DEPARTMENT OF PHYSICS

UNDER GRADUATE PROGRAMME FOR PHYSICS HONOURS STUDENTS

PROGRAMME OUTCOME

1. This Programme consists of six Semesters.
2. It covers all basic branches of physics such as classical mechanics, Quantum mechanics, relativistic mechanics, Thermal Physics, Electromagnetism, Electronics, and Optics 7 Modern physics etc.
3. It emphasizes to include detailed study of basic principle of Physics in students to help them for higher study in physics.
4. It helps the learner is cognitive development of their interest in physics.
5. It helps the students for students for building their careers applied physics and other branches.

PROGRAMME SPECIFIC OUTCOME

1. The objectives of the learning calculus and vector are to gain basic knowledge to solve different problem of physics and explain the physical phenomena quantitively.
2. By assimilating the basic concepts of mathematical physics a learner understands the physics in a better way.
3. Study of mathematical physics is also helpful to understand and can explain the other branches of physics such as quantum mechanics, Electromagnetic theory, classical dynamics etc.
4. By solving different problems of mathematical physics a learner can solve advance level of physics.
5. The classical and relativistic mechanics are two pillars for the foundation of studying Physics.
6. Classical mechanic is related to the Influence of Material bodies of medium size moving with medium velocity under the action of external force.
7. Relativistic mechanic is applicable to the participles moving with velocity nearly equal to velocity of life.
8. Einstein's mass-energy relation is a revolutionary concept of science.
9. By learning the topics of electricity, Magnetism and electro magnetism a learner gets basic idea about the flow of electric current and how it can be used in different electrical appliances.
10. It gives idea about production, transmission of A.C & their practical uses in different field.
11. The study of optics helps the learners to explain the principle of reflection and refraction used in the optical instruments.
12. Wave optics helps the learners to understand different physical phenomena by using the concept of interference, diffraction and polarization.
13. Study of thermo dynamics helps to acquire basic knowledge about the conversion of heat into mechanical energy applicable to heat engine and other appliances.

14. In thermal physics the students are able to understand behavior of gases under change of pressure and temperature.
15. The study of quantum mechanic helps the learner to understand the dynamics of microscopic world.
16. The study of electronics helps us to understand how electrons and holes flow in semi conductor and how to manipulate them.
17. Study of modern physics helps to gather knowledge regarding atomic structure and spectra lines.
18. Study of nano material helps in advance technology.

Semester-1

MATHEMATICAL PHYSICS -1(CORE-1)

COURSE OUTCOME

1. Calculus which gives idea about plotting of functions or curves.
2. Partial derivatives, differentials, integrating factors etc.
3. Vector algebra, vector differentiation and vector integration.
4. Orthogonal curvilinear co-ordinates.
5. Dirac delta functions and its properties.

MECHANICS: (CORE-II)

COURSE OUTCOME

1. Rotational dynamics, centre of mass, angular momentum. Theorems to calculate moment of inertia of different bodies. Non-inertial frames, centrifugal and coriolis force.
2. Properties of matter like elasticity. Fluid in motion and viscosity.
3. Law of gravitation, gravitational field and potential along with central force motion. Geo-stationary

satellites and global positioning system (GPS).

4. Simple harmonic motion, damped and undamped vibration. Forced vibration and resonance.

5. Special theory of relativity and Einstein's mass energy relation $E=mc^2$ and Relativistic Doppler's effect.

Semeter-2

ELECTRICITY AND MAGNETISM (CORE-III)

COURSE OUTCOME

1. Electric field, potential, Gauss's law and its application, electrostatic energy etc.
2. Magnetic effect of electric current, Biot-Savart's law and Ampere's circuital law and their applications.
3. Faraday's law of electro-magnetic induction.
4. A.C circuits, transient current and its growth and decay.
5. Network theorems with current and voltage sources.

WAVES AND OPTICS (CORE-IV)

COURSE OUTCOME

1. Matrix formulation of geometrical optics. Cardinal points. Formation of in tin thick lenses. Eye piece and dispersion.
2. Huygen's principle, Types of waves and their velocities, S.H.M. and Lissajous figures.
3. Interference , Newton's ring, colour in thin films . Michelson and Fabry-perrot Interferometer.
4. Diffraction through single slit, double slit and plane transmission grating.
5. Theory of zone plate. Resolving power of telescope and microscope.

Semeter-3

MATHEMATICAL PHYSICS II (CORE-V)

COURSE OUTCOME

1. Fourier series, even and odd function. Differentiation and integration of Fourier series.
2. Frobenius method and its application to solve Legendre and Hermite differential equations.
3. Legendre and Hermite polynomials and their properties.
4. beta and Gamma functions and their properties.
5. Solutions of partial differential equations.
6. Laplace equations and solving different problems using it.

THERMAL PHYSICS(CORE-VI)

COURSE OUTCOME

1. 1^{st} and 2^{nd} law of thermodynamics.
2. Thermodynamic scales of temperature.
3. Entropy and T-S diagram for Carnot's and third law of thermodynamics.
4. Thermodynamics potentials, Maxwell's thermodynamic relation and its application.
5. Kinetic theory of gases. Maxwell-Boltzmann' law of distribution of velocities.
6. Mean free path and transport phenomena in ideal gases.
7. Real gases and its deviation from ideal gas equation. Vander wall gas equation and Joule's Porous plug experiment.

ANALOG SYSTEM AND APPLICATION9CORE-VII)

COURSE OUTCOME

1. P and n type semiconductor, P-N junction diode, forward biasing and reverse biasing.
2. P-N junction diode as full wave and half wave rectifier.
3. Concept of Zener diode, LED, photo diode and solar cells.
4. N-P-N and P-N-P transistors and its use as an amplifier and hybrid models.
5. R-C coupled amplifier, Heartley and Coulpit's oscillators.
6. Operational amplifiers and their applications.

