

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)



Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for

Program: Bachelor of Science

Course: T.Y.B.Sc
(AS PER NEP 2020)

Subject: Physics

Choice Based Credit System (CBCS)

with effect from

Academic Year 2025-2026

Deccan Education Society's
Kirti M. Doongursee College (Autonomous)
Proposed Curriculum For T.Y.B.Sc. as per NEP 2020
Year of implementation- 2025-26
Name of the Department: PHYSICS

Semester	Course Code	Course Title	Vertical	Credit
V	25PHYMJ511	Solid State Physics	Major	2
	25PHYMJ512	Atomic & Molecular Physics	Major	2
	25PHYMJ513	Electrodynamics	Major	2
	25PHYMJ514	Physics in Indian Knowledge System (IKS)	Major	2
	25PHYEL511	Analog Circuits, Instruments and Consumer Appliances	Elective	2
	25PHYMN521	Electricity & Magnetism	Minor	2
	25PHYVS541	Electronics	VSC	2
	25PHYMJP51	Physics Major Practical	Major Practical	2
	25PHYELP51	Practicals on Analog Circuits, Instruments and Consumer Appliances	Elective Practical	2

	25PHYMNP51	Practicals on Electricity & Magnetism	Minor Practical	2
	25PHYF561		Field Project	2
VI	25PHYMJ611	Classical Mechanics	Major	2
	25PHYMJ612	Mathematical Methods in Physics & Statistical Mechanics	Major	2
	25PHYMJ613	Nuclear Physics	Major	2
	25PHYMJ614	Special Theory of Relativity	Major	2
	25PHYEL611	Digital Electronics, Microprocessor, Microcontroller and OOP	Elective	2
	25PHYMN621	Electrodynamics & Communication systems	Minor	2
	25PHYOJT61		OJT	4
	25PHYMJP61	Physics Major Practical	Major Practical	2
	25PHYELP61	Practicals on Digital Electronics, Microprocessor, Microcontroller and OOP	Elective Practical	2
	25PHYMNP61	Practicals on Electrodynamics & Communication Systems	Minor Practical	2

SEM-V

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ511	PAPER I - Solid State Physics	2	2
Course Objectives: On successful completion of this course students will be able to: CO1: Remember the basics of crystal structure, properties of metal, semiconductors and superconductivity. CO2: Understand the basics of crystallography, Electrical properties of metals, Band Theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity. CO3: Demonstrate quantitative problem solving skills in all the topics covered. CO4: Analyze and solve problems based on Miller indices, fermi energy, carrier . concentration, superconductivity.			
Unit	Topics	No of Lectures	
I	Crystal Physics 1. The crystalline state, Basic definitions of crystal lattice, basis vectors, unit cell, primitive and non-primitive cells, The fourteen Bravais lattices and the seven crystal systems, elements of symmetry, nomenclature of crystal directions and crystal planes, Miller Indices, spacing between the planes of the same Miller indices, examples of simple crystal structures, The reciprocal lattice and X-ray diffraction. Ref: Elementary Solid State Physics-Principles and Applications: M. Ali Omar, Pearson Education, 2012 : (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 2.6) Electrical properties of metals: 2. Classical free electron theory of metals, Drawbacks of classical theory, Relaxation time, Collision time and mean free path 3. Quantum theory of free electrons, Fermi Dirac statistics and electronic distribution in solids, Density of energy states and Fermi energy, The Fermi distribution function, Heat capacity of the Electron gas, Mean energy of electron gas at 0 K, Electrical conductivity from quantum mechanical considerations, Failure of Sommerfeld's free	15	

	electron Theory Ref.: Solid State Physics: S. O. Pillai, New Age International. 6th Ed. Chapter 6: II, III, IV, V, XIV, XV, XVI, XVII, XVIII, XX, XXXV, XXXI.	
II	1. Band theory of solids, Brillouin zones, Number of wave functions in a band, Motion of electrons in a one-dimensional periodic potential, Distinction between metals, insulators and intrinsic semiconductors. Ref.: Solid State Physics: S. O. Pillai, New Age International, 6th Ed. Chapter 6: XXXVI, XXXVII, XXXVIII, XXXIX, XXXX, XXXXI 2. Electrons and Holes in an Intrinsic Semiconductor, Conductivity of a Semiconductor, Carrier concentrations in an intrinsic semiconductor, Donor and Acceptor impurities, Charge densities in a semiconductor, Fermi level in extrinsic semiconductors, Diffusion, Carrier lifetime, The continuity equation, Hall Effect. Ref.: Electronic Devices and Circuits: Millman, Halkias & Satyabrata Jit. (3rd Ed.) Tata McGraw Hill.: 4.1 to 4.10. 3. Semiconductor-diode Characteristics: Qualitative theory of the p-n junction, The p-n junction as a diode, Band structure of an open-circuit p-n junction, The current components in a p-n junction diode, Quantitative theory of p-n diode currents, The Volt-Ampere characteristics, The temperature dependence of p-n characteristics, Diode resistance. Ref.: Electronic Devices and Circuits: Millman, Halkias & Satyabrata Jit. (3rd Ed.) Tata McGraw Hill.: 5.1 to 5.8 4. Superconductivity: Experimental Survey, Occurrence of Superconductivity, destruction of superconductivity by magnetic field, The Meissner effect, London equation, BCS theory of superconductivity, Type I and Type II Superconductors, Vortex state. Ref.: Introduction to Solid State Physics-Charles Kittel, 7th Ed. John Wiley & Sons: Topics from Chapter 12	15
References: 1. Elementary Solid State Physics-Principles and Applications: M.Ali Omar, Pearson Education, 2012. 2. Solid State Physics: S. O. Pillai, New Age International, 6th Ed. 3. Electronic Devices and Circuits: Millman, Halkias & Satyabrata Jit. (3rd Ed.) Tata McGraw Hill. 4. Introduction to Solid State Physics - Charles Kittel, 7th Ed. John Wiley & Sons.		

5. Modern Physics and Solid State Physics: Problems and solutions New Age International.

Additional References:

1. Solid State Physics: A. J. Dekker, Prentice Hall.
2. Electronic Properties of Materials: Rolf Hummel, 3rd Ed. Springer.
3. Semiconductor Devices: Physics and Technology, 2nd Ed. John Wiley & Sons.
4. Solid State Physics: Ashcroft & Mermin, Harcourt College Publisher.

