0302099 Remedial Physics

Credit hours: 3
Prerequisite : -

Kinematics in One Dimension, Kinematics in Two Dimensions and Vectors, Newton's Laws of Motion, Circular Motion, Work and Energy, Electric Charge and Field, Electric Potential, Electric Direct Current, Direct Current Circuits, Magnetism.

0302100 Science and the Society.

Credit hours: 3
Prerequisite : -

Human knowledge and science, Nature of Human Knowledge, What is Science?, Historical Development of Science, The Scientific Method, The Scientific Explanation. The Effect of the Society on the Development of Science, The Modern Science and the Scientific Research, Types of the Scientific Research, Evaluation Criteria, The Value and Importance of Science. The Effect of Science on Society, The Importance of Technology and its Effect on Modern Sciences. Intellectual Property and Protection,
Patent. Modern Scientific Revolution. The Global Problems and the Role of Science in their Solutions, Globalization. Science and Energy, The Role of Science in Solving the Energy Problems.

0302101 General Physics-1

Credit hours: 3
Prerequisite : (High School Physics or 0302099)

Motion in One Dimension, Vectors, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum.

0302102 General Physics-2

Credit hours: 3
Prerequisite :(0302101)

Electric Field, Gauss's Law; Electric Potential; Capacitance and Dielectrics; Current and Resistance; Direct Current Circuits, Magnetic Field, Sources of the Magnetic Field, Faraday's Laws of Induction.

0342103 General Physics for Biological Sciences Students

Credit hours: 3
Prerequisite : (High School Physics or 0302099)

Motion in a Straight Line, Motion in two Dimensions, Newton's Laws of Motion, STATICS, Work, Energy, and Power, Linear Momentum, Temperature and the Behavior of Gases, Thermodynamics, Thermal Properties of Matter, Electric Forces, Electric Fields, Electric Potentials, Direct Currents.

0302104 General Physics-3

Credit hours: 3
Prerequisite : (0302102)

Equilibrium, Gravitation, FluidMechanics, Oscillatory Motion, Wave Motion, Heat andThermodynamics, Inductance, AC-Theory.

0302105 Physics for Dentistry Students

Credit hours: 4
Prerequisite : (High School Physics or 0302099)

Motion in a Straight Line, Motion in two Dimensions, Newton's Laws of Motion, STATICS, Work, Energy and Power, Linear Momentum, Temperature and the Behavior of Gases, Thermodynamics, Thermal Properties of

Matter, the Mechanics of Non Viscous Fluids, Electric Forces, Electric Fields, Electric
Potentials, Direct Currents, Magnetism, Induced Currents and Fields, Nuclear Physics, Ionizing Radiation.

0302111 Practical Physics - 1

Credit hours: 1
Prerequisite : (0302101 or simultaneously)

Students perform 11 experiments of 3 hr/week duration. These experiments are: Collection and Analysis of Data, Measurements and Uncertainties, Vectors: Force Table, Kinematics of Rectilinear Motion, Force and Motion,Collision in Two Dimensions, Rotational Motion, Simple Harmonic Motion: Simple Pendulum, The Behaviour of Gases with Changes in Temperature and Pressure, The Falling Sphere Viscometer, Specific Heat Capacity of Metals.

0302112 Practical Physics - 2

Credit hours: 1
Prerequisite : (0302102 or simultaneously)

Students perform 12 experiments of 3 hr/ week duration. These experiments are: Electric Field Mapping, Specific Charge of Copper Ions, Power Transfer, Potentiometer, Capacitors: RC Time Constant, Kirchhoff's Laws, Magnetic Field of a Current, Lenses, Young's Double Slit Experiment, Electromagnetic Induction, Ohm's Law.

0302113 Practical Physics for Biological Sciences Students

Credit hours: 1
Prerequisite :
(0302103)

Students perform 12 experiments of 3 hr/week duration. These experiments are: Measurements and Uncertainties, Collection and Analysis of Data, Vectors: Force Table, Newton's 2nd Law of Motion, Simple

Harmonic Motion: Simple Pendulum, The Falling Sphere Viscometer, The Laws of Gases, Measurement of Resistance, The Potentiometer, Specific Charge of Copper Ions, Introduction to the Oscilloscope, Joule Heat, Lenses.

