"Dissemination of Education for Knowledge, Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur
(Empowered Autonomous).

DEPARTMENT OF PHYSICS
Three/Four- Years UG Programme
Department/Subject Specific Core or Major (DSC)

Curriculum, Teaching and Evaluation Structure

for

B.Sc.-II Physics

Semester – III & IV

(Implemented from academic year 2024-25 onwards)

VIVEKANAND COLLEGE, KOLHAPUR

(EMPOWERED AUTONOMOUS)

Department of Physics
B. Sc.-II

Program Outcomes (POs):

PO1	Acquire the knowledge with facts.
PO2	Acquire the skills in handling scientific instruments.
PO3	Develop scientific outlook with respect to science subjects.
PO4	Analyse the given scientific data critically and systematically.
PO5	Realize ethical moral and social values in personal and social life.

Program Specific Outcomes (PSOs):

PSO1	Students should understand mathematical concepts needed for understanding Physics.
PSO2	Students should understand fundamental basic theories of General Physics, Classical Mechanics, Quantum Mechanics, Electricity and Magnetism, Modern Physics, Space Science and Semiconductor Physics and able to apply this knowledge to analyze the variety of physics phenomenon.
PSO3	Students should learn laboratory skills and able to take measurements in Physics practicals and analyze the measurements to draw valid conclusions.
PSO4	Students will be capable of oral and written scientific communication and will prove that they can think critically and work independently.

VIVEKANAND COLLEGE, KOLHAPUR (EMPOWERED AUTONOMOUS)

Department of Physics

Departmental Teaching and Evaluation scheme

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

(as per NEP-2020 Guidelines)

B.Sc. II, Semester-III & IV

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	SEE	CIE	PR	Marks	
Semester-III										
1	DSC-V	DSC03PHY31	Thermal Physics and Statistical Mechanics – I	2	-	40	10	-	50	2
2	DSC-VI	DSC03PHY32	Waves and Oscillations	2	-	40	10	-	50	2
3	MIN-V	MIN03PHY31	Basic Electronics	2	-	40	10	-	50	2
4	MIN-VI	MIN03PHY32	Energy Studies	2	-	40	10	-	50	2
5	VSC-PR-II	VSC03PHY39	Fundamentals of Astronomy and Astrophysics	-	4	-	-	25	25	2
6	DSC-PR-III	DSC03PHY39	DSC-Physics Lab-3	-	8	-	-	50	50	4
7	MIN-PR-III	MIN03PHY39	MIN-Physics Lab-3	-	4	-	-	25	25	2
Semester – III Total				**8**	**16**	**160**	**40**	**100**	**300**	**16**
Semester-IV										
1	DSC-VII	DSC03PHY41	Thermal Physics and Statistical Mechanics – II	2	-	40	10	-	50	2
2	DSC-VIII	DSC03PHY42	Optics	2	-	40	10	-	50	2
3	MIN-VII	MIN03PHY41	Mathematical Physics	2	-	40	10	-	50	2
4	MIN-VIII	MIN03PHY42	Environmental Physics	2	-	40	10	-	50	2
5	VSC-PR-III	VSC03PHY49	Galaxies and Cosmic Electrodynamics	-	4	-	-	25	25	2
6	DSC-PR-IV	DSC03PHY49	DSC-Physics Lab-4	-	8	-	-	50	50	4
7	MIN-PR-IV	MIN03PHY49	MIN-Physics Lab-4	-	4	-	-	25	25	2
Semester – IV Total				**8**	**16**	**160**	**40**	**100**	**300**	**16**

B.Sc. II, Semester-III (DSC-V)
Thermal Physics and Statistical Mechanics -I
(DSC03PHY31)

Course Outcomes: After the completion of the course the student will be able to –

CO1	Demonstrate and understand the basic primary knowledge of Thermal Physics and Statistical Mechanics.
CO2	Get a proficiency in solving problems in Thermal Physics and Statistical Mechanics.
CO3	Understand the basic concepts of Kinetic Theory of Gases, Transport Phenomena, Thermometry, Thermodynamic Laws, Thermodynamic Process, Isothermal, Adiabatic Process, Entropy Etc.
CO4	Develop the critical skills in students to understand Thermal Physics, Statistical Mechanics etc.