Semester-4

MATHEMATICAL PHYSICS-III(CORE-III)

COURSE OUTCOME

1. Complex analysis.
2. Cauchy-Reimann condition.
3. De-moivres theorem.
4. Cauchy integral formula and Laurent and Taylor expansion. Residue theorems.
5. Fourier transforms and its applications .
6. Dirac-delta functions, inverse Fourier transform and convolution theorems.
7. Laplace transform and its properties.
8. Application of LT to solve different equations.

ELEMENTS OF MODERN PHYSICS(CORE-IX)

COURSE OUTCOME

1 Inadequacy of classical physics, photoelectric effect, Compton Effect. Dual nature of radiation.

2. Rutherford's model of atom. Bohr's model of hydrogen atom. Somerfield's modification of Bohr's theory.

3. de-Broglie hypothesis, wave-particle duality, wave packet representation. Heisenberg's Uncertainty principle.

4. Characteristics of nucleus, nuclear force, liquid drop model, semi-empirical mass formula and binding energy.

5. Radio activity, alpha decay and beta decay.

6. Nuclear fission and nuclear fusion. Nuclear reactors .

DIGITAL SYSTEM AND APPLICATIONS(CORE-X)

COURSE OUTCOME

1. Active and passive components of integrated circuits and its classification.

2. Difference between analog and digital circuits.

3. Gates, Boolean algebra and De-Morgan's theorems.

4. CRO and its applications.

5. Data processing circuits, arithmetic circuits and timers.

6. Introduction to computer organizations.

7. Shift registers and counters.

Semeter-5

QUANTUM MECHANICS AND APPLICATIONS (CORE-XI)

1. Schrodinger time dependent equation, properties of wave function and uncertainty principle.
2. Operators and commutation algebra.
3. Time independent Schrodinger inquisition and its applications.
4. Atoms in electric and magnetic fields. Vector atom model, Zeeman effect, Paschen back effect and stark effect.

SOLID STATE PHYSICS(CORE-XII)

COURSE OUTCOME

1. Crystal structure lattice with basis. Unit cell, types of lattice.

2. Diffraction of X-rays by crystals and Bragg's law.

3. Lattice vibrations and phonons. Dulong and Petit's law.

4. Einstein and Debye theories of specific heat of solids.

5. Magnetic properties of matter. Langevin's theory of dia and paramagnetism.

6. Curie's law and Weis's theory of ferromagnetism.

7. Dielectric properties of matter. Clausius and Mossoti equation.

8. Lasers. Spontaneous and stimulated emission.

9. Kronig- Penny model of band gap. Hall effect.

10. Super conductivity. London's equation ,BCS theory.

CLASSICAL DYNAMICS(DSE-I)

COURSE OUTCOME

1. Lagrange's equation of motion from de-Alembert's principle.
2. Lagrengian and its application.
3. Hamilton's principle and derivation of Lagrenge's equations from Hamilton's principle.
4. The equation of motion and first integrals, classification of orbits.
5. Special theory of relativity and Lorentz trans formation and mass-energy relation.
6. Four vectors, Doppler's effect from a four vector.
7. Conservation of four momentums.

NUCLEAR AND PARTICLE PHYSICS(DSE -II)

COURSE OUTCOME

1. Characteristics of nucleus, binding energy, angular momentum, parity and magnetic moments.
2. Alpha decay, beta decay, neutrino hypothesis and gamma decay.
3. Liquid drop model, semi empirical mass formula, nuclear magic number and shell model.
4. GM and detectors for nuclear radiation.
5. Parabolic accelerator, cyclotron.
6. Particle physics.
7. Parity, Baryon number, strangeness and charm.
8. Elementary ideas of quarks and gluons.

Semester-6

ELECTROMAGNETIC THEORY(CORE-XIII)

COURSE OUTCOME

1. Maxwell's equation, Lorentz and Coulomb gauge, poynting theorems and pointing vectors.

2. EM wave propagation in unbounded media, propagation through conducting media, skin depth and relaxation time.

3. EM in bounded media, Fresnel's formulae for perpendicular and parallel polarization.

4. Polarization of EM waves, double refraction and Nicol prism.

5. Phase retardation plates, Bebinets's compensator and its uses.

6. Biot's law for rotator polarization. Fresnel's theory of optical polarization.

STATISTICAL MECHANICS(CORE-XIV)

COURSE OUTCOME

1. Macro state and microstate, concept of ensemble, Maxwell-Boltzmann' s distribution law of energies.

2. Gibb's paradox, Sackur -Tetrode equation,law of equipartition of energy.Specific heat and its limitations.

3. Quantum statistics, bose-Einstein and Fermi-Dirac distribution function .Bose- Einstein condensation.

4. Black body radiation, Kirchoff's law,Stefen Boltzmann's law, Wien displacement law and Rayleigh Jeans law.

5. Planck's law of black body radiation.

NANO-MATERIALS AND APPLICATION (DSE-III)

COURSE OUTCOME

1. Nano scale system, nano structure, quantum confinement of carriers in3D, 2D, 1D nano structure.

2. Synthesis of nano structure materials, physical vapor deposition. Sol-gel electro deposition.

3. X-ray diffraction optical microscopy, scanning electron microscopy, scanning tunneling microscopy.

4. Applications of nano particle, photonic devices, quantum dots, magnetic quantum well, micro-electro mechanical systems, nano electro mechanical systems.