The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P100	General Physics I	Physical quantities-units and dimensional analysis - Vectors - The laws of motion in one- and two- dimensions and its applications - Work and energy - Heat and hat conduction - The kinetic theory of gases - Specific heat of gases - Liquefaction of gases - First law of thermodynamics.	None	2	0/2	3
P 105	General Physics II	The nature and propagation of light - Reflection and refraction at plane surface - Reflection and refraction of spherical waves - Lenses, eye's structure and camera - Microscopes and Telescopes - Coulomb law and electrostatic fields - Electrostatic potential- Capacitance and dielectrics- Electric current and DC circuits - Magnetic field and magnetic force - Electromagnetic induction.	P 100	2	0/2	3
P221	Vibrations and Waves	The simple harmonic motion - The simple harmonic motion in mechanical and electrical systems - The damped oscillation in mechanical and electrical systems - The forced damped oscillation in mechanical and electrical systems - Summation of the simple harmonic motions in two dimensions - Types of the waves, reflection and transmission of the waves - The ultrasonic waves - Doppler's effect.	P 100	2	1/2	3
P223	Thermodynamics	Thermodynamics definitions - The 1st law of thermodynamics –Adiabatic and isothermal process - Heat engine and Camot's cycle - The 2°- law of thermodynamics - The entropy and thermodynamic potential – Important thermodynamic relations - Applications on Maxwell's equations - The 3-law of thermodynamics - The principles of gas liquefaction.	P 100	2	1/2	3
P224	Physical Optics	Waves motion and superposition - Interference of light waves - Interference Pattern from double slits (Young's experiment) - Interference of light in thin films - Diffraction of light waves - Single and double slits diffraction – The diffraction grating, resolving power of the diffraction grating - X-rays diffraction by crystals - Polarization of light waves, optical activity. Laser definitions.	P 105	2	0/3	3

The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P225	Modern Physics	Nature and characteristics of modem physics - Black-body radiation, Planck's law of radiation, photo-electric effect - The Hydrogen atom. Rutherford model of the atom - Bohr's theory , Sommerfeld's theory of elliptic orbits - Compton effect - Dual nature of matter, De Broglie waves, the uncertainty principle - Galilean and Lorentz transformations - Michelson-Morley experiment, Doppler effect - Special theory of relativity.	P 105	2	0/3	3
P226	Electricity and AC Current	RC and RL circuits, stored energy - RLC circuit under its different conditions (over damped, critically damped and oscillatory damped circuits)- Alternating current: RC and RL circuits analyses - Analyses of AC circuits in terms of complex numbers - Power of AC circuits - AC transient current for RL, RC and RLC circuits	P 105	2	1/2	3
P 330	Quantum mechanics I	Equation of motion, conservation laws - Integration of motion equations - Canonical equations. Failure of classical mechanics - Origin of the quantum theory. Hydrogen atom - Wave particle dualism. Postulates	P225/M212	2	1/0	3
P333	Electromagnetic Theory	Vector Analysis - Electrostatics, Poisson equation, energy in electric field, electrostatic of materials - Magnetostatics, vector potential, energy in magnetic field, magnetostatic of materials - Faraday's law, inductance, solution to the Laplace's equation Maxwell's equations.	P 105/M211	2	1/0	3
P341	Atomic and Molecular Physics	Bohr's theory and hydrogen spectra - Emission and absorption of many electron atoms - Zeeman and Stark effect, Pauli principle – Electronic spectra of diatomic molecules - Vibrational and rotational spectra – Raman spectroscopy, Mossbauer spectroscopy	P 225	3	0/0	3
P342	Plasma Physics	Motion of charged particles in electric and magnetic fields - Characteristic of Plasma, Aurora zone and Van Alien belt- Plasma interaction with a magnetic field - Plasma electron oscillation and ion oscillation - Hydro magnetic waves, Alfven waves - Plasma diagnostic techniques - Plasma applications, Nuclear fussion.	P 225	2	2	3
P350	Solid State Physics I	Crystal structure - Reciprocal lattice. X-ray diffraction in crystals – Lattice vibrations and thermal properties - Elastic waves in crystals, elastic strains - Defects in solids (point defects & dislocations).	P 225	2	0/3	3

The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P322	Electronics	Semiconductor diodes and applications- Bipolar junction transistors - Field- effect transistors - Biasing of transistors, integrated circuits – Operational amplifiers - Feedback amplifiers and oscillators.	P226	2	0/3	3
P323	Biophysics	Studying DNA and biopolymers - Cell membranes and membrane potentials - Electrical activity of nerve cells - Fundamentals of measuring circuits and systems - Temperature and pressure measurements - Measurina cell potentials.	P105	3	0/0	3
P324	Astrophysics	Historical introduction, special astronomy - Solar and lunar eclipses – Solar system. Active sun - Stars, structure, evolution, formation, properties - Interstellar matter, star clusters, galaxies, cosmology.	P105	3	0/0	3
P326	Electron optics and optical fibers	Introduction to electron optics - Motion of electrons in uniform electrostatic and magnetic fields - Types and design of electron lenses – Physical similarity of light and electron lenses - Fundamental of optical fibers - Properties of fibers - Fabrication and connecting of fibers - Applications in communications and medicine.	P224	3	0/0	3
P331	Statistical Physics	Thermodynamics, review - Phase space and ensemble average Micro-canonical, canonical, and grand canonical ensembles - Partition function and binomial distribution - Classical statistics, Poisson and Gibbs distribution - Quantum statistics. Applications.	P223	2	1/0	3
P337	Computer and physics Measurements	Polynomial interpolation. Error function - Lagrange and Hermit interpolation. Airy pattern - Aitken and Chebyshev interpolation Interpolation techniques - Theory of finite differences. Types of differences - Inverse interpolation and predictions - Divided differences and derivative estimation.	P105	2	0/2	3
P338	Methods of Mathematical Physics	Vector analysis with applications - Partial differential equations and boundary value problem - Laplace's and Fourier's transforms – Special functions.	P105 +M211	2	1/0	3
P343	Nuclear physics I	Rutherford theory of alpha scattering-The classical properties of the nucleus-The constituents of the nucleus. Quark theory-The nuclear binding energy-Nuclear fission and fusion reactions-The natural radioactivity.	P225	2	0/3	3