Unit	Syllabus	Hours
Unit 1	**Kinetic Theory of Gases and thermometry** Kinetic model of an ideal gas, Mean free path and its expression, 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), Thermoelectric thermometer.	15
Unit 2	**Laws of Thermodynamics** 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 thermodynamics (Isothermal process, Adiabatic process, Isochoric, Isobaric), Relation between C_P & C_V, Workdone 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.	15

Reference Books:

1. Heat and Thermodynamics - Brijlal and N. Subramanyam, S. Chand and Co. Ltd., 2002
2. Theory and Experiments on Thermal Physics – P. K. Chakrabarti, New Central Book Agency (P) Ltd., 2013
3. Thermodynamics And Statistical Physics - Sharma, J. M., Himalaya Publishing House, 2005
4. Text book of heat- J. B. Rajam, S. Chand and company Ltd., 1967
5. Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics - S.C. Garg, R.M. Bansal, C.K. Ghosh, Mc Graw Hill, 2017

B.Sc. II, Semester-III (DSC-VI)

Waves and Oscillations
(DSC03PHY32)

Course Outcomes: After the completion of the course the student will be able to -

CO1	Demonstrate and understand the basic primary knowledge of waves and oscillations.
CO2	Get a proficiency in solving problems in waves and oscillations.
CO3	Understand the basic concepts of harmonic oscillations, oscillations of different frequencies, Lissajous figures, coupled oscillations, ultrasonic waves their applications, acoustic of building and reverberations
CO4	Develop the critical skill in students to understand waves and oscillations.

Unit	Syllabus	Hours
Unit 1	**Superposition of Harmonic Oscillations:** 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. **Coupled Oscillations:** Normal modes of vibration, Normal coordinates, Degrees of freedom, Types of coupling, Frequency of oscillatory systems, Energy transfer in coupled oscillatory system. **Waves Motion and Ultrasonic waves:** 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 of ultrasonic waves, Applications of ultrasonic waves.	15
Unit 2	**Sound and Acoustics of buildings:** Sound: Transducers and their characteristics, Types of microphones, Moving coil loudspeaker, Intensity and loudness of sound, Decibels, Intensity levels, Musical notes, Musical scale. Acoustics of buildings: Reverberation and reverberation time, Absorption coefficient, Concept of perfect absorber, Optimum reverberation, Sabine's	15

	formula for measurement of reverberation time, Acoustic aspects of halls and auditoria. **Viscosity:** 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, Variation in viscosity of a liquid with temperature, Lubrication and pressure. **Physics of low pressure:** 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. Elements of properties of matter - D. S. Mathur, S. Chand & Co. Pvt. Ltd., New Delhi, Reprint, 2016
2. A textbook of sound – N Subrahmanyam, Brijlal, Vikas Publishing House Pvt. Ltd., New Delhi., 1985
3. Waves and Oscillations - N. Subrahmanyam, Brij Lal, Vikas Publishing House Pvt. Ltd., New Delhi, 2nd Revised Edition, 2012
4. Waves and Oscillations – Dr. D. N. Tripathy, Kedarnant Ramnant Meerut , Delhi., 2020

B.Sc. II Physics Lab Work (Practical)
DSC Physics Lab III
(DSC03PHY39)
Group I
(Thermal 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 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

Group II
(Waves, Oscillation and Sound)

1. Viscosity of liquid by Poiseuille's method.
2. Viscosity of liquid by Searle's viscometer.
3. Velocity of sound in air using resonating bottle.
4. Velocity of sound in air using Kundt's tube.
5. Study of Lissajous figures using CRO.
6. To investigate the motion of coupled oscillators.
7. Determination of frequency of an electrically maintained tuning fork by Melde's experiment and to verify λ^2-T law.
8. Colpitts's oscillator.

