SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus for M.Sc. (PHYSICS) Entrance Examination (2026-27)

Syllabus for Entrance Examination of M.Sc. (Physics) for the academic year 2026-27, will be based on B.Sc. (Physics) courses.

The distribution of weightage of marks will be as follows:

Sr. No	**Topic**	**Weightage**
1	Physics courses of B.Sc.- III (SEM V and VI)	80 %
2	Physics courses of B.Sc.- II (SEM III and IV)	10 %
3	Physics courses of B.Sc.- I (SEM I and II)	10 %

Instructions for the Entrance Exam:

1. Duration of Examination: 3 hours
2. Total number of multiple-choice questions (MCQs): 100
3. Each question carry 01 Mark
4. Maximum Marks: 100
5. All MCQs are compulsory.

(Please refer to the attached syllabus.)

SHIVAJI UNIVERSITY, KOLHAPUR.

Accredited By NAAC with A^{++} Grade

Revised Syllabus For

B.Sc Part- III
Physics

CBCS (NEP) Pattern
Syllabus to be implemented from
Academic Year 2024-25.

SHIVAJI UNIVERSITY, KOLHAPUR

CBCS (NEP) Syllabus with effect from June 2024

B.Sc. Part-III Semester-V

PHYSICS Paper-IX

DSE-E1: Mathematical Physics and Classical Electrodynamics

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks -50 (Credits: 02)

UNIT I

1. Orthogonal Curvilinear Co-ordinates: (10 hours)

Introduction to Cartesian, Spherical polar and Cylindrical co-ordinate systems, Concept of orthogonal curvilinear co-ordinates, Unit tangent vectors, Arc length, Area and Volume elements in orthogonal curvilinear co-ordinate system, Gradient, Divergence, Curl, Del and Laplacian in orthogonal curvilinear co-ordinate system, Extension of gradient, divergence, curl, del and Laplacian in Cartesian, Spherical polar and Cylindrical coordinate systems.

2. Partial Differential Equation (8 hours)

Introduction to differential equations, Method of separation of variables for solving second order partial differential equations, Form of two dimensional Laplace differential equation in Cartesian coordinates and its solution, Three dimensional partial differential equation in Cartesian coordinates and its solution, The differential equation of progressive wave and its solution.

UNIT II

1. Charged Particles Dynamics (9 hours)

Poisson's and Laplace's equations and their physical significance, Laplace's equation in one dimension and its solutions, Motion of charged particle - in uniform electric field E, magnetic field B, Crossed uniform electric field E and magnetic field B.

2. Maxwell's Equations (9 hours)

Biot-Savarat's law, Amperes law, Derivation of $\vec{\nabla}\cdot\vec{B}=0$ and $\vec{\nabla}\times\vec{B}=\vec{J}$, Displacement current, Maxwell's correction to Amperes law, Maxwell's equation for time dependent electric and magnetic fields in vacuum and material medium.

Reference Books

1. Advanced calculus, Robert C. Wrede, Murray Spiegel.
2. Differential Equations with Modeling Applications, Dennis G.Zill.
3. Partial Differential Equations, Gupta Malik and Mittal.
4. Differential Equations, Gupta Malik and Mittal.
5. Differential Equations, Ramachandra Rao,H. R. Anuradha.
6. Partial Differential Equations, N. P. Bali.
7. Differential Equations, N. Ch. S. N. Iyenger.
8. Mathematical Physics, B. S. Rajput.
9. Mathematical Methods for Physicists, G. Arfken, Weber, 2005, Elsevier.
10. Mathematical Methods for Scientists and Engineers, McQuarrie, 2003, Viva Books.
11. Mathematical Physics, H. K. Das, Rama Varma.
12. Essential Mathematical methods, K. F. Riley, M. P. Habson, 2011,Cambridge.
13. Mathematics for Physicists, Susan M.Lea, 2004, Thomson Books/Cole.
14. Concepts of Modern Physics, Arthur Beiser, McGraw Hill
15. Introduction to Special Relativity, Robert Resnick, Wiley India
16. Classical Electrodynamics, Puri S.P., Tata McGraw/Alpha Science 2011
17. Classical Electrodynamics, Jackson J. D., Wiley India , 2007
18. Electromagnetics, Laud B.B., New Age International. 2011
19. Introduction to Electrodynamics , David. J. Griffiths , Pearson Publishing

CBCS (NEP) Syllabus with effect from June 2024

B.Sc. Part-III Semester-V

PHYSICS Paper-X

DSE-E2: Quantum Mechanics

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks -50 (Credits: 02)

Unit-I

1. Matter Waves (08 hours)

Wave particle duality, De-Broglie hypothesis of matter waves, Derivation of wavelength of matter wave, Concept of wave packet, Relation between group velocity - phase velocity and group velocity-particle velocity, Davisson and Germer experiment, Uncertainty principle (statements only): position–momentum and energy- time, Application of uncertainty principle- non existence of free electrons in the nucleus.

2. Schrodinger's Wave Equation (10 hours)

Wave function and its physical interpretation, Condition of physically acceptable wave function, Normalized and orthogonal wave function, Schrödinger time dependent and time independent (steady state) wave equations in 1D and 3D, Probability current density (continuity equation), Eigen values and Eigen functions, Expectation values of dynamic variables.

Unit-II

1. Operators in Quantum Mechanics (10hours)

Definition of an operator, position operator (x), Linear momentum operator (p), Commutationrelation in quantum mechanics, Commutation relation between x and p, Kinetic energy operator (T), Hamiltonian operator (H), Parity operator (π), Angular momentum operator (L) – components of angular momentum operator in cartesian and spherical polar coordinate system, Ladder operators, Eigen values of L_z and L^2 (use equations for L^2 and L_z in spherical polar coordinates).

2. Applications of Schrodinger Equation (08 hours)

Particle in a rigid box (infinite potential well) in one dimension and three dimension, Step potential- reflection and transmission coefficients, Potential barrier- tunneling effect (qualitative treatment), Schrodinger wave equation for Hydrogen atom in spherical polar coordinates, Separation of radial and angular parts. Solution of radial part of Schrodinger wave equation - energy eigen values.

Reference Books:

1. Modern Physics, R. Murugeshan, 1997, S. Chand and Company Ltd.
2. Atomic Physics, J B Rajam, S Chand and Co.
3. Perspectives of Modern Physics, Arthur Beiser, McGraw Hill International Editions.
4. Concepts of Modern Physics, Arthur Beiser, Ahobhit Mahajan, S. Rai Choudhury,Sixth Edition, Tata McGraw Hill Education Private Ltd.
5. Modern Physics, S. L. Kakani and Shubhra Kulkarni, 2006, Viva books Private Ltd.
6. Principles of Quantum Mechanics-I. S. Tyagi, Pearson Education.
7. Introduction to Modern Physics, F. K. Richtmyer, E. H. Kennard, John N. Cooper,Sixth Edition, Tata McGraw Hill Education Private Ltd
8. A Text book of Quantum Mechanics, P.M. Mathews & K. Venkatesan, 2nd Edn.,2010,Tata McGraw Hill,
9. Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
10. Quantum Mechanics Theory and Applications, A. K. Ghatak and S. Lokanathan, Third Edition.1995, Macmillan India Ltd.
11. Quantum Mechanics Theory and applications, Ajoy Ghatak, S. Lokanathan, 5thEd,2017, Trinity.
12. Quantum Mechanics, Chatwal and Anand, Reprint 2010, Himalaya Publishing house.
13. Quantum Mechanics, Gupta, Kumar, Sharma, Thirteenth Edn., 2011, Jai Prakash NathPublications.
14. Advanced Quantum Mechanics, Satya Prakash, Reprint 2011, Kedar Nath Ram NathMeerut.
15. Advanced Quantum Mechanics, B. S. Rajput, Ninth Edn., 2009, Pragati Prakashan.
16. Quantum Mechanics, B. N. Srivastava, Reprint 2011, Pragati Prakashan.
17. Quantum Mechanics, P. J. E. Peebles, 2003, Prentice Hall of India.
18. Quantum Mechanics, S. P. Singh, M. K. Bagade, Kamal Singh, S. Chand & companyLtd, New Delhi

CBCS (NEP) Syllabus with effect from June 2024

B.Sc. Part-III Semester-V

PHYSICS Paper-XI

DSE-E3: Classical Mechanics

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks -50 (Credits: 02)

UNIT-I

1. Lagrangian Formulation (10 hours)

Constraints, Degrees of freedom, Generalized coordinates, Principle of virtual work, D'Alembert's principle, Lagrange's equation from D'Alembert's principle, Applications of Lagrange's equation to a particle in space, Atwood's machine and a bead sliding on uniformly rotating wire under force free condition.

2. Techniques of Calculus of Variation (8 hours)

Hamilton's principle, Deduction of Hamilton's principle from D'Alembert's principle, Deduction of Lagrange's equation from Hamilton's principle, Applications-shortest distance between two points in a plane, Brachistochrone problem.

UNIT- II

1. Rigid Body Motion (6 hours)

Motion of rigid body in space, Euler's theorem, Angular momentum and kinetic energy, Euler's equations of motion.

2. Special Theory of Relativity (12 hours)

Inertial and non-inertial reference frames, Galilean transformation equations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformation equations, Relativistic addition of velocities, Length contraction, Time dilation, Variation of mass with velocity, Mass-energy relation.

Reference Books

1. Classical Mechanics, Goldstein Herbert, Narosa Publi./ Pearson Edu. 2018
2. Classical Mechanics, Gupta, Kumar and Sharma, Pragati Prakashan.2019
3. Introduction to Classical Mechanics, Takwale R.G., Puranik P. S.,Tata McGraw 1979
4. Classical Mechanics, Panat P.V., Narosa Publi. 2016
5. Concepts of Modern Physics, Arthur Beiser, McGraw Hill
6. Introduction to Special Relativity, Robert Resnick, Wiley India.

