COURSE MODULE

Faculty Name: **Mrs. Keerthi A Kumbar & Mr. Guruprasad K N**			Academic Year: **2025-26 (ODD Sem)**				
Department: **ECE**							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BEC701	**Microwave Engineering and Antenna Theory**	**Core (IPCC)**	**Vector calculus, Maxwell's equations and wave theory, Electromagnetic field theory, Signals and systems**	**3**	**-**	**2**	**40 (8 Hours / Module)**

Course objectives: This course will enable students to:

1. Describe the microwave properties and its transmission media.
2. Describe the microwave devices for several applications.
3. Understand the basic concepts of antenna theory.
4. Identify antenna types for specific applications.

Topics Covered as per Syllabus

Module-1

Microwave Sources: Introduction, Gunn Diode (Text 2: 7.1,7.1.1,7.1.2)

Microwave transmission lines: Microwave frequencies, Microwave devices, Microwave systems. Transmission line equations and solutions, Reflection Coefficient and Transmission Coefficient. Standing wave and standing wave ratio. Smith chart, Single stub matching.

Text 2: 0.1, 0.2, 0.3, 3.1, 3.2, 3.3, 3.5, 3.6 (except double stub matching)

Module-2

Microwave Network Theory: Introduction, S matrix representation of multi-port networks.

(Text 1: 6.1, 6.3, 6.3.1, 6.3.2)

Microwave passive devices: Coaxial connectors and Adapters, Attenuators, Phase shifters, waveguide Tees, Magic Tee, Circulator, Isolator.

(Text 1: 6.4.2, 6.4.14, 6.4.15, 6.4.16, 6.4.17 A, B)

Module-3

Strip Lines: Introduction, Microstrip lines, Parallel Strip lines.

(Text 2: 11.1,11.2)

Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam efficiency, Directivity and Gain, Antenna Aperture Effective height, Bandwidth, Radio communication Link, Antenna Field Zones.

(Text 3: 2.1-2.7, 2.9-2.11, 2.13).

Module-4

Point sources and arrays: Introduction, Point Sources, Power patterns, Power theorem, Radiation Intensity, Arrays of 2 isotropic point sources, Pattern multiplication, Linear arrays of n Isotropic sources of equal amplitude and Spacing.

(Text 3: 5.1-5.6, 5.9, 5.13)

Electric Dipole: Introduction, Short Electric dipole, Fields of a short dipole. Radiation resistance of a short dipole. Thin linear antenna (field analysis).

(Text 3: 6.1-6.5)

Module-5

Loop and Horn antenna: Introduction: Small loop, Comparison of far fields of small loops and short dipole. Radiation resistance of small loop, Horn Antennas, Rectangular antennas.

(Text 3: 7.1,7.2, 7.4, 7.6, 7.7, 7.8, 7.19, 7.20)

Antenna Types: Yagi Uda array, Parabolic Reflector, Microstrip Antennas, Features of Microstrip Antennas,

(Text 3: 8.8, 9.5, 14.1,14.2)

List of Text Books

Text Books:

1. Microwave Engineering -Annapurna Das, Sisir K Das, TMH Publication, 2ndEdition, 2010.
2. Microwave Devices and Circuits – Samuel Y Liao, Pearson Education.
3. Antennas and Wave Propagation -John D Krauss, Ronald J Marhefka, Ahmad S Khan, 4th Edition, McGraw Hill Education, 2013.

Reference Books:

1. Microwave Engineering -David M Pozar, John Wiley India Pvt Ltd., Pvt Ltd., 3rd edition, 2008.
2. Microwave Engineering-Sushrut Das, Oxford Higher Education, 2nd Edn, 2015.
3. Antennas and Wave Propagation- Harish and Sachidananda, Oxford University Press, 2007.

Web links and Video Lectures (e-Resources):

1. https://www.tutorialspoint.com/antenna_theory/antenna_theory_horn.html
2. http://www.antenna-theory.com/antennas/smallLoop.php

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Programming Assignments / Mini Projects can be given to improve practical skills

Course Outcomes: At the end of the course the student will be able to:

CO1: Describe the use and advantages of microwave transmission	**L2**
CO2: Analyze various parameters related to transmission lines.	**L3**
CO3: Identify microwave devices for several applications	**L3**
CO4: Analyze various antenna parameters and their significance in building the RF system	**L3**
CO5: Identify various antenna configurations for suitable applications	**L2**

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code: BEC701	**TITLE:** Microwave Engineering and Antenna Theory				**Faculty Name:** Mrs. Keerthi A K & Mr. Guruprasad K N							
List of Course Outcomes	**Program Outcomes**											Total
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO-1	3	2	-	-	-	-	-	-	-	2	1	3	**17**
CO-2	3	2	2	2	2	-	-	-	-	2	1	3	**17**
CO-3	3	2	2	2	2	1	1	1	1	2	1	3	**21**
CO-4	3	2	2	2	2	1	1	1	1	2	1	3	**21**
CO-5	3	2	2	2	2	1	1	1	1	2	1	3	**21**
Total	15	10	10	10	10	3	3	3	3	10	5	15	**97**

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code: BEC701		**TITLE:** Microwave Engineering and Antenna Theory	
List of Course Outcomes	**Program Specific Outcomes**		
	PSO1	**PSO2**	**Total**
CO-1	2	1	**3**
CO-2	2	1	**3**
CO-3	2	1	**3**
CO-4	2	1	**3**
CO-5	2	1	**3**
Total	**10**	**5**	**15**

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribute