

Department of Physics

UNDERGRADUATE COURSE DESCRIPTIONS- Department of Physics

2010118 General Physics (for Agriculture students) 2 Cr. Motion, fluid mechanics, the laws of gases, temperature, heat transfer, light properties, spectroscopy, radioactivity.

2010119 General Physics Lab. (for Agriculture students) 1 Cr. Measurement of density, surface tension, heat conduction, specific heat, calorimetry, the thermal expansion.

2010101 General Physics (Mechanics) 2 Cr. Vectors, motion in one and two dimensions, dynamics of a particle, work and energy, conservation of linear momentum, collisions, rotational kinematics and dynamics, oscillations.

2010103 General Physics (Heat) 2 Cr. Fluid mechanics, heat and first law of thermodynamics, kinetic theory of gases, entropy and second law of thermodynamics.

2010110 Basic Physics I 4 Cr. Vectors, motion in one and two dimensions, dynamics of a particle, work and energy, conservation of linear momentum, collisions, rotational dynamics, fluid mechanics, heat and the first law of thermodynamics, kinetic theory of gases, entropy and second law of thermodynamics.

2010120 Basic Physics II 4 Cr. Coulomb's law, electric field, Gauss law, electric potential, capacitors, electromotive force and circuits, magnetic field, Amper's law, Faraday's law and induction, Electromagnetic waves, wave in elastic media, sound waves, electromagnetic waves. geometrical optics, interference, diffraction.

Prerequisite : Basic Physics I 20109

2010116 Gen. Physics Lab. (Heat) 1 Cr. Thermal expansion, heat conduction, specific heat, calorimetry, the mechanical equivalent of heat, surface tension.

20115 Basic Physics II 4 Cr. Charge and matter, electric field, Gauss' law, electrostatic potential, capacitors and dielectrics, electric current and resistance, EMF and circuits, magnetic fields, Ampere's law, induction, Faraday's law, magnetic properties of matter, electromagnetic oscillations, alternative currents, maxwell's equations, electromagnetic waves.

Prerequisite : Basic Physics I 20114

2010111 Basic Physics Lab. (Mechanics) 1 Cr. Measurements of length, angle, etc, force constant of spring and determination of g, coefficients of friction, verification of Newton's laws, elastic and inelastic collisions, conservation of angular momentum, moment of inertia.

2010121 Basic Physics Lab. (Electricity) 1 Cr. Measurement of resistivity, verification of Ohm's and Kirchhoff's laws, study of capacitors and EMF, hysteresis curves, R-C and R-L circuits, application of oscilloscope, Biot and Savart's law.

2010122 Basic Physics III 4 Cr. Waves in elastic media, sound waves, temperature, heat and the first law of thermodynamics, kinetic theory of gases, entropy and the second law of thermodynamics, electromagnetic waves, geometrical optics, interference, diffraction.

Prerequisite : Basic Physics I 20114

2010123 Basic Physics Lab. (Waves, Heat and Light) 1 Cr. Sound waves and vibrating strings, standing waves, geometrical optics, reflection and refraction laws. Concave and convex mirrors and lenses. Spectroscope and microscope, thermal expansion, heat conduction, specific heat, calorimetry, the mechanical equivalent of heat.

Prerequisite : Basic Physics III 20128

2010104 General Physics (Electricity and Magnetism) 2 Cr. Coulomb's law, electric field, Gauss' law, electric potential, capacitors, electromotive force and circuits, magnetic field, Ampere's law, Faraday's law.

Prerequisite : General Physics (Mechanics) 20101

2010219 General Physics (Waves) 2 Cr. Oscillations, waves in elastic media, sound waves, electromagnetic waves, geometrical optics, interference, diffraction.

Prerequisite : General Physics 20203

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2010319 History of Science 2 Cr. Physics in ancient times, physics in the middle ages (special contribution from moslem's world), physics after nineteen century, modern physics.

2010126 General Physic Lab. (Electricity) 1 Cr. Measurement of resistivity, verification of Ohm's and Kirchhoff's laws, study of capacitors, hysteresis curves, R-C and R-L circuits, oscilloscope, Biot and Savart's law.

2010226 English Language for Physics Students 2 Cr. Reading and analysis of some physics texts in english, writing short physics articles in english.

Prerequisite : 25510

2010216 Mathematical Physics I 3 Cr. Vector Analysis, coordinate systems, tensor analysis, discrete groups and continuous groups, groups representation, infinite series, second order differential equations, linear spaces, matrix operations and determinants.

Prerequisite s: Calculus II 19102, Differential equation 19201

2010412 Electronics 4 Cr. Semiconductors, diode circuits, rectifiers, transistor characteristics, transistor as an amplifier, transistor configurations, Thevenin's and Norton's theorems, oscillator circuits.

Prerequisite : Basic Physics II 20123

2010413 Electronics Lab. 1 Cr. Introducing the electronic instruments, oscil-loscope, signal generators, rectifiers, low, high and band pass filters, semiconductor diodes, construction of power sources, the transistor, amplifier with negative and positive feed- back.

