

## Department Core Course-12 (DCC)

### EC305: Microwave & RF Communication

Details of course:-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Microwave and RF Communication	3	0	2	Electromagnetic Field Theory

**Course Objective:** This course aims to provide in-depth knowledge to the student about various microwave components, Microwave amplifiers, oscillators and its applications in communication systems

**Course Outcomes:**

- CO1: To define and explain the microwave sub bands, various parameters and its applications.
- CO2: To describe the various components of microwave and their practical applications
- CO3: To describe various microwave tubes, state of art performance figures, relative advantages, and applications of competing devices
- CO4: To describe various semiconductor microwave devices, their state-of-the-art performance figures and comparison from practical point of view
- CO5: To learn basics of microwave antennas.

S. No.	Content	Contact Hours
Unit 1	Introduction to RF and Microwave Communication Systems: RF and Microwave sub-bands, microwave signal attenuation in different frequency bands, Scattering matrix: Reflection and Transmission coefficients. Symmetry, reciprocity, power, zero, and unitary properties. Planar Transmission Line: Microstrip line, types of Microstrip line, their comparison and application.	8
Unit 2	Microwave components: Waveguide couplings, bends and twists, Directional couplers, hybrid couplers, Matched load, Attenuators and phaseshifters, E-plane, H-plane and Hybrid Tees, Hybrid ring, Waveguide discontinuities, Windows, Irises and	10

	Tuning screws, Diode Detector; Isolators and Circulators, tunable detector, slotted line carriage.	
Unit 3	Microwave Tubes: Limitation of conventional active devices at microwave frequency Velocity modulation, Principle of operation, performance characteristics and application of two cavity Klystron, Multi-cavity Klystron, Reflex Klystron, TWT, Magnetron. Slow wave structures and their applications.	10
Unit 4	Microwave Semiconductor Devices: PIN diode, Tunnel diode, LSA diode, varactor diode, Parametric Amplifier, Gunn Devices, IMPATT, and TRAPATT, their principle of operation, characteristics, and applications.	8
Unit 5	Introduction to Antennas, Antenna parameters: Radiation intensity. Directivity. Power gain. Beam Width. Band Width. Radiation pattern, Analysis of Hertzian dipole, halfwave dipole, and monopole antenna. Microstrip Antennas: Basic characteristics of microstrip antennas, feeding methods, design of rectangular patch antennas	6
Total		42

Books:-

S. No	Name of Books/Authors/Publisher
1	Microwave Devices & Circuits/ Liao, S.Y./2 <sup>nd</sup> Ed, PHI, 2003
2	Foundations for Microwave Engineering/ Collin, R.E. /2 <sup>nd</sup> Ed, TMH, 2007
3	Microwave and Radar Engineering/M.Kulkarni /5 <sup>th</sup> Ed, Umesh, 2003
4	Understanding Microwaves/Allan W.Scott/1 <sup>st</sup> ed, Wiley-Interscience/1993