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination and vocational skill courses (VSC).

Paper No.	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total
V	40	10	50
VI	40	10	50

- There will be practical examination of 50 marks at the end of semester III
- Distribution of 50 marks of practical is as below

Group I	22
Group II	22
Journal	06
Total	**50**

Nature of Question Paper (Semester End Examination)

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**

Paper V

Q:1] Chose correct alternative

Eight Multiple Choice Questions 8 Marks

1)
2)
3)
4)
5)
6)
7)
8)

Q:2] Long Answer questions (Attempt any **TWO** out of three) 16 Marks

1)
2)
3)

Q.3] Short Answer questions (Attempt any **FOUR** out of six) 16 Marks

1)
2)
3)
4)
5)
6)

B.Sc. II, Semester-IV (DSC-VII)

Thermal Physics and Statistical Mechanics -II

(DSC03PHY41)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of Thermal Physics, Statistical Mechanics.
CO2	Students will demonstrate a proficiency in solving problems in Thermal Physics, Statistical Mechanics.
CO3	Understand the basic concepts of (I) Application of Maxwell's thermodynamic relations, cooling effect observed in case of gases, black body radiation, different radiation laws e.g Wein's, Planck's, Rayleigh-jeans, Stefan -Boltzmann law.(II) Microstate, macro state, phase space, momentum space , thermodynamic probability, distribution of molecular speed.
CO4	Develop the critical skill in students to understand applied knowledge of Thermal Physics, Statistical Mechanics

Unit	Syllabus	Hours
Unit 1	**Thermodynamic Potentials:** Energy functions of Enthalpy, Gibbs free energy, Helmholtz free energy, Internal energy, Maxwell's thermodynamical relations, Joule-Thomson effect, Clausius- Clapeyron equation, Expression for ($C_P - C_V$), C_P/C_V, TdS equations. **Theory of Radiation:** Thermal radiations, Blackbody radiation and its importance, Black body in practice and 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.	15
Unit 2	**Classical statistics:** Degrees of freedom, Momentum space, Position space, 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. **Quantum statistics:** Need of quantum statistics, Comparison of M.B., B.E., and F.D. statistics, Bose-Einstein distribution law, Photon gas, Fermi-Dirac distribution law, Free electron in metal, Electron gas.	15

Reference Books:

1. Heat and Thermodynamics- Brij Lal and N. Subramanyam, S. Chand and Co. Ltd., 2002
2. Theory and Experiments on Thermal Physics - P K Chakrabarti, New Central Book Agency (P) Limited, 2013
3. Text book of heat- J.B. Rajam , S. Chand and company Ltd, 1967
4. Statistics and Thermal Physics – S. Lokanathan, R. Gambhir, PHI learning Pvt. Ltd., 2011
5. Thermodynamics and Statistical Physics – Sharma and Sarkar, Himalaya Publishing House, 2005
6. Heat Thermodynamics and Statistical physics- J.P. Agrawal and SatyaPrakash, Pragati Prakashan, 2020

B.Sc. II, Semester-IV (DSC-VIII)
Optics
(DSC03PHY42)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of Optics.
CO2	Students will demonstrate a proficiency in solving problems in Optics.
CO3	Understand the basic concepts of (I) Geometrical optics, cardinal points, lens system, resolving power of various optical instrument (II) Detail concepts of polarization, interference, and diffraction.
CO4	Develop the critical skill in students to understand applied knowledge of Optics.