CBCS (NEP) Syllabus with effect from June 2024
B.Sc. III- Semester- V

PHYSICS Paper XII

DSE-E4: Digital and Analog Circuits and Instrumentation

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks- 50 (Credits: 02)

Unit-I

1. Digital Electronics (06 hours)

Review of basic logic gates, Derived logic gates (NOR, NAND, XOR and XNOR gates), NAND and NOR gates as universal gates, De Morgan's theorems, R-S flip flop, J-K flip- flop, Half adder, Full adder, 4-bit parallel binary adder, Counter.

2. Transistors Amplifier (04 hours)

Review of output characteristics of transistor in common emitter mode, Single stage transistor CE amplifier, D.C. and A.C. equivalent circuits, load line analysis-d.c. load line, a.c. load line and Q point.

3. Sinusoidal Oscillators (08 hours)

Oscillator: Feedback in amplifiers and its types, theory of feedback oscillator, Barkhausen's criterion for sustained oscillations, Oscillatory circuit (tank circuit), essentials of transistor oscillator, sinusoidal oscillators-phase shift oscillator, Colpitt's oscillator, Crystal oscillator using transistors.

Unit-II

1. Operational Amplifier (10 hours)

Operational Amplifier: Differential amplifier and its type, Op-Amp, Block diagram of an Op-Amp. Op-Amp parameters, Characteristics of an ideal and practical Op-Amp (IC 741), concept of virtual ground, Applications of Op-Amps: Inverting amplifier and Non-inverting amplifier, Adder, Subtractor, Differentiator, Integrator.

2. Timer (04 hours)

Timer IC:Block diagram of IC555, IC 555 Pin configuration, Applications of IC 555 as astable and monostable multivibrator.

3. Cathode ray Oscilloscope (04 hours)

Introduction to CRO, Block diagram of CRO, Principle, construction and working of CRT, Applications of CRO: measurement of A. C. and D.C. voltages, periodic time, frequency and phase difference, Lissajous figures.

Reference Books

1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
3. Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning.
4. Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning.
5. Digital Principles & Applications, A.P. Malvino, D.P. Leach &Saha, 7th Ed.,2011, Tata McGraw Hill.
6. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6thEdn., Oxford University Press.
7. Fundamentals of Digital Circuits, A. Anand Kumar, 2ndEdition, 2009, PHI Learning Pvt. Ltd.
8. OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.
9. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
10. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
11. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
12. A text book of Electronics, SantanuChattopadhay, New Central Book Agency, Kolkata.
13. Basic Electronics, 2ndEdition , B. Basavaraj, H. N. Shivashankar, Vikas Publishing house Pvt. Ltd. New Delhi.
14. Electronic principles, V. K. Mehta.
15. Basic Electronics, Bhargava and Gupta.

CBCS (NEP) Syllabus with effect from June 2024
B.Sc. III- Semester- VI

PHYSICS Paper-XIII

DSE-F1:Nuclear and Particle Physics

Theory: 36 Hours (45 Lectures of 50 minutes)

Marks -50 (Credits: 02)

Unit-I

1. General Properties of Nuclei and Nuclear Model (10 hours)

Constituents of nucleus and their intrinsic properties, Quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy of a nucleus and its variation with mass number, Liquid drop model approach, Semi empirical mass formula, Magic numbers.

2. Particle Accelerators (8 hours)

Need of accelerators, Cyclotron- construction, working, theory and its limitations, Principle of phase stable orbit, Synchrocyclotron - construction and working, Synchrotrons- electron synchrotron and proton synchrotron, Betatron - principle, construction and working condition, expression of energy gain.

Unit-II

1. Nuclear Detectors (10 hours)

Ionization chamber, Geiger Muller counter- construction, working and theory, dead time and recovery time, quenching mechanism, Construction of photo-multiplier tube (PMT), Scintillation detector- principle, construction and working, Wilson cloud chamber, Semiconductor detector, Cerenkov radiations, Cerenkov detector.

2. Particle Physics (8 hours)

Particle interactions, Classification of elementary particles, Symmetries and conservation laws of energy, momentum, angular momentum and parity, Baryon number, Lepton number, Concept of quark model.

Reference Books

1. Introductory nuclear Physics, Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
2. Concepts of nuclear physics, Bernard L. Cohen. (Tata Mcgraw Hill, 1998).
3. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004)
4. Introduction to Elementary Particles, D. Griffith, John Wiley & Sons
5. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi
6. Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP-Institute of Physics Publishing, 2004).
7. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
8. Theoretical Nuclear Physics, J.M. Blatt &V.F.Weisskopf (Dover Pub.Inc., 1991)
9. Nuclear Physics by John Lilley,The Manchester Physics Series – Willy
10. Nuclear Physics by S. B. Patel, New age international (p) lit. Publishers New Delhi.
11. Modern Physics by R. Murugeshan, S. Chand & company Ltd, Ram Nagar New Delhi
12. Nuclear Physics by D. C. Tayal, Himalaya Publishing house
13. Concept of modern physics by Arthir Beiser, Tata McGraw- Hill publishing company ltd. New Delhi
14. Atomic and nuclear structure by D. K. JHA, Discovery publishing house New Delhi
15. Nuclear energy by D. K. JHA Discovery publishing house New Delhi)
16. Nuclear physics by S. N. Ghoshal , S. Chand & company Ltd, Ram Nagar New Delhi

CBCS (NEP) Syllabus with effect from June 2024
B.Sc. III- Semester- VI

PHYSICS Paper-XIV

DSE-F2: Solid State Physics
Theory: 36 Hours (45 lectures of 48 min)

Marks-50 (Credits: 02)

Unit-I

1. Crystal Structure (10 hours)

Solids: amorphous, polycrystalline and crystalline materials; lattice, basis, unit cell – primitive, non-primitive unit cell, symmetry operations, symmetry elements of cube, Bravais lattice in two and three dimensions, Miller indices, Miller indices and interplaner spacing, Simple crystal structures: SC,BCC,FCC and HCP (Co-ordination number, atomic radius, atoms per unit cell and packing fraction)

2. X-Ray Diffraction (8 hours)

Reciprocal lattice and its properties, Diffraction of X-rays by crystals, Ewald construction, Bragg's law in reciprocal lattice, Experimental methods in X-ray diffraction (Laue method, rotating crystal method, powder photograph method), Analysis of cubic crystal by powder method.

Unit-II

1. Magnetic Properties of Matter (8 hours)

Classical Langevin theory of diamagnetic and paramagnetic materials, Curie's law, Weiss theory of ferromagnetism and ferromagnetic domains, Hysteresis loop for ferromagnetic materials.

2. Elementary Band Theory of Solids (10 hours)

Concept of density of states, Bloch theorem (statement only), Kronig-Penney model, Origin of energy gap, Velocity of electrons according to band theory, Effective mass of an electron, Distinction between metals, Semiconductors and insulators, Hall Effect- Hall voltage and Hall Coefficient.

Reference Books

1. Introduction to solid state physics, Charles Kittle,8th Ed.,2004,Wiley India Pvt. Ltd.
2. Elements of solid state physics ,J.P. Srivastava, 2nd Ed., 2006, Prenice-Hall of India.
3. Introduction to Solid, Leonid V.Azaroff,2004,Tata Mc-Graw Hill.
4. Solid State physics, Neil W.Aschroft and N. David Mermin,1976, Cengage Learning.
5. Solid State physics, Rita John,2014,Mc-Graw Hill.
6. Solid State physics, Adrianus J.Dekker, Macmillan Publishrs India Ltd.
7. Solid State physics,M.A.Wahab, 3rd Ed.,2018,Narosa Publishing House Pvt. Ltd.
8. Solid State physics, S.O. Pillai,5th Ed., New Age International(P) Ltd., Publishers.
9. Fundamentals of Solid State physics, Saxena-Gupta-Saxena,(Pragati Prakashan Meerut).
10. Solid State physics, R.L.Singhal.
11. Solid State physics, C.M.Kachhava (Tata McGraw Hill Publication).
12. Elements of X-ray diffraction, B.D. Cullity and S. Stock.
13. Solid State electronic devices, B.G.Streetman & S.K.Banerjee, 5th Ed.[PHI Learning Delhi].

CBCS (NEP) Syllabus with effect from June 2024
B.Sc. III- Semester- VI

PHYSICS Paper-XV
DSE-F3: Atomic and Molecular Physics and Astrophysics
Theory: 36 Hours (45 Lectures of 48 minutes)
Marks -50 (Credits: 02)

UNIT-I

1. Atomic Spectra: (09 hours)

Introduction of atomic structure and spectra, Spectral notations and optical spectral series for doublet structure, Spectrum of sodium and its doublet fine structure, Selection and intensity rules for fine structure doublets, Observed hydrogen fine structure, Normal order of fine structure doublets, Electron spin-orbit interaction, Normal Zeeman effect (qualitative explanation) and anomalous Zeeman effect and their explanation from vector atom model, Lande's g factor.

2. Molecular Spectra: (09 hours)

Molecular bond, Electron sharing, H_2^+ molecular ion, the hydrogen molecule, Rotational energy levels, Rotational spectra, Vibrational energy levels, Vibrational spectra, Vibration – rotation spectra, Electronic spectra of diatomic molecules.

UNIT-II

1. Raman Spectra: (04 hours)

Raman Effect, Experimental arrangement of Raman Effect, Characteristic properties of Raman lines, Classical and quantum theory of Raman Effect, Difference between Raman spectra and infrared spectra, Applications of Raman effect.

2. Structure of Universe: (08 hours)

Introduction of Cosmology, Big-Bang theory, Oscillating theory, Steady state theory, Hubble law, Hubble Constant, Cosmological tests, Definition of Galaxy, Milky Way galaxy, Our Solar system, Origin of solar system - Condensation theory; arguments for and against the theory.