0302115 Practical Physics for Dentistry Students

Credit hours: 1
Prerequisite: (0302105 or simultaneously)

Students perform 12 experiments of 3 hr/week duration. These experiments are: Measurements and Uncertainties, Collection and Analysis of Data, Vectors: Force Table, Newton's 2nd Law of Motion, Simple Harmonic Motion: Simple Pendulum, The Falling Sphere Viscometer, The Laws of Gases, Measurement of Resistance, The Potentiometer, Specific Charge of Copper Ions, Introduction to the Oscilloscope, Joule Heat, Electromagnetic Induction, Lenses.

0302199 Mechanical Workshop

Credit hours: 1
Prerequisite: -

Students perform exercises involving filing and shaping of metals, marking, drilling and tapping work pieces, and using the lathe.

0302211 Practical Physics-3

Credit hours: 1
Prerequisite : (0302221)

Students perform 12 experiments of 3 hr/week duration. Theses experiments are: Double Slit Diffraction , Single Slit Diffraction, RC Circuits, RLC Circuits, Diffraction Grating, e/m , Michelson Interferometer, Newton's Rings, Black Body Radiation, Thermal Conductivity, Polarization of light, Thermo couple.

0302221 Optics-1

Credit hours: 3
Prerequisite : (0302112)

Nature of Light; Huygens's Principle; Fermat's Principle; Wave Equations; Superposition of Waves; Interference of Light; Optical interferometry; Production of Polarized Light; Fraunhofer Diffraction; Diffraction Grating.

0320231 Electronics

Credit hours: 3
Prerequisite : (0302104)

Fundamental Concepts; Semiconductors; Diodes and Application; Bipolar Junction Transistor; Small Signal Bipolar Amplifier; Field-Effect Transistors; Operational Amplifier; Operational Amplifier Applications ; Digital Electronics.

0302261 Modern Physics

Credit hours: 3
Prerequisite : (0302102)

Special Theory of Relativity (Kinematics and Dynamics); Quantum Nature of Radiation; Wavelike Properties of Particles; Rutherford-Bohr Model; The Nucleus; Radioactivity; Nuclear Reactions; Elementary Particles.

0302265 Radiation Physics

Credit hours: 3
Prerequisite : (0302261)

Atomic and Nuclear Structure, Radiation Sources, Radioactivity and Radiation, Interaction of Radiation with Matter, Radiation Units And Limits, Radiation Detection and Measurement, Radiation Protection , Radiation Hazard And Dosimetry, Biological Effects of Radiation, Radiation and Life (Application).

0302271 Polymer Physics

Credit hours: 3
Prerequisite: (0302104)

Macromolecules, Molecular Weight, Molecular Conformation, Tactility, Molecular Elasticity, Crystalline and Amorphous Polymers, Crystal Orientation, Drawing, Structural Studies, Fibrillar and Lamella Structure, Commercial Polymers, Mechanical Properties and Mechanical Testing, Annealing and Heat Treatments, Melting and Glass Transition Temperatures.

0302281 Mathematical Physics –1

Credit hours: 3
Prerequisite : (0301102)

Complex Numbers, Linear Equations; Vectors Matrices and Determinants, Partial Differentiation, Multiple Integrals, Vector Analysis, Fourier Series, Ordinary Differential Equations.

0302282 Mathematical Physics-2

Credit hours: 3
Prerequisite : (0302281)

Coordinate Transformations; Tensor Analysis, Gamma, Beta and Error Functions, Asymptotic Series, Stirling's Formula, Elliptic Integrals and Functions, Integral Transforms, Series Solutions of Differential Equations, Legender Polynomials, Bessel Functions, Sets of Orthogonal Functions, Partial Differential Equations, Functions of A Complex Variable.

0302291 Software Packages in Physics -1

Credit hours: 2
Prerequisite : (0302261)

This course is an interdisciplinary course that requires the knowledge of basic Physics and Mathematics and utilization of computational and programming techniques to implement a solution. The course introduces a wide selection of computer-powered mathematical tools for doing physics and mathematics problems. It will introduce software packages starting with basic instructions and commands. Students are exposed to the following packages: (Mathematica, Maple, Matlab, ...etc)

in real and complex algebra, trigonometry, linear algebra, differential equations, special functions, and graphics. Some applications to intermediate physics course problems will be addressed including : Optics, Waves and Vibrations, Modern Physics, Thermal Physics,....etc.
Document preparation and programming is in the manner of a research paper.

0302300 Environmental Physics

Credit hours: 3
Prerequisite : (0302261)

The Essentials of Environmental Physics, Basic Environmental Spectroscopy, The Global Climate, Energy for Human Use, Transport of Pollutants, Noise, Spectra and Examples of Environmental Spectroscopy: Atomic Spectra; Molecular Spectra; Scattering; Spectroscopy of the Inner Electron of Atom**s** and Molecules; Examples of Environmental Analysis.