Unit	Syllabus	Hours
Unit 1	**Cardinal points:** 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. **Resolving Power of optical instruments:** Resolution, Resolving power of optical instruments: telescope and microscope, Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion, Comparison between magnification and resolution, Resolving power of plane diffraction grating and prism. **Polarization of light:** Revision of plane of vibration, Plane of polarization, Perpendicular vibration, Parallel vibrations, Polarization by reflection and refraction, Idea of polarization, Polarization by double refraction, Huygen's explanation of double refraction through uniaxial crystals, Nicol prism (construction and working), Production and detection of circularly and elliptically polarized light, Optical rotation - laws of rotation of plane of polarization, Polarimeter.	15
Unit 2	**Interference:** Principle of Superposition, Coherence and condition for interference, Division of amplitude and division of wave front, Division of wave front – Lloyd's single mirror (determination of wavelength 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. **Diffraction:** 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.	15

Reference books:

1. Text book of optics for B.Sc.- Brij Lal and N. Subrahmanyam, S. Chand & Co. Ltd. New Delhi, 2006.
2. Optics- Ajay Ghatak, 2nd Edition, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi, 2012
3. Wave Optics- R. K. Verma, Discovery Publishing House New Delhi, 2006
4. A text book of light - D. N. Vasudeva, 8th Edition, Atma Ram & Sons, Delhi,1976
5. Fundamentals of Optics -Francies A. Jenkins and Harvey E. White, 4th Edition, Tata McGraw-Hill Education Private Ltd., New Delhi, 2011

B.Sc. II Physics Lab Work (Practical)
DSC Physics Lab IV
(DSC03PHY49)
Group I
(Thermal Physics and Statistical Mechanics II)

1. To determine the temperature coefficient of resistance using post office box.
2. To verify Stefan's fourth power law.
3. To determine specific heat of graphite.
4. To determine the ratio of specific heat of air by Kundt's tube.
5. Temperature of flame
6. To determine the coefficient of thermal conductivity of glass in the form of tube.
7. To determine the thermal conductivity of metal bar by Forbes's method.
8. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.

Group II
(Optics)

1. Goniometer I (Cardinal Points)
2. Goniometer II (Equivalent Focal Length)
3. Resolving Power of Prism
4. Determination of Cauchy's constant
5. Resolving power of grating
6. Determination of wavelength of light using Newton's ring
7. Determination of thickness of thin film using interference of wedge shaped thin film
8. Polarimeter

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination and vocational skill courses (VSC).

Paper No.	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total
V	40	10	50
VI	40	10	50

- There will be practical examination of 50 marks at the end of semester IV
- Distribution of 50 marks of practical is as below

Group I	22
Group II	22
Journal	06
Total	**50**

Nature of Question Paper (Semester End Examination)

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**

Paper V

Q:1] Chose correct alternative

Eight Multiple Choice Questions 8 Marks

9)
10)
11)
12)
13)
14)
15)
16)

Q:2] Long Answer questions (Attempt any **TWO** out of three) 16 Marks

1)
2)
3)

Q.3] Short Answer questions (Attempt any **FOUR** out of six) 16 Marks

1)
2)
3)
4)
5)
6)

B.Sc. II, Semester-III (MIN-V)
Basic Electronics
(MIN03PHY31)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of electronics.
CO2	Students will demonstrate a proficiency in designing electric circuit.
CO3	Understand the basic concepts of (I) semiconductor devices (II) digital electronics.
CO4	Develop the critical skill in students to understand applied knowledge of electronics.

Unit	Syllabus	Hours
Unit 1	**Semiconductor Diodes and Applications:** Introduction to semiconductor, p-n junction diode, LED, Zener diode, Rectifier diode, Tunnel diode, Variable capacitance diode, Photodiode, solar cell. **Bipolar Junction Transistor:** BJT Operation, BJT voltages and currents, BJT amplification, Common base, Common emitter, Common collector characteristics, Numerical examples as applicable. **Operational Amplifiers:** Ideal OP-AMP, Inverting and Non-Inverting OP-AMP circuits, OP-AMP applications: voltage follower, addition, subtraction, integration, Differentiation, Numerical examples as applicable.	15
Unit 2	**Digital Electronics:** Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion, Complement of Binary Numbers, Boolean Algebra Theorems, De Morgan's theorem, Digital Circuits, Logic gates: Fundamental and derived gates, NAND Implementation, NOR Implementation, Half adder, Full adder. **Communication Systems:** Introduction, Elements of Communication Systems, Modulation: Amplitude Modulation, Spectrum Power, AM Detection (Demodulation), Frequency and Phase Modulation, Comparison between Amplitude and Frequency Modulation	15