3. Stellar Evolution: (06 hours)

The H–R Diagram, Evolution of main sequence stars - Red giants and White dwarfs, Evolution of more massive stars- Supernova, Neutron star, Black hole, Structure of Sun, Surface of the Sun, Sunspots, Sunspot cycle.

Reference books

1. Atomic and Nuclear Physics – H. Semat and T. E. Albright.

2. Introduction to Atomic Spectra – H. E. White.

3. Atomic Spectra - J B Rajam

4. Concepts of Modern Physics – Arthur Beiser.

5. Perspectives of Modern Physics – Arthur Beiser.

6. Modern Physics- Agarwal

7. Spectroscopy (Atomic and Molecular) – Gurdeep Chatwal, Sham Anand.

8. Astronomy – Fundamentals and Frontiers – Robert Jastrow and M. H.Thompson

9. Astronomy – Frank Bash.

10. Foundation of Astronomy, Michael A. Seeds, 10th edition Thomson Learning, Inc., USA, 2008.

CBCS (NEP) Syllabus with effect from June 2024
B.Sc. III- Semester- VI

PHYSICS Paper- XVI

DSE- F4: Energy Studies and Materials Science

Theory: 36 Hours (45 lectures)

Marks 50 (Credits: 02)

UNIT- I

1. Wind Energy (8 hours)

Origin of wind, Wind energy, Wind energy chains, Wind energy quantum, Planning of wind farm, Wind power density, Efficiency factor of wind turbine (P-H graph), Power of wind turbine for a given incoming wind velocity, Types of a wind turbine generator unit, Horizontal axis propeller type wind turbine generator unit.

2. **Solar Energy (8 hours)**

Solar energy, Solar Energy spectrum (UV, Visible and IR), Solar constant, Clarity index, Solar insolation.

Utilization of solar energy- **Thermal route**: Solar Thermal Devices, Essential subsystems in thermal power plant, Status of thermal power plants.

Photovoltaic route: Solar photovoltaic systems, Merits and limitations of solar PV systems, Prospects of solar PV systems, Power of a solar cell and solar PV panel. Solar energy from satellite station through microwave to earth station,

3. **Biomass Energy (2 hours)**

Origin of biomass, Biomass energy resources (biomass from cultivated crops, biomass from waste organic matter), Biomass conversion process (biochemical conversion- anaerobic digestion and fermentation).

UNIT- II

1. Superconductivity (6 hours)

Idea of superconductivity, Critical temperature, Critical magnetic field, Meissner effect, Type-I and Type- II superconductors, BCS theory of superconductivity, London equation and penetration depth, Isotope effect, Application (magnetic levitation)

2. Nanotechnology (12 hours)

Introduction to nanoscience and nanotechnology, Length scales relevant to nanoscience, Nanostructures: 1D, 2D and 3Dnanostructures, Size effects in nanosystems, Quantum confinement, Synthesis of nanostructured materials (Top down and bottom up approach), Photolithography, Bail milling, Nucleation and growth, Applications of nanotechnology (Spintronics, Molecular electronics, Nanobiotechnology).

Reference Books

1. Energy Technology- Non-conventional, Renewable and Convention- S. Rao and Dr. Parulekar, Khanna Publishers, New Delhi.
2. Non- conventional Energy sources- G.D. Rai (4^{th} edition), Khanna Publishers, Delhi.
3. Solar Energy- S.P. Sukhatme (Second edition), Tata Mc. Graw Hill Ltd. New Delhi.
4. Solar Energy Utilization- G.D. Rai (5^{th} edition), Khanna Publishers, Delhi.
5. Elements of Material Science and Engineering- I.H. Vanvlach (4^{th} Edition)
6. Material science and metallurgy for Engg. – Kodigire V.D. Everest Publication house, Pune.
7. Material Science and Engg. – 5^{th} Edition- V.Raghavan PHI Learning Pvt. Ltd. Delhi.
8. Nanotechnology Principles and Practices, Sulabha K. Kulkarni (Third Edition), Capital Publishing Co. New Delhi.
9. Introduction to Nanoscience, S.M. Lindsay , Oxford University Press.

B.Sc.Part III Physics Laboratory Experiments

Total Marks: 200 Credits: 08

- **Group-I**

1. Resonance pendulum
2. S.T. of soap solution
3. Surface tension of mercury by Fergusson modified method
4. Y and η using Flat Spiral Spring
5. Y by Koenig's method
6. Y by Cornu's spiral
7. C program to arrange the given set of numbers in ascending/descending order
8. C program to find largest/smallest number from a given set of numbers
9. Scilab Expt. 1 (problem from Quantum Mechanics)
10. Scilab Expt. 2 (problem from Quantum Mechanics)

- **Group-II**

1. Cardinal points by turn table method
2. Cardinal points by Newton's method
3. Refractive index of glass by Brewster's law
4. Diffraction at a Single Slit
5. Diffraction at cylindrical obstacle
6. Lloyd's single mirror
7. Double refracting prism
8. Diameter of Lycopodium powder
9. Spherical aberration
10. Absorption spectrum of a liquid ($KMnO_4$ solution)

- **Group-III**

1. Self-Inductance by Owen's Bridge/Self-inductance by Maxwell's bridge.
2. Measurement of B_H , B_V and θ using Earth Inductor /Hysteresis by magnetometer method
3. Mutual inductance using Ballistic galvanometer.
4. Resistance of B.G. by half deflection method
5. e/m of Electron by Thomson's Method/Calibration of wire by Carey Foster bridge
6. Calibration of wire by Griffith's method
7. Absolute capacity of condenser
8. I-V characteristics of Solar Cell
9. Band gap energy of semiconductor using p-n junction diode
10. Determination of Plank's constant by using LED.

- **Group–IV**

1. To verify the truth tables of NAND, NOR, Ex-OR and Ex-NOR gates by using basic gates with IC-74series.
2. To verify the De-Morgan's theorems by using IC-74 series.
3. To design a single stage CE amplifier of given gain using voltage divider bias.
4. To built and test Colpitts oscillator using BJT.
5. To built and test phase shift oscillator using BJT.
6. To determine A.C. and D.C. sensitivity of the C.R.O. and to measure unknown frequency.
7. To design and test an astable multivibrator using IC-555 Timer.
8. To design and test monostable multivibrator using IC-555 Timer.
9. To study Op-amp as an inverting amplifier.
10. To study Op-amp as Schmitt trigger.

Skill Testing Experiments

- **Group-V-A**

1. Study of divergence of LASER beam.
2. Measurement of wavelength of LASER using plane diffraction grating.
3. Schuster's method and optical leveling of spectrometer.
4. Obtaining Biprism fringes without lateral shift.
5. Measurement of distance between two coherent sources in Biprism experiment.
6. Polar graph using photocell/photovoltaic cell.
7. Study of quantum tunneling effect using tunnel diode / Plotting of given data using excel.
8. Testing of electronic components.
9. C program–Edit, save and execute given C program.
10. C program–Edit, save and execute given C program

- **Group–V-B**

1. Radius of Capillary bore using mercury thread.
2. Determination of lattices constant using given XRD powder pattern.
3. Estimation of errors.
4. Measurement of phase shift of RC network using CRO.
5. Study of Half and Full adder.
6. Simplification of digital circuit using Boolean laws (paper-work).
7. Measurement of resistance of galvanometer (Kelvin's method).
8. Electrical wiring of bulb, switch and plug.
9. Tracing of given electronic circuit/build the given circuit using breadboard.
10. Assembling of given electronic circuit (soldering method).

- **Group VI: Assessment of Annual Work of a Student**
    1. Certified Laboratory Journal.
    2. Study Tour Report.
    3. Seminar Report (2 Seminars) / Project work.

- **Reference Books for practical**

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia PublishingHouse.
2. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition,reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, KitabMahal, New Delhi.
4. B.Sc. Practical Physics, C.L.Arora, S.Chand & Company Pvt.Ltd., New Delhi
5. B.Sc. Practical Physics, Harman Singh,Hemane, 2012 Edition.

- **Revised Scheme of Practical Examination for B. Sc. Part – III**

1. Practical examination will be conducted annually.
2. Practical examination will be conducted for three days per batch.
3. The examination will be conducted in two sessions per day and each session will be of three hours duration.
4. Every candidate should perform one experiment each from Groups I to IV and one experiment each from Group V-A and Group V-B (total 6 experiments).
5. Study tour anywhere in India is compulsory.
6. At least eighty percent practical should be completed by the student.
7. The marks distribution for practical is as below.

Practical groups	**Marks**
Group I	30
Group II	30
Group III	30
Group IV	30
Group VA-15, Group VB-15	30
Group VI I)Certified laboratory journal (certified Journal- 10 marks, neatness-5 marks, punctuality- 5 marks) II) Study Tour / Industrial Visit Report III) Seminar Report / Project Report	 20 10 20
Total Marks	**200**

- **Revised Scheme of Theory Examination for B. Sc. Part – III**

Mark Distribution of each THEORY paper of 50 marks will be

a) Term work (internal assessment) : 10 marks

b) University examination (Semester) : 40 marks

Nature of the Question Paper of University examination

Time: 2 Hours **Max. Marks: 40**

Instructions:

1. All questions are compulsory
2. Figures to the right indicates full marks
3. Draw neat labeled diagrams wherever necessary.
4. Use of scientific calculator/log table is allowed

Q.1 Select the correct alternative. **(08 marks)**

(Eight questions with four alternatives carrying 1 mark each)

Q.2 Attempt ANY TWO of the following **(16 marks)**

(a)

(b)

(c)

Q.3 Attempt ANY FOUR of the following. **(16 marks)**

(a)

(b)

(c)

(d)

(e)

(f)

Note: Equal weightage should be given to all the units.