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ512	PAPER II- Atomic and Molecular Physics	2	2
Course Objectives: Upon successful completion of this course, the student will understand CO1: To remember the laws and formulas in quantum mechanics. CO2: To Understand the importance of electron spin, symmetric and antisymmetric wave functions and vector atom model, effect of magnetic field on atoms and its application CO3: To apply quantum mechanical concept to solve numericals in atomic and molecular physics CO4: To Analyse the concepts of Atomic and Molecular Physics such as L-S, J-J coupling, stokes and antistoke lines, types of Zeeman effect etc.			
Unit	Topics	No of Lectures	
I	1. Hydrogen atom: Schrödinger's equation for Hydrogen atom, Separation of variables, Quantum Numbers: Total quantum number, Orbital quantum number, Magnetic quantum number. Angular momentum, Electron probability density (Radial part). 2. Electron spin: The Stern-Gerlach experiment, Pauli's Exclusion Principle Symmetric and Anti-symmetric wave functions. Ref – Unit – I - B: 9.1 to 9.9, B: 10.1, 10.3. 2	15	

	3. Spin orbit coupling, Total angular momentum, Vector atom model, L-S and j-j coupling. Origin of spectral lines, Selection rules. 4. Effect of Magnetic field on atoms, the normal Zeeman effect and its explanation (Classical and Quantum), The Lande g - factor, Anomalous Zeeman effect. Ref – Unit – II - B: 10.2, 10.6, 10.7, 10.8, 10.9. B : 11.1 and 11.2	
II	1. Molecular spectra (Diatomic Molecules): Rotational energy levels, Rotational spectra, Vibrational energy levels, Vibrational-Rotational spectra. Electronic Spectra of Diatomic molecules: The Born-Oppenheimer approximation, Intensity of vibrational-electronic spectra: The Franck-Condon principle. 2. Infrared spectrometer & Microwave spectrometer Ref – Unit – III - B: 14.1, 14.3, 14.5, 14.7 3. Raman effect: Quantum Theory of Raman effect, Pure Rotational Raman spectra: Linear molecules, symmetric top molecules, Asymmetric top molecules, Vibrational Raman spectra: Raman activity of vibrations, Experimental set up of Raman Effect. 4. Electron spin resonance: Introduction, Principle of ESR, ESR spectrometer 5. Nuclear magnetic resonance: Introduction, principle and NMR instrumentation. Ref – Unit – IV 1. BM: 6.11, 6.1.3. 2, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.3.1. 2. GA: 8.6.1, 11.1, 11.2 and 11.3, 10.1, 10.2, 10.3	15
References: 1. B: Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGraw Hill. 2. BM: Fundamentals of Molecular Spectroscopy : C. N. Banwell & E. M. McCash (TMH).(4th Ed.) 3. GA: Molecular structure and spectroscopy : G Aruldas (2nd Ed) PHI learning Pvt Ltd. 4. Atomic Physics (Modern Physics): S.N.Ghoshal. S.Chand Publication (for problems on atomic Physics).		

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ513	PAPER III - Electrodynamics	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember the laws of electrodynamics and be able to perform calculations using them. CO2: Understand Maxwell's electrodynamics and its relation to relativity CO3: Apply electromagnetic principles to derive optical laws. CO4: Analyse quantitative problem solving skills.			
Unit	Topics	No of Lectures	
I	Electrostatics 1. Review of Coulomb & Gauss law, The divergence of E , Applications of Gauss law, The curl of E . The classic image problem- point charge and grounded infinite conducting plane and conducting sphere. DG: 2.1.1 to 2.1.3, 2.2.2 to 2.2.4, 2.3.1 to 2.3.4 DG: 3.1.1 to 3.1.4, 3.1.5, 3.1.6, 3.2.1 to 3.2.4 Electrostatics in Matter and Magnetostatics 1. Dielectrics, Induced Dipoles, Alignment of polar molecules, Polarization, Bound charges and their physical interpretation, Gauss' law in presence of dielectrics, A deceptive parallel, Susceptibility, Permittivity, Dielectric constant and relation between them, Energy in dielectric systems. 2. Review of Biot-Savart's law and Ampere's law, Straight-line currents, Applications of Ampere's Law in the case of a long straight wire and a long solenoid. DG: 4.1.1 to 4.1.4, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, 4.4.3 DG: 5.2.1, 5.3.1 to 5.3.4, 5.4.1	15	
II	Magnetostatics in Matter and Electrodynamics 1. Review of Ampere's law in magnetized materials, 2. Energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's correction to Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, Boundary conditions. DG: 6.1.1, 6.1.4, 6.2.1, 6.2.2, 6.2.3, 6.3.1, 6.3.2, 6.4.1	15	

	DG: 7.2.4, 7.3.1 to 7.3.6 Electromagnetic Waves 1. The continuity equation, Poynting's theorem 2. The wave equation for E and B, Monochromatic Plane waves, Energy and momentum in electromagnetic waves, Propagation in linear media, Reflection and transmission of EM waves at normal incidence, Reflection and transmission of EM waves at oblique incidence. DG : 8.1.1, 8.1.2 DG : 9.2.1 to 9.2.3, 9.3.1 to 9.3.3	
References: 1. DG: Introduction to Electrodynamics, David J. Griffiths (3rd Ed) Prentice Hall of India. 2. Introduction to Electrodynamics: A. Z. Capria and P. V. Panat, Narosa Publishing House. 3. Engineering Electrodynamics: William Hayt Jr. & John H. Buck (TMH). 4. Foundations of Electromagnetic Theory: Reitz, Milford and Christy. 5. Solutions to Introduction to Electrodynamics: David J. Griffiths (3rd Ed) Prentice Hall of India.		

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ514	Physics in Indian Knowledge System (IKS)	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Recall ancient Indian astronomical techniques and their applications. CO2: Explain ancient Indian astronomical techniques and their applications. CO3: Use ancient Indian astronomical techniques to solve basic astronomical problems. CO4: Differentiate between various ancient Indian astronomical techniques and their specific applications.			
Unit	Topics	No of Lectures	
I	Celestial Predictions and Measurements Basic Framework of Indian Astronomy: Concepts of the celestial sphere, ecliptic, and equatorial systems, Ancient Indian perspectives on the motion of celestial bodies. Time and Calendar Systems: Solar and lunar calendars in Indian tradition, Intercalation methods (Adhik Maas) and their scientific basis, Introduction to Panchang: Tithi, Nakshatra, and Karana. Planetary and Stellar Positions: Observing and predicting the positions of planets and stars, Use of Nakshatras as a reference for celestial measurements. Epicycles and Geometric Models: Explanation of planetary motion using epicycles and eccentric circles, Comparisons with modern elliptical orbits. Practical Applications in Ancient Astronomy: Calculating solstices, equinoxes, and seasonal changes, Determining auspicious times using celestial data.	15	
II	Eclipses, Conjunctions, and Astronomical Distances Eclipses in Indian Astronomy: Types of eclipses: Solar and lunar, Predictions using ancient Indian methods (Aryabhatiya, Surya Siddhanta), Role of parallax and shadow geometry Conjunctions and Yutis: Understanding planetary conjunctions (Yutis) and their significance, Observing and recording celestial intersections Astronomical Distances and Scaling: Concepts of angular measurement in celestial objects, Techniques to estimate distances between celestial bodies Tools and Techniques in Ancient Astronomy: Gnomons,	15	