Reference books:

1) Semiconductor Devices – S. M. Sze, M. K. Lee, 3rd edition, John Wiley & Sons, Inc., 2002
2) Solid state devices and electronics – K. Singh, and S.P. Singh, S Chand & Co. Ltd., 2000
3) Basic electronics solid state – B.L. Theraja, S. Chand, 2006
4) Basic electronics devices and circuits - M. L. Anand, S. Chand, 2019
5) Principles of electronics – V.K. Mehata, Rohit Mehta, S. Chand, 2022

B.Sc. II Semester-III (MIN-VI)

Energy Studies

(MIN03PHY32)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of energy.
CO2	Students will demonstrate a proficiency in solving problems in energy.
CO3	Understand the basic concepts of solar cell, solar PV panel, wind energy etc.
CO4	Develop the critical skill in students to understand applied knowledge of energy.

Unit	Syllabus	Hours
Unit 1	**Energy:** Man and Environment, Energy and Thermodynamics, Some well-known Forms of Energy, Energy Chains, Energy Resources, Energy Demands, Age of Renewables and Alternatives. **Solar Energy:** Essential subsystems in solar energy plants, Solar energy chains, Solar energy from satellite station through microwave to earth station, Solar photovoltaic systems, Merits and limitation of solar PV Panel system, Power of solar cell and solar PV panel. **Wind Energy:** Application of wind energy, wind power density, Types of wind, Turbine Generator unit, Planning of wind farm, Horizontal axis propeller type wind turbine generator units, Mono, Twin and Three blade HAWT.	15
Unit 2	**Biomass Energy:** Origin of biomass, Biomass energy resources, Biomass conversion processes. **Ocean Energy:** Ocean energy resources, Off-shore and on-shore ocean energy conversion technologies, advantages and limitations of ocean-energy conversion, The guidelines for ocean energy conversions plants, Ocean energy.	15

Reference Books

1. Non-conventional Energy sources – G. D. Rai, Khanna Publisher, 1988
2. Solar energy and Non- conventional energy sources – V. M. Dhomkundwar, Dhanpat Rai & Co., 2022
3. Renewable energy sources and emerging technologies – D.P.Kothari, R. Ranjan, 3rd edition, PHI Learning, 2021

B.Sc. II Physics SEM III
Lab Work (Minor Practical)
(MIN03PHY39)
Min-Physics Lab III

1) Verification of truth table of basic gates (AND, OR, NOT) using ICs.
2) Construction of basic gates (AND, OR, NOT) using NOR and NAND gates
3) Construction and study of half adder using NAND gates.
4) Construction and study of full adder using NAND gates.
5) Study of Colpitts oscillator
6) Study of Hartley Oscillator
7) Study of low pass and high pass filter using resistance and capacitance
8) To study input out characteristics of solar cell
9) To study about solar lighting
10) To study of solar cooker
11) To study of wind energy
12) To study of characteristics of LDR

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination and vocational skill courses (VSC).

Paper No.	**Semester End Examination (SEE)**	**Continuous Internal Evaluation (CIE)**	**Total**
V	40	10	50
VI	40	10	50

- There will be practical examination of 25 marks at the end of semester III
- Distribution of 25 marks of practical is as below

Group I	22
Journal	03
Total	**25**

Nature of Question Paper (Semester End Examination)

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**

Paper V

Q:1] Chose correct alternative

Eight Multiple Choice Questions 8 Marks

1)
2)
3)
4)
5)
6)
7)
8)

Q:2] Long Answer questions (Attempt any **TWO** out of three) 16 Marks

1)
2)
3)

Q.3] Short Answer questions (Attempt any **FOUR** out of six) 16 Marks

1)
2)
3)
4)
5)
6)

B.Sc. II, Semester-IV (MIN-VII)

Mathematical & Thermal Physics

(MIN03PHY41)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of Mathematical & Thermal Physics.
CO2	Students will demonstrate a proficiency in solving problems in Mathematical & Thermal Physics.
CO3	Understand the basic concepts of complex number, matrix, Basic Concepts of Thermodynamics.
CO4	Develop the critical skill in students to understand applied knowledge of Thermodynamics.

