SHIVAJI UNIVERSITY, KOLHAPUR

B.Sc. Part-III Physics CBCS Syllabus with effect from June 2020

B.Sc. Part-III Semester-V

PHYSICS Paper-IX

DSE-E1 Mathematical Physics

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks -50 (Credits: 02)

UNIT-I

1. **Partial Differential Equation (8 hours)**

   Introduction to differentialequations, 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.

2. **Frobenious Method and Special Functions (10hours)**

   Singular points of second order differential equations, Application of singularity to Legendre and Bessel differential equation, Series solution method of solving second order linear differential equation(Frobenious method) and its application to Legendre differential equation.

UNIT-II

1. **Some Special Integrals (6 hours)**

   Gamma function, Properties of Gamma function, Beta function, Properties of Beta function,Relation between Beta and Gamma functions, Error function (Probability Integral).

2. **Complex Analysis (12 hours)**

   Revision of complex numbers and their graphical representation: Geometrical representation, Equal complex numbers, Addition, Subtraction, Multiplication and Division of complex number by geometry. Types of complex numbers, square roots of complex numbers, Logarithmic function of complex variables, Euler's formula, De'Moivre's theorem, Cauchy-Riemann conditions.

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,RamachandraRao,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, 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.

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 (08 hours)

Definition of an operator, Position operator (x), Linear momentum operator (p), Commutation relation 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 coordinate system, Ladder operators, Eigen values of L_z and L^2 (use equations for L^2 and Lz in spherical polar coordinates).

2. Applications of Schrodinger Equation (10 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), One dimensional simple harmonic oscillator (operator method)- energy levels, zero point energy, Schrodinger equation for Hydrogen atom in spherical polar coordinates, Separation of radial and angular parts, Solution of radial part of Schrodinger's 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. Modern Physics, D. L. Sehgal, K. L. Chopra and N. K. Sehgal, Reprint 1995, Sultan Chand & sons.
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, 3rd Edn. 2010, Tata McGraw Hill.
10. Quantum Mechanics Theory and Applications, A. K. Ghatak and S. Lokanathan, Third Edn.1995, Macmillan India Ltd.
11. Quantum Mechanics Theory and applications, AjoyGhatak, S. Lokanathan, 5th Ed,2017, Trinity.
12. Quantum Mechanics, Chatwal and Anand, Reprint 2010, Himalaya Publishing house.
13. Quantum Mechanics, Gupta, Kumar, Sharma, Thirtieth Edn., 2011, Jai Prakash Nath Publications.
14. Advanced Quantum Mechanics, SatyaPrakash, Reprint 2011, KedarNath Ram Nath Meerut.
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 & company Ltd, New Delhi

B.Sc. Part-III Semester-V

PHYSICS Paper-XI

DSE-E3 Classical Mechanics and Classical Electrodynamics

Theory: 36 Hours (45 Lectures of 48 minutes)

Marks -50 (Credits: 02)

UNIT-I

1.Lagrangian Formulation (10 hour)

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 hour)

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.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.

2. Charged Particles Dynamics (6 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.

Reference Books

1. Classical Mechanics, Goldstein Herbert, NarosaPubli./ Pearson Edu. 2018
2. Classical Mechanics, Gupta, Kumar and Sharma, Pragati Praka.2012
3. Introduction to Classical Mechanics, Nikhil Ranjan Roy, S Chand Publ. 2016
4. Introduction to Classical Mechanics,Takwale R.G., Puranik P. S.,Tata McGraw 1979
5. Classical Mechanics,Panat P.V., NarosaPubli. 2016
6. Atomic physics, J B Rajam S Chand
7. Concepts of Modern Physics, ArthurBeiser, McGraw Hill
8. Introduction to Special Relativity, Robert Resnick, Wiley India
9. Classical Electrodynamics, PuriS.P., Tata McGraw/Alpha Science 2011
10. Classical Electrodynamics, Jackson J. D., Wiley India , 2007
11. Electromagnetics, Laud B.B., New Age Interna. 2011

B.Sc. Part 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 (08 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.

2.TransistorsAmplifier and Sinusoidal Oscillators (10 hours)

Transistor Amplifier: 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.

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, Colpitts oscillator, Hartley oscillator, Crystal oscillator using transistors.