SHIVAJI UNIVERSITY, KOLHAPUR - 416 004,
MAHARASHTRA
www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४,महाराष्ट्र
दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९३/९४

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NAAC(2021)
With CGPA 3.52

SU/BOS/Science/481 **Date: 01/07/2023**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

B.Sc. Part-II (Sem III & IV) as per NEP-2020			
1.	Mathematics	8.	Chemistry
2.	Statistics	9.	Sugar Technology (Entire)
3.	Physics	10.	Microbiology
4.	Astrophysics	11.	Industrial Microbiology
5.	Zoology	12.	Electronics
6.	Botany	13.	Geology
7.	Plant Protection		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in**)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

Estd. 1962
NAAC 'A' Grade

SHIVAJI UNIVERISTY, KOLHAPUR-416 004. MAHARASHTRA
PHONE : EPABX-2609000 **website- www.unishivaji.ac.in**
FAX 0091-0231-2691533 & 0091-0231-2692333 – BOS - 2609094
शिवाजी विद्यापीठ, कोल्हापूर – 416004.
दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग– २६०९०९४)
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Sci & Tech/509 **Date: 12/07/2023**

To,
The Principal,
All affiliated college,
Shivaji University, Kolhapur.

Subject: Regarding minor change in Syllabus of **B.Sc.Part-II Physics Programme as per NEP-2020** under Faculty of Science & Technology.

Ref: SU/BOS/Science/481dated 01/07/2023.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University have accepted and granted approval to minor change in Syllabus of **B.Sc. Part-II Physics Programme as per NEP-2020** under Faculty of Science & Technology which is enclosed herewith.

This minor change in Syllabus of will be implemented from the academic year 2023-24 i.e.

You are therefore, requested to bring this to the notice, all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy. Registrar

Copy to :-

1	**The Dean, Faculty of Science & Technology**	8	**Appointment Section**
2	**The Chairman, Respective, BOS**	9	**Centre for Distance Education**
3	**Exam Section**	10	**Computer Centre**
4	**Eligibility Section**	11	**Affiliation Section (U.G.)**
5	**O.E. I Section**	12	**Affiliation Section (P.G.)**
6	**O.E. II Section**	13	**P.G.Admission Section**
7	**O.E. III Section**	14	**P.G.Seminar Section**

SHIVAJI UNIVERSITY, KOLHAPUR

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Revised Syllabus for Bachelor of Science Part II

PHYSICS

CBCS (NEP) Pattern

Syllabus to implement from June 2023.

SHIVAJI UNIVERSITY, KOLHAPUR
CBCS (NEP) Syllabus with effect from June, 2023
B.Sc. Part-II Semester-III PHYSICS Paper-V
DSC-C1 THERMAL PHYSICS AND STATISTICAL MECHANICS – I
Theory: 36 Hours
Marks-40 (Credits: 02)

Unit I: **(18 hrs)**

Laws of Thermodynamics

Thermodynamic system, thermodynamic variables, equation of state, thermodynamic equilibrium, Zeroth Law of thermodynamics, Internal energy, First law of thermodynamics, conversion of heat into work, specific heats C_P & C_V, Applications of First Law (Isothermal process, Adiabatic process, Isochoric, Isobaric), relation between C_P & C_V, work done during isothermal and adiabatic processes, reversible & irreversible processes, Second law of thermodynamics, Carnot's ideal heat engine, Carnot's cycle (Working, efficiency), Carnot's theorem, Entropy (concept & significance), Entropy changes in reversible & irreversible processes, Third law of thermodynamics, Unattainability of absolute zero.

Unit II: **(18 hrs)**

1. Transport Phenomena (09 hrs)

Molecular collisions, Mean free path and collision cross-section, Estimation of molecular diameter and mean free path, Clausius and Maxwell`s equation for mean free path (without derivation). Transport Phenomena: transport of momentum (viscosity), transport of thermal energy (conduction), Transport of mass (diffusion).

2. Thermometry (09 hrs)

Principle of thermometry, types of thermometers, Scales of temperature (Celsius, Kelvin, Fahrenheit and Rankine), Principle construction and working of a) mercury thermometer; b) platinum resistance thermometer and c) thermocouple thermometer. Thermistor.

Reference books

1) Heat and Thermodynamics, M.W. Zemansky and R. Dittman, (8^{th}Edn) McGraw Hill.
2) Text Book of Heat- J.B. Rajam, S.Chand and Company Ltd.
3) A Treatise on Heat- MeghnadSaha and B.N. Srivastava, Indian Press.
4) Heat and Thermodynamics- Brijlal and N. Subramanyam, S.Chand and Company Ltd.
5) Heat Thermodynamics and Statistical Physics- J.P. Agrawal, Satya Prakash, Pragati Publ.
6) Fundamentals of Heat - D.S.Mathur, S.Chand and sons.

SHIVAJI UNIVERSITY KOLHAPUR

CBCS (NEP) Syllabus with effect from June, 2023

B.Sc. Part-II Semester-III PHYSICS Paper-VI

DSC-C2 WAVES AND OPTICS – I

Theory: 36 Hours Marks-40 (Credits: 02)

Unit I: (18 hrs)

1.**Superposition of Harmonic Oscillations** (6 hr)

Linearity and superposition principle, Superposition of two collinear harmonic oscillations for oscillations having equal frequencies: Analytical method, oscillations having different frequencies (Beats), Superposition of two perpendicular harmonic oscillations: for oscillations having equal frequencies (Analytical method).Oscillations having different frequencies (Lissajous figures), Uses of Lissajous figures.

2. Coupled Oscillations (4 hr)

Frequencies of coupled oscillatory systems, normal modes and normal co-ordinates, energy of coupled oscillations, energy transfer in coupled oscillatory system.

3. Wave Motion and Ultrasonic Waves (8 hr)

Wave Motion: Transverse waves on a string, travelling and standing waves on a string, Normal modes of a string, Group velocity and Phase velocity, Plane waves, Spherical waves. Ultrasonic waves: Piezo-electric effect, Production of ultrasonic waves by Piezo-electric oscillator, Detection of ultrasonic waves, Properties of ultrasonic waves, Applications of ultrasonic waves.

Unit II: (18 hr)

1. Sound and Acoustics of Buildings (7 hr)

Sound: Transducers and their characteristics, Pressure microphone, Moving coil loudspeaker, Intensity and loudness of sound, Decibels, Intensity levels, Acoustics of buildings: Reverberation and time of reverberation, Absorption coefficient, Sabine's formula for reverberation time, Acoustic aspects of halls and auditoria.

2. Viscosity (11hr)

Rate flow of liquid in a capillary tube - Poiseuille's formula, experimental determination of coefficient of viscosity of a liquid by Poiseuille's method, effect of temperature on viscosity of a liquid, Viscosity of liquid by rotating cylinder method, Searle's viscometer, viscosity of gases by Rankine's method (qualitative treatment only), Lubrication.

Reference books:

1. The Physics of Waves and Oscillations- N. K. Bajaj, Tata McGraw-Hill Reprint 2022.
2. Physics of Degree Students- C. L. Arora and Dr. P. S. Hemne, S Chand & company
3. A Text Book of Sound- Khanna and Bedi, Atma Ram & Sons, Delhi.
4. Waves and Oscillations-N Subrahmanyam, BrijLal. Vikas 2nd edition, Reprint 2022
5. Elements of Properties of Matter-D.S. Mathur, S. Chand.
6. Electronic Instrumentation – H.S. Kalasi McHraw , Hill

SHIVAJI UNIVERSITY KOLHAPUR

CBCS (NEP) Syllabus with effect from June, 2023

B.Sc. Part-II Semester-IV PHYSICS Paper-VII

DSC-D1 THERMAL PHYSICS AND STATISTICAL MECHANICS – II

Theory: 36 Hours

Marks-40 (Credits: 02)

Unit I **(18 hrs)**

1. Thermodynamic Potentials (10 hrs)

Enthalpy, Gibbs function, Helmholtz function, Internal Energy, Maxwell's thermodynamical relations, Joule-Thomson effect, Clausius- Clapeyron equation, Expression for ($C_P - C_V$), C_P/C_V, TdS equations.

2. Theory of Radiation (8 hrs)

Blackbody radiation and its importance, Experimental study of black body radiation spectrum, Concept of energy density, Derivation of Planck's law, Deduction of Wien's displacement law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Unit II **(18 hrs)**

1. Classical Statistics (12 hrs)

Phase space, Microstate and Macrostate, Accessible microstates, apriori probability, thermodynamic probability, probability distribution, Maxwell-Boltzmann (MB) distribution law, evaluation of constants α and β, Entropy and Thermodynamic probability, Distribution of molecular speeds.

2. Quantum Statistics (6 hrs)

Bose-Einstein (BE) distribution law, Fermi-Dirac (FD) distribution law, comparison of M.B., B.E., and F.D. statistics.

Reference books

1) Heat and Thermodynamics-M.W.Zemasky and R. Dittman, McGraw Hill.
2) Physics for Degree Students B.Sc. second year- Arora, Hemne, S. Chand.
3) Concepts of Modern Physics- Arthur Beiser, McGraw-Hill.
4) Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
5) Thermodynamics, Kinetic theory & Statistical Thermodynamics, F.W.Sears G.L.Salinger. 1988, Narosa.
6) University Physics- Ronald Lane Reese, Thomson Brooks/Cole.
7) Heat Thermodynamics and Statistical Physics, N. Subramanyam, Brij Lal, P. Hemne, 2008, S. Chand.

SHIVAJI UNIVERSITY KOLHAPUR

CBCS (NEP) Syllabus with effect from June, 2023

B.Sc. Part-II Semester-IV PHYSICS Paper-VIII

DSC-D2 WAVES AND OPTICS -II

Theory: 36 Hours Marks-40 (Credits: 02)

Unit - I **(18 hrs)**

1. Cardinal Points (7 hrs)

Cardinal points of an optical system (definitions only), graphical construction of image using cardinal points, Newton's formula, relation between f and f' for any optical system, relation between lateral, axial and angular magnifications.

