Bachelor's Degree Programme (BDP) in Physics

Syllabus

Netaji Subhas Open University

Programme's objective:

Netaji Subhas Open University established in the year 1997 following the State Act (W.B. Act (XIX) of 1997 and Recognised by U.G.C.). From its inception Universities mission was "to reached the unreached" and thus imparting education to the learners those who could not entered into the higher education due to their (i) distance from the higher education institution(s); (ii) poverty; (iii) other-wise engaged in jobs. Most people would probably agree that learning science with understanding is desirable for all the students. Keeping this in mind Netaji Subhas Open University launched its Physics course (EPH) at the Under-graduate level (BDP) from the session 2000-2001. The opening of the graduate course in Physics was the need and demand of the students as well as the study centres.

The main objectives for offering this program are: –

A. To educate and trained individuals to be an effective managers and decision-makers.
B. For the understanding that scientific knowledge is the product of a process engaged in by a community of scientists.
C. To equip individuals with the necessary scientific skills and competencies to enable them to seek jobs and progress in their career.
D. To enhance the capabilities of the existing workforce in the country and thus contribute to economic as well as scientific development.
E. To give chances to the willing students those who could not entered into the conventional Universities due to their job and limitation of the seat in the respective subjects.
F. Understand and apply theoretical and practical knowledge in the appropriate areasand enhance their living condition as well as to save the nature and its surroundings.
G. Work collaboratively with others (within different sections of the society) in cross-functional teams, and to motivate, lead, and mentor others.

Programme Outcome:

The mission of the Higher Education Institutions is to bring more and more learners in the higher education and thus contribute to economic as well as scientific development. In other way, involvement of more learners in higher education will help the nation to reach its goal. Students completing this program will be able to: (i) " hand on" knowledge of the Physics and provide insight for wise management decisions about how the planet's resources should be used; (ii) learners focus on "real world" relationships and dependencies among the phenomena and processes will give character to any location or *place; (iii)* summarizing a great deal of knowledge economically by incorporating it in a limited set of general principles; (iv) conduct spatial representation using visual, verbal, digital, and cognitive approaches; and (v) leading to specific, testable predictions.

Detailed Course structure of BDP Physics (EPH):

1. Compulsory Subjects : Foundation Course

(a) Humanities and Social Science (FHS)	8 Credits/ 100 Marks
(b) Science and Technology (FST)	8 Credits/ 100 Marks
(c) Bengali (FBG)	4 Credits/ 50 Marks
(d) English (FEG)	4 Credits/ 50 Marks
	24 Credits/ 300 Marks

2. Elective Subjects : Honours Courses (EPH)

Course 01 : Mathematical Methods in Physics	4 Credits/ 50 Marks
Course 02 : Mechanies and General Properties of Matter	4 Credits/ 50 Marks
Course 03 : Harmonic Motion, Waves & Acoustics	4 Credits/ 50 Marks
Course 04 : Practical Physics - 1	8 Credits/ 100 Marks
Course 05 : Heat and Thermodynamics	4 Credits/ 50 Marks
Course 06 : Optics	4 Credits/ 50 Marks
Course 07 : Electrostatics	4 Credits/ 50 Marks
Course 08 : Practical Physics - 2	8 Credits/ 100 Marks
Course 09 : Electricity and Magnetism	4 Credits/ 50 Marks
Course 10 : Electronic Circuits and Devices	4 Credits/ 50 Marks
Course 11 : Relativity and Advanced Mechanies	4 Credits/ 50 Marks
Course 12 : Practical Physics - 3	8 Credits/ 100 Marks
Course 13 : Structure of atoms and molecular spectra	2 Credits/ 25 Marks
Course 14 : Nuclear Physics	2 Credits/ 25 Marks
	64 Credits/ 800 Marks

3. Subsidiary Course

One Subsidiary Course — 24 Credits/ 300 Marks

4. Application Oriented Course

Household Chemistry (AOC-03) — 8 Credits/ 100 Marks

5. Environmental Studies (ENVS) — 4 Credits/ 50 Marks

Total Credits for the Course = (24+64+24+8+4) = 124 Credits (1550 Marks.)

