Scheme of B. Sc. Physics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	PHY-1T	Mechanics	Theory	4	50	17
	PHY-2T	Electricity and Magnetism	Theory	4	50	17
	PHY-1P	LAB 1: Mechanics, Electricity and Magnetism	Practical	2	50	17
Second year	PHY-3T	Thermal Physics and Statistical Mechanics	Theory	4	50	17
	PHY-4T	Waves and Optics	Theory	4	50	17
	PHY-2P	LAB 2: Thermal Physics, Statistical Mechanics, Waves and Optics	Practical	2	50	17
Third year	PHY-5T	Digital and Analog Circuits and Instruments	Theory	4	50	17
	PHY-6T	Elements of Modern Physics	Theory	4	50	17
	PHY-3P	LAB 3: Digital and Analog Circuits and Instruments, Modern Physics	Practical	2	50	17

Note: There shall be four extra credits in all the years of under graduation for internship/apprenticeship. The certificate of extra credits would be provided by the university concern.

Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc. III year**	Year: **2024** Third Year	Session: **2024-25**
1	Course Code	**PHY- 3 P**		
2	Course Title	LAB 3		
3	Course Type	Practical		
4	Pre-requisite (if any)	NO		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the working of semiconductor diode, LED, transistor, and their characteristics • Understand the working of rectifier, filter, regulator etc. • Understand the function of Zener diode as voltage regulator • Gain knowledge about amplifier and logic gates,		
6	Credit Value	Practical : 2		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course
Total No. of Lectures: 60
Experiments
At least 12 experiments from the following or other experiments of equal standards 1. To study IV characteristics of p n junction diode, Zener diode and LED 2. To study the characteristics of p n p and n p n transistor in CE configuration 3. To study the characteristics of p n p and n p n transistor in CB configuration 4. To study regulated power supply and determination of ripple factor and voltage regulation factor 5. To draw and study the frequency response curve of two stage RC coupled amplifier 6. To design and study the CE amplifier of a given gain using voltage divider biasing circuit 7. To measure voltage and frequency of a periodic waveform using a CRO 8. To design and study Wein Bridge Oscillator 9. To design and verify the truth table of AND, OR, NOT AND XOR gates 10. To determine Boltzmann constant using I-V characteristics of p n diode 11. To determine function of material of filament of directly heated vacuum diode valve 12. To determine Planck's constant using LEDs of at least four different colors 13. To determine ionization potential of mercury 14. To measure the susceptibility of paramagnetic solution (Quinke's method) 15. To draw the B-H curve of iron using a solenoid and determine the energy loss from hysteresis 16. To measure the resistivity of semiconductor (Ge) crystal with temperature by four probe method and to determine its band gap 17. To determine the Hall coefficient of a semiconductor sample 18. To study the photo electric effect by drawing photo current versus intensity curve and to determine the wavelength of light 19. To study the diffraction pattern of a single and double slit using laser source 20. To study Half adder, Full adder and 4-bit binary adder 21. Study of adder, subtractor using full adder IC 22. To minimize a given logic circuit

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: • Basic Electronics- A Text Lab Manual, P.B. Zbar, A.P. Malvino, M. A. Miller, 1994,Tata Mc Graw Hill • Electronics: Fundamentals and Applications, J. D. Ryder, 2004, Prentice Hall of India • Electronic Principles, A.P. Malvino,2008, Tata Mc Graw Hill • Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill. • Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill. • Microelectronic Circuits, M.H. Rashid, 2ndEdn.,2011, Cengage Learning. • Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning • Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill • Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press. • Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd. • OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd. • e-Resources: https://link.springer.com https://web.pdx.edu https://yooktal.in https://www.bookfobia.com.av https://www.nhbs.com

Part D: Assessment and Evaluation
Suggested Continuous Evaluation Method: Maximum Marks: 50 Continuous Comprehensive Evaluation(CCE): Not Applicable University Exam. (UE): 50 Marks

