PHYSICS (PHYS)

PHYS 100 - Concepts in Science **4 Credits**
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. 3 hours lecture, 2 hours lab.

PHYS 104 - History of Science **3 Credits**
The historical and philosophical development of science traced from the ancient Egyptians to the present. 3 hours lecture.

PHYS 106 - Science and Society **3 Credits**
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. 3 hours lecture.

PHYS 109 - Energy and Climate Change **3 Credits**
The physics of energy and climate change. The course will focus on issues such as the current energy crisis, alternative energy efforts and the scientific data indicative of climate change and global warming. 3 hours lecture.

PHYS 180 - Descriptive Astronomy **3 Credits**
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. 3 hours lecture.

PHYS 191 - University Physics I **4 Credits**
Prerequisite(s): MATH 122 is prerequisite or co-requisite. 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. Meets Gen Ed - Natural Science Laboratory. 3 hours lecture, 2 hours lab.

PHYS 192 - University Physics II **4 Credits**
Prerequisite(s): MATH 221 is prerequisite or corequisite. 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. 3 hours lecture, 2 hours lab.

PHYS 193 - College Physics I **4 Credits**
Prerequisite(s): MATH 100. 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. 3 hours lecture, 2 hours lab.

PHYS 194 - College Physics II **4 Credits**
Prerequisite(s): PHYS 193; and MATH 100 or MATH 111 or MATH 112. 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. 3 hours lecture, 2 hours lab.

PHYS 210 - Mechanics **4 Credits**
Prerequisite(s): PHYS 191. 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. 3 hours lecture, 2 hours lab.

PHYS 240 - Electricity and Magnetism **4 Credits**
Prerequisite(s): PHYS 192; and MATH 222 is a prerequisite or corequisite. 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. 3 hours lecture, 2 hours lab.

PHYS 245 - Electronics and Digital Circuits **3 Credits**
Prerequisite(s): PHYS 192 or 194. An introduction to the principles of amplifiers, waveform generators, and digital circuits, with emphasis on the use of commonly available integrated circuit packages. 2 hours lecture, 2 hours lab.

PHYS 280 - Astronomy **4 Credits**
Prerequisite(s): PHYS 191 and 192 or PHYS 193 and 194. 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. 3 hours lecture, 2 hours lab.

PHYS 310 - Advanced Mechanics **3 Credits**
Prerequisite(s): MATH 222 and MATH 420 and PHYS 210. 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. 3 hours lecture.

PHYS 320 - Thermodynamics **3 Credits**
Prerequisite(s): MATH 222 and PHYS 210. Thermodynamic systems; laws of thermodynamics; entropy; kinetic theory; transport processes; statistical thermodynamics. (Offered alternate years.) 3 hours lecture.

PHYS 341 - Electronic Fundamentals **3 Credits**
Prerequisite(s): PHYS 240 or PHYS 245. Circuit conditions; analysis of electronic concepts, theoretically and experimentally. 2 hours lecture, 2 hours lab.

PHYS 350 - Optics **4 Credits**
Prerequisite(s): PHYS 240. 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. 3 hours lecture, 2 hours lab.

PHYS 368 - Fluid Mechanics **3 Credits**
Prerequisite(s): MATH 222 with a grade of C- or better. 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. 3 hours lecture.

PHYS 377 - Mathematical Physics **3 Credits**
Prerequisite(s): 2 years of physics and MATH 222. Vector analysis, complex variables, ordinary and partial differential equations, matrices. (Not offered every year.) 3 hours lecture.

PHYS 380 - Observational Astronomy **4 Credits**
Prerequisite(s): PHYS 191, PHYS 192 or PHYS 193, PHYS 194. Observational techniques for the Moon, planets, satellites of other planets, asteroids, comets, stars, star clusters, and galaxies. 3 hours lecture, 2 hours lab.

PHYS 399 - Topics in Physics **1-4 Credits**
Prerequisite(s): PHYS 210 or departmental approval. Study of advanced topics in Physics. Topics will vary. May include a laboratory component. May be repeated for a maximum of 8 credits. 1 hour lab and 1 hour lecture.

PHYS 430 - Computer Simulations of Physical Systems **3 Credits**
Prerequisite(s): MATH 221, PHYS 191, PHYS 192, and CSIT 111. 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. 3 hours lecture.

PHYS 460 - Modern Physics **4 Credits**
Prerequisite(s): PHYS 210, 240. 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.) 3 hours lecture, 2 hours lab.

PHYS 461 - Special and General Relativity **3 Credits**
Prerequisite(s): PHYS 320 or PHYS 350 or PHYS 368 or MATH 368. 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. 3 hours lecture.

PHYS 462 - Nuclear Physics **4 Credits**
Prerequisite(s): PHYS 210, 240. 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. 3 hours lecture, 2 hours lab.

PHYS 464 - Quantum Mechanics **3 Credits**
Prerequisite(s): PHYS 460. Shroedinger's wave equation, its application and interpretation; Pauli exclusion principle and spectra. (Offered alternate years.) 3 hours lecture.

PHYS 470 - Solid State Physics **3 Credits**
Prerequisite(s): PHYS 460. Properties of solid state matter are developed from the quantum mechanics of atoms and molecules. (Not offered every year.) 3 hours lecture.

PHYS 480 - Astrophysics **3 Credits**
Prerequisite(s): PHYS 191, 192 or PHYS 193, 194; PHYS 280; MATH 221. Prerequisite or corequisite: STAT 401. 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. 3 hours lecture.

PHYS 490 - Literature Research in Physics **2 Credits**
Prerequisite(s): At least 16 credit hours of physics beyond PHYS 192. 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 provide the literature research related to his/her laboratory problem. (Not offered every year.) 2 hours lecture.

PHYS 495 - Laboratory Research in Physics **1-4 Credits**
Prerequisite(s): At least 16 credit hours of physics beyond PHYS 192. Solution of a laboratory problem research in pure physics or in physics education. Written report required. (Not offered every year.)

PHYS 519 - Special Topics in Physics **3 Credits**
Prerequisite(s): At least 12 semester hours in physics and permission of Physics certification program coordinator. 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. 3 hours lecture.