Prerequisite : Basic Physics Lab (Electricity) 20126

2010210 Analytical Mechanics I 3 Cr. Newtonian mechanics, motion of particles in one, two and three dimensions, motion of a system particles, rigid bodies motion.

Prerequisite : Basic Physics I 20114

2010214 Modern Physics 4 Cr. Limitation of classical physics, relativistic kinematics (space and time), relativistic dynamics (momentum and energy), wave aspects of material particles, particle aspects of electromagnetic radiation, the structure of hydrogen atom, many- electron atoms.

Prerequisites: Basic Physics II 20123; Basic Physics III 20128

2010212 Thermodynamics 4 Cr. Thermodynamic systems and ideal gas, first and second laws of thermodynamics, reversibility and irreversibility, Carnot's cycle, entropy, properties of pure substances and phase changes, Maxwell-Boltzmann and Fermi-Dirac statistics.

Prerequisite : Basic Physics III 20128

2010224 Physics Modern Lab. 1 Cr. Michelson - Morly Experiment, Franck-Hertz x-ray absorption, Zeeman effect, specific charge of the electron, Stern-Gerlach's experiment, compton effect, photoelectric effect, Planck's constant, black body radiation, Balmer series of Hydrogen line spectrum, Milikan experiment.

2010277 Waves 3 Cr. Simple harmonic vibrating systems, normal modes of oscillating systems with finite and infinite degrees of freedom, forced oscillations, traveling waves, boundary conditions, reflection and refraction, wave packets, phase and group velocities.

Prerequisite: Basic Physics II 20123

2010312 Mathematical Physics II 3 Cr. Complex functions: analytic properties, conformal mapping, calculus of residues, Sturm-Liouville theory, linear space and operators, orthogonal functions, Fourier Series, calculus of variation.

Prerequisite: Mathematical Physics I 20217

2010371 Electromagnetism I 3 Cr. Review of differential and integral calculus, electrostatic, Coulomb's and Gauss' laws, Poisson and Laplace equations, boundary value equations, dielectrics, polarizations, magnetic fields, Biot-savart's law, Amper's law, vector potential.

Prerequisite: Basic Physics II 20123

2010373 Electronic Physics 3 Cr. Energy bands, carrier concentration, carrier transport phenomena, p-n junctions, bipolar devices, unipolar devices, microwave devices, photonic devices.

Prerequisite: 17222

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2010374 Analytical Mechanics II 3 Cr. Statics, gravitation, moving coordinates, Lagrange's Eqs, Hamilton's Eqs, inertia and stress tensors, rotation of rigid bodies, Euler's Eqs, small vibration.

Prerequisite: Analytical Mechanics I 20223

2010222 Statistical Mechanics 3 Cr. Entropy, temperature, Boltzmann distribution function, ideal gas, fermion gas, boson gas, heat and work, phase transitions, kinetic theory of gases.

Prerequisite: Thermodynamics 20230

2010280 Quantum Mechanics I 3 Cr. The limits of classical physics, wave packet and uncertainty relations, Schrödinger equation, general structure of quantum mechanics, angular momentum, the radial Schrödinger equation.

Prerequisites: Modern Physics 20229; Analytical Mechanics II 20311

2014322 Nuclear Physics I 3 Cr. Binding energy, liquid drop model, semi-empirical mass formula, shell model, energy levels of nuclides, charge symmetry and charge independence of nuclear forces, interactions of nuclear radiations with matter, interactions of charged particles with matter, interactions of neutron with matter, radioactive decays.

Prerequisite : Quantum Mechanics I 20314

2014323 Nuclear Physics Lab. 1 Cr. Measurement techniques with G.M. counters, measurement of resolution time of G.M. counters, statistical distribution of nuclear radiations, verification of the inverse square law, Gamma ray absorption, Gamma spectroscopy.

Prerequisite: Nuclear Physics I 20315

2010281 Basic Computer Science and Programming 3 Cr. Computer organization, machine language, flowcharting, algorithms, data structure, a programming language such as FORTRAN.

2010228 Electromagnetism II 3 Cr. Magnetization, magnetic dipoles, electromotive force, induction, Maxwell's equations, gauge transformation, wave equations, radiations, relativistic electrodynamics.

Prerequisite: Electromagnetism 20293

2010747 Astrophysics 3 Cr. The sun, double stars, the birth of stars, star clusters, evolution and death of old stars, the Milky Way galaxy, galaxies, structure and evolution of the universe, the big bang.

Prerequisite: Analytical Mechanics I 20223

2010376 Quantum Mechanics II 3 Cr. Hydrogen atom, operator spin and angular momentum addition, perturbation theory, real hydrogen atom, helium atom, structure of atoms, radiation of atom, scattering theory.

Prerequisite: Quantum Mechanics I 20314

2012324 Solid State Physics I 3 Cr. Crystal structures, scattering, reciprocal space, Brillouin zones, lattice dynamics, thermal properties of solids, free electron in metals, band structure.

