

**Subject Code: 02PY0502**
**Subject Name: Communication Physics**
**M.Sc. Year-II, Sem-III**

**Objective:** To analyse the fundamental propagation properties of electromagnetic waves and its usefulness in communications.

**Credits Earned:** 4 Credits

**Course Outcomes:** After completion of this course, post graduate will be able to

- Interpret various properties of electromagnetic waves and its propagation in waveguides
- Identify the applications in communications.
- Apply knowledge of physics as a basic science in solving real life and scientific problems
- Apply knowledge of physics to become successful in national level examinations like NET, SLAT, GATE etc.
- Engage in research in the field of pure and applied physics and involve in life-long learning

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva (V)	Term work (TW)	
4	0	0	4	50	30	20	25	25	150



Contents:

Unit	Topics	Contact Hours
1	<b>Electromagnetic Waves</b> Waves in one dimension the wave equation, sinusoidal waves, and boundary conditions: reflection and transmission. polarization, electromagnetic waves in vacuum, the wave equation for $e$ and $b$ , monochromatic plane waves , energy and momentum in electromagnetic waves , electromagnetic waves in matter	15
2	<b>Propagation of Electromagnetic Waves</b> Propagation in linear media, reflection and transmission at normal incidence, reflection and transmission at oblique incidence, absorption and dispersion, electromagnetic waves in conductors, reflection at a conducting surface, the frequency dependence of permittivity, guided waves, wave guides, waves in a rectangular wave guide, the coaxial transmission line	12
3	<b>Transverse Electromagnetic Waves</b> Plane waves, the wave equation, properties, sources of plane waves, Doppler frequency shifts, ohmic losses, low loss limit, large loss limit, high-frequency wave propagation, media, dispersive media, normal incidence on to perfect conductor, normal incidence onto a dielectric	12
4	<b>Uniform and Non-uniform Plane Waves</b> Propagation at an arbitrary angle, the complex propagation constant, non-uniform plane waves, oblique incidence onto a perfect conductor $e$ field parallel to the interface, $h$ field parallel to the interface oblique incidence onto a dielectric , $e$ parallel to the interface, Brewster's angle of no reflection, critical angle of transmission, $h$ field parallel to the boundary	11



5.	<b>The Rectangular Waveguide</b> Governing equations transverse magnetic (TM) modes, transverse electric (TE) modes, waveguide power flow, power flow for the tm modes, power flow for the TM modes, wall losses, dielectric waveguide, tm solutions odd solutions (b) even solutions TM solutions (a) odd solutions, (b) even solutions	<b>10</b>
<b>Total Hours</b>		<b>60</b>

**References:**

1. Introduction to Electrodynamics by David J. Griffiths. Pearson (2013)
2. Electromagnetic field theory: A problem solving approach by Markus Zahn. John Wiley and Sons (2003)

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	25%	10%	10%

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.