for original thinking. Also offered at the site of the New Jersey Marine Sciences Consortium. May be repeated three times for a maximum of 10.0 credits as long as the topic is different. Cross listed with Earth and Environmental Studies, EAES 559. Previous course PHMS 598 effective through Spring 2012.
PHMS564	Title	Benthic Ecology.
	Prerequisites	Departmental approval.
	Number and type of credits	1 hour lecture, 6 hours lab.
	Course Description	Community structure, tropic dynamics species diversity and distribution of bottom dwelling organisms in relationship to their environment. Lectures, lab work, field investigation of marine benthos. Offered at N.J. Marine Sciences Consortium.
PHMS565	Title	Tidal Marsh Ecology.
	Prerequisites	Departmental approval.
	Number and type of credits	3 hours lecture, 3 hours lab.
	Course Description	Salt marsh development and physiography: community structure, energetics, and interrelationships. The role of salt marshes in estuarine and marine systems. The impact of man on the marsh. Offered at N.J. Marine Sciences Consortium.
PHMS566	Title	Ecology of the Estuary.
	Prerequisites	Departmental approval.
	Number and type of credits	3 hours lecture, 3 hours lab.
	Course Description	Emphasis is placed upon the important biotic, chemical and physical parameters of New Jersey's estuaries. An underlying theme is the evolution and successional trends of estuarine communities. Ecology of individual communities is studied by field trips to Delaware Bay shore and to some Atlantic coastbays, marshes and off-shore barrier islands. Also offered at the N.J. Marine Sciences Consortium.
PHYS100	Title	Concepts in Science.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	This is a one-semester physical science course with laboratory designed for those students not majoring in science areas. This course will introduce the student to methods of science while teaching some principles of physical science and some of their applications. Topics discussed include: energy and

		motion; heat, energy and solar heating; sound and noise; light, lenses and fiber optics.
PHYS104	Title	History of Science.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture.
	Course Description	The historical and philosophical development of science traced from the ancient Egyptians to the present.
PHYS106	Title	Science and Society.
	Number and type of credits	3 hours lecture.
	Course Description	This is a one semester course for non-science majors designed to provide a knowledge of some of the principles of physical science and to indicate how they are related to society. Formal laboratory is not included in the course. Topics discussed vary but may include such areas as: science, a human activity; man and energy; radiation and man; electricity and man; nuclear power and man; and others.
PHYS109	Title	Energy and Climate Change.
	Number and type of credits	3 hours lecture.
	Course Description	The physics of energy and climate change. The course will focus on issues
PHYS109	Course Description	such as the current energy crisis, alternative energy efforts and the scientific data indicative of climate change and global warming.
PHYS180	Title	Descriptive Astronomy.
	Number and type of credits	3 hours lecture.
	Course Description	For the general student -- a discussion of our place in the universe from ancient ideas to modern data on the moon, planets, comets, stars, galaxies and quasars. The formation and evolution of planets, stars, black holes and the universe as a whole reveal our place in time.
PHYS191	Title	University Physics I.
	Prerequisites	MATH 122 is prerequisite or co-requisite.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	This one-semester calculus-based course including laboratory is a study of the principles of physics and some applications to society's problems. Topics

		covered include mechanics, thermodynamics, fluids, and harmonic motion.
PHYS192	Title	University Physics II.
	Prerequisites	MATH 221 is prerequisite or corequisite.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Calculus-based course. Study of some principles of physics and some applications to society's problems. Topics include: wave motion, sound and noise pollution, optics, electricity, lasers, nuclear theory, radiation, nuclear reactors, waste disposal.
PHYS193	Title	College Physics I.
	Prerequisites	MATH 100 or MATH 111 or MATH 112 or MATH 116 or MATH 122.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	This one-semester course including laboratory is a study of the principles and applications of classical physics. Topics covered include mechanics, heat and thermodynamics, wave motion and sound, as well as societal applications of physical principles. Calculus is not used, but familiarity with some algebra and trigonometry is required.
PHYS194	Title	College Physics II.
	Prerequisites	PHYS 193; and MATH 100 or MATH 111 or MATH 112.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	This one-semester course including laboratory is a study of the principles and applications of classical physics. Topics covered include optics, electricity and magnetism, and an introduction to modern and nuclear physics, as well as societal applications of physical principles. Calculus is not used, but familiarity with some algebra and trigonometry is required.
PHYS204	Title	Selected Topics in Contemporary History of Science.
	Number and type of credits	3 hours lecture.
	Course Description	A study which will consider the most important discoveries of the twentieth century that are changing our world and the events leading to the inventions. These concepts will be related to twentieth century idealism, materialism, and ideas of progress. No prior knowledge of science of mathematics is assumed and the course could be used as a sequential to PHYS 104 History of Science.