Prerequisites: Statistical Mechanics 20312, Quantum Mechanics I 20314

2010432 Mathematical Physics III 3 Cr. Gamma function, Bessel functions, Legendre functions, special functions, integral transforms, and integral equations.

Prerequisite: Mathematical Physics II 20247.

2010410 Modern Optics 3 Cr. Maxwell's equations in scalar and vector forms, coherence and interference, Fraunhofer and Fresnel diffractions, propagation of light in solid media.

Prerequisites: Electromagnetism 20293; Basic Physics III 20128

2010411 Optics Lab. 1 Cr. Interference and diffraction by lasers, linear, circular and elliptical polarizations, interference, diffraction gratings, dispersion, optical activity.

2010314 Relativity 3 Cr. Lorentz transformation and its consequence, relativistic kinematics and dynamics, Minkowski geometry, four-vectors and tensors, Lorentz group, general relativity.

Prerequisite: Modern Physics 20229; Analytical Mechanics I 20223

2014416 Reactor Physics I 3 Cr. Components of nuclear reactors, classification of reactors, decay of radioactive nuclei, neutron sources, neutron interactions, neutron diffusion theory.

Prerequisite: Nuclear Physics I 20315

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2014477 Nuclear Radiation Protection 2 Cr. Radiation dosimetry, biological effects of radiation, radiation protection guides, external radiation protection, internal radiation protection.

Prerequisite: Nuclear Physics I 20315

2014422 Reactor Physics II 3 Cr. The time-dependent reactor, reactor kinetics, control rods, temperature effects on reactivity, fission product poisoning, heat removal from nuclear reactors, heat generation in reactors, nuclear safety and environmental impact.

Prerequisite: Reactor Physics I 20421

2010480 Group Theory 3 Cr. Basic group theory, group representations, continuous groups, weight diagrams, Young tableaux, selected examples in physics.

Prerequisites: Mathematical Physics II 20247; Solid State Physics I 20322

2012423 Crystallography 3 Cr. Geometry of crystals, stereographic projection, properties of x-rays, diffraction, experimental methods, orientation and quality of single crystals, determination of space groups, determination of crystal structure.

Prerequisite: Solid State Physics I 20322

2012418 Physics of Semiconductor Devices I 3 Cr. Energy bands, carrier concentration, carrier transport phenomena, p-n junctions, bipolar devices, unipolar devices, microwave devices, photonic devices.

Prerequisite: Solid State Physics I 20322

2012417 Solid State Physics II 3 Cr. Semiconductor solids, Fermi surface in metals, superconductivity, dielectric and ferroelectrics, magnetism, dislocations, optical properties of solids, plasmas, polarons.

Prerequisite: Solid State Physics I 20322

2014420 Nuclear Physics II 3 Cr. Cross-section, compound nuclear and direct reaction, optical model, nuclear fission, two nucleons systems, deuteron, nucleon-nucleon scattering, Yukawa theory, strong and weak forces.

Prerequisite: Nuclear Physics I 20315

2014415 Radiation Detectors 3 Cr. Interaction of radiation with matter, counting statistics and error prediction, gas detectors, scintillation detectors, semiconductor detectors, neutron detectors, spark chambers, Cerenkov detectors, single and multi-channel pulse analyzers.

Prerequisite: Nuclear Physics I 20315

2010426 Computational Physics 3 Cr. Advanced aspects of FORTRAN programming, numerical methods, simultaneous equations, numerical solution of differential equations, matrices, Monte Carlo and molecular dynamics simulation.

Prerequisites: Thermodynamics 20230, Computer Programming 18150

2016482 Particle Accelerators 2 Cr. Particle accelerators as a tool for nuclear research, the static accelerators, Van de Graaf accelerators, Tandem accelerators, linear accelerators, the betatron, the cyclotron, the synchrocyclotron, the proton synchrotron, the electron synchrotron.

Prerequisite: Nuclear Physics I 20315

2012424 Superconductivity and its Applications 3 Cr. Superconductivity and superfluidity properties, Meissner effect, thermodynamics properties of new phase, Ginzburg-Landau phenomenological theory, BCS theory and pairing mechanism, tunnelling and Josephson's effect, general properties of high temperature superconductivity.

Prerequisites: Solid State Physics II 20447

2016414 Elementary Particles 3 Cr. Some basic concepts, relativistic wave equations, Quarks and leptons symmetries, Feynman diagrams, gauge theories, introduction to QED, QCD and weak interactions.

Prerequisite: Quantum Mechanics II 20321

2012493 Vacuum Technology 3 Cr. Vacuum pumps (mechanical pump, ion pump, sorption pump, diffusion pump, dry pump, roots pump), cold trap, vacuum gauge (Mc lead gauge, thermocouple gauge, thermistor gauge, ionization gauge), leak detectors.

Prerequisite: Solid State Physics I 20322