Evaluation System :

Theoritical :
Internal assessment : 30%
Term-end Examinations : 70%
Practical :
Continuous Counselling for 11 days : 70% Examination : 30%

Detailed Syllabus of Physics (EPH):

Course : EPH 01 : Mathematical methods in Physics.
Block : I : Vectors and Probability
Unit 1 : Vector algebra
Unit 2 : Vector differential equation
Unit 3 : Coordinate systems
Unit 4 : Integration of scalar and vector fields
Unit 5 : Probability
Unit 6 : Certain probability distributions
Unit 7 : Applications of probability in physics
Block II :
Unit 8 : General differential equations of first order
Unit 9 : General differential equations with constant coefficient of second order
Unit 10 : General differential equations of second order with variable coefficients
Unit 11 : Differential equations in physics
Unit 12 : Partial differential equations
Unit 13 : Partial differential equations in physics
Unit 14 : Fourier series
Unit 15 : Fourier series in solution of partial differential equations

Course : EPH 02 : Mechanics and General Properties of matter
Block : 1 :
Unit 1 : Motion, speed, velocity and acceleration
Unit 2 : Force and momentum
Unit 3 : Work, power and energy
Unit 4 : Angular motion and non-inertial frames
Unit 5 : Dynamics of rigid bodies
Unit 6 : Central conservative forces
Unit 7 : Behaviour of systems of particles
Unit 8 : Scattering of particles
Block II :
Unit 9 : Gravity and gravitation
Unit 10 : Elasticity
Unit 11 : Beams and springs
Unit 12 : Surface tension of liquids
Unit 13 : Viscosity
Unit 14 : Hydrodynamics
Unit 15 : Production of vacuum and measurment of pressure
Unit 16 : Units and dimensions

Course : EPH 03 : Harmonic Motion, Waves & Acoustics

Block I :

Unit 1 : Simple Harmonic motion
Unit 2 : Superposition of simple harmonic motions
Unit 3 : Damped vibrations
Unit 4 : Forced vibrations and resonance
Unit 5 : Coupled oscillations
Unit 6 : Wave motions
Unit 7 : Superposition of waves

Block II :

Unit 8 : Wave propagation in different media
Unit 9 : Vibrations of string under tension
Unit 10 : Measurment of loudness, intensity and pitch of sound
Unit 11 : Auditorium Acoustics
Unit 12 : Ultrasonics
Unit 13 : Recording and reproduction of sound
Unit 14 : Speech and audibility

Course : EPH 04 : Practical Physics-1

Block : I

Unit 1 : To find Fourier coefficients of different periodic vibrations by graphical method
Unit 2 : Extension of spring and to find out spring constant from vertical oscillations
Unit 3 : To find out modulus of rigidity from torsional oscillation of a wire
Unit 4 : Melde's experiment – production of waves by electrically vibrated tuning fork
Unit 5 : Viscosity of water by flow in a capillary tube
Unit 6 : Jager's method to find out surface tension
Unit 7 : Use of thermocouple to draw cooling curve and to measure melting point
Unit 8 : Bar pendulum – time period and distance from point of suspension
Unit 9 : To determine focal lengths of convex & concave lenses by displacement and combination method
Unit 10 : Lee's method for determination of K of bad conductors

Course : EPH 05 : Heat and Thermodynamics

Block : I

Unit 1 : General concepts in thermodynamics
Unit 2 : Concept of temperature and measurment
Unit 3 : First law of thermodynamics & applications
Unit 4 : Second law of thermodynamics & entropy
Unit 5 : Applications of 2nd law of thermodynamics
Unit 6 : Change of phase
Unit 7 : Radiation
Unit 8 : Production of very low temperatures

Block II :

Unit 9 : Ideal gases
Unit 10 : Transport phenomena
Unit 11 : Brownian motion
Unit 12 : Real gases
Unit 13 : Principles of statistical mechanics
Unit 14 : Partition function
Unit 15 : Particle Statistics

Course : EPH 06 : Optics
Block I : Geometrical optics, Interference and diffraction
Unit 1 : Nature of light
Unit 2 : Geometrical optics–Matrix method
Unit 3 : Seidel aberrations
Unit 4 : Interferance of light and coherence
Unit 5 : Multiple beam interference
Unit 6 : Fraunhofer diffraction
Unit 7 : Frensel's diffraction
Block II : Polarisation and Realated aspects
Unit 8 : Polarisation of light
Unit 9 : Optical rotation
Unit 10 : Laser and Hologram
Unit 11 : Optical fibers and electronics
Unit 12 : Scattering of light
Unit 13 : Vision

