Teaching Plan of 4th Semester 2025-2026

Subject: Physics

Semester: FYUGP 4th Semester

Paper Name: Electromagnetic Theory

Paper Code: PHY4400504MN

Total Number of Classes/Lectures: 45

Period: January-June

Total Credit: 4 (Theory 3 + Laboratory 1)

Existing Base Syllabus: HS Physics and 2nd Sem Electricity and Magnetism

Faculty: Dr. Manisha Phukan and Dr. Palash Jyoti Boruah

Lecture No.	Unit/Topic	Mode of Teaching	Assessment Method	Faculty
10	**Unit-I: Maxwell's equations** Maxwell's equations, Displacement Current, Vector and Scaler Potentials Gauge Transformations: Coulomb and Lorentz Gauge, Boundary Conditions at Interface between Different Media Poynting Theorem and Poynting Vector.	Lectures Oral Questions-P Problem Solving Previous year Question paper solving	Sessional & Class-tests	Dr. Palash Jyoti Boruah
10	**Unit-II: EM Wave Propagation in Unbounded Media** Plane EM Waves through Vacuum and Isotropic Dielectric Medium	Lectures Oral Questions-P	Sessional & Class-tests	Dr. Palash Jyoti Boruah

	Transverse Nature of Plane EM Waves, Refractive Index and Dielectric Constant, Propagation though Conducting Media Relaxation Time, Skin Depth. Wave Propagation through Dilute Plasma (Basic Concepts)	Problem Solving Previous year Question paper solving		
10	**Unit-III: EM wave in Bounded Media** Reflection and Refraction of Plane EM Waves at Plane Interface between two Dielectric Media – Laws of Reflection and Refraction Fresnels's Formula for Parallel Polarization Case, Brewster's Law, Reflection and Transmission Co-efficients Waveguides: Basic Concepts and Propagation of EM Waves in a Rectangular Waveguide	Lectures Oral Questions-P Problem Solving Previous year Question paper solving	Sessional & Class-tests	Dr. Palash Jyoti Boruah
11	**Unit-IV: Polarization of Electromagnetic Waves** Description of Linear, Circular and Elliptical Polarization, Propagation of EM Waves in Anisotropic Media Symmetric Nature of Dielectric Tensor, Fresnel's Formula, Uniaxial and Biaxial Crystals, Light Propagation in Uniaxial Crystal Double Refraction, Polarization by Double Refraction, Nicol Prism; Ordinary &Extraordinary Refractive Indices, Production & Detection of Plane, Circularly and Elliptically Polarized Light;	Lectures Oral Questions-P Problem Solving Previous year Question paper solving	Sessional & Class-tests	Dr. Manisha Phukan

	Phase Retardation Plates: Quarter-Wave and Half-Wave Plates, Babinet Compensator and its Uses, Analysis of Polarized Light			
04	**Unit-V: Rotary Polarization** Optical Rotation, Biot's Laws for Rotatory Polarization Fresnel's Theory of Optical Rotation, Calculation of Angle of Rotation, Experimental Verification of Fresnel's Theory, Specific rotation Laurent's Half-shade Polarimeter	Lectures Oral Questions-P Problem Solving Previous year Question paper solving	Sessional & Class-tests	Dr. Manisha Phukan
Sl. No.	**Experiment No. and Aim of the Experiment**		**Mode of Teaching**	**Faculty**
1.	1. To verify the law of Malus for plane polarised light		Demonstrating the concepts clearly. Engaging students in hands-on experimental work for better understanding	Dr. Manisha Phukan Dr. Palash Jyoti Boruah
2.	2. To determine the specific rotation of sugar solution using Polarimeter			
3.	6. To study the reflection and refraction of microwaves.			
4.	11. To verify the Stefan' s law of radiation and to determine Stefan's constant			
5.	12. To determine the Boltzmann constant using V-I characteristic of pn junction diode			

Reference Books

[1] Introduction to Electrodynamics, D. J. Griffiths.

[2] Electromagnetics, B. B. Laud, New Age International Publishers.

[3] Elements of Electromagnetics, M. N. O. Sadiku, 2001, Oxford University Press.

[4] Introduction to Electromagnetic Theory, T. L. Chow, 2006, Jones & Bartlett Learning.

[5] Feynman Lectures Vol. 2, R. P. Feynman, R. B. Leighton, M. Sands, 2008, Pearson Education.

[6] Fundamentals of Electromagnetics, M. A. W. Miah, 1982, Tata McGraw Hill.

[7] Electromagnetic Field Theory, R. S. Kshetrimayun, 2012, McGraw Hill.

[8] Engineering Electromagnetic, Willian H. Hayt, 2012, McGraw Hill.

[9] Electricity and Magnetism [With electromagnetic theory and special theory of relativity], D. Chattopadhyay and P. C. Rakshit, 2013, New Central Book Agency (P) Limited.