PHYS205	Title	Scientific Principles of Technology.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	The practical implications of physical concepts on technology will be studied, emphasizing how technical machines work.
PHYS210	Title	Mechanics.
	Prerequisites	PHYS 191.
	Special Fee	Special fee.
PHYS210	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Classical mechanics: Kinematics, Newton's laws, impulse and momentum, statics, work and energy, oscillations, general motion, central force motion, non-inertial frames, system of particles, methods of handling data.
PHYS240	Title	Electricity and Magnetism.
	Prerequisites	PHYS 192; and MATH 222 is a prerequisite or corequisite.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Basic principles of electromagnetism: Coulomb's law and general techniques in electrostatics, currents and their associated magnetic field, electromagnetic induction and magnetic properties of materials. Foundations of Maxwell's equations (without detailed solutions). Laboratory experiments.
PHYS242	Title	Circuit Theory.
	Prerequisites	PHYS 192 or PHYS 194 and MATH 221.
	Special Fee	Special fee.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	Introduces basic methods in circuit analysis and design. Topics include linear electric circuits and their response, circuit theorems, filters, Fourier analysis of different inputs and outputs, and transmission lines.
PHYS245	Title	Electronics and Digital Circuits.
	Prerequisites	PHYS 192 or 194.
	Special Fee	Special fee.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	An introduction to the principles of amplifiers, waveform generators, and digital circuits, with emphasis on the use of commonly available integrated

		circuit packages.
PHYS247	Title	Microprocessors and Their Applications.
	Prerequisites	PHYS 192 or 194.
	Special Fee	Special fee.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	One semester course providing an introduction to the principles, operations and applications of microprocessors including experiment control and data manipulation.
PHYS280	Title	Astronomy.
	Prerequisites	PHYS 191, 192 or PHYS 193, 194.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Application of physical laws to the earth as a planet; nature of the other planets; orbital motion and space flight; origin of the solar system; the birth, life and death of a star galactic structure; and cosmology. Meets the University Writing Requirement for majors in Physics.
PHYS310	Title	Advanced Mechanics.
	Prerequisites	MATH 222, and 420, and PHYS 210.
	Number and type of credits	3 hours lecture.
	Course Description	Classical mechanics; transformations, oscillators, generalized motion; Lagrange's equations; Hamilton's equation; small oscillations; wave propagation. (Offered alternate years.) Meets the University Writing Requirement for majors in Physics.
PHYS320	Title	Thermodynamics.
	Prerequisites	MATH 222 and PHYS 210.
	Number and type of credits	3 hours lecture.
	Course Description	Thermodynamic systems; laws of thermodynamics; entropy; kinetic theory; transport processes; statistical thermodynamics. (Offered alternate years.)
PHYS322	Title	Digital Communications.
	Prerequisites	PHYS 122.
PHYS322	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	Digital communications will focus on the conversion of information into

		digital structure and the transmission of information within networks comprised of intelligent machines and humans.
PHYS341	Title	Electronic Fundamentals.
	Prerequisites	PHYS 205.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	Circuit conditions; analysis of electronic concepts, theoretically and experimentally.
PHYS350	Title	Optics.
	Prerequisites	PHYS 240.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Propagation of light, optical components, instruments and photometry. Interference, diffraction and polarization with elements of spectroscopy. (Offered alternate years.) Meets the University Writing Requirement for majors in Physics.
PHYS368	Title	Fluid Mechanics.
	Prerequisites	MATH 222 with a grade of C- or better.
	Number and type of credits	3 hours lecture.
	Course Description	Mechanics of continuous media, liquids and gases; stress, viscosity, Navier-Stokes and Euler Equations, exact solutions, potential flow, circulation and vorticity, dimensional analysis and asymptotic models, boundary layers, stability theory and applications to industrial environmental problems. Cross listed with MATH 368. Previous course PHYS 468 effective through Spring 2014.
PHYS377	Title	Mathematical Physics.
	Prerequisites	2 years of physics and MATH 222.
	Number and type of credits	3 hours lecture.
	Course Description	Vector analysis, complex variables, ordinary and partial differential equations, matrices. (Not offered every year.)
PHYS380	Title	Observational Astronomy.
	Prerequisites	PHYS 191, PHYS 192 or PHYS 193, PHYS 194.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Observational techniques for the Moon, planets, satellites of other planets, asteroids, comets, stars, star clusters, and galaxies.