Unit	Syllabus	Hours
Unit 1	**Complex Numbers**: Introduction to complex numbers, geometrical representation of imaginary number, Argand diagram, Addition of complex numbers, Addition of complex numbers by geometry, Subtraction, Types of complex numbers, power of 'i', De-Moivre's theorem (statement only), problems. **Matrix:** Introduction, Definition, Types of matrices, Addition of matrix, Subtraction of matrix, Scalar multiple of matrix, Multiplication, Properties of multiplication, Inverse of matrix, Rank of matrix, Problems.	15
Unit 2	**Basic Concepts of Thermodynamics:** Thermodynamic state of a system, Thermal Equilibrium, Zeroth law of Thermodynamics, Internal Energy of System-Concept of heat, Equation of State for a perfect Gas, First law of Thermodynamics, Thermodynamic Processess-Isothermal, Adiabatic, Isobaric, Isochoric, Adiabatic relations of system for perfect gas, Work done during Isothermal and Adiabatic changes, Reversible and Irreversible changes. Problems. **Laws of Thermodynamics:** Conversion of Heat into Work, Reversible and Irreversible Processes, Carnot's Cycle and Carnot's Heat Engine and its efficiency, second law of Thermodynamics-(Statements only), Carnot Theorem, Entropy, Principle of Increase in Entropy, Generalized form of the First and Second laws: i) Entropy changes for an Ideal Gas, ii) Entropy of van der Waals' gas, Problems	15

Reference books:

1) Mathematical Physics -B. S. Rajput, 25th edition, Pragati Prakashan, Meerut, 2013
2) Mechanics – D. S. Mathur, S. Chand & Co. Ltd., New Delhi, 2009
3) Heat Thermodynamics and Statistical Physics - Brij Lal & N Subrahmanyam, S. Chand & Co. Ltd., 2012
4) Mathematical Physics – B. D. Gupta, 3rd edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2009

B.Sc. II, Semester-IV (MIN-VIII)

Environmental Physics

(MIN03PHY42)

Course Outcomes: After the completion of the course the student will be able to:

CO1	Demonstrate and understand the applied knowledge of Environment.
CO2	Students will demonstrate a proficiency in solving problems in Atmosphere and Energy.
CO3	Understand the basic concepts of Energy Transport in the Atmosphere and to the Poles, Vertical Structure of the Atmosphere.
CO4	Develop the critical skill in students to understand applied knowledge of Environment.

Unit	Syllabus	Hours
Unit 1	**Environmental Pollution:** Environmental Problems, Standards for Environmental Quality, Sun Light and the Solar Spectrum, Photosynthesis, Greenhouse Effect, Human Induced Changes, Natural Changes, Ozone and Life, Solar UV and Biological Molecules, The Ozone Filter, Ozone in the Troposphere.	15
Unit 2	**Atmosphere and Energy:** Energy Transport in the Atmosphere and to the Poles, Vertical Structure of the Atmosphere, Vertical Motion of Humid Air, The Adiabats, Cumulus Cloud Formation, Horizontal Motion of Air, Newton's Equations of Motion, Geostrophic Flow, Origin of Pressure Difference, Atmosphere-Ocean Interaction, The Big Oceans, EL Nino and NAO.	15

Reference books:

1) Environmental Pollution – R. K. Khitoliya, S.Chand Publication, 2012
2) Textbook of environmental chemistry and Pollution control - S. S. Dara, D. D. Mishra, S. Chand Publication, 2012
3) The Earths Atmosphere – K. Saha, Springer Berlin Heidelberg, 2008

B.Sc. II Physics SEM VI
Lab Work (Minor Practical)
(MIN03PHY49)
Min-Physics Lab IV