	water clocks, and celestial charts, Applications of these tools in distance measurement and prediction, Integration with Modern Tools: Simulating eclipses and conjunctions using Stellarium, Bridging ancient methods with modern astronomical software.	
References: Indian Astronomy: An Introduction by S. Balachandra Rao Unit I Celestial Predictions and Measurements: (Introduction to Celestial Sphere and Ecliptic Systems: Pages 5–12., Time and Calendar Systems: Pages 35–42, Nakshatras and their Role: Pages 43–48, Planetary and Stellar Positions: Pages 49–53, Epicycles and Geometric Models: Pages 54–61) Unit II Eclipses, Conjunctions, and Astronomical Distances: (Eclipses in Indian Astronomy: Pages 65–72, Prediction Techniques for Eclipses: Pages 73–78, Yutis (Conjunctions) and Significance: Pages 79–83, Parallax and Shadow Geometry: Pages 84–90, Angular Measurements and Distances: Pages 91–95)		

Course Code	Course Title	Credits	Lectures/ Week
25PHYEL511	ELECTIVE - ANALOG CIRCUITS, INSTRUMENTS AND CONSUMER APPLIANCES	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember the formulae, circuit and block diagrams of the different devices. CO2: Understand the concept of signal conditioning, devices used and their operations. Understand the difference between a transducer and a sensor. CO3: Apply: Get the insight of the modern medical instruments in principle, which are used in day to day life. CO4: Analyze/design and implement combinational logic circuits.			
Unit	Topics	No of Lectures	
I	Transducers, Sensors and Optoelectronic Devices 1. Transducers: Definition, Classification, Selection of transducer. 2. Electrical transducers: Thermistor, Thermocouple, Pressure Transducer: Strain gauges (wire, foil, & semiconductor), Displacement transducer: LVDT, Piezo-electric Transducer. [Ref. 2, 3, 6 & 9] 3. Chemical sensors: PH sensor, Gas sensor (Fundamental aspects), Humidity sensor (Resistive). [R6 R7]. 4. Electronic Weighing Systems: Operating principle, Block diagram, features [Ref12 & 13]. 5. Optoelectronic Devices: LDR, LED (Construction, Working & Applications), Multicolour LED, Seven Segment Display, Liquid Crystal Display (LCD), Photodiode (construction, Characteristics & applications), Phototransistor. [Ref. 1, 2 & 3] Signal Conditioning, SMPS and Measuring Instruments	15	

	1. Half wave precision rectifier, Active Peak detector, Active Positive Clamper 2. Active Positive and Negative Clippers 3. Microphones: characteristics, types (list only), carbon microphone and dynamic type microphone (principle, construction and working) 4. Loud speakers: Characteristics, Dynamic (Moving coil type) speaker, Multi-way speaker system (woofer and tweeter) 5. Switching Regulators: Basic and Monolithic Switching regulators (buck, boost and buck – boost) (Only basic Configurations) 6. Digital Storage Oscilloscope 7. DMM: 3 ½ Digit, resolution and sensitivity, general specification.	
II	Data Acquisition and Conversion 1. Data acquisition system: Objectives of DAS, Signal conditioning of inputs, Single channel Data Acquisition system, Multichannel Data Acquisition system. [Data Transmission systems IEEE-488 GPIB*] 2. D to A Converters: Resistive divider network, Binary ladder network. 3. A to D Converters: Successive approximation type, Voltage to Time (Single slope, Dual slope). Modern Techniques and Appliances 1. Printed Circuit Board: Idea of PCB, advantages, copper clad, Etching processes, Principle of Photolithography (For PCB). 2. Microwave Oven: Operating principle, block	15

	diagram, features. 3. Medical instruments: Bio-Potential, Types of electrodes, ECG, EEG, EMG, CT Scan and MRI (principle, block diagram and features), Ultrasonography: working principle	
References: 1. MB: Electronic Principles, Malvino & Bates -7th Ed TMH Publication. 2. AM: Electronic Devices and Circuits, Allen Mottershead -PHI Publication. 3. A Textbook of Applied Electronics – R S Sedha, S Chand & Company, New Delhi. 4. Basic Electronics Solid state - B. L. Thereja, S Chand & Company, New Delhi. 5. Electronic Instrumentation – H S Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.		

Course Code	Course Title	Credits	Lectures/ Week

25PHYMN521	Minor - Electricity and Magnetism	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Remember the laws of electrostatics and magnetostatics. CO2: Understand Maxwell's electrodynamics and Maxwell's equations CO3: Implement the electrostatic and magnetostatic laws to solve problems. CO4: Analyse quantitative problem solving skills.			
Unit	Topics	No of Lectures	
I	Electrostatics 1. Review of Coulomb & Gauss law, The divergence of $\mathbf{E}$, Applications of Gauss law, The curl of $\mathbf{E}$. The classic image problem- point charge and grounded infinite conducting plane and conducting sphere. DG: 2.1.1 to 2.1.3, 2.2.2 to 2.2.4, 2.3.1 to 2.3.4 DG: 3.1.1 to 3.1.4, 3.1.5, 3.1.6, 3.2.1 to 3.2.4 Electrostatics in Matter 1. Dielectrics, Induced Dipoles, Alignment of polar molecules, Polarization, Bound charges and their physical interpretation, Gauss' law in presence of dielectrics, A deceptive parallel, Susceptibility, Permittivity, Dielectric constant and relation between them, Energy in dielectric systems.	15	
II	Magnetostatics 1. Review of Biot-Savart's law and Ampere's law, Straight-line currents, Applications of Ampere's Law in the case of a long straight wire and a long solenoid. DG: 4.1.1 to 4.1.4, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, 4.4.3 DG: 5.2.1, 5.3.1 to 5.3.4, 5.4.1 2. Magnetostatics in Matter and Electrodynamics Review of Ampere's law in magnetized materials, Energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's correction to Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, Boundary conditions. DG: 6.1.1, 6.1.4, 6.2.1, 6.2.2, 6.2.3, 6.3.1, 6.3.2, 6.4.1 DG: 7.2.4, 7.3.1 to 7.3.6	15	

References:

1. DG: Introduction to Electrodynamics, David J. Griffiths (3rd Ed) Prentice Hall of India.
2. Introduction to Electrodynamics: A. Z. Capria and P. V. Panat, Narosa Publishing House.
3. Engineering Electrodynamics: William Hayt Jr. & John H. Buck (TMH).
4. Foundations of Electromagnetic Theory: Reitz, Milford and Christy.
5. Solutions to Introduction to Electrodynamics: David J. Griffiths (3rd Ed) Prentice Hall of India.

