

"Education for Knowledge, Science and Culture"

- Shikshanmaharshi Dr. BapujiSalunkhe

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)



Department of Physics and Astrophysics

B.ScPart – II,

Semester III & IV, CBCS

Physics

Semester	Paper No.	Course Code	Course Title	No. of Credits
III	III	DSC-1001C	Physics Paper III	8
IV	IV	DSC-1001D	Physics Paper IV	8
III & IV	-	SEC-I	Basic Instrumentation Skill	2
III & IV	-	SEC-II	Physics workshop Skill	2

Syllabus with effect from June, 2019

VIVEKANAND COLLEGE (AUTONOMOUS) KOLHAPUR

CBCS Syllabus with effect from June, 2019

B. Sc. Part – II Semester-III

DSC-1001C PHYSICS Paper-III

Theory: 72 Hours

Marks-100 (Credits: 04)

Section -I

THERMAL PHYSICS AND STATISTICAL MECHANICS – I

Unit I:

(18 hrs)

Kinetic Theory of Gases and thermometry

Mean free path, expression, approximate method derivation of Maxwell's law of distribution of velocities and its experimental verification, Transport Phenomena: transport of momentum (viscosity), transport of thermal energy (conduction), Transport of mass (diffusion), Law of equipartition of energy (qualitative) and its applications to specific heat of monoatomic and diatomic gases. Thermometry: Concept of heat and temperature, temperature scales, principle of thermometry mercury thermometer, platinum resistance thermometer, thermocouple. (Principle, construction and theory)

Reference books:

- 1) Heat and Thermodynamics- Brijlal and N. Subramanyam, S. Chand and company LTD
PP.149-152, PP.171-177, PP.177-179, PP.179-181,PP.182-183 ,PP.168-171 .
- 2) A treatise on Heat- Meghnad Saha and B.N. Srivastava, Indian Press
PP.104-112, PP.123-126,PP.132-136 ,PP.139-141 ,PP.141-143 ,PP.118 ,PP.120-123 .
- 3) Heat and Thermodynamics (8th Ed)-M.W. Zemansky and R.Dittman, McGraw Hill.
PP. 10-12, PP. 21-26, PP.258-260,PP.268-271,PP.271-273 ,PP.273-274 ,PP.274-275 .

Unit II:

Laws of Thermodynamics

(18hrs)

Thermodynamic system, thermodynamic variables, thermodynamic state, 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), change in entropy, Entropy changes in reversible & irreversible processes, Third law of thermodynamics, Entropy change in conduction of heat, diffusion of gases ,physical significance of entropy, Un-attainability of absolute zero. Zero point energy.

Reference books:

- 1) Heat and Thermodynamics- Brijlal and N.Subramanyam, S.Chand and company LTD
*PP.215-219 ,(PP.216,PP.221,PP.220,PP.227-230 ,PP.244-446 PP.235-237 , PP.225-228,
PP.246-247, PP.248-251,PP.256-257,(PP.248, PP.291-292 ,PP.292-293 ,PP.294-295,PP.293*
- 2) Text book of heat- J.B. Rajam ,S.Chand and company Ltd
PP.477-485.
- 3) Heat and Thermodynamics (8th Ed)-M.W. Zemansky and R.Dittman, McGraw Hill
*PP.28-31 ,PP.72, PP.73-77 ,PP.66-70 ,PP.133-135 ,PP.159-164 ,PP.165-166 ,
PP.179-181 ,PP.187-191,PP.448-451.*
- 4) Heat Thermodynamics and Statistical physics- J.P. Agrawal and Satya Prakash, Pragati Prakashan
*PP.1-2,3-5 ,PP.2-3 ,(PP.6-8 ,PP.11-12 ,)(PP.17-19 ,PP.82-83 ,PP.23-25 ,PP.99-101 ,
PP.81-82,84-89 , PP.102-104 ,PP.121-127 ,PP.123-125 ,PP.129-132.*

- **Reference books details:**

- 1) Heat and Thermodynamics- Brijlal and N.Subramanyam, S.Chand and Company Ltd.
- 2) Text book of heat- J.B. Rajam, S.Chand and company Ltd
- 3) A treatise on Heat- Meghnad Saha and B.N. Srivastava, Indian Press
- 4) Heat and Thermodynamics (8th Ed), M.W. Zemansky and R. Dittman, McGraw Hill
- 5) Heat Thermodynamics and Statistical physics- J.P. Agrawal and Satya Prakash, Pragati Prakashan

Section -II

WAVES AND OPTICS - I

Unit III

(18hrs)

1) Superposition of Harmonic Oscillations

(7 hrs)

Linearity and superposition principle, Composition of two simple harmonic motions, Superposition of two collinear harmonic oscillations- for oscillations having equal frequencies (Analytical and geometrical methods) and oscillations having different frequencies (Beats), Superposition of two perpendicular harmonic oscillations- for oscillations having equal frequencies (Graphical and analytical methods) and oscillations having different frequencies (Lissajous figures), Uses of Lissajous figures.