Course : EPH 07
Block I : Electrostatics
Unit 1 : Units and dimensions of e.m. quantities
Unit 2 : Charge, force and electric field
Unit 3 : Gauss theorem
Unit 4 : Electric potential
Unit 5 : Capacity and capacitors
Block II :
Unit 6 : Insulators and their properties
Unit 7 : Method of images
Unit 8 : Laplace's equations
Course : EPH 08 (Lab) : Practical Physics–2
Unit 1 : To verify Thevenin, Norton and Reciprocacity theorem
Unit 2 : Calibration of a Thermister with the help of a thermocouple
Unit 3 : To make a power supply circuit and to study it with the help of a CRO
Unit 4 : To draw input-output characteristics of a common base or common emitter transistor
Unit 5 : Zenor Diode–characteristics in forward and reverse bias
Unit 6 : To find leakage resistance by discharging a capacitor
Unit 7 : To find out temparature coefficiant of the material of a wire by Carey- Foster bridge
Unit 8 : To find mutual inductance by Carey-Foster method
Unit 9 : To find wavelength of Na-light by double slit / biprism method
Unit 10 : To find optical rotation of a sugar solution by a polarimeter

Course EPH 09 : Electricity and Magnetism
Block I :
Unit 1 : Steady current
Unit 2 : Effect of current on magnetic field
Unit 3 : Motion of charged particles in electric and magnetic fields
Unit 4 : Magnetic proposition of substances
Unit 5 : Electric induction and transient current

Block II :
Unit 6 : Alternating current
Unit 7 : Motor and transformer
Unit 8 : A. C. bridges
Unit 9 : Thermoelectricity
Unit 10 : Electromagnetic waves and Maxwell's equations

Course EPH 10 : Electronic circuits and devices
Block I : Electronic circuits and devices
Unit 1 : Analysis of circuits
Unit 2 : Electronic control devices
Unit 3 : Some Semi-conductor devices
Unit 4 : Rectifiers & power supply
Unit 5 : Amplifier circuits
Unit 6 : Oscillatory circuits
Unit 7 : Some electronic devices
Block II :
Unit 8 : OPAMP & uses
Unit 9 : Integrated circuits
Unit 10 : Linear integrated circuit amplifier
Unit 11 : Numerical Electronics
Unit 12 : Boolean Algebra
Unit 13 : Flip-Flop Counter, Register, Memory, Analog / Digital circuits

Course EPH 11 : Relativity and Advanced Mechanics
Block I :
Unit 1 : Experimental basis of Relativity
Unit 2 : Lorentz's transformations
Unit 3 : Relativistic Kinematics
Unit 4 : Relativistic Dynamics
Unit 5 : Lagrange's and Hamiltonian equations
Unit 6 : Moment of inertia and Top motion
Unit 7 : Small oscillations
Block II : Quantum Mechanics
Unit 8 : Particle wave dualism
Unit 9 : Uncertainty principles
Unit 10 : Schrodinger equation
Unit 11 : Applications of Schrodinger equations – Free State
Unit 12 : Applications of Schrodinger equations – Bound State
Unit 13 : Hydrogen Atom

Course : EPH 12 (Lab) : Practical Physics–3
Unit 1 : To draw ™□L, ™□1/L2 graphs and find an unknown wavelength by a prism Spectrometer
Unit 2 : To draw : sin \□L graph with the help of a diffraction grating and find wavelengths
Unit 3 : To draw the hysteresis cycle of a ferro-magnatic material and calculate hysteresis loss
Unit 4 : To study series and parallel resonances and change of current with frequency
Unit 5 : Use of an OPAMP as adder, substractor, inverting and non-inverting amplifier

Course EPH 13 : Structure of Atoms, Molecular Spectra and Solid State Physics
Block I : Structure of Atoms and Molecular spectra
Unit 1 : Electron, Cathode rays, Photoelectric effect, Thermal electrons
Unit 2 : Positive rays and mass spectrometer
Unit 3 : Atomic model and Bohr's theory
Unit 4 : Electron spin and vector model
Unit 5 : Alkali spectra and periodic table
Unit 6 : Zeeman & Stark effects
Unit 7 : Molecular spectra and Raman scattering
Unit 8 : Production of x-rays, spectra and properties
Block II : Solid State Physics
Unit 9 : Crystal structure and uses of x-rays in crystallography
Unit 10 : Bonds in crystals
Unit 11 : Lattice vibrations
Unit-12 : Specific heat of crystalline solids
Unit 13 : Free electron theory
Unit 14 : Band theory of solids
Unit 15 : Magnetic properties of materials
Unit 16 : Superconductivity

Course : EPH 14 : Nuclear Physics
Block I :
Unit 1 : General properties of nucleus
Unit 2 : Nuclear models
Unit 3 : Radioactivity
Unit 4 : Alpha-rays
Unit 5 : Beta-rays
Unit 6 : Gama-rays
Block II :
Unit 7 : Neutron
Unit 8 : Nuclear Reactions
Unit 9 : Nuclear fission and fusion
Unit 10 : Detection and measurement of nuclear radiations
Unit 11 : Particle accelerators
Unit 12 : Fundamental particles