Course Code	Course Title	Credits	Lectur es/ Week
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25PHYVS541	VSC - Electronics	2	4
Learning Outcome: On successful completion of this course students will be able to : CO1: Recall the basic principles, components, and configurations used in electronic circuits. CO2: Explain the working and applications of various electronic circuits and devices. CO3: Use electronic components and instruments to design and implement basic circuits. CO4: Differentiate between different circuit configurations based on their performance and functionality.			

Sr No	Name of the Experiment
1	JFET as a common source amplifier
2	JFET as switch (series and shunt)
3	UJT characteristics and relaxation oscillator
4	Study of Pulse width modulation (BB)
5	Study of Pulse position modulation (BB)
6	Design and study of transistorized monostable multivibrator (BB)
7	Design and study of transistorized bistable multivibrator (BB)
8	Application of Op-Amp as a Log amplifier
9	Application of IC 555 as a voltage to frequency converter (BB)
10	Application of IC 555 as a voltage to time converter (BB)
11	LM-317 as variable voltage source
12	Shift register

Course Code	Course Title	Credits	Lectures/Week
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25PHYMJP51	PRACTICAL - SEMESTER V	2	4
Course Outcome: On successful completion of this course students will be able to: CO1: Recall fundamental principles, laws, and formulas related to physical phenomena. CO2: Explain the concepts and theories underlying various physics experiments. CO3: Use physical principles and experimental techniques to perform basic experiments. CO4: Distinguish between ideal and practical results through analysis of experimental data.			

Sr No	Name of the Experiment
1	Determination of 'g' by Kater's pendulum
2	Surface tension of soap solution
3	Elastic constants of a rubber tube
4	Design and study of Wien bridge oscillator
5	Logarithmic decrement
6	Searle's Goniometer
7	Determination of Rydberg's constant
8	Edser's 'A' pattern
9	Mutual inductance by BG.
10	Determination of e/m by Thomson's method
11	R. I. by total internal reflection
12	Band gap energy of Ge diode

References:

1. Advanced course in Practical Physics: D. Chattopadhyaya, PC. Rakshit & B. Saha (8th Edition) Book & Allied Pvt. Ltd.
2. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001.
3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition).
4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co. Ltd.
5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge University Press.
6. University Practical Physics: D C Tayal. Himalaya Publication.
7. Advanced Practical Physics: Worsnop & Flint.

Note: Minimum **8** experiments should be completed and reported in the journal, in the fifth semester. **A Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

Course Code	Course Title	Credits	Lectures/Week
25PHYELP51	PRACTICAL - ANALOG CIRCUITS, INSTRUMENTS AND CONSUMER APPLIANCES	2	4
Learning Outcome: On successful completion of this course students will be able to : CO1: Recall fundamental principles, laws, and formulas related to physical phenomena. CO2: Explain the concepts and theories underlying various physics experiments. CO3: Use physical principles and experimental techniques to perform basic experiments. CO4: Distinguish between ideal and practical results through analysis of experimental data.			

Sr No	Name of the Experiment
1	Thermistor Characteristics –Thermal and electrical. (H & C)
2	Thermistor as sensor in temperature to voltage converter using OPAMP. (C&D Ch.8)
3	Study of LVDT characteristics. (K Ch. 13)
4	Study of Load Cell / Strain Guage. (K Ch. 13)
5	Study of seven segment display.
6	Characteristics of Photo diode and photo transistors.
7	Basic Instrumentation Amplifier using 3 Op-Amps coupled to resistance bridge. (C & D Ch. 8)
8	Temperature to frequency Conversion using 555 timer. (C & D Ch.13)
9	OPAMP D/A Converter: Binary weighted resistors.
10	OPAMP D/A Converter: Ladder network. (M & L Ch. 12)
11	Sample and hold circuit using op-amp 741. (G Ch. 8)
12	Peak detector using op-amp 741. (G Ch. 8)
References: 1. Advanced course in Practical Physics: D. Chattopadhyaya, PC. Rakshit & B. Saha (8th Edition) Book & Allied (P) Ltd. 2. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001. 3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition). 4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co. 5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge Univ. Press. 6. University Practical Physics: D C Tayal, Himalaya Publication. 7. Advanced Practical Physics: Worsnop & Flint.	

Note: Minimum **8** experiments should be completed and reported in the journal, in the fifth semester. **A Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

Course Code	Course Title	Credits	Lectures/Week
25PHYMNP51	PRACTICAL - Electricity & Magnetism	2	4
Course Outcome: On successful completion of this course students will be able to: CO1: Recall fundamental principles, laws, and formulas related to physical phenomena. CO2: Explain the concepts and theories underlying various physics experiments. CO3: Use physical principles and experimental techniques to perform basic experiments. CO4: Distinguish between ideal and practical results through analysis of experimental data.			

Sr No	Name of the Experiment
1	Gauss Meter: Determination of Magnetic Field with change in current in a coil.
2	To determine self inductance of a coil by Maxwell bridge.
3	Mutual inductance by BG.
4	L/C by Maxwell's bridge
5	C-R circuit: Determination of capacitance.
6	Determination of e/m by Thomson's method
7	Study of forced oscillations by electromagnetically driven simple pendulum
8	Core losses in transformers
9	To study Capacitance by series bridge.
10	To study Capacitance by parallel bridge.
11	Determination of dielectric constant.
12	L-R circuit: Determination of inductance of a coil.
References: 1. Advanced course in Practical Physics: D. Chattopadhyaya, PC. Rakshit & B. Saha (8th Edition) Book & Allied (P) Ltd. 2. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001. 3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition). 4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co. 5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge Univ. Press. 6. University Practical Physics: D C Tayal, Himalaya Publication. 7. Advanced Practical Physics: Worsnop & Flint.	

Note: A minimum of 08 experiments must be completed from the Minor paper in Semester V. All experiments should be recorded neatly in a certified journal. Submission of the certified journal is compulsory to be eligible for the semester-end practical examination.