2. Resolving Power of Optical Instruments (5 hrs)

Resolution, resolving power (RP) of optical instruments, Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion, comparison between magnification and resolution, RP of plane diffraction grating, RP of a prism.

3. Polarization of Light (6 hrs)

Idea of polarization, polarization by double refraction, Huygens explanation of double refraction through uniaxial crystal, Nicol prism (construction, working), production of circularly and elliptically polarized light, optical rotation - laws of rotation of plane of polarization, polarimeter.

Unit-II **(18 hrs)**

1. Interference (10 hrs)

Principle of Superposition, Coherence and condition for interference, Division of amplitude and division of wave front, Lloyds single mirror (determination of wavelength of light of monochromatic source), Interference in thin parallel films (reflected light only), Wedge shaped films, Newton’s rings and its application for determination of wavelength and refractive index of light.

2. Diffraction (8 hrs)

Fraunhoffer diffraction- Elementary theory of plane diffraction grating, Determination of wavelength of light using diffraction grating, Theory of Fresnel’s half period zones, Zone plate (construction, working and its properties), Fresnel’s diffraction at straight edge.

Reference books

1) Optics – Ajoy Ghatak, 2021, McGraw Hill.
2) A Textbook of Optics-N. Subrahnmanyam,Brij Lal, M.N. Avadhanulu, S.Chand.
3) A Textbook of Light- D.N. Vasudeva, Atma ram and Sons.
4) Waves and Optics – M. N. Avadanulu , TVS Arun Murthy, S. Chand.
5) Fundamentals of Optics – Devraj Singh PHI Learning.

B.Sc. Part II, PHYSICS LAB Experiments (DSC C1, C2, D1, D2 Paper V,VI,VII,VIII)

Total Marks: 100 Credits: 04

- **Group I (Thermal Physics and General Physics)**

1. To determine the value of Stefan's constant.
2. To determine the coefficient of thermal conductivity of copper by Searle's apparatus.
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
4. To determine the temperature co-efficient of resistance by platinum resistance thermometer.
5. To study the variation of thermo e. m. f. across two junctions of a thermocouple with temperature. / To determine the surface tension of water by ripple method.
6. To record and analyze the cooling temperature of hot object as a function of time using a thermocouple.
7. To calibrate Resistance Temperature Device (RTD) using Null Method / Off-Balance Bridge.
8. To determine the surface tension of mercury by Quincke's method.

- **Group II (Thermal Physics and Electricity)**

1. To determine the temperature coefficient of resistance using post office box.
2. To verify the Stefan's fourth power law.
3. To determine the specific heat of graphite.
4. To determine the ratio of specific heat of air by Kundt's tube.
5. To determine Joules constant (J) by electrical method.
6. To determine the thermal coefficient of linear expansion of a metal rod.
7. To determine Mechanical equivalent of heat J by Callender and Barne's constant flow method.
8. To determine the constants of Ballistic Galvanometer (B. G.)

- **Group III (Waves and Optics-I)**

1. To investigate the motion of coupled oscillators.
2. To determine the frequency of an electrically maintained tuning fork by Melde's experiment and to verify λ^2–T Law.
3. To study Lissajous figures using CRO.
4. To determine coefficient of viscosity of water by capillary flow method (Poiseuille's method)
5. To determine velocity of sound in air by Kundt's tube and audio oscillator or Phase shift method (CRO and microphone).
6. To determine the viscosity of liquid by Searle's viscometer.
7. To determine the velocity of sound in air by resonating bottle.
8. To determine the frequency of a crystal oscillator.

- **Group IV (Waves and Optics II)**

1. To determine the resolving power of a prism.
2. To determine the resolving power of a plane diffraction grating.
3. To determine wavelength of sodium light: using straight edge / Biprism.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine thickness of thin film using interference in wedge shaped thin film.
6. Goniometer I-To study cardinal points of optical system
7. Goniometer II-To study the equivalent focal length of optical system.
8. To study angle of specific rotation of sugar using Polarimeter.

Reference Books:

1. B.Sc. Practical Physics – Harnam Singh , P.S. Hemane, S. Chand.
2. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
3. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
5. B.Sc. Practical Physics, C. L. Arora, S. Chand & Company Pvt. Ltd., New Delhi.

Scheme of Theory Examination for B. Sc. part –II

1. Two theory papers for each semester.
2. Each paper is of two hour duration and of 40 marks and internal evaluation of 10 Marks.
3. The theory examination will be conducted with university 80% + Internal 20% Pattern

Scheme of Practical Examination for B. Sc. Part II

1. The marks distribution for practical marks is as below.

Group	***Allotted Marks***
Group I	20
Group II	20
Group III	20
Group IV	20
Journal Certified Journal -10 Marks Neatness -5 Marks Punctuality-5 Marks	20
Total Marks	**100**
Credits	04

2. Practical examination will be conducted annually.
3. Practical examination will be conducted for two days per batch of 16 students.
4. The examination will be conducted in two sessions per day and each session will be of three hours duration.
5. Every candidate should perform one experiment each from Groups I to IV (total 4 experiments).
6. At least eighty percent practical should be completed by the student.

Nature of Question Paper

Time: 2 Hours **Total Marks: 40**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat labelled diagrams wherever necessary.
4. Use of scientific calculator /log table is allowed.

Q.1 Select the correct alternative for the following.

(Eight questions with four alternatives carrying 1 mark each) **(08)**

Q.2 Attempt ANY TWO of the following. **(16)**

(A)

(B)

(C)

Q.3 Attempt ANY FOUR of the following. **(16)**

(A)

(B)

(C)

(D)

(E)

(F)

Note : Equal Weightage should be given to all the units.

Course outcome:

Paper	Course Outcome
Paper V Thermal Physics and Statistical Mechanics-I	1: Highlight different types of velocities of gas molecules. 2: Acquire Knowledge of Maxwell's distribution of gas molecules. 3: Visualize Merits and drawbacks of thermometers. 4: Apply knowledge of thermodynamic processes in design of heat engine.
Paper VI Waves and Optics –I	1: Apply superposition principle to develop mathematical model of harmonic oscillators. 2: To develop the mathematical model for coupled oscillations. 3: Understand the ultrasonic waves and their applications. 4: Use of Basic principles of sound in context of acoustics of buildings.
Paper VII Thermal Physics and Statistical Mechanics-II	1: Develop Conceptual clarity of thermodynamic functions and Clausius-Clapeyron equation. 2: Appreciate the problem associated with the black body radiation spectrum. 3: Know, how the problems can be solved by using Planck's law of radiation. 4: Acquire preliminary knowledge of classical and quantum statistical mechanics.
Paper VIII Waves and Optics-II	1: Draw ray diagrams to demonstrate Cardinal points. 2: Determine the resolving power of prism and grating by making use of Rayleigh criterion. 3: Qualitatively study phenomenon of polarization of light. 4: Apply phenomenon of interference of light for determination of its wavelength.
Practical	1: Acquire skills in setting up of optics experiments. 2: Develop the practical skills and techniques for accurate measurements. 3: Acquire observational skills 4: Determine Least counts of different measuring instruments

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SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref:SU/BOS/Science/495 **Date: 02/09/2024**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/876/ Date: 26/12/2023 & 350 Date:/24/06/2024 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change syllabi, nature of question paper of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	B.Sc Part I Sugar Technology (Entire)	3.	B.Sc Part I Electronics
2.	B.Sc Part I Physics		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	5	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	6	I.T.Cell /Computer Centre
3	The Chairman, Respective Board of Studies	7	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	8	Affiliation Section (T.1) (T.2)
9	IQAC Cell		

Shivaji University Kolhapur

Accredited By NAAC with 'A^{++}' Grade

Syllabus for Bachelor of Science

Part-I

Physics

(NEP-2.0)

To be implemented from

June, 2024 onwards

Shivaji University, Kolhapur

NEP-2020 (2.0): Credit Framework for UG (B. Sc. I) Programme under Faculty of Science and Technology

B. Sc. I Physics

Level	Semester	COURSES			OE	VSC/SEC	AEC/ VEC/ IKS	OJT/FP/CEP/CC/ RP	Total Credit
		Course - I	Course - II	Course - III			IKS		
4.5	I	DSC-I (2) DSC-II (2) DSC Pract.-I (2)	DSC-I (2) DSC-II (2) DSC Pract.-I (2)	DSC-I (2) DSC-II (2) DSC Pract.-I (2)	OE -I (T/P) (2)		IKS-I (2) Introduction to IKS		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
	II	DSC-III (2) DSC-IV (2) DSC Pract.-II (2)	DSC-III (2) DSC-IV (2) DSC Pract.-II (2)	DSC-III (2) DSC-IV (2) DSC Pract.-II (2)	OE-II (T/P) (2)		VEC -I (2) (Democracy, Election and constitution)		
	Credits	4+2=6	4+2=6	4+2=6	2		2		22
1st Year Cum. Credits		8(T) + 4(P) = 12	8(T) + 4(P) = 12	8(T) + 4(P) = 12	2 + 2 = 4		2 + 2= 4		44
Exit option: Award of UG Certificate with 44 Credits									

Titles of papers for Basic Physics

Semester		Code	Paper No.	Title of paper
I		DSC-I	PHYSICS Paper-I	Mechanics
		DSC-II	PHYSICS Paper-II	Electricity and Magnetism I
		DSC-P-I	PHYSICS Practical I	Mechanics & Electricity and Magnetism I
		OE	OE -I (T/P) (2)	OE I: Household Electrical and Electronic Appliances -I (गृहउपयोगी इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे-I)
II		DSC-III	PHYSICS Paper-III (Major)	Properties of Matter
		DSC-IV	PHYSICS Paper-IV (Major)	Electricity and Magnetism II
		DSC-P-II	PHYSICS Practical II (Major)	Properties of Matter & Electricity and Magnetism II
		OE	OE -II (T/P) (2)	OE II: Household Electrical and Electronic Appliances (गृहउपयोगी इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे-II)

Papers of Astrophysics

Semester		Code	Paper No.	Title of paper
I		DSC-I	ASTROPHYSICS Paper-I	Fundamentals of Astronomy-I
		DSC-II	ASTROPHYSICS Paper- II	Fundamentals of Astrophysics-I
		DSC-P-I	ASTROPHYSICS Practical-I	Astrophysics and Astronomy-I
II		DSC-III	ASTROPHYSICS Paper-III	Fundamentals of Astronomy-II
		DSC-IV	ASTROPHYSICS Paper- IV	Fundamentals of Astrophysics -II
		DSC-P-II	ASTROPHYSICS Practical-II	Astrophysics and Astronomy-II

SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester I
DSC-I PHYSICS Paper-I
Mechanics
Theory: 30 Hours
(Credits: 02)

1. Vector algebra (9 hours)

Revision - (Vector Algebra: Components of vectors and unit vector, Addition and subtraction of vectors), Scalar product, Vector product, and their properties, Scalar triple product and its physical significance, Properties of scalar triple product, Vector triple product, Properties of vector triple product.