The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P344	Radiation Physics and Detectors	Sources of Radiations, Interaction of Radiation with Matter, Detectors and Radiation Detection, Biological effects of ionizing Radiations, Dosimeters, Radiation Scan, Radiation Dangerous, Store of Radioactive materials, Radiation Protection.	P225	3	0/0	3
P347	Laser physics	Introduction to laser physics and its characteristics - Theory of laser oscillation - Types of lasers - Applications of Lasers in different fields.	P224	3	0/0	3
P348	Environmental physics	Origin and composition of the atmosphere - Charged particles, temperature distribution in the atmosphere - Atmospheric thermodynamics – Radiation transfer and spectrum, absorption and emission - Atmospheric absorption of solar radiation.	P105	3	0/0	3
P351	Crystal growth and physical properties of crystals	Theories and mechanisms of crystal growth from solutions melt and vapor phases - Phase diagrams and Equilibriums. Methods of crystal growth - Characterization of single crystals using various techniques - Fine structure and physical properties of single crystals.	P225+C 230	2	0/0	2
P352	X-ray diffraction and its Applications	X-rays, Production & Detection - Review of crystalline Structure – Basic idea of diffraction. X-ray cameras - Reciprocal space - Models For diffracted intensity - Small-angle scattering of X-rays - Electron diffraction	P251 or P225	3	0/0	3
P400	Research Project/article	Topics to be suggested by Physics Department.	Accomplishing 100 credit hours			2
P411	Quantum mechanics II	Schrodinger equation. Classical limits-One-dimensional problems-Three-dimensional problems - Complete description of a state - Constants of the motion, Uncertainty principle -Wave packets. Probability current density.	P330	3	1/0	4

The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P422	Low temperatures Physics and superconductors.	Production and measurements of low temperatures - Electrical and mechanical properties - Magnetism, Specific heat at low temperatures - Superconductors, Normal transition - The energy gap and zero resistance - Applications of superconductors - Introduction to high temperature superconductors.	P211	3	0/0	3
P432	Atomic and Molecular Spectroscopy	Observed molecular spectra - Rotation of diatomic molecules - Vibration of diatomic molecules - Electronic spectra diatomic molecules	P214	3	0/0	3
P433	Advanced Quantum Physics	Matrix representations - Matrix algebra. Matrix mechanics - Spin operator electron spin - Total angular momentum - Approximate methods for bound state problems - Perturbation methods, variational methods - WKB approximations.	P432	2	2/0	3
P434	Physics System Modeling	Solving Systems of Equations - Problems in Vector Calculus - Fourier Series - Differential Equations (Ordinary and Partial) - Advanced Graphics (including Animation) - Curve-Fitting & Statistics.	P338+M323	3	0/0	3
P441	Nuclear Physics II	Electric and magnetic properties of the nucleus - Nuclear energy levels, Vector coupling. Parity - The nuclear forces, Schrodinger's wave equation of deuteron - Mechanisms of Alpha, Beta and Gamma decay – Neutron reactions and detection - Principles of reactors. Accelerators.	P343	2	0/0	3
P343	Materials Science	Types of materials. Phase diagrams - Physics of metals and alloys Crystal structure and processing of ceramic materials - Composite materials - Metal matrix and ceramic matrix composites - Polymeric materials processing - Deformation and strengthening of polymers	P350+ C105	3	0/0	3
P444		Nucleon forces, Isospin - Pions, Muons, strangeness - Fundamental interactions and conservation laws - Families of elementary particles - Hypercharge and quarks	P342	3	0/0	3

The course		Syllabus	Prerequisites	Hours/week		
Code	Title			L	T/P	C
P451	Thin Solid films and its applications	Introduction, Vacuum techniques. Vacuum gauges - Different methods of thin films preparation - Thickness measurements - Characterization of thin films - Thin films applications.	P353	3	0/0	3
P452	Semiconductors and its applications	Crystal structure, energy bands - Intrinsic and extrinsic semiconductors, Fermi-Dirac function - Density of carriers, carrier transport. Hall effect - p-n junctions, I-V and C-V characteristics - Characteristics of transistors (BJT, MIS) - Optoelectronic : photodiodes, laser diodes, solar cells	P350	3	0/0	3
P455	Magnetic resonance imaging	Conditions for paramagnetic resonance - Line width, effect of damping - Fine and hyperfine structure - Electron paramagnetic resonance - Ferromagnetic and anti-ferromagnetic resonance - Nuclear magnetic resonance - Magnetic resonance imaging	P353	3	0/0	3
P458	Physics and Applications of Nano-materials	Fabrication methods - Factors affect the particle shape - Characterization techniques - Electrical, magnetic and optical properties - Nanotechnology for Bio-materials and tissues - Nanoparticulates applications	P353	3	0/0	3
P491	Selected Topics in Physics (I)	To be organized by the Physics Department	Department consent	3	0/0	3
P492	Selected Topics in Physics (I)	To be organized by the Physics Department	Department consent	3	0/0	3
P491 or P492	Solid state physics II	The free electron model and electrical properties - Energy bands in solids, Brillouin zones - Theory of the dielectrics Optical properties of solids - Magnetic properties of solids.	P350	2	0/3	3