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

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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 : Mechanies 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 Mechanies	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 :

Theoritical :

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 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 $\delta-\lambda$, $\delta-1/\lambda^2$ 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-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

SUGGESTED BOOKS ON PHYSICS

1. Mathematical methods – M. C. Potter & J. Goldberg
2. Vector Analysis – M. R. Spiegel
3. Tatwiya Padartha Bidyar Bhumika – S. Sengupta, A. Ghosh & D. P. Roychaudhury
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 – Sriranjan 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 & ENVS

*** Practical Courses**