2. Gravitation (6 hours)

Newton's law of gravitation, Motion of a particle in a central force field (motion in a plane, angular momentum is conserved), Kepler's laws (statement only), Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).

3. Momentum and energy (7 hours)

Conservation of linear and angular momentum, work and energy theorem, conservation of energy (Single particle), Dynamics of a system of particles (linear momentum, angular momentum and energy), Center of mass, Motion of rockets (qualitative treatment only).

4. Rotational motion (8 hours)

Angular velocity, Angular momentum, and torque, Kinetic energy of rotation and moment of inertia, Moment of inertia of a spherical shell and solid cylinder (only about axis of symmetry), Motion of spherical shell and solid cylinder rolling down an inclined plane.

Reference Books

1. Mathematical Physics -B. S. Rajput, 25th edition 2013, Pragati Prakashan, Meerut.
2. Mechanics – D. S. Mathur, 2009, S. Chand & Company Ltd., New Delhi.
3. Mathematical Physics – B. D. Gupta, 3rd edition, 2009, Vikas Publishing House Pvt. Ltd., New Delhi.
4. Mathematical Physics – P. P. Gupta, R. P. S. Yadav, G. S. Malik, 4th edition 1983-84, Kedar Nath Ram Nath, Meerut, Delhi.
5. University Physics. FW Sears, MW Zemansky and HD Young, 13/e, 1986, Addison - Wesley.
6. Mechanics Berkeley Physics course, V.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.
7. Physics – Resnick, Halliday& Walker 9/e, 2010, Wiley Eastern Ltd, New Delhi.
8. Engineering Mechanics, Basudeb Bhattacharya, 2ndedn., 2015, Oxford University Press.

Course Outcome

- Students are able to understand and identify scalar and vector physical quantities in mechanics
- Students are able to understand and apply vector algebraic methods to elementary exercises in mechanics
- Students are able to understand and apply basic concepts of rotational motion
- In general, students are capable of correlating the above concepts and methods in mechanics to both theoretical and experimental domains revealing analytical as well as numerical skills

SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester I
DSC-II PHYSICS Paper-II

Electricity and Magnetism I

Theory: 30 Hours
(Credits: 02)

1. Vector analysis (7 hours)

Del operator, Gradient of a scalar field and its physical significance, Divergence of vector field and its physical significance, Curl of vector field, Line, surface and volume integral (definitions only), Gauss divergence theorem and Stoke's theorem (statements only).

2. Electrostatics (8 hours)

Coulomb's law, Electrostatic field, electric flux, Gauss's theorem of electrostatics, electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential.

3. Dielectrics (6 hours)

Dielectric medium, Polarisation vector, Displacement vector, electric vector, Relation between E, P, and D vectors, Electric susceptibility of dielectrics.

4. Magnetostatics (9 hours)

Introduction to magnetization and intensity of Magnetization, Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law.

Reference Books

1. Mathematical Physics -B. S. Rajput, 25th edition 2013, Pragati Prakashan, Meerut.
2. Mathematical Physics – B. D. Gupta, 3rd edition, 2009, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Mathematical Physics – P. P. Gupta, R. P. S. Yadav, G. S. Malik, 4th edition 1983-84, Kedar Nath Ram Nath, Meerut, Delhi.
4. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
5. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford University Press.
6. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
7. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
8. Electricity and Magnetism, Khare and Shrivastav. Atma Ram & Sons, Delhi, 1976
9. University Physics 9th Edition, Young and Freedman.

Course Outcome

- Students are able to understand the physical significance of gradient, divergence and curl
- Students are able to apply concepts in vector calculus such as gradient, divergence and curl related to vector and scalar fields using Gauss, Stokes and green`s theorem
- Students are able to understand and apply concepts of electrostatic field, potential to point charges, electric dipole and geometrically regular charged bodies
- Students are able to understand and apply concept of energy density in electric field
- Students are capable of applying above concepts to solve numerical exercise in electrostatics

SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester I
DSC PHYSICS Practical I
(Credits: 02)
Group I

1. Measuring dimensions of the body/object by using a Vernier caliper and screw gauge.
2. To determine the MI of the disc using an annular ring.
3. To determine the MI of the flywheel.
4. To determine the modulus of rigidity by dynamic method.
5. To determine 'g' by Bar Pendulum.
6. To study the motion of a spring and calculate (a) spring constant (b) value of g.
7. To determine 'g' by Kater's Pendulum.
8. Exponential decay of amplitude of simple pendulum.

Group II

1. Use of multimeter.
2. To study different types of resistors and capacitors.
3. Series and Parallel connections of resistances.
4. Verification of Ohm's law.
5. To determine the resistance of the galvanometer using PO box.
6. Measurement of field strength B and its variation in a solenoid (Determine dB/dx).
7. To determine the frequency of A. C. mains by sonometer (magnetic material of wire).
8. To determine the frequency of A. C. mains by sonometer (non-magnetic material).

Reference Books:

1. Advanced Practical Physics for students, B. L. Flint & H. T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).
5. Practical Physics – Gupta and Kumar (Pragati Prakation Meerat)
6. Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).
7. Engineering Practical Physics- S. Panigrahi & B. Mallick,2015, Cengage Learning India Pvt. Ltd.
8. B.Sc. Practical Physics - Harnam Singh and P S Hemne, S Chand publications.

Course Outcome

- Apply fundamental mechanical principles: Utilize concepts like moment of inertia, simple harmonic motion, and gravity to design and conduct experiments, analyzing and interpreting results.
- Develop experimental skills: Demonstrate competence in setting up apparatus, taking precise measurements, and calculating uncertainties, understanding limitations and sources of error.
- Explore electrical components and circuits: Classify and characterize resistors, capacitors, and galvanometers based on their properties and roles in circuits, measuring resistance and magnetic field strength.
- Investigate wave phenomena and their interactions: Analyze the behavior of sound waves in different media (magnetic vs. non-magnetic), employing a sonometer to determine frequency and comprehend the influence of material properties.

SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester II
DSC-III PHYSICS Paper-III

Properties of Matter

Theory: 30 Hours
(Credits: 02)

1. Elasticity (9 hours)

Introduction (Hooke's law, Elastic moduli-Relation between elastic constants), Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants, Bending of beam, Bending moment, Cantilever (without considering weight of cantilever), Beam supported at both the ends (without considering weight of beam). Torsional oscillation, Determination of Rigidity modulus and moment of inertia - q, η and σ by Searle's method

2.Surface tension (6 hours)

Surface tension (definition), Angle of contact and wettability, Relation between surface tension, excess of pressure and radius of curvature, Experimental determination of surface tension by Jaeger's method, Applications of surface tension.

3. Fluid dynamics (8 hours)

Introduction, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, Bernoulli's Theorem, practical applications: (i) Law of hydrostatic pressure (ii) Filter pump (iii) Speed of efflux (iv) Venturytube

4. Viscosity (7 hours)

Introduction, Ideal and viscous fluids, Flow of liquid through capillary tube, Poiseuille's equation, Experimental determination of coefficient of viscosity of liquid by Poiseuille's method, effect of temperature and pressure on viscosity of liquid.

Reference Books

1. Physics – S.G. Starling and Woodal Longmams and Green Co. Ltd.
2. Elements of properties of matter – D.S. Mathur, Shamlal Charitable Trust New Delhi.
3. A text Book of properties of matter–N.S. Khare and S. Kumar. Atmaram and Sons New Delhi.
4. Physics Vol. I and Vol. II–David Halliday and Robert Resnik, Willey Eastern Ltd, New Delhi.
5. Concepts of Physics -H.C. Varma -Bharati Bhavan Publishers

SHIVAJI UNIVERSITY, KOLHAPUR

B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester II
DSC-IV PHYSICS Paper-IV

Electricity and Magnetism II

Theory: 30 Hours
(Credits: 02)

1. A.C. circuits (10 hours)

Complex numbers and their application in solving a. c. series LCR circuit using j operator and phasor diagram, Resonance in LCR series circuit, Sharpness of resonance (qualitative treatment only), Resonance in LCR Parallel circuit, complex Impedance, Reactance, Admittance, and Susceptance, Examples of series and parallel resonance, A.C.Bridge - Owen's Bridge Q-factor (definition only).

2. Electromagnetic induction (5 hours)

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field.

3. Ballistic galvanometer (7 hours)

Construction and working of B. G., expression for charge flowing through ballistic galvanometer, Correction for damping in galvanometer, Constants of the ballistic galvanometer.