1. To determine Coefficient of Thermal Conductivity of a bad conductor by Lees method.
2. To determine temperature coefficient of resistance by platinum resistance thermometer.
3. To calibrate Resistance Temperature Device (RTD) using null method / off-balance bridge.
4. Surface Tension of liquid by Capillary method.
5. Measurement of log decrement by Exponential Decay.
6. Numerical Integration.
7. Numerical Differentiation.
8. Solution of ordinary differential equation.
9. Demonstration of Training modules on Solar energy, wind energy, etc.
10. Conversion of thermal energy into voltage using thermoelectric effect.
11. Familiarization with renewable energy gadgets.
12. To study biogas plants.

B.Sc. II Physics SEM III
Lab Work (Minor Practical)
(MIN03PHY39)
Min-Physics Lab III

1) Verification of truth table of basic gates (AND, OR, NOT) using ICs.
2) Construction of basic gates (AND, OR, NOT) using NOR and NAND gates
3) Construction and study of half adder using NAND gates.
4) Construction and study of full adder using NAND gates.
5) Study of Colpitts oscillator
6) Study of Hartley Oscillator
7) Study of low pass and high pass filter using resistance and capacitance
8) To study input out characteristics of solar cell
9) To study about solar lighting
10) To study of solar cooker
11) To study of wind energy
12) To study of characteristics of LDR

Evaluation Scheme

- The total marks for each paper will be 50.
- There will be semester end examination (SEE) of 40 marks for each paper.
- There will be continuous internal evaluation (CIE) of 10 marks for each paper.
- There will be separate passing for SEE, CIE, practical examination and vocational skill courses (VSC).

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Paper No.	Semester End Examination (SEE)	Continuous Internal Evaluation (CIE)	Total
VII	40	10	50
VIII	40	10	50

- There will be practical examination of 25 marks at the end of semester IV
- Distribution of 25 marks of practical is as below

Group I	22
Journal	03
Total	**25**

Nature of Question Paper (Semester End Examination)

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**

Paper V

Q:1] Chose correct alternative

Eight Multiple Choice Questions 8 Marks

1)
2)
3)
4)
5)
6)
7)
8)

Q:2] Long Answer questions (Attempt any **TWO** out of three) 16 Marks

1)
2)
3)

Q.3] Short Answer questions (Attempt any **FOUR** out of six) 16 Marks

1)
2)
3)
4)
5)
6)

B.Sc. II, Semester-III
(Fundamental of astrophysics and astronomy)
VSC-PR-II
(VSC03PHY39)

1) Study of solar spectrum.
2) Sunspots activity analysis.
3) Measurement of wavelength using F. P. Etalon.
4) Solution of ordinary differential equations.
5) Lummer Brothum Photometer (comparison of intensities)
6) Spherical aberration (caustic curve).
7) Resolving power of telescope.
8) Magnifying power of telescope.
9) Determination of Planck's constant using LED
10) Goniometer: Equivalent focal length
11) Study of scattering of light (Diameter of Lycopodium powder).
12) Verification of Stefan's forth power law.

Distribution of 25 marks of practical is as below

VSC-PR-II	**22**
Journal	**03**
Total	**25**

B.Sc. II, Semester-IV
(Galaxies and Cosmic Electrodynamics)
(VSC-PR-III)
(VSC03PHY49)

1) I-V Characteristics of solar cell and verification of inverse square law of intensity.
2) Velocity of sound using CRO and microphone.
3) Study of Lissajous figures using CRO.
4) D.C. Amplifier using Operational amplifier.
5) Measurement of Earth's magnetic field using Earth inductor.
6) Measurement of wavelength of given LASER source using diffraction grating.
7) Phase shift measurement RC network using CRO.
8) Study of hysteresis curve using CRO.
9) Calibration of spectrometer.
10) Study of Balmer lines.
11) Measurement and identification of spectral lines.
12) Band absorption spectrum of liquid ($KMnO_4$ solution).

Distribution of 25 marks of practical is as below

VSC-PR-III	**22**
Journal	**03**
Total	**25**