DECLARATION

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Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc.**	Year: **Third Year**	Session: **2024-25**
1	Course Code	**PHY- 5T**		
2	Course Title	Digital, Analogue Circuits and Instrumentation		
3	Course Type	Theory		
4	Pre-requisite (if any)	Passed B.Sc. II		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the basic principles and industrial applications of semiconductor diode, Zener diode and transistor • Understand the construction working and applications of transistor • Gain the knowledge of analogue and digital circuits • Understand the construction and working principles of various instruments that are used in the physics laboratory • Develop interest in electronic components		
6	Credit Value	Theory :4		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	**Topics**	**No. of Lectures**
1	Semiconductor Devices and Amplifiers: Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, PN junction and its characteristics, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.	12
2	Power Supply: Half-wave Rectifier, Central-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, L-section filter and π-section filter, Zener diode as voltage regulator. Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α, β and γ. Relations between α, β and γ. Load Line analysis of Transistors. DC Load line and Q-point. Classification of Amplifiers: Class A, B, and C	12
3	Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output impedance. Current, Voltage and Power Gains. Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers (2) Adder (3) Subtractor (4) Differentiator (5) Integrator, (6) Zero Crossing Detector.	12
4	Sinusoidal Oscillator: Barkhausen's criterion for Self-sustained oscillations, Determination frequency of RC oscillator. Wein Bridge Oscillator, Hartley oscillator and Phase shift oscillator Introduction to CRO: Block diagram, construction and working of CRO, Applications of CRO in (i) study of waveform (ii) measurement of voltage, current , frequency and phase difference,	12
5	Digital Circuits Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.	12

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: • Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill. • Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill. • Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning. • Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning • Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill • Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press. • Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd. • OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd. • **e-resources:** 1. https://www.quora.com 2. https://www.allaboutcircuit.com 3. https://www.wileyindia.com 4. https://www.instrumentationtools.com 5. https://www.ibiblio.com 6. https://www.easyengineering.net 7. https://www.elsevier.com

Part D: Assessment and Evaluation
Suggested Continuous Evaluation Method: Maximum Marks: 50 Continuous Comprehensive Evaluation(CCE): Not Applicable University Exam. (UE): 50 Marks
Internal Assessment: Max. Marks: 10 Class Test/Assignment/Presentation (Proposed)

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Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc. III year**	Year: **2024** Third Year	Session: **2024-25**
1	Course Code	**PHY- 6T**		
2	Course Title	ELEMENTS OF MODERN PHYSICS		
3	Course Type	Theory		
4	Pre-requisite (if any)	B.Sc. II		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Gain of advanced theoretical and experimental method including the use of numerical method • Understand the basic postulates of quantum mechanics • Gain knowledge about physical quantities as operators • Understand the Schrodinger equation and its applications • Gain knowledge about structure of nucleus, nuclear fission and fusion and be familiar of nuclear energy		
6	Credit Value	Theory :4		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	**Topics**	**No. of Lectures**
1	Planck's quantum theory, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	12
2	Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle, Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence	12
3	Matter waves and wave function; probabilistic interpretation of wave function, Probability and probability current densities in one dimension. Normalization of wave function, Expectation value of dynamical variables, Operators: Position, Momentum and Energy operators; stationary states; probabilities and normalization; Schrodinger equation for non-relativistic particles;	12
4	One dimensional infinitely rigid box- energy eigenvalues and eigen function, Quantum dot; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier. Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation	12
5	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; α- decay; β-decay, energy released, spectrum and Pauli's prediction of neutrino; γ-ray emission. Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	12

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: • Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill • Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning • Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill • Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co. • Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning • Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill • e-Resources: 1. https://link.springer.com 2. https://web.pdx.edu 3. https://yooktal.in 4. https://www.bookfobia.com.av 5. https://www.nhbs.com

Part D: Assessment and Evaluation
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