4. Magnetic materials and their properties (8 hours)

Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. diamagnetic, paramagnetic, ferromagnetic: Hysteresis and hysteresis curve, ferrimagnetic and anti-ferromagnetic materials.

Reference Books

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2.Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford University Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. Electricity and Magnetism, Khare and Shrivastav. Atma Ram & Sons, Delhi, 1976
6. University Physics 9th Edition, Young and Freedman.
7. Foundations of Electromagnetic Theory, Rritz and Milford. Pearson Publication
8. Electricity and Magnetism, Gupta, Kumar and Singal

9. Basic Electronics and Liner Circuits, N. N. Bhargava, D. C. Kulshrestha and S. S. Gupta, Tata McGraw-Hill
10. Electronic Fundamentals and Applications, J. D. Ryder, Prentice-Hall of India Pvt. Ltd
11. Network theory and Filter Design, V. K. Aatre, New Age International Publisher
12. Principals of Electronics, V. K. Mehata, S. Chan

Course Outcome

- Students are able to understand importance of complex numbers in analysis of AC Circuits contacting Inductance(L) Capacitor(C) and Resistance (R) and their various configurations

- Students are able to define and apply the concepts in AC circuits such as Impedance (Z), reactance (XC and XL), Admittance, Susceptance and Quality Factor (Q)

- Students are able to understand and design AC bridge: Owen`s Bridge

- Students are able to understand basic working principle of Ballistic galvanometer

- Students are able to define constants of ballistic galvanometer

- Students are able to understand the explain the phenomenon of hysteresis in magnetism

- Students are able to discriminate different magnetic materials based on their characteristic properties

SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part I Physics NEP Syllabus with effect from June 2024
B. Sc. I Semester II
DSC PHYSICS Practical II
(Credits: 02)
Group I

1. To determine the coefficient of viscosity by Poiseuille's method.
2. To determine Y by method of bending.
3. Surface tension by Jaeger's method.
4. To determine the viscosity of viscous liquid by the Stokes method.
5. To determine Poisson's ratio of rubber (rubber tube).
6. Young's modulus of the material of bar by vibration.
7. To determine the time period and constant of the logarithmic decrement of B. G.
8. To determine constants of B. G.

Group II

1. To determine the impedance of the series LCR circuit.
2. To study the series LCR circuit.
3. To study a parallel LCR circuit.
4. Verification of Kirchhoff's current law.
5. Verification of Kirchhoff's voltage law.
6. Owen's Bridge- To determine the resistance of a coil by DC balance.
7. Study of transformers.

Reference Books:

1. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

2. Advanced Practical Physics for students, B. L. Flint & H. T. Worsnop, 1971, Asia Publishing House.

3. Engineering Practical Physics- S. Panigrahi & B. Mallick,2015, Cengage Learning India Pvt. Ltd.

4. College Practical Physics – Khanna and Gulati (S. Chand and Co. Ltd, Delhi).

5. Practical Physics – Gupta and Kumar (Pragati Prakashan Meerat)

6. Advanced Level Practical Physics – J.M. Nelcon, J.M. Ogloom (EIBS).

7. B.Sc. Practical Physics - Harnam Singh and P S Hemne, S Chand publications.

8. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

Course Outcome

- Master mechanical measurements and principles: Utilize advanced techniques like Poiseuille's method, bending, and vibration to measure viscosity, Young's modulus, and Poisson's ratio, demonstrating understanding of fluid dynamics and elasticity.

- Analyze surface tension and its impact: Employ Jaeger's method to investigate surface tension, recognizing its role in various phenomena and its dependence on material properties.

- Explore AC circuits and impedance: Analyze the behavior of series and parallel LCR circuits, measuring impedance and comprehending the influence of individual components (L, C, R) on resonance and phase relationships.

- Investigate bridge circuits and transformers: Utilize a B.G. bridge to determine unknown resistances and delve into the principles and applications of transformers, understanding their role in AC power transmission and voltage transformation

Shivaji University Kolhapur
B.Sc. Part-I (NEP 2020), Syllabus applicable from June, 2024
B.Sc. Part-I Semester I
OE I: Household Electrical and Electronic Appliances-I (Practical)
Credits: 2 (60 hours)

Group I

1. Identify and draw the symbols of various electrical components.
2. Identify and draw the symbols of various electronic components.
3. Use of various tools –multi-meter, cutter, different screwdrivers, testers, electronic gun
4. Testing of electrical components.
5. Testing of electronic components.
6. Make series connections of resistances validate via experimental proof.
7. Make parallel connections of resistances validate via experimental proof.

Group II

8. Identify and verify - various DC voltage sources
9. Make series connections for D. C. power supply and validate via experimental proof.
10. Make parallel connections for D. C. power supply and validate via experimental proof.
11. Prepare and test3V and 5V AC voltages power supply.
12. Prepare and test variable AC voltage power supply
13. Prepare and test 3V and 6V DC voltage power supply
14. Prepare and test variable DC voltage power supply
15. Prepare and test the regulated power supply.

References

1. Electrical Wiring- O. B. Choudhari
2. Electrical Wiring and electrical technology - O. B. Choudhari

शिवाजी विद्यापीठ कोल्हापूर

बी.एस्सी. भाग- I (NEP 2020) , जून, 2024 पासूनलागू अभ्यासक्रम

बी.एस्सी. भाग- I सेमिस्टर I

OE I: गृहउपयोगी इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे-I (प्रात्यक्षिक)

Credits: 2 (६० तास)

ग्रुप १

1. विविध इलेक्ट्रिकल कॉम्पोनन्टची चिन्हे ओळखा आणि काढा.

2. विविध इलेक्ट्रॉनिक कॉम्पोनन्टची चिन्हे ओळखा आणि काढा.

3. मल्टी-मीटरचा, कटर, वेगवेगळ्या प्रकारचे स्क्रूड्रायव्हर्स, टेस्टर्स, इलेक्ट्रॉनिक गन इत्यादी साधनांचा वापर.

4. इलेक्ट्रिकल कॉम्पोनन्ट टेस्ट करणे.

5. इलेक्ट्रॉनिक कॉम्पोनन्ट टेस्ट करणे.

6. रेजिस्टन्सची सिरीज जोडणी करणे व प्रात्यक्षरीत्या पडताळणे.

7. रेजिस्टन्सची पॅरलल जोडणी करणे व प्रात्यक्षरीत्या पडताळणे.

ग्रुप २

8. विविध डी. सी. व्होल्टेज स्त्रोत ओळखणे आणि पडताळणे.

9. डी. सी. पॉवर सप्लायची सिरीज जोडणी करणे व प्रात्यक्षरीत्या पडताळणे.

10. डी. सी. पॉवर सप्लायची पॅरलल जोडणी करणे व प्रात्यक्षरीत्या पडताळणे.

11. 3 V आणि 5 V ए. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

12. व्हेरिएबल ए. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

13. 3 V आणि 6 V डी. सी व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

14. व्हेरिएबल डी. सी. व्होल्टेज पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

15. रेग्युलेटेड पॉवर सप्लाय तयार करणे आणि तपासून पाहणे.

संदर्भपुस्तके

1. इलेक्ट्रिकल वायरिंग- ओ.बी. चौधरी

2. इलेक्ट्रिकल वायरिंग आणि इलेक्ट्रिकल तंत्रज्ञान - ओ.बी. चौधरी

Shivaji University Kolhapur
B.Sc. Part-I (NEP 2020), Syllabus applicable from June, 2024
B.Sc. Part- I Semester II
OE II: Household Electrical and Electronic Equipment -II (Practical)
Credits: 2 (60 Hours)

Group I

1. Teat and repair DC power supply
2. Test and repair AC power supply.
3. Make and test the connection of the table lamp.
4. Make and test the connections of the extension box.
5. Test and repair basic fluorescent tube lights.
6. Test and repair the electronic tube light system.
7. Testing and repairing of electrical Irons
8. Testing and repairing of electronic Irons

Group II

9. Testing and repairing of electrical Bell
10. Testing and repairing of electronic Bell
11. Testing and repairing of decoration LED lamps and strings - I. (Series connection)
12. Testing and repairing of decoration LED lamps and strings - II (Parallel connection)
13. Testing and repairing battery (cell) torch.
14. Testing and Repairing of emergency torch - I (Single light)
15. Testing and Repairing of an emergency torch - II (multilight)
16. Testing and repairing electronic toys/ electronic watch/remote

References

1. Electrical Wiring- O. B. Choudhari
2. Electrical Wiring and electrical technology - O. B. Choudhari

शिवाजी विद्यापीठ कोल्हापूर

बी.एस्सी. भाग- I (NEP 2020) , जून, 2024 पासूनलागू अभ्यासक्रम

बी.एस्सी. भाग- I सेमिस्टर II

OE II: गृहउपयोगी इलेक्ट्रिकल आणि इलेक्ट्रॉनिक उपकरणे-II (प्रात्यक्षिक)

Credits: 2 (६० तास)

ग्रुप १

1. डी. सी. पॉवर सप्लायची चाचणी आणि दुरुस्ती.
2. ए. सी. पॉवर सप्लायची चाचणी आणि दुरुस्ती.
3. टेबल लॅम्पची जोडणी आणि चाचणी.
4. एक्स्टेंशन बॉक्सची जोडणी आणि चाचणी.
5. फ्लोरोसेंट ट्यूबलाइटची चाचणी आणि दुरुस्ती.
6. इलेक्ट्रॉनिक ट्यूबलाईटची चाचणी आणि दुरुस्ती.
7. इलेक्ट्रिकल इस्त्रींची चाचणी आणि दुरुस्ती.
8. इलेक्ट्रॉनिक इस्त्रीची चाचणी आणि दुरुस्ती.