SEM-VI

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ611	PAPER I- Classical Mechanics	2	2
Course Objectives: After the completion of the course the student should be able to CO1: Remember the concepts central force, Kepler's laws of orbital motion, degree of			

freedom, constraints, fluid motion, anharmonic oscillator. CO2: Understand the kinds of motions that can occur under a central potential and their applications to planetary orbits, simple concepts from fluid mechanics dynamics of rigid bodies. CO3: Apply quantitative problem solving skill in all the topics covered CO4: Analyze the drastic effect of adding nonlinear corrections to usual problems of mechanics and nonlinear mechanics can help understand the irregularity we observe around us in nature.		
Unit	Topics	No of Lectures
I	Central Force 1. Motion under a central force, the central force inversely proportional to the square of the distance, Elliptic orbits, The Kepler problem. 2. Moving origin of coordinates, Rotating coordinate systems, Laws of motion on the rotating earth, The Foucault pendulum, Larmor's theorem. KRS: 3.13 - 3.15, 7.1 - 7.5. Lagrange's equations 1. D'Alembert's principle, Constraints, Examples of holonomic constraints, examples of nonholonomic constraints, degrees of freedom and generalized coordinates, virtual displacement, virtual work, D'Alembert's principle, illustrative problems. 2. Lagrange's equations (using D'Alembert's principle), properties of Lagrange's equations, illustrative problems, canonical momentum, cyclic or ignorable coordinates. PVP: 4.2 to 4.9, 5.2 to 5.4, 7.2, 7.3.	15
II	Fluid Motion and Rigid body rotation 1. Kinematics of moving fluids, Equation of motion for an ideal fluid, Conservation laws for fluid motion, Steady flow. 2. Rigid dynamics: introduction, degrees of freedom, rotation about an axis: orthogonal matrix, Euler's theorem, Eulerian angles, inertia tensor, angular momentum of rigid body, Euler's equation of motion of rigid body, free motion of rigid body, motion of symmetric top (without notation). KRS : 8.6 to 8.9 PVP: 16.1 to 16.10	15

	Non Linear Mechanics 1. Nonlinear mechanics: Qualitative approach to chaos, The anharmonic oscillator, Numerical solution of Duffing's equation. 2. Transition to chaos: Bifurcations and strange attractors, Aspects of chaotic behavior (Logistic map). BO: 11.1, 11.3 to 11.5	
References: 1. PVP: Classical Mechanics, P. V. Panat (Narosa). 2. KRS: Mechanics : Keith R. Symon, (Addison Wesley) 3rd Ed. 3. BO: Classical Mechanics- a Modern Perspective: V. D. Barger and M. G. Olsson. (Mc Graw Hill International 1995 Ed.) Additional References 1. Classical Mechanics: Herbert Goldstein (Narosa 2nd Ed.). 2. An Introduction to Mechanics: Daniel Kleppner & Robert Kolenkow Tata Mc Graw Hill (Indian Ed. 2007). 3. Chaotic Dynamics- an introduction: Baker and Gollub (Cambridge Univ. Press). 4. Classical Mechanics: J. C. Upadhyaya (Himalaya Publishing House).		

Course Code	Course Title	Credits	Lectures / Week
25PHYMJ612	Paper II- Mathematical Methods in Physics and Statistical Mechanics	2	2
About the Course: The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.			

Course Objectives:

- CO1: To understand the physical phenomena at the undergraduate level and get exposure to important ideas of statistical mechanics.
- CO2: Students are expected to be able to solve simple problems in probability, understand the concept of independent events and work with standard continuous distributions.
- CO3: To understand the functions of complex variables; solve nonhomogeneous differential equations and partial differential equations using simple methods.
- CO4: To analyze and understand the difference between different statistics, classical as well as quantum.

Unit	Topics	No of Lectures
I	Probability Review of basic concepts, introduction, sample space, events, independent events, conditional probability, probability theorems, methods of counting (derivation of formulae not expected), random variables, continuous distributions (omit joint distributions), binomial distribution, the normal distribution, the Poisson distribution. Ref: MB – 15.1-15.9 section 2: 1-5, 11-15, section 3: 1, 3, 4, 5, section 4: 1, 3, 5, 13, 21, section 5: 1, 10, 13, section 6: 1 to 9, section 8: 1 and 3, section 9: 2, 3, 4, 9. Complex functions and differential equations 1. Functions of complex variables: The exponential and trigonometric functions, hyperbolic functions, logarithms, complex roots and powers, inverse trigonometric and hyperbolic functions, some applications. Ref.: MB: 2.11 to 2.16 , section 2: 16 – 2, 3, 8, 9, 10. 2. Second-order nonhomogeneous equations with constant coefficients, partial differential equations, some important partial differential equations in physics, method of separation of variables. Ref : CH :5.2.4, 5.3.1 to 5.3.4 Expected to cover all solved problems. In addition, solve the following problems: 5.17 a to e, 5.23, 5.26, 5.29 to 5.35.	15
	Statistical Thermodynamics Microstates and configurations, derivation of Boltzmann distribution, dominance of Boltzmann distribution, physical meaning of the Boltzmann distribution law, definition of , the canonical ensemble, relating Q to q for an ideal gas, translational partition function, equipartition theorem, energy, entropy ER: 13.1 to 13.5, 14.1, 14.2, 14.4, 14.8, 15.1, 15.4	15

II	Classical and Quantum Statistics The probability of a distribution, The most probable distribution, Maxwell Boltzmann statistics, Molecular speeds. Bose-Einstein statistics, Black-body radiation, The Rayleigh-Jeans formula, The Planck radiation formula, Fermi-Dirac statistics, Comparison of results. AB : 15.2 to 15.5, 16.1 to 16.6	
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References:

1. MB: Mathematical Methods in the Physical sciences: Mary L. Boas Wiley India, 3rd ed.
2. ER: Thermodynamics, Statistical Thermodynamics and Kinetics: T. Engel and P. Reid (Pearson).
3. AB: Perspectives of Modern Physics: Arthur Beiser, (Mc Graw Hill International).
4. CH: Introduction to Mathematical Methods: Charlie Harper (PHI Learning).

Additional References:

1. Mathematical Physics: A K Ghatak, Chua – 1995 Macmillian India Ltd.
2. Mathematical Method of Physics: Riley, Hobson and Bence, Cambridge (Indian edition).
3. Mathematical Physics: H. K. Das, S. Chand & Co.
4. Mathematical Methods of Physics: Jon Mathews & R. L. Walker, W A Benjamin inc.
5. A Treatise on heat: Saha and Srivastava (Indian press, Allahabad)
6. Statistical Physics: F. Reif (Berkeley Physics Course, McGraw Hill)
7. Introductory Statistical Mechanics: R. Bowley and M. Sanchez (Oxford Science Publications).
8. An Introduction to Thermal Physics: D. V. Schroeder (Pearson).
9. PROBABILITY: Schaum's Outlines Series by S. Lipschutz and M. L. Lipson (Mc Graw Hill International).