PHYS399	Title	Topics in Physics.
	Prerequisites	PHYS 210 or departmental approval.
	Number and type of credits	1 hour lab and 1 hour lecture.
	Course Description	Study of advanced topics in Physics. Topics will vary. May include a laboratory component. May be repeated for a maximum of 8 credits.
PHYS430	Title	Computer Simulations of Physical Systems.
	Prerequisites	MATH 221, PHYS 191, PHYS 192, and CMPT 183.
	Number and type of credits	3 hours lecture.
	Course Description	This course applies computer techniques and numerical analysis to model physical systems. Simulations and calculations will be done of falling bodies, gravitational orbits, scattering, oscillations, electrical circuits, molecular dynamics, Monte Carlo techniques, chaos, and quantum systems.
PHYS443	Title	Computer-Aided Drafting: An Introduction.
	Prerequisites	PHYS 143.
	Number and type of credits	2 hours lecture, 2 hours lab.
	Course Description	Students will study the command structure of AutoCad to create, modify and manage CAD drawings and designs. Various applications in graphic communication will be explored with practical hands-on lab sessions. Experience with computers or technical graphics is not required.
PHYS446	Title	Micro-Computer Technology.
	Prerequisites	PHYS 240 and CMPT 184.
	Number and type of credits	3 hours lecture.
	Course Description	Manufacturing, design and consumer product application of computer technology will be emphasized. Hands-on experience with micro computers, plotters, digitizers, printers and other peripherals will aid the student in developing an appreciation for the less publicized applications of the computer. Software, firmware and hardware will be illustrated and discussed, especially as related to interfacing. Numerical controlled machining and robotics will also be studied.
PHYS460	Title	Modern Physics.
	Prerequisites	PHYS 210, 240.
	Special Fee	Special fee.

	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Special relativity, kinetic theory of matter; quantization of electricity, light and energy; nuclear atom; elementary quantum mechanics and topics on solid state. (Offered alternate years.)
PHYS461	Title	Special and General Relativity.
	Prerequisites	PHYS 320 or PHYS 350 or PHYS 368 or MATH 368.
	Number and type of credits	3 hours lecture.
	Course Description	An introduction to Einstein's geometric theory of gravity. Topics will include: special relativity, 4-vectors, the twin paradox, the metric tensor, non-Euclidean geometry, the equivalence principle, the gravitational redshift, geodesics, the Schwarzschild solution, and black holes.
PHYS462	Title	Nuclear Physics.
	Prerequisites	PHYS 210, 240.
	Special Fee	Special fee.
	Number and type of credits	3 hours lecture, 2 hours lab.
	Course Description	Nuclear radiation; radioactive decay; detectors; nuclear spectroscopy and reactions; theories and models; fission, fusion, reactors; and application of radioisotopes. (Offered alternate years.) Meets the University Writing Requirement for majors in Physics.
PHYS464	Title	Quantum Mechanics.
	Prerequisites	PHYS 460.
	Number and type of credits	3 hours lecture.
	Course Description	Shroedinger's wave equation, its application and interpretation; Pauli exclusion principle and spectra. (Offered alternate years.)
PHYS470	Title	Solid State Physics.
	Prerequisites	PHYS 460.
	Number and type of credits	3 hours lecture.
	Course Description	Properties of solid state matter are developed from the quantum mechanics of atoms and molecules. (Not offered every year.)
PHYS480	Title	Astrophysics.
	Prerequisites	PHYS 191, 192 or PHYS 193, 194; PHYS 280; MATH 221. Prerequisite or corequisite: STAT 401.
	Number and type of credits	3 hours lecture.
	Course Description	The laws of physics applied to planetary structure, stars and their evolution

		in time, the interstellar medium, galaxies, and large-scale structure of the universe.
PHYS490	Title	Literature Research in Physics.
	Prerequisites	At least 16 credit hours of physics beyond PHYS 192.
	Number and type of credits	2 hours lecture.
	Course Description	Student considers topics in physics and gains facility in literature research techniques: topics in pure physics or related to physics education. Students intending to enroll in laboratory research in physics should use PHYS 490 to
PHYS490	Course Description	provide the literature research related to his/her laboratory problem. (Not offered every year.)
PHYS495	Title	Laboratory Research in Physics.
	Prerequisites	At least 16 credit hours of physics beyond PHYS 192.
	Course Description	Solution of a laboratory problem research in pure physics or in physics education. Written report required. (Not offered every year.)
PHYS519	Title	Special Topics in Physics.
	Prerequisites	At least 12 semester hours in physics and permission of Physics certification program coordinator.
	Number and type of credits	3 hours lecture.
	Course Description	Designed to acquaint the student with recent developments in physics and applications of physics. Examples of topic areas are astrophysics, laser applications, applications of quantum theory, solid state applications, radiation safety, nuclear waste disposal, and medical physics. May be repeated once for a maximum of 6.0 credits.
POLS100	Title	Introduction to Politics.
	Number and type of credits	3 hours lecture,
	Course Description	This course analyzes politics from the four main vantage points of the discipline of political science, that is, political theory, comparative politics, international relations and American government. Of special concern is the U.S. Constitution, its classical and English roots, and its development to the present. This course is required for Political Science Majors. Meets Gen Ed 2002 - Social Science, Social Science.
POLS101	Title	American Government and Politics.