0302311 Practical Physics-4

Credit hours: 2
Prerequisite (0302261)

Students perform 11 experiments of 6 hr/week duration. These experiments are: Frank-Hertz Experiment, Thermionic Emission, Statistical Nature of Nuclear Counting. The Geiger Counter and Propagation of Radiation Through Matter , Millikan's Oil Drop Experiment, Mechanical Oscillations, e/h- Photoelectric Effect, e/k_B , Speed of Sound, Speed of Light, Reflection from Dielectric Mirror.

0302312 Practical Electronics

Credit hours: 1
Prerequisite : (0302231)

Students perform 12 experiments of 3 hr/week duration. These experimental are: Measurements, Diode and Transistor Characteristics, Rectification and Filtering, Zener Diode and Regulation, Transistor Biasing, Transistor Amplifiers , Operational Amplifiers, Comparators, Oscillations (Sine Wave), Oscillations (Relaxation), Logic Gates.

0332321 Optics-2

Credit hours: 3
Prerequisite : (0302221)

Matrix Treatment of Polarization, Fresnel Diffraction, Theory of Multilayer Films, Fresnel Equations, Laser Basics, Laser Applications, Nonlinear Optics and the Modulation of Light, Optical Properties of Materials

0302330 Digital Electronics

Credit hours: 3
Prerequisite : (0302231)

Number Systems and Codes, Digital Electronic Signals and Switches, Basic Logic Gates, Boolean Algebra and Reduction Techniques, Exclusive-OR and Exclusive-NOR Gates, Arithmetic Operations and Circuits, Code Converters, Multiplexers, and De-multiplexers, Flip-Flops and Registers, Practical Considerations for Digital Design, Counter Circuits, Shift Registers, Multi-vibrators and the 555 Timer, Interfacing to the Analog World, Microprocessor Fundamentals.

0302331 Electricity and Magnetism-1

Credit hours: 3
Prerequisite : (0302282 or 0301321)

Electrostatics: Electrostatic field, Electrostatic potential, Work and energy in electrostatics, Conductors. Calculation of Electrostatic Potentials: Laplace's Equation, The Method of Images, Separation of Variables, Multipole Expansion. Electrostatic Fields in Matter; Magnetostatics, Magnetostatic Fields in Matter.

0302332 Electricity and Magnetism-2

Credit hours: 3
Prerequisite: (0302331)

Electrodynamics: Electromotive Force, Faraday's Law, Maxwell's Equations, Potential Formulations, Energy and Momentum, Electromagnetic Waves, the Wave Equation, Electromagnetic Waves in Nonconductors and Conductors, Dispersion, Wave Guides, Electromagnetic Radiation; Electrodynamics and Special Relativity.

0302341 Thermal Physics

Credit hours: 3
Prerequisite: (0302261)

Binary Model System, Entropy, Temperature, Thermal Equilibrium, Laws of Thermodynamics, Boltzmann Distribution, Thermal Radiation, Chemical Potential, Gibbs Distribution, Ideal Gas, Fermi-Dirac and Bose-Einstein Distribution Functions, Heat and Work, Heat Engines, Phase Transformation, Van der Waal's Equation of State, Kinetic Theory.

0302351 Classical Mechanics-1

Credit hours: 3
Prerequisite : (0302281)

Newtonian Mechanics, Oscillations, Gravitation, Lagrangian Dynamics, Central Force Motion

0302352 Classical Mechanics-2

Credit hours: 3
Prerequisite : (0302351)

Lagrangian and Hamiltonian Dynamics, Dynamics of System of Particles, Motion in a Nonlinear Frame, Dynamics of Rigid Bodies, Coupled Oscillations.

0302361 Quantum Mechanics

Credit hours: 3
Prerequisite : (0302282)

Introduction to Wave Mechanics: Wave Functions, Schrödinger Equation, Wave Palates, Probability Amplitudes, Stationary States, Heisenberg Uncertainty Relation, One-dimensional System; Potential Well and Potential Barrier Problems. Matrix Mechanics: Linear Vector Spaces, Operators , Measurements and Probability Amplitudes, Position and Momentum Space Wave Functions. Schrödinger Equation in Three Dimensions: Central Potentials, Orbital, Angular Momentum and Spin, Hydrogen-Like Atoms.

0302371 Physics of Materials

Credit hours: 3
Prerequisite :
(0302261)

Classification of Materials: Metals, Ceramics, Polymers, Composites; Crystallography, Phase Transformation, Material Deformation, Mechanical Properties of Materials; Heat Treatment; Smart Materials.