ग्रुप २

9. इलेक्ट्रिकल बेलची चाचणी आणि दुरुस्ती.
10. इलेक्ट्रॉनिक बेलची चाचणी आणि दुरुस्ती.
11. सजावटीचे एल. ई. डी. दिवे/माळा यांची चाचणी आणि दुरुस्ती- I (सिरीज जोडणी).
12. सजावटीचे एल. ई. डी. दिवे/माळा यांची चाचणी आणि दुरुस्ती- II (पॅरलल जोडणी).
13. बॅटरी (ड्रायसेल) चाचणी आणि दुरुस्ती.
14. आपत्कालीन टॉर्चची चाचणी आणि दुरुस्ती - I (सिंगल लाईट).
15. आपत्कालीन टॉर्चची चाचणी आणि दुरुस्ती - II (मल्टी लाईट).
16. इलेक्ट्रॉनिक खेळणी/इलेक्ट्रॉनिक घड्याळ/रिमोट यांची चाचणी आणि दुरुस्ती.

संदर्भपुस्तके

1. इलेक्ट्रिकल वायरिंग- ओ.बी. चौधरी
2. इलेक्ट्रिकल वायरिंग आणि इलेक्ट्रिकल तंत्रज्ञान - ओ. बी. चौधरी

SHIVAJI UNIVERSITY, KOLHAPUR.
B. Sc. - I NEP Syllabus with effect from June, 2024
B. Sc. Part – I Semester-I
Astrophysics Paper-I
Credits: 2 (30 Hours)
Paper - I (Fundamentals of Astronomy-I)

Course Outcomes: -

- To understand the basic concepts of Astrophysics and Astronomy.
- Aim to give an in-depth understanding of the principles and methods of astrophysics to the student, and skilled to apply this understanding to a range of theoretical, observational, and practical problems, at a level appropriate for a professional scientist.

1. Introduction to Astronomy and Astrophysics (7 Hours)

Astronomy and Astrophysics, Importance of astronomy, Methods of astronomy and astrophysics, Scientific methods, History of astronomy (Babylonian, Greek, Indian etc).

2. Theories of Planetary motion (8 Hours)

Introduction, Ptolemy's astronomical work, Copernican heliocentric theory, Tycho Brahe theory, Newton's law of Gravitation, Kepler's laws and its explanation.

3. Celestial Coordinates (7 Hours)

Introduction, coordinate system, celestial sphere, terrestrial latitude and longitude, equator and poles.

4. Time and Calendar (8 Hours)

Introduction, Moon and its phases, moon, sun and stars as calendars, modern calendar, sidereal day, sidereal time, Apparent and Mean solar time, Sidereal Time Versus Solar Time.

SHIVAJI UNIVERSITY, KOLHAPUR.
B. Sc. - I NEP Syllabus with effect from June, 2024
B. Sc. Part – I Semester-I
Astrophysics Paper-II
Credits: 2 (30 Hours)
Paper - II (Fundamentals of Astrophysics-I)

1. Unraveling the Forces Binding the Universe (5 Hours)

Nuclear force, Electromagnetic force, Gravitational force, Weak forces, Dominant forces in the outer space

2. The Nature of Light (6 Hours)

Light as an electro-magnetic wave, Electromagnetic spectrum. Electromagnetic radiation from heated object (Wein's law), Photon and photon diffusion time. Doppler shift and its applications.

3. Basic Tools of Astronomers (12 Hours)

Optical telescopes-Galilean, Newtonian, Cassegrainian, Hubble space telescope, Magnifying power of telescope, Resolving power of telescope, Spectroscope (prism, grating), UV, IR, Radio, X-Ray and Gravitational waves astronomy, LIGO(qualitative).

4.Message of Star light (7 Hours)

The Atom, Atomic spectra-emission and absorption spectra (Fraunhofer lines), Molecular spectra, Spectrum of a star, Classification of stellar spectra based on temperature, Sun as a 'G' type star

SHIVAJI UNIVERSITY, KOLHAPUR.
B. Sc. - I NEP Syllabus with effect from June, 2024
B. Sc. Part – I Semester-II
Astrophysics Paper-III
Credits: 2 (30 Hours)
Paper - III (Fundamentals of Astronomy-II)

1. The Stellar distances (8 Hours)

Introduction, Measurement of terrestrial distances, Definition of parallax and Geocentric parallax, distance of moon, distance of planets, Trigonometric parallax of stars, Astronomical unit (light years and parsec).

2. Luminosity of stars (7 Hours)

Introduction, Luminosity of stars, magnitude scale, Luminosity measurement: 1) Visual method 2) Photographic method 3) Photoelectric method.

3. Constellations (7 Hours)

Introduction, Constellations – Aries, Pisces, Orion, Asterisms – summer triangle and Big Dipper (Saptarishi), hunter (Orion).

4. Comets, Asteroids &Meteoroids (8 Hours)

Introduction, Origin of Comets, Asteroids and Meteors, properties of Comets, Asteroids & Meteoroids, meteor & Meteorites, impacts on earth

SHIVAJI UNIVERSITY, KOLHAPUR.
B. Sc. - I NEP Syllabus with effect from June, 2024
B. Sc. Part – I Semester-II
Astrophysics Paper-IV
Credits: 2 (30 Hours)
Paper - IV (Fundamentals of Astrophysics-II)

1. The Hertzsprung-Russell (H-R) Diagram (6 Hours)
Color of glowing object, Luminosity and brightness, Population of stars, The Hertzsprung-Russell Diagram, Main sequence, Variable stars, Binary stars.

2. Nuclear Reactions in a Stars (5 Hours)
Nuclear Fission, Nuclear fusion, Thermonuclear reactions in stars: p-p chain reaction and Carbon Nitrogen Oxygen (CNO) cycle

3. Stellar evolution (8 Hours)
Life cycle of stars: Gravitational condensation (Protostar), Birth of a star, Maturity of a star, ageing of stars, electron degeneracy pressure, dependance of stellar evolution on mass (Chandrasekhar limit).

4. White Dwarfs, Neutron Stars and Black Holes (8 Hours)
Death of a small star: The white Dwarf, Death of a massive Star : The Supernova Explosion, Pulsars and Neutron stars, Black holes in space

Reference Books:

1) Astronomy: Fundamentals and Frontiers – Jastrow &Thomson.
2) Astrophysics (Stars & Galaxies) – K. D. Abhyankar
3) The Structure of Universe – JayantNaralikar.
4) Fundamental of Astronomy and Astrophysics – Michael Seed.
5) Introductory Astronomy and Astrophysics – Zeilik and Greogary.
6) A revision book of Astronomy and Astrophysics – RohanGharate
7)A textbook of Astronomy of astrophysics – MohitSharma and Suresh Chanra
8) Cosmic Adventure – JayantNaralikar.
9) Astronomy: A Physical Perspective - Marc L. Kutner
10) Stars, Life, Death and Beyond – A. K. Kimbhavi and JayantNaralikar.
11) Unfolding our universe – Lain Nicolson
12) An introduction to Cosmology – Jayant Vishnu Narlikar

SHIVAJI UNIVERSITY, KOLHAPUR.
B. Sc. - I NEP Syllabus with effect from June, 2024
B. Sc. Part – I Semester-I
Astrophysics and Astronomy Practical I
Credits: 2 (30 Hours)

Practical Course I (Sem I)

1. Solution of ordinary differential equations
2. To use idea of parallax to determine large distance
3. Lummer Brodhun Photometer (comparison of intensities)
4. Resolving power of telescope.
5. I-V Characteristics of solar cell and verification of inverse square law ofintensity
6. Study of Lissajous figures using CRO
7.Calibration of spectrometer
8. Study of Balmer lines

B. Sc. Part – I Semester-II
Astrophysics and Astronomy Practical II

Practical Course II (Sem II)

1. Numerical interpolation.
2. Constellation map drawings – a) Orion b) Ursa Major (Big Dipper) c) Auriga
d) Taurus.
3. Magnifying power of telescope.
4. Determination of Planck's constant using LED
5. Measurement of wavelength of given LASER source using diffraction grating
6. Velocity of sound using CRO and microphone
7. Measurement and identification of spectral lines
8. Band absorption spectrum of liquid ($KMnO_4$ solution)

B.Sc. I Syllabus (NEP-2020)

To be implemented from June 2024 onwards Semester I & II

Nature of Question paper

Total Marks 40

Q.1 Choose the correct alternatives **8 Marks**

a)

b)

c)

d)

e)

f)

g)

h)

Q.2. Attempt any TWO of the following (Out of Three) **16 Marks**

a)

b)

c)

Q.3. Answer any FOUR of the following (Out of SIX) **16 Marks**

a)

b)

c)

d)

e)

f)

B.Sc. I Syllabus (NEP-2020)

To be implemented from June 2024 onwards

Nature of Practical Examination

Total Marks 50

Scheme of Practical Examination for B. Sc. Part –I

1. Practical examination will be conducted semester wise.
2. Practical examination will be conducted for one day per batch.
3. The examination will be conducted in two sessions per day and each session will be of three hours duration.
4. Every candidate should perform one experiment each from Group I and Group II.
5. At least eighty percent practical should be completed by the student.
6. The marks distribution for practical is as below

Practical groups	**Marks**
Group I	20
Group II	20
Certified laboratory journal	10
Total Marks	**50**

B.Sc. I Syllabus (NEP-2020)

To be implemented from June 2024 onwards

Nature of Practical Examination

Total Marks 50

Scheme of Practical Examination for B. Sc. Part –I (OE)

1. Practical examination will be conducted semester wise.
2. Practical examination will be conducted for one day per batch.
3. The examination will be conducted in two sessions per day and each session will be of three hours duration.
4. Every candidate should perform one experiment each from Group I and Group II.
5. At least eighty percent practical should be completed by the student.
6. The marks distribution for practical is as below

Practical groups	**Marks**
Group I	20
Group II	20
Certified laboratory journal	10
Total Marks	**50**