Reference books:

- 1) The Physics of Waves and Oscillations- N. K. Bajaj, Tata McGraw-Hill Pvt. Ltd., New Delhi, Reprint 2010
(Chapter 2, pp. 54)
- 2) Elements of properties of matter-D. S. Mathur, S. Chand & company Pvt. Ltd., New Delhi, Reprint 2016
(Chapter 4, pp. 110)
- 3) Physics for degree students- C. L. Arora and Dr. P. S. Hemne, S Chand & Company Pvt. Ltd., Second revised Edition, reprint 2014, Ram Nagar, New Delhi

- 4) A textbook of sound – N Subrahmanyam Brijlal, Vikas Publishing House Pvt. Ltd., New Delhi,
(Chapter 1, pp. 17, Chapter 2, pp 29)

2) Coupled Oscillations: (4 hrs)

Normal modes of vibration, normal coordinates, degrees of freedom, types of coupling, frequency of oscillatory systems, Energy transfer in coupled oscillatory system.

Reference books:

- 1) Oscillations & Waves- Satya Prakash, Pragati Prakashan, Meerut, 3rd Edition
(Chapter 4, pp. 161)
- 2) The Physics of Waves and Oscillations- N. K. Bajaj, Tata McGraw-Hill Pvt. Ltd., New Delhi, Reprint 2010
(Chapter 5, pp. 177)
- 3) Classical Mechanics – Gupta Kumar Sharma, Pragati Prakashan, Meerut, Reprint 2016 (Chapter 8)
- 4) Introduction to Classical Mechanics- Nikhil Ranjan Ray, Vikas Publishing.
(Chapter 12, pp 306-317)
- 5) Introduction to Classical Mechanics by R. G. Takwale & P. S. Puranik, McGraw Hill Education (India) Pvt. Ltd.
(Chapter 6 pp 179)

3) Waves Motion and Ultrasonic waves (7hrs)

Waves 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 generator, Detection of ultrasonic waves, Properties ultrasonic waves, Applications of ultrasonic waves.

Reference books:

- 1) Oscillations & waves-Satya Prakash, Pragati Prakashan, Meerut, 3rd Edition
(Chapter 8, pp 315, 319)
- 2) A Text book of sound- Khanna and Bedi, Atma Ram & sons, Delhi
(Chapter 4, pp 62)(Chapter 7, pp 135)(Chapter 3, pp 46)(Chapter 22, pp 442)
- 3) Waves and Oscillations-Subrahmanyam Brijlal, Vikas Publishing House Pvt. Ltd., New Delhi, 2nd Revised Edition
(Chapter 12, pp 296)(Chapter 11, pp. 282)
- 4) Waves and Oscillations – Dr. D. N. Tripathy, Kedarnant Ramnant Meerut, Delhi.
(Chapter 14, pp 259)
- 4) Physics for degree students- C. L. Arora and Dr. P. S. Hemne, S Chand & Company Pvt. Ltd., Second revised Edition, reprint 2014, Ram Nagar, New Delhi
(Chapter 13 pp. 511-556, chapter 15 pp. 571-602,)

Unit IV

(18 hrs)

1) Sound and Acoustics of buildings:

(7 hrs)

Sound: Transducers and their characteristics, Pressure microphone, Moving coil loudspeaker, Intensity and loudness of sound, Decibels, Intensity levels, musical notes, musical scale.

Acoustics of buildings: Reverberation and time of reverberation, Absorption coefficient, concept of perfect absorber, optimum reverberation, Sabine's formula for measurement of reverberation time, Acoustic aspects of halls and auditoria.