Course Code	Course Title	Credits	Lectures/ Week
25PHYMJ613	Paper III - Nuclear Physics	2	2
Course Objectives: CO1: Remember the basic properties of alpha, beta and gamma rays, elementary particles. CO2: To understand the fundamental principles and concepts governing classical nuclear and particle physics and have a knowledge of their applications interactions of ionizing radiation with matter the key techniques for particle accelerators the physical processes involved in nuclear power generation. CO3: Apply the concepts of nuclear physics to real life problems and solve the examples on it. CO4: Analyse the fundamental constituents of matter and lay foundation for the understanding of unsolved questions about dark matter, antimatter and other research oriented topics.			
Unit	Topics	No of Lectures	
I	Alpha & Beta Decay 1. Alpha decay: Velocity, energy, and Absorption of alpha particles: Range, Ionization and stopping power, Nuclear energy levels. Range of alpha particles, alpha particle spectrum, Fine structure, long range alpha particles, Alpha decay paradox: Barrier penetration (Gamow's theory of alpha decay and Geiger Nuttal law). 2. Beta decay: Introduction, Velocity and energy of beta particles, Energy levels and decay schemes, Continuous beta ray spectrum-Difficulties encountered to understand it, Pauli's neutrino hypothesis, Detection of neutrino, Energetics of beta decay. 1. IK: 13. 1, 13.2, 13.5, SBP: 4. II. 1, 4. II. 2, 4. II. 3, 1.II.3 2. IK: 14.1, 14.7, SBP: 4. III. 1, 4. III. 2, 4. III. 3, 4. III. 5, SNG : 5.5. Gamma Decay & Nuclear Models 1. Gamma decay: Introduction, selection rules, Internal conversion, nuclear isomerism, Mossbauer effect. 2. Nuclear Models: Liquid drop model, Weizsacker's semi-empirical mass formula, Mass parabolas -	15	

	Prediction of stability against beta decay for members of an isobaric family, Stability limits against spontaneous fission. Shell model (Qualitative), Magic numbers in the nucleus. 1.SBP: 4. IV. 1, 4. IV.2, 4. IV. 3, 4. IV. 4, 9.4 2.SBP: 5.1, 5.3, 5.4, 5.5. AB: 11.6-pages (460,461)	
II	Nuclear Energy & Particle Accelerators 1. Nuclear energy: Introduction, Asymmetric fission - Mass yield, Emission of delayed neutrons, Nuclear release in fission, Nature of fission fragments, Energy released in the fission of U235, Fission of lighter nuclei, Fission chain reaction, Neutron cycle in a thermal nuclear reactor (Four Factor Formula), Nuclear power and breeder reactors, Natural fusion Possibility of controlled fusion. 2. Particle Accelerators: Van de Graaff Generator, Cyclotron, Synchrotron, Betatron and Idea of Large Hadron Collider. 1. SBP: 6.1, 6.3 to 6.9, 9.6, 9.7, 8.1,8.2,8.3 2. SBP: 1.I.4 (i), 1.I.4 (ii), 1.I.4 (iii), 1.I.4 (iv), 6.9, AB: 13.3 Nuclear force & Elementary particles 1. Nuclear force: Introduction, Deuteron problem, Meson theory of Nuclear Force- A qualitative discussion. 2.Elementary particles: Introduction, Classification of elementary particles, Particle interactions, Conservation laws (linear & angular momentum, energy, charge, baryon number & lepton number), particles and antiparticles (Electrons and positrons, Protons and anti-protons, Neutrons and anti neutrons, Neutrinos and anti-neutrinos), Photons, Mesons, Quark model (Qualitative). 1. SBP: 8.6 2. DCT: 18.1, 18.2,18.3, 18.4 , 18.5 to 18.9 AB: 13.5	15
References: 1. AB: Concepts of Modern Physics: Arthur Beiser, Shobhit Mahajan, S Rai Choudhury (6th Ed.) (TMH). 2. SBP: Nuclear Physics, S.B. Patel (Wiley Eastern Ltd.). 3. IK: Nuclear Physics, Irving Kaplan (2nd Ed.) (Addison Wesley). 4. SNG: Nuclear Physics, S. N. Ghoshal (S. Chand & Co.) 5. DCT: Nuclear Physics, D. C. Tayal (Himalayan Publishing House) 5th ed.		

Additional References

1. Modern Physics: Kenneth Krane (2nd Ed.), John Wiley & Sons.
2. Atomic & Nuclear Physics: N Subrahmanyam, Brij Lal.(Revised by Jivan Seshan.) S. Chand.
3. Atomic & Nuclear Physics: A B Gupta & Dipak Ghosh Books & Allied (P) Ltd.
4. Introduction to Elementary Particles: David Griffith, Second Revised Edition, Wiley-VCH.

Course Code	Course Title	Credits	Lecture s/ Week
25PHYMJ614	Paper IV - Special Theory of Relativity	2	2
Course Outcomes: After the completion of the course the student should be able to CO1: Remember the significance of Michelson Morley experiment and failure of the existing theories to explain the null result CO2: Understand the importance of postulates of special relativity, Lorentz transformation equations and how it changed the way we look at space and time, Absolutism and relativity, Common sense versus Einstein concept of Space and time. CO3: Apply the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields. CO4: Analyse and solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.			

Unit	Topics	No of Lectures
I	Introduction to Special theory of relativity: Inertial and Non-inertial frames of reference, Galilean transformations, Newtonian relativity, Electromagnetism and Newtonian relativity. Attempts to locate absolute frame: Michelson- Morley experiment (omit derivation part), Attempts to preserve the concept of a preferred ether frame: Lorentz Fitzgerald contraction and Ether drag hypothesis (conceptual), Stellar aberration, Attempt to modify electrodynamics. Relativistic Kinematics - I: Postulates of the special theory of relativity, Simultaneity, Derivation of Lorentz transformation equations. Some consequences of the Lorentz transformation equations: length contraction, time dilation and meson experiment, The observer in relativity. RR: 1.1 to 1.9, 2.1 to 2.5 Relativistic Kinematics - II: The relativistic addition of velocities, acceleration transformation equations, Aberration and Doppler effect in relativity, The common sense of special relativity. The Geometric Representation of Space-Time: Space-Time Diagrams, Simultaneity, Length contraction and Time dilation, The time order and space separation of events, The twin paradox. RR: 2.6 to 2.8, Supplementary topics A1, A2, A3, B1, B2, B3.	15
II	Relativistic Dynamics: Mechanics and Relativity, The need to redefine momentum, Relativistic momentum, Alternative views of mass in relativity, The relativistic force law and the dynamics of a single particle, The equivalence of mass and energy, The transformation properties of momentum, energy and mass. RR: 3.1 to 3.7 Relativity and Electromagnetism: Introduction, The interdependence of Electric and Magnetic fields, The Transformation for E and B, The field of a uniformly moving point charge, Force and fields near a current-carrying wire, Force between moving charges, The invariance of Maxwell's equations. The principle of equivalence and general relativity, Gravitational red shift.	15

