SHIVAJI UNIVERSITY, KOLHAPUR.

Accredited By NAAC with 'A' Grade

Revised Syllabus For

Bachelor of Science

Part-II

PHYSICS

CBCS PATTERN

Syllabus to be implemented from

June, 2019 onwards.

SHIVAJI UNIVERSITY KOLHAPUR
CBCS Syllabus with effect from June, 2019
B. Sc. Part – II Semester-III
PHYSICS Paper-V
DSC-C1 THERMAL PHYSICS AND STATISTICAL MECHANICS – I
Theory: 36 Hours
Marks-50 (Credits: 02)

Unit I: **(18 hrs)**
Kinetic Theory of Gases and thermometry

Mean free path, 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. Principle of thermometry, types of thermometers, Scales of temperature (Celsius, Kelvin, Fahrenheit and Rankine) , Mercury thermometer, Thermoelectric thermometer ,Platinum resistance thermometer , Thermister

Reference books:

1) Heat and Thermodynamics- Brijlal and N.Subramanyam, S.Chand and company LTD
PP.1-2 ,PP.3 ,PP.3-5, PP.27-30 , PP.21-23,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) Fundamentals of heat - D.S.Mathur, S.Chand and Sons publisher
PP.3-5, PP.3-5, PP.6-10, PP.36-42, (PP.30-35, PP.51
4) Text book of heat - J.B. Rajam, S. Chand and company Ltd
PP.3-4, PP.4-13, PP.34-38, PP.28-3
5) Heat and Thermodynamics (8^{th} 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, 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.

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 (8^{th} 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.1-5 ,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 (8^{th} Ed), M.W. Zemansky and R. Dittman, McGraw Hill

5) Heat Thermodynamics and Statistical physics- J.P. Agrawal and Satya Prakash, Pragati Prakashan

6) Fundamentals of heat - D.S.Mathur, S.Chand and Sons publisher

SHIVAJI UNIVERSITY KOLHAPURSHIVAJI UNIVERSITY KOLHAPUR
CBCS Syllabus with effect from June, 2019
B. Sc. Part –II Semester III
PHYSICS Paper VI
DSC-C2: WAVES AND OPTICS - I
Theory: 36 Hours
Marks -50 (Credits: 02)

Unit I **(18 hrs)**

1) Superposition of Harmonic Oscillations (7 hrs)

Linearity and superposition principle, 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
   (chapter 14, pp. 557-570)
4) A textbook of sound – N SubrahmanyamBrijlal, Vikas Publishing House Pvt. Ltd., New Delhi,
   (Chapter 1, pp. 17, Chapter 2, pp 29)

2) Coupled Oscillations: (4 hrs)

Frequencies of coupled oscillatory systems, normal modes and normal co-ordinates, energy of coupled oscillations, 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-HillPvt. 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 Motionand **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, pp315, 319)*
2) A Text book of sound- Khanna and Bedi, Atma Ram & sons, Delhi *(Chapter 4, pp 62)(Chapter 7, pp 135)(Chapter 3, pp46)(Chapter 22, pp442)*
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, pp259)*
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 II **(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, 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 11Page No. 224)(Chapter 23Page 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)

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.

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)

Production and measurement of low pressure, 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)*

SHIVAJI UNIVERSITY KOLHAPUR
CBCS Syllabus with effect from June, 2019
B. Sc. Part – II Semester-IV
PHYSICS Paper-VII
DSC-D1 THERMAL PHYSICS AND STATISTICAL MECHANICS – II
Theory: 36 Hours
Marks-50 (Credits: 02)

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)

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 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)

Phase space, Microstate and Macrostate, Accessible microstates, priory probability thermodynamic probability, probability distribution, Maxwell-Boltzmann distribution law, 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)

Bose-Einstein distribution law, photon gas, Fermi-Dirac distribution law, 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.

SHIVAJI UNIVERSITY KOLHAPUR

CBCS Syllabus with effect from June, 2019

B. Sc.Part II Semester IV

PHYSICS Paper VIII

DSC- D2 - WAVES AND OPTICS-II

Theory: 36 Hours

Marks -50 (Credits: 02)

Unit III **(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.

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)

Idea of polarization, polarization by double refraction, Huygens explanation ofdouble 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)

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

PHYSICS LAB DSC C1-D1: Paper V–VII
THERMAL PHYSICS AND STATISTICAL MECHANICS

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 andCharlton's disc method.
5. To determine the temperature co-efficient of resistance by Platinum resistancethermometer.
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 timeusing a thermocouple.
8. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge
9. To determine the temperature coefficient of resistance using post office box.
10. To verify Stefan's fourth power law.
11. To determine specific heat of graphite.
12. To determine the ratio of specific heat of air by Kundt's tube.
13. Temperature of flame
14. To determine the coefficient of thermal conductivity of glass in the form of tube.
15. To determine the thermal conductivity of metal bar by Forbes's method.
16. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.

PHYSICS LAB DSC C2-D2: Paper VI and Paper VIII - WAVES AND OPTICS

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 by 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 oscillatoror Phase shift method (CRO and microphone).
6. To determine viscosity of liquid by Searle's viscometer.
7. To determine velocity of sound in air by resonating bottle.
8. To determine frequency of a crystal oscillator.
9. To determine the Resolving Power of a Prism.
10. To determine the Resolving Power of a Plane Diffraction Grating.
11. To determine wavelength of sodium light using diffraction due to straight edge.
12. To determine wavelength of sodium light using Newton's Rings.
13. Determine thickness of thin film using interference in wedge shaped thin film.
14. Goniometer I-To study cardinal points of optical system.
15. Goniometer II- To study the equivalent focal length of optical system.
16. To study angle of specific rotation of sugar using Polarimeter.

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

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