Reference books:

- 1) A Text book of sound- Khanna and Bedi, Atma Ram & Sons, Delhi
(Chapter 11 Page No. 224)(Chapter 23 Page No. 455)
- 2) Oscillations & waves-Satya Prakash, Pragati Prakashan, Meerut, 3rd Edition
(Chapter 15, Page no. 515)
- 3) Waves and Oscillations-Subrahmanyam Brijlal, Vikas Publishing House Pvt. Ltd.,
New Delhi, 2nd Revised Edition
(Chapter 7 pp 182)
- 4) Physics for degree students- C. L. Arora and Dr. P. S. Hemne, S Chand & Company
Pvt. Ltd., Second revised Edition, reprint 2014, Ram Nagar, New Delhi,
(Chapter 16 pp.605-619, chapter 18, pp.632-655)
- 5) Physics for engineering (Vol 1)- P. K. Palanisany, Scitech Publications (India) Pvt
Ltd. (Chapter 2)
- 6) University Physics –Gurbachan S. Chaddha (chapter 3) Narosa Publishing House
Pvt. Ltd. Delhi,(pp. 3.1 - 3.18)

2) Viscosity

(5hrs)

Revision of viscosity, stream line flow, turbulent flow, coefficient of viscosity, critical velocity Rate flow of liquid in a capillary tube - Poiseuille's formula, experimental determination of coefficient of viscosity of a liquid by Poiseuille's apparatus method, variations of viscosity of a liquid with temperature lubrication and pressure

Reference books:

- 1) University Physics – FW Sears, MW Zemansky and HD Young, Addison Wesley
- 2) Elements of properties of matter-D. S. Mathur, S. Chand & Company Pvt. Ltd., New
Delhi, Reprint 2016 (Chapter XII, pp 382)

3) Physics of low pressure

(6hrs)

Definition of vacuum , Production and measurement of low pressure, Exhaust pump ,Rotary pump, Diffusion pump, Molecular pump, Knudsen absolute gauge, Pirani gauge, Detection of leakage.

• Reference books:

- 1) Mechanics- D. S. Mathur, S. Chand & company Pvt. Ltd., New Delhi, Reprint 2009
(Chapter 15, pp 796)
- 2) Elements of properties of matter-D. S. Mathur, S. Chand & company Pvt. Ltd., New
Delhi, Reprint 2016(Chapter XV, pp508)
- 3) Physics for engineering (Vol 1)- P. K. Palanisany, Scitech Publications (India) Pvt.Ltd.
(Chapter 1)

VIVEKANAND COLLEGE (AUTONOMOUS) KOLHAPUR

CBCS Syllabus with effect from June, 2019

B. Sc. Part – II Semester-IV

DSC-1001D PHYSICS Paper-IV

Theory: 72 Hours

Marks-100 (Credits: 04)

Section -I

THERMAL PHYSICS AND STATISTICAL MECHANICS – II

Unit I: (18 hrs)

1) Thermodynamic Potentials (10 hrs)

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

Reference books:

- 1) *Heat and Thermodynamics- M.W.Zemasky and R. Dittman (Ch. No. 11)*
- 2) *Physics for degree students B.Sc. second year- Arora, Hemne, S. Chand(Ch. No. 6)*

2) Theory of Radiation (8 hrs)

Thermal radiations, Blackbody radiation and its importance, Black body in practice, its temperature dependence ,emissive power, absorptive power, pressure of radiation ,Experimental study of black body radiation spectrum, Concept of energy density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Reference books:

- 1) *Concepts of Modern Physics- Arthur Beiser(Ch. No. 9)*
- 2) *Physics for degree students B.Sc. second year- Arora, Hemne, S. Chand(Ch. No. 8)*

Unit II: Statistical Mechanics (18 hrs)

1) Classical statistics (10hrs)

Degrees of freedom ,momentum space, position space ,Phase space, Microstate and Macrostate, Accessible microstates, priory probability thermodynamic probability, probability distribution, Maxwell-Boltzmann distribution law, energy or speed, evaluation of constants α and β , Entropy and Thermodynamic probability, Distribution of molecular speeds.

Reference books:

- 1) *Concepts of Modern Physics- Arthur Beiser(Ch. No. 9)*
- 2) *Physics for degree students B.Sc. second year- Arora, Hemne, S. Chand(Ch. No. 9, 11)*

2) Quantum statistics (8 hrs)

Need of quantum statistics, Bose-Einstein distribution law, photon gas, Planck's radiation law, Fermi-Dirac distribution law, free electron in metal, electron gas, comparison of M.B., B.E., and F.D. statistics.

Reference books:

- 1) *Concepts of Modern Physics- Arthur Beiser(Ch. No. 9)*
- 2) *Physics for degree students B.Sc. second year- Arora, Hemne, S. Chand(Ch. No. 12)*

Reference books details:

- 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. Subramaniam, Brijlal, P. Hemne, 2008, S. Chand.

Section -II

WAVES AND OPTICS-II

Unit III

(18 hrs)

1. Cardinal points (7 hrs)

Thick lens, combination of lenses (system) 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.

References book: *Text book of optics- Brijlal and Subrahmanyam(Chaper no. 5)*

2. Resolving Power of optical instruments:

(5 hrs)

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

Reference Books:

- 1) *Text book of optics- Brijlal and Subrahmanyam(Chaper no. 19)*
- 2) *Waves and Optics- R. K. Verma (Chapter no. 9)*
- 3) *A text book of light- D. N. Vasudeva(Chapter no. 17)*

3. Polarization of light:

(6 hrs)

Revision of plane of vibration, plane polarization, perpendicular vibration, parallel vibrations, polarization by reflection and refraction, Idea of polarization, polarization by double refraction, Huygens explanation of double refraction through uniaxial crystals, Nicol prism(construction, working), production and detection of circularly and elliptically polarized light, optical rotation - laws of rotation of plane of polarization, polarimeter.

Reference books:

- 1) *Text book of optics- Brijlal and Subrahmanyam (Chapter no. 20)*
- 2) *Fundamentals of Optics- Jenkins and white (Chapter no. 24)*
- 3) *A text book of light- D. N. Vasudeva(Chapter no. 18)*

UNIT-IV**(18 hrs)****1. Interference:****(10 hrs)**

Principle of Superposition ,Coherence and condition for interference, Division of amplitude and division of wave front, Division of wave front – Lloyds single mirror(determination of wavelength of light of monochromatic source),Division of amplitude- 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.

Reference Books:

- 1) *Fundamentals of Optics- Jenkins and white (Chater no. 12,13 and 14)*
- 2) *Optics- Ajay Ghatak (Chapter no. 11, 12, 13 and 14)*
- 3) *Text book of optics- Brijlal and Subrahmanyam (Chaper no. 14 and 15)*
- 4) *Waves and Optics- R.K. Verma (Chapter no. 4)*

2. Diffraction:**(8 hrs)**

Revision of wave fronts and diffraction , Fraunhofer 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 a straight edge.

• Reference Books:

- 1) *Fundamentals of Optics- Jenkins and white (Chater no. 15,16,17 and 18)*
- 2) *Optics- Ajay Ghatak (Chapter no. 16 and 17)*
- 3) *Text book of optics- Brijlal and Subrahmanyam (Chaper no. 17 and 18)*

Reference Book Details:

1. Text book of optics for B.Sc.Classes- BrijLal and N.Subrahmanyam, S.Chand & Company Ltd. New Delhi, 2006
2. Wave Optics- R. K. Verma, Discovery Publishing House New Delhi, 2006
3. A text book of light- 8th Edition,D. N. Vasudeva, Atma Ram & Sons, Delhi (1976)
4. Fundamentals of Optics- 4th Edition ,Francies A.Jenkins and Harvey E.White, Tata McGraw-Hill Education Private Ltd., New Delhi 2011
5. Optics- 2nd Edition, Ajay Ghatak, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi,
6. Principles of Physics-10th Edition, Halliday and Resnick, Wiley
7. University Physics- 14th Edition, H.D. Young and R. A. Freedman, Pearson

Skill Enhancement Course
SEC I
BASIC INSTRUMENTATION SKILLS B.SC.II
(Credits: 02)
(30 Lectures)

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics

Basic of Measurement **(4 Lectures)**

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter **(4 Lectures)**

Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance.

Cathode Ray Oscilloscope **(6 Lectures)**

Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

Use of CRO **(3 Lectures)**

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Signal Generators and Analysis Instruments: **(4 Lectures)**

Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters **(3 Lectures)**

Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Digital Instruments **(3 Lectures)**

Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

Digital Multimeter**(3 Lectures)**

Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
- Performance and design of AC machines - M G Say ELBS Edn.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
- Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
- Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

Skill Enhancement Course
SEC II
PHYSICS WORKSHOP SKILL
B.SC. II
(Credits: 02)
(30 Lectures)

The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

Introduction:**(4 Lectures)**

Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metalsheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Mechanical Skill:**(10 Lectures)**

Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothing of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Electrical and Electronic Skill:**(10 Lectures)**

Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay.

Introduction to prime movers:**(6 Lectures)**

Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems, demonstration of pulley experiment.

Reference Books:

- A text book in Electrical Technology - B L Theraja – S. Chand and Company.
- Performance and design of AC machines – M.G. Say, ELBS Edn. 36
- Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
- Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn.,

Editor Newnes [ISBN: 0750660732]

- New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]

PHYSICS LAB DSC1011C-D: Paper V–VII**And****Skill Enhancement Course****(THERMAL PHYSICS AND STATISTICAL MECHANICS)****Set-I (Any 8 experiments)**

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 Cu by Angstrom's Method.
4. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
5. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
6. To study the variation of thermo e.m.f. across two junctions of a thermocouple with temperature.
7. To record and analyze the cooling temperature of hot object as a function of time using a thermocouple.
8. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge
9. Temperature of flame.
10. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
11. Measurement of Planck's constant using Black body radiation.

Set-II**(Skill Enhancement Course)****(Basic Instrumentation Skill)**

The test of lab skill will be of the following test items:-

1. Use of an oscilloscope.
2. CRO as A versatile measuring device.

3. Circuit tracing of Laboratory electronic equipments.
4. Use of digital multimeter/ VTVM for measuring voltages.
5. Winding coil/transformers.
6. Study the layout of receiver circuit.
7. Trouble shooting a circuit.
8. Balancing of bridges.

Laboratory Exercise:-

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency using a Q-meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of rise, fall and delay time using a CRO
6. Measurement of distortion of a RF signal generator using distortion factor meter.
7. Measurement of R, L and C using a LCR bridge/ universal bridge.
8. Measurement of time period, frequency, average period using using universal counter/ frequency counter.

Open Ended Experiments:-

1. Using a Dual Trace Oscilloscope.
2. Converting the range of a given measuring instrument (Voltmeter, ammeter)

Set-III

Waves and Optics (Any 8 experiments.)

1. Familiarization with Schster's focusing: determination of angle of prism .
2. To determine the frequency of an electrically maintained tuning fork by Melde's experiment and to verify $\lambda^2 - T$ Law
3. To study Lissajous figures by using CRO
4. To determine coefficient of viscosity of water by capillary flow method (Poiseuille's method)
5. To determine the refractive index of the material of a given prism using Sodium/ Mercury light.
6. To determine the value of Cauchy Constants of a material of a prism.
7. To determine the wavelength of sodium light using Fresnel Biprism.
8. To determine the Resolving Power of a Prism.
9. To determine the Resolving Power of a Plane Diffraction Grating.
10. To determine wavelength of Laser light using diffraction of single slit.
11. To determine wavelength of sodium light using Newton's Rings.
12. To determine wavelength of 1) Sodium & 2) spectrum of Mercury light using plane diffraction grating.

13. Goniometer I-To study cardinal points of optical system.
14. Goniometer II- To study the equivalent focal length of optical system.
15. To study angle of specific rotation of sugar using Polarimeter.

Set –IV

(Skill Enhancement Course)

Physics Workshop Skill

The test of lab skill will be of the following test items:-

1. Unit measurement and its conversion (SI , CGS, BTU).
2. Dimension measurement of solid block, volume of cylindrical beaker/ glass, diameter of thin wire, thickness of metal sheet.
3. Cutting of metal sheets using blade, drilling of holes of different diameters in metal sheet and wooden block
4. Soldering of electrical circuits having discrete components(R,L,C, diode etc.) on PCB .
5. Testing different electronic components using CRO/ Multimeter.
6. Understanding of gear system, wheel breaking system, pulleys etc. (Demonstration).

Laboratory Exercise:-

1. Preparation of regulated power supply.
2. Ic 555 timer.
3. Electronic switch using transistor.
4. Characteristics of FET.
5. FET as VVR.
6. Characteristics of Transistor.
7. Use of sextant to measure height of object.
8. Crystal Oscillator.
9. Colpitts oscillator.