	RR: 4.1 to 4.7. Supplementary topic C1, C2, C3, C4. Note: (A good number of problems to be solved from Resnick).	
References: 1. RR: Introduction to Special Relativity: Robert Resnick (Wiley Student Edition). 2. Special theory of Relativity: A. P. French. 3. Very Special Relativity – An illustrated guide: by Sander Bais - Amsterdam University Press. 4. Chapter 1: Concepts of Modern Physics by Arthur Beiser. 5. Chapter 2: Modern Physics by Kenneth Krane.		

Course Code	Course Title	Credits	Lectures/ Week
25PHYEL611	ELECTIVE - DIGITAL ELECTRONICS, MICROPROCESSOR, MICROCONTROLLER AND OOP	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Develop assembly language programing skills and real time applications of microprocessor. CO2: Illustrate how to interface the I/O peripheral (PPI) with 8085 microprocessor CO3: Understand architecture, silent features, instruction set, programming and interfacing of 8051 microcontroller. CO4: Develop the programming skills in programming Language C++.			
Unit	Topics	No of Lectures	
I	Digital Electronics 1. Combinational Logic Design: Introduction, Boolean identities, K – map (2, 3 and 4 variable), Ref: N G P 4.1 – 4.8. (additional ref. RPJ) 2. Design and implementations of: Decoders, Encoders, Multiplexers, De- multiplexers, Use of MUX and DEMUX in Combinational Logic design. Code Converters (based on – binary, BCD, Gray and Excess – 3 codes). Tri-State logic, buffers, D latch. Advanced 8085 Programming and 8255(PPI) 1. Introduction to advanced instructions and applications Ref. RG: 10.7, 10.8, 10.9 2. Stack and Subroutines: Stack, Subroutine Ref. RG: 9.1, 9.1.1, 9.2&9.2.1 3. The 8255 Programmable Peripheral Interface: Block Diagram of the 8255, Mode 0 – Simple Input / Output mode,	15	

	BSR (Bit Set/Reset Mode) Ref. RG: 15.1.1, 15.1.2& 15.1.3	
II	Introduction to Microcontrollers 1.Introduction, Microcontrollers and Microprocessors, History of Microcontrollers and Microprocessors, Block diagram of 8051 Microcontroller*, Embedded Versus External Memory Devices, 8-bit & 16-bit Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Commercial Microcontrollers. Ref. AVD-Ch: 1 Ref. MMM - For * Refer 1.2 The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidiand R. D. Mckinlay, Second Edition, Pearson. 2. 8051 Microcontrollers: Introduction, MCS-Architecture, Registers in MCS-51, 8051 Pin Description, 8051 Connections, 8051 Parallel I/O Ports, Memory Organization. AVD-Ch: 2, 3. 3. 8051 Instruction Set and Programming: MCS-51 Addressing Modes and Instructions: 8051 Addressing modes, MCS-51 Instruction Set, 8051 Instructions and Simple Programs, UsingStack Pointer AVD-Ch: 4 Basic Concepts of Object Oriented Programming and C++ 1. Basics of Object-Oriented Programming & Beginning with C++: Basic concepts of Object-Oriented Programming, Benefits of OOP, Object- Oriented Languages, Applications of OOP. What is C++?, Applications of C++, A simple C++ program, More C++ Statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking. Ref EB: 1.5, 1.6, 1.7 & 1.8 EB: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 & 2.8 2. Tokens and Expressions in C++: Introduction, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type	15

	Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator, Expressions and Their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence. Ref EB: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22 & 3.23 3 Control Structures and Functions: Control Structures, Functions: The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, Constant Arguments, Function Overloading, Math Library Functions. Ref EB: 3.24, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 & 4.11	
References: 1. N G P - 5.1 (only introduction), 5.3, 7.1 -7.6 (except 7.5) RPJ - 4.20. 2. RG: 3.5.1, 3.5.2, 3.5.3, 3.5.4 & 3.5.5 3. NGP: Digital Electronics and Logic design by N G PALAN, https://archive.org/details/hellomr82k_gmail_DE 4. RG: Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, 5th Edition. 5. RPJ: R. P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4th Edition. 6. RG: Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, 5th Edition. 7. RG: Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, 5th Edition. 8. EB: Object Oriented Programming with C++ by E Balagurusamy, Third/ Fourth Edition, Tata McGraw-Hill Publishing Company Limited.		

Additional Reference books:

1. The 8051 Microcontroller & Embedded Systems-Dr. Rajiv Kapadia (Jaico Pub. House)
2. 8051 Micro-controller by K.J.Ayala., Penram International.
3. Programming & customizing the 8051 microcontroller By Myke Predko, TMH.
4. The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidi and R.D. McKinlay, Second Edition, Pearson.

Course Code	Course Title	Credits	Lectures/ Week
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25PHYMN621	Minor - Electrodynamics & Communication Systems	2	2
Course Outcomes: On successful completion of this course students will be able to: CO1: Memorize electromagnetic theory and digital communication. CO2: Explain electromagnetic waves and digital communication techniques. CO3: Apply quantitative problem solving skills in all the topics covered. CO4: Distinguish reflection and transmission of EM waves at normal incidence and oblique incidence.			
Unit	Topics	No of Lectures	
I	Electromagnetic Waves 1. The continuity equation, Poynting's theorem 2. The wave equation for E and B , Monochromatic Plane waves, Energy and momentum in electromagnetic waves, Propagation in linear media, Reflection and transmission of EM waves at normal incidence, Reflection and transmission of EM waves at oblique incidence. DG : 8.1.1, 8.1.2 DG : 9.2.1 to 9.2.3, 9.3.1 to 9.3.3	15	
II	Digital Communication Techniques: Digital Transmission of Data, Benefits of Digital Communication, Disadvantages of Digital Communication, Parallel and Serial Transmission, Pulse Modulation, Comparing Pulse-Modulation Methods (PAM, PWM, PPM), Pulse-Code Modulation. 1. ML: 6.2, 6.4, 6.6, 6.7, 7.2 to 7.4. 2. LF: 7.1, 7.2, 7.4	15	
References: 1. VM: Principles of Electronics – V. K. Mehta and Rohit Mehta. (S. Chand –Multicolor revised edition) 2. MB: Electronic Principles, Malvino& Bates -7th Edition TMH Publication. 3. AM: Electronic Devices and Circuits, Allen Mottershead -PHI Publication. 4. KVR: Functional Electronics, K.V. Ramanan-TMH Publication			

Course Code	Course Title	Credits	Lectur es/ Week
25PHYMJP61	PRACTICAL - SEM VI	2	4

Course Outcome:

On successful completion of this course students will be able to :

- CO1: Recall fundamental principles, laws, and formulas related to physical phenomena.
CO2: Explain the concepts and theories underlying various physics experiments.
CO3: Use physical principles and experimental techniques to perform basic experiments.
CO4: Distinguish between ideal and practical results through analysis of experimental data.

