

Syllabus of Generic Elective Course

M.Sc. (Physics) Semester-II

Program	Subject	Year	Semester
M.Sc.	Physics	1	II
Course Code	Course Title		Course Type
PHY-610	Physics of electronic devices		Elective
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	2	1	0
Maximum Marks	CIA		ESE
100	30		70

Learning Objective (LO):

This course provides the basic physics behind the devices used in daily life like Wide Area Network (WAN), Local Area Network (LAN), Wireless- Fidelity (Wi-Fi), Bluetooth, Basic understanding of mobile phone communication, Electrocardiogram (ECG), Blood pressure monitor, Pulse Oximeter, Pacemakers etc.

Course Outcomes (CO):

CO No.	Expected Course Outcomes At the end of the course, the students will be able to:	CL
1	Understand the principles of electric and magnetic fields. Comprehend electric current, voltage, and their measurement using a multi-meter. Differentiate between conductors and insulators. Explain the characteristics and applications of resistors, capacitors, and inductors. Apply Ohm's law to analyze electrical circuits. Describe domestic electric supply and the concept of grounding. Identify the heating effect of electric current and its applications in daily life devices. Explain the working principles of incandescent lighting devices. Understand the magnetic effects of electric current, electromagnetic induction, and the working principles of DC motors and AC dynamos.	Ap
2	Differentiate between intrinsic and extrinsic semiconductors. Understand N-type and P-type semiconductors. Explain the functioning of PN-junction diodes and LEDs. Analyze the operation and applications of transistors. Describe the working principles of solar cells. Understand the applications of phototransistors and photodiodes in electronic systems. Comprehend the role of semiconductors in electronic devices.	An
3	Understand electromagnetic waves (EMWs) and wireless communication. Differentiate between types of modulation and demodulation techniques. Identify essential components of wireless communication systems. Explain the basics of wireless networks, including WAN, LAN, Wi-Fi, and Bluetooth. Gain a basic understanding of mobile phone communication.	Ap
4	Identify different types of electromagnetic radiations. Differentiate between ionizing and non-ionizing radiations. Understand medical imaging techniques such as X-Ray imaging, CT scans, MRI, and ultrasound. Comprehend the functioning of medical devices like ECG, blood pressure monitors, pulse oximeters, and pacemakers.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

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CO-PO/PSO Mapping for the course:

PO CO	Pos											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	1	3	1	1	3	2	1	2	3	3	3	3	3	1
CO2	3	3	1	3	1	1	3	2	1	2	3	3	3	3	3	1
CO3	3	3	1	3	1	1	3	2	1	2	3	3	3	3	3	1
CO4	3	3	1	3	1	1	3	2	1	2	3	3	3	3	3	1

"3" – Strong; "2" – Moderate; "1" – Low; "-" No Correlation

Detail Syllabus

Unit 1: Electricity and Magnetism Fundamentals

Electric and magnetic fields, Electric current and voltage and measuring device: Ammeter, Voltmeter and Multi-meter, Alternating and Direct Currents (AC & DC), Conductors and insulators, Resistors, Capacitors, Inductor, Ohm's law, Domestic electric supply and concept of grounding, Heating effect of electric current and its application in daily life devices- stoves, electric iron; Magnetic effects of electric current, Electromagnetic induction, Working-principle of DC motors and AC Dynamo.

Unit 2: Semiconductor Devices and Applications

Semiconductors, Intrinsic and extrinsic semiconductors, N-type and P-type semiconductors. PN-junction diodes and Light Emitting Diodes (LEDs), Solar Cell, Transistor and its applications as switch and current amplifier, Phototransistor and its applications in burglar alarming systems and light sensitive switches, Photodiode and its applications in barcode readers and security systems.

Unit 3: Wireless Communication and Networks

Electromagnetic Waves (EMWs), Wireless communication and Types, Modulation and Demodulation, Types of modulation, Essential components of Wireless communication: Transmitter, Receiver, amplifier, Modem, Router, Firewalls Wireless Networks: Wide Area Network (WAN), Local Area Network (LAN), Wireless- Fidelity (Wi-Fi), Bluetooth, Basic understanding of mobile phone communication.

Unit 4: Electromagnetic Radiations and Medical Imaging

Electromagnetic Radiations and types, Ionizing and non-ionizing radiations, Imaging techniques in medical: X-Ray imaging, Computed Tomography (CT scan), Magnetic Imaging Resonance (MRI) and Ultrasound Imaging; Electrocardiogram (ECG), Blood pressure monitor, Pulse Oximeter, Pacemakers.

References:

1. "Principles of Electronics" by V.K. Mehta
2. "Electronic Principles" by Albert Malvino
3. NCERT Physics 12th
4. "Wireless Communication Systems" by Ke-Lin Du & M.N.S. Swamy
5. "Elements of Electromagnetics" by Mathew N.O. Sadiku
6. "Looking Within: How X-Ray, CT, MRI, Ultrasound and other Medical Images are created and How they help Physicians save Lives" by Anthony Brinton Wolbarst
7. "Concepts of Physics" by H. C. Verma
8. "The Physics of Everyday Phenomena: A Conceptual Introduction to Physics" by W. Thomas Griffith