0302411 Practical Physics-5

Credit hours: 2
Prerequisite :
(0302311)

Students perform 12 experiments of 6 hr/week duration. These experiments are: -Ray Spectrometry, - Ray Spectrometry, - Ray Spectroscopy, Faraday Effect, Kerr Effect, Hall Effect, Zemman Effect, Electron Spin Resonance, Nuclear Magnetic Resonance, Measurement of Dielectric Constant, Magnetic Susceptibility, X-rays.

0302421 Optical Netwoks : Components

Credit hours : 3
Prerequisite :
(0302321)

Fundamentals of Light " Interaction with Matter"; Optical Component: Optical Waveguides, Filters and Gratings, Multiplexers and Demultiplexers, Sources of Light, Photodetecters, Light Amplifiers and Switches.

0302462 Atomic and Molecular Physics

Credit hours: 3
Prerequisite : (0302361)

Review of One-Electron Atoms; Electron Spin; addition of Angular Momenta; Time-Dependent and Time-Independent Perturbation; Fine Structure; Hyperfine Structure; Interaction of One-Electron Atoms with Electromagnetic Radiation; Electric Dipole Transitions; Interaction of One-Electron Atoms with External Electric and Magnetic Fields; Two-Electron Atoms; Molecular Structure and Spectra of Diatomic Molecules.

0302463 Nuclear Physics

Credit hours: 3
Prerequisite : (0302361)

Basic Nuclear Concepts and Nuclear Properties, Nuclear Force: The Two-Body Nucleon System, Nuclear Force: Nucleon-Nucleon Scattering, Nuclear Models, Radioactive Decay, Nuclear Reactions: An Introduction.

0302464 Astrophysics

Credit hours: 3
Prerequisite : (0302341)

Basic Concept in Astrophysics, Matter and Radiation in Stars, Heat Transfer in Stars and Nucleosynthesis, Stellar Structure, Stellar Evolution and the Cosmology of the Universe, Astrophysics and General Relativity Neutron Stars, Black Holes; Galaxies and the Universe.

0302466 Elementary Particles.

Credit hours: 3
Prerequisite: (0302361)

Fundamental Principles. Methods of Particle Detection. Scintillation Detectors, Bubble Chambers. Production of Elementary Particles. Accelerators, Cosmic Rays. Strong Reactions. Conservation Laws. Parity Principle.

Electromagnetic Interactions. Muons, Pair Production. Weak Interactions. Neutrinos. Quark Model.

0302471 Solid State Physics

Credit hours: 3
Prerequisite : (0302361)

An Introductory Survey, Crystal Lattices, Structure of Solids, Elastic Scattering of Waves, Bonding, Lattice Vibrations, Electron States.

0302472 Physics of Semiconductors

Credit hours: 3
Prerequisite :(0302471)

Semiconductor Crystal Structure, The Energy Band Structure of Crystals, Transport of Carriers in Semiconductors, Semiconductor Diode Devices and Frequency Speed Behavior , The Bipolar Junction Transistor (BJT)

0302481 Software Packages in Physics -2

Credit hours: 2
Prerequisite : (0302291)

Students will tackle in this course advanced computational tools applied to more involved problems in physics. Topics represent implementations to what students have taken in advanced courses such as: Quantum Mechanics, Electricity and Magnetism, Atomic Physics Nuclear Physics and Solid State Physics. Simulation of real physical systems will be another part of the course.

0302499 Research Project and Methods of Teaching Physics

Credit hours : 2
Prerequisite: (0302261)

Research projects as suggested by staff members; discussing different teaching methods and introducing how to use computer for teaching purposes. Some demonstration experiments to explore certain basic physical concepts such as: Speed of Sound, Prism Spectrometer, Hook's Law.

0302490 Scientific Research Methodologies

Credit hours : 1
Prerequisite: -

Every student completes a culminating undergraduate experience during his/her senior year by conducting a comprehensive project. Each project is carried out in one semester under the supervision of a faculty member of the Physics Department in one of the following topics:

- Theoretical and experimental solid state physics
- Materials physics and nanoscience

- Theoretical condensed matter physics
- Theoretical nuclear physics
- Mathematical and computational physics
- Theoretical high energy physics
- Experimental nuclear physics
- Atomic and molecular physics
- Medical physics
- Environmental physics
- Synchrotron radiation
- Any other topic agreed upon by the student and the advisor.

The project is culminated in a project thesis and a formal presentation in front of panel comprised of the advisor and some faculty members at the end of the semester.