Regular Experiment:

Sr. No	Name of the Experiments
1	Surface tension of mercury by Quincke's method
2	Thermal conductivity by Lee's method
3	Determination of h/e by photocell
4	Lloyd's single mirror: determination of wavelength
5	Determination of M/C by using BG
6	Self-inductance by Anderson's bridge Hall effect
7	Solar cell characteristics and determination of V_{oc} , I_{sc} and P_{max}
8	Determination of dielectric constant
9	Determination of wavelength by Step slit
10	Gauss Meter: Determination of Magnetic Field with change in current in a coil.
11	OP-Amp as astable multivibrator
12	To study the resistivity by Four Probe method

References:

1. Advanced course in Practical Physics: D. Chattopadhyaya, PC. Rakshit & B. Saha (8th Edition) Book & Allied (P) Ltd.
2. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001.
3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition).
4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co.
5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge Univ. Press.
6. University Practical Physics: D C Tayal, Himalaya Publication.
7. Advanced Practical Physics: Worsnop & Flint.

Note: Minimum 8 experiments should be completed and reported in the journal, in the sixth semester. **Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

Course Code	Course Title	Credits	Lectures/Week
25PHYELP61	PRACTICAL - DIGITAL ELECTRONICS, MICROPROCESSOR & MICROCONTROLLER AND OOP	2	4

Course Outcome:

On successful completion of this course students will be able to :

CO1: Recall fundamental principles, laws, and formulas related to physical phenomena.

CO2: Explain the concepts and theories underlying various physics experiments.

CO3: Use physical principles and experimental techniques to perform basic experiments.

CO4: Distinguish between ideal and practical results through analysis of experimental data.

Sr No	Name of the Experiment
1	Study of 3:8 Decoder (74LS138), 8:3 Priority Encoder (74LS148) and their applications.
2	Study of Latch (74LS373) and its application
3	Study of 8:1 Multiplexer (74LS151), 1: 4 De-multiplexer (74LS155) and their applications.
4	Study of unidirectional buffer (74LS244) and bidirectional buffer (74LS245).
5	Write An ALP to Evaluate simple arithmetic Expression (like $Y = a \times b + c \times d$ where a, b, c and d are 8-bit HEX numbers)
6	Write An ALP for code conversion (any two)
7	16-bit Data manipulation (Addition, subtraction) Display result on Address field. Write ALP for Addition/ Subtraction/Multiplication of two, 8-bit hex, numbers. [Note: Use Read Keyboard Utility for inputting the hex numbers and display the result on the Address field.]
8	Simple data manipulation programs. (8/16-bit addition, subtraction, multiplication, division).
9	Finding greatest/smallest number from a block of data, decimal / hexadecimal counter.
10	To count the number of “ON” switches and display on LED’s
11	Program based on Input, Output Statements. (Programs to read any two numbers through keyboard and to perform simple arithmetic operations and to display the result).
12	Program based on for loop, while loop and do-while loop.
13	Program using switch statements and if-else ladder.
14	Program based on nested if statement

Note: Minimum **8** experiments should be completed and reported in the journal, in the sixth semester. **Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

Course Code	Course Title	Credits	Lectures/Week
25PHYMNP61	PRACTICAL - Electrodynamics & Communication Systems	2	4

Course Outcome:

On successful completion of this course students will be able to :

- CO1: Recall fundamental principles, laws, and formulas related to physical phenomena.
 CO2: Explain the concepts and theories underlying various physics experiments.
 CO3: Use physical principles and experimental techniques to perform basic experiments.
 CO4: Distinguish between ideal and practical results through analysis of experimental data.

Regular Experiment:

Sr No	Name of the Experiment
1	Study of Pulse width modulation (BB)
2	Study of Pulse position modulation (BB)
3	R. P. of Prism
4	Lloyd's single mirror: determination of wavelength
5	Self-inductance by Anderson's bridge
6	Hall effect
7	Hysteresis by magnetometer
8	R. P. Grating
9	Fiber Optics Communication
10	C1/C2 by De-Sauty Bridge
11	Measurement of potential (parallel and perpendicular to electric field) in sodium chloride solution.
12	Study of LVDT characteristics

References:

1. Advanced course in Practical Physics: D. Chattopadhyaya, PC. Rakshit & B. Saha (8th Edition) Book & Allied (P) Ltd.
2. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001.
3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition).
4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co.
5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge Univ. Press.
6. University Practical Physics: D C Tayal, Himalaya Publication.
7. Advanced Practical Physics: Worsnop & Flint.

Note: Minimum 8 experiments should be completed and reported in the journal, in the sixth semester. **Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

Evaluation Scheme for Third Year (UG) under AUTONOMY(NEP)**I. Theory Examination : 50 marks**

Internal Evaluation for Theory Courses – 20 Marks (CIA-1 and CIA-2)

CIA-1: Assignment CIA-2: Internal Test

External Examination for Theory Courses – 30 Marks

II. Practical Examination : 50 marks

Experiment :- 40 + 5 viva + 5 Journal

Evaluation Scheme for Third Year (UG) under AUTONOMY (NEP) (2025-2026)

I. Internal Evaluation for Theory Courses – 20 Marks

- (i) Continuous Internal Assessment 1 (Assignment): **10 Marks**
- (ii) Continuous Internal Assessment 2 – (Class Test with Multiple Choice Questions): **10 Marks**

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern:

All questions are compulsory.

Question	Based on	Options	Marks
Q.1	Unit I	A or B OR	(i)04 (ii)03 OR (i)05

		C or D	(ii)03
Q.2	Unit II	E or F OR G or H	(i)04 (ii)03 OR (i)05 (ii)03

All questions shall be compulsory with internal choice within the questions. •

Each Question may be sub-divided into sub questions as A, B, C, D, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks (Practical 40+Viva 05+journal 05) •

Duration: 2 Hours for each practical course.

- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam