



**Syllabus Of
Physics
B.Sc. (Hons.)
Course Code: EPH**

NETAJI SUBHAS OPEN UNIVERSITY

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Course Structure for The Bachelor's Degree Programme (BDP) in Physics (EPH)

With effect from July 2006

- 1. Compulsory Subjects : Foundation Course**
 - (a) Humanities and Social Science (FHS) 8 Credits
 - (b) Science and Technology (FST) 8 Credits
 - (c) Bengali (FBG) 4 Credits
 - (d) English (FEG) 4 Credits**24 Credits**

- 2. Elective Subjects : Honours Courses (EPH)**

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

64 Credits

- 3. Subsidiary Course**

One Subsidiary Course 24 Credits

- 4. Application Oriented Course (Any one)**
 - (a) Basic Accounting (AOC-01) 8 Credits
 - (b) Food Processing (AOC-02)
 - (c) Household Chemistry (AOC-03)

- 5. Environmental Studies (ENVS) 4 Credits**

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

Evaluation System :

Theoretical :

Internal assessment : 30%

Term-end Examinations : 70%

Practical :

Cumulative Counselling for 11 days : 70%

Examination : 30%

For further details please consult the respective prospectus

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 measurement 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 : Measurement 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 measurement
- 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 : Interference of light and coherence

Unit 5 : Multiple beam interference

Unit 6 : Fraunhofer diffraction

Unit 7 : Fresnel's diffraction

Block II : Polarisation and Related 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 Reciprocity 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 temperature coefficient 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 $\delta-\lambda$, $\delta-1/\lambda^2$ graphs and find an unknown wavelength by a prism Spectrometer
- Unit 2 : To draw : $\sin \theta-\lambda$ graph with the help of a diffraction grating and find wavelengths
- Unit 3 : To draw the hysteresis cycle of a ferro-magnetic 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, subtractor, 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

SUGGESTED BOOKS ON PHYSICS

1. Mathematical methods – M. C. Potter & J. Goldberg
2. Vector Analysis – M. R. Spiegel
3. Tatwiyā Padārtha Bidyā Bhumika – S. Sengupta, A. Ghosh & D. P. Roychoudhury
4. Introduction to Classical Mechanics – R. G. Takwale & P. S. Puranik
5. Mechanics & General properties of matter – D. P. Roychoudhury & S. N. Maiti



6. Podarther Dharma – D. P. Roychaudhury
8. Waves & Oscillations – Rathin N. Chaudhury
9. Kinetic theory of gases – Loeb
10. Tapgatividya – Asok Ghosh
11. A Treatise on Heat – Saha & Srivastava
12. Gaser Anabik Tattawa – P. K. Chaudhury
13. Heat & Thermodynamics – H. P. Roy & A. B. Gupta
14. Optics – A. K. Ghatak
15. Optics – B. K. Mathur
16. Bhauta Alok Bigyan – B. S. Basak
17. Introduction to Special Theory of Relativity–R. Resnik
18. Apekshikata Tattwa – Sriranjjan Bandyapadhyay
19. Indroduction to Electrodynamics – D. J. Griffith
20. Electricity & Magnetism – D. Chattopadhyay & P. C. Rakshit
21. Integrated Electronics – J. Millman & C. C. Halkias
22. Electronic Fundamentals & Applications–D. Chattopadhyay & P. C. Rakshit
23. Classical Mechanics – J. Goldstein
24. Classical Mechanics – A. K. Roychoudhury
25. Introductory Quantum Mechanics–S. N. Ghosal
26. Quantum Mechanics – J. L. Powell & B. Crasemann
27. Fundamental of Statistical & Thermal Physics–F. Reif
28. Paramanu O Kendrak Gathan Parichay (Vol I & II)– S. N. Ghosal
29. Nuclei and Particles – E. Segree
30. Atomic & Nuclear Physics (Vol I & II)– S. N. Ghosal
31. Solid State Physics – D. L. Bhattacharya
32. Nuclei and Particles–E. Segree

Examination system (Subject to Change)

1st Semester - FBG, FEG, E-1 & E - 4*

2nd Semester - FHS, E - 2, E - 3 & E - 5

3rd Semester - FST, E - 6 & E - 8*

4th Semester - E - 7, E - 9, E - 10 & S - 1

5th Semester - E - 11, E - 12* & S - 2

6th Semester - E - (13 & 14), S - 3, AOC & ENV5

*** Practical Courses**