Reference Books for practical:

- 1) Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- 2) 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
- 6) A text book in Electrical Technology – B.L.Theraja – S Chand and Co.
- 7) Performance and design of AC machines – MG Say ELBS Edn.
- 8) Mechanical workshop practice, K.C.John, 2010, PHI Learning Pvt. Ltd.
- 9) Workshop Processes ,practices and materials, Bruce J Black 2005,3rd Edn., Editor Newness [ISBN:0750660732]

- 11) New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN:0861674480]
- 12) Digital Circuits and systems, Venugopal.2011, Tata McGraw Hill.
- 13) Logic Circuit design, Shimon P, Vingron.2012, and Springer.
- 14) Digital Electronics, Subrata Ghoshal, 2012Cengage Learning.
- 15) Electronic Devices and circuits , S.Salivahanan & N.S.kumar ,3rd Ed.,2012, Tata McGraw Hill
- 16) Electronic Circuits: Handbook of design and applications, U.Tietze, Ch.schenk, 2008 Springer.
- 17) Electronic Devices, 7/e Thomas L.Floyd, 2008, Pearson India.

Specific outcomes

Thermal Physics and Statistical Mechanics

1. To study the statistical nature of concepts and laws in thermodynamics, e. g. entropy , temperature, chemical potential, Free energies, partition functions.
2. . To study statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions and to solve problems in some physical systems.
3. To apply the concepts and principles of black-body radiation to analyzeradiation phenomena in thermodynamic systems.
4. To solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.
5. To analyze phase equilibrium condition and identify types of phase transitions of physical systems.
6. To make connections between applications of general statistical theory in various branches of physics.

Waves and optics

1. To gain knowledge on various theories of light.
2. To acquire skills to identify and apply formulas of optics and wave physics.
3. To understand the properties of light like reflection, refraction, interference, diffraction etc.
4. To study and understand the applications of diffraction and polarization.
5. To study the applications of interference in design and working of interferometers.
6. To study the resolving power of different optical instruments.

Practical Examination: Each candidate has to perform a total of 4 experiments (one experiment from each group)

Practical Marks distribution:

- i) Each experiment carries 20 marks X 4 = 80
- ii) Journal = 10
- iii) Punctuality and neatness = 10

Nature of Question Paper

- Instructions:** 1) All the questions are **compulsory**.
2). Figures to the right indicate **full** marks.
3) Draw neat labeled diagrams **wherever** necessary.

Time : 2 hours

Total Marks: 40

SECTION-I

Choose correct alternative.

8

i)

A) B) C) D)

ii)

A) B) C) D)

iii)

A) B) C) D)

iv)

A) B) C) D)

v)

A) B) C) D)

vi)

A) B) C) D)

vii)

A) B) C) D)

viii)

A) B) C) D)

Attempt any two.

16

- i)
- ii)
- iii)

Q.3. Attempt any four.

16

- i)
- ii)
- iii)
- iv)
- v)
- vi)

SECTION-II

Instructions: 1) All the questions are **compulsory**.

2) Figures to the right indicate **full** marks.

3) Draw neat labeled diagrams **wherever** necessary.

Time : 2 hours

Total Marks: 40

Choose correct alternative.

8

- i)
A) B) C) D)
- ii)
A) B) C) D)
- iii)
- iv) A) B) C) D)

- v) A) B) C) D)
 A) B) C) D)
 vi) A) B) C) D)
 vii) A) B) C) D)
 viii) A) B) C) D)
 A) B) C) D)

Q.2. Attempt any two.

16

- i)
 ii)
 iii)

Q.3. Attempt any four.

16

- i)
 ii)
 iii)
 iv)
 v)
 vi)

Instruction to paper setters: Equal weight age should be given to all units.

SCHEME OF MARKING (THEORY)

Sem.	DSC	Marks	Evaluation	Sections	Answer Books	Standard of passing
III	DSC-1001C	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28 marks)
IV	DSC-1001D	80	Semester wise	Two sections each of 40 marks	As per Instruction	35% (28marks)

SCHEME OF MARKING (CIE) Continuous Internal Evaluation

Sem.	DSC	Marks	Evaluation	Sections	Answer Books	Standard of passing
III	DSC-1001C	20	Concurrent	-	As per Instruction	35% (7 marks)
IV	DSC-1001D	20	Concurrent	-	As per Instruction	35% (7 marks)

SCHEME OF MARKING (PRACTICAL)

Sem.	DSC	Marks	Evaluation	Sections	Standard of passing
III AND IV	DSC-1001C DSC-1001D	100	Annual	As per Instruction	35% (35 marks)

***A separate passing is mandatory**