Unit-II

1. Cathode Ray Oscilloscope (8 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.

2. Operational Amplifier and Timer (10 hours)

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

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

ReferenceBooks

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, 6th Edn., Oxford University Press.
7. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 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, 2nd Edition , B. Basavaraj, H. N. Shivashankar, Vikas Publishing house pvt. Ltd. New Delhi.
14. Electronic principles, V. K. Mehta
15. Basic Electronics, Bhargava and Gupta

B.Sc. Part-III Semester-VI

PHYSICS Paper-XIII

DSE-F1 Nuclear and Particle Physics

Theory: 36 Hours (45 Lectures of 48 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, chargedensity (matter energy), binding energy, average binding energy 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 workingcondition, expression of energy gain.

Unit-II

1. Nuclear Detectors (10 hours)

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

2. Particle Physics (8 hours)

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

ReferenceBooks

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 ArthirBeiser, 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

B.Sc. Part-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 andinter-planer 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 (08 hours)

Reciprocal lattice and its properties, Brillouin zone, 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 (10 hours)

Classical Langevin theory of diamagnetic and paramagnetic materials, Quantum mechanical treatment of paramagnetism, Curie's law, Weiss theory of ferromagnetism and ferromagnetic domains, Explanation of B-H curve, Hysteresis and energy loss.

2. Elementary Band Theory of Solids (8 hours)

Concept of density of states, Bloch theorem (statement only), Kroning–Penny 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 Publishers 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, (PragatiPrakashan 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,5thEd.[PHI Learning Delhi.

B.Sc. Part-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)

Observed hydrogen fine structure, 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, Normal order of fine structure doublets, Electron spin-orbit interaction,Normal 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 (4 hours)

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

2. Structure of Universe: **(08 hours)**

Big-Bang theory, Steady state theory, Oscillating theory,Hubble law, Cosmological tests, Milky Way galaxy, 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,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. Concepts of Modern Physics – Arthur Beiser.

4. Perspectives of Modern Physics – Arthur Beiser.

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

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

7. Astronomy – Frank Bash.

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

B.Sc. Part-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. Energy and Wind Energy (8 hrs)

Energy, Forms of energy, Man and environment, Energy chains, Classification of energy resources, Energy demands, Age of renewable and alternatives,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 hrs)

Solar energy, Solar energy spectrum (UV,Visible and IR), Utilization of solar energy-thermal route, photovoltaic route, Essential subsystems in solar energy plant, Solar constant, Clarity index, Solar insolation, Solar energy from satellite station through microwave to earth station, Solar photovoltaic systems, Merits and limitations of solar PV systems, Prospects of solar PV systems, Power of a solar cell and solar PV panel.

3. Biomass Energy (2 hrs)

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 hrs)

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

2. Nanotechnology (12 hrs)

Introduction tonanoscience 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, Ball milling,Nucleation and growth, Applications of nanotechnology (Spintronics, Molecular electronics, Nanobiotechnology)

ReferenceBooks

1. Energy Technology – Non-conventional, Renewable and Conventional – S. Rao and Dr. Parulekar.
2. Non-conventional Energy sources - G. D. Rai (4th 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 (5th edition), Khanna Publishers, Delhi.
5. Non-conventional Energy Sources – G. D. Rai (Khanna Publishers).
6. Elements of Material Science and Engineering - I.H.Vanvlach (4th Edition)
7. Material Science and Engineering - V. Raghva
8. Material science and metallurgy for Engg.-Kodigire V. D. Everest publication house, Pune
9. Material Science and Engg. - 5th Edition- V. Raghavan PHI Learning Pvt. Ltd. Delhi
10. Nanotechnology: Principles and Practices,Sulbha K Kulkarni (2nd Edition), Capital Publishing Co. New Delhi.
11. Science at the Nanoscale: An Introductory Textbook, Chin Wee Shong, ChorngHaur Sow, Andrew T. S. Wee (Pan Stanford Publishing Pte. Ltd.)
12. Introduction to Nanoscience, S.M. Lindsay (Oxford University press)

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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 findlargest/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
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 usingbasic gates with IC-74 series.
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 builtand test phase shift oscillator using BJT.
6. To determine A.C. and D.C. sensitivity of the C.R.O. andto measure unknown frequency.
7. To design and test an astablemultivibrator using IC-555 Timer.
8. To design and testmonostablemultivibratorusing IC-555 Timer.
9. To studyOp-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
    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 Publishing House.
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, Kitab Mahal, 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 Report III) Seminar Report / Project Report	 20 10 20
Total Marks	**200**

Nature of Question Paper

Theory: Time -2 hours, Marks-50

Question 1: Select the correct alternative (Compulsory 10 questions) 10 marks

(Four alternatives for each question)

Question 2: (Attempt any Two out of three) 20 marks

(Long answer type)

Question 3: (Attempt any four out of six) 20 marks

(Short answer type)

- **Note:** Equal weightage should be given to each unit.