



Kadi Sarva Vishwavidyalaya
Faculty of Engineering & Technology
Fourth Year Bachelor of EC Engineering
(VIIth sem Academic Year 2020)

Subject Code: EC703-N	Subject Title: Microwave Engineering
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Course Objective:

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Microwave Engineering.
- To address the underlying concepts and methods behind Microwave Engineering.

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
04	00	02	06	05	03	70	30	20	30	150

Outline Of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction to microwaves	03
2	Microwave transmission lines and waveguides	20
3	Microwave components & their s-parameters	08
4	Microwave tubes and circuits	10
5	Semiconductor microwave devices and circuits	09
6	Radar systems	10
	Total	60

Total hours (Theory): 60

Total hours (Lab):

Total hours:



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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weight age(%)
1	Introduction to microwaves: Microwave frequencies, advantages of microwaves, general and Industrial applications of microwaves.	03	5
2	Microwave transmission lines and waveguides: Transmission line equations & solutions, reflection and transmission coefficient, standing wave and standing wave ratio, line impedance and admittance, impedance matching, using stub line, application of smith chart in solving transmission line problems Introduction to strip lines, Microstrip lines, parallel strip lines, coplanar strip lines, shielded strip lines, Rectangular waveguides theory and analysis, principle of circular waveguide.	20	35
3	Microwave components & their s-parameters: Wave-guide tees, magic tees, wave-guide corners, bends, twists, directional couples, circulators and isolators. S Matrix and its applications in analyzing microwave components.	08	15
4	Microwave tubes and circuits: Limitations of conventional tubes at UHF & Microwave, Klystrons, velocity modulation, multicavity klystron, reflex klystron, traveling wave tube, Magnetron. (Without derivations).	10	15
5	Semiconductor microwave devices and circuits: Microwave transistors and integrated circuits, varactor diodes, step recovery diodes, parametric amplifiers, tunnel diode and its applications, Gunn diode and its applications IMPATT diode, TRAPATT diode, PIN diode, schottky barrier diodes.	09	15
6	Radar systems: Basic principle, radar range equation: powers and frequencies used in radar, basic pulsed radar system, Factors Influencing maximum range, Effect of noise, Display Methods, Search and Tracking radar systems, Moving target indicator (MTI), CW Doppler Radar, Frequency Modulated CW radar	10	15
	Total	60	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.



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Learning Outcome:

On successful completion of the course

- The student can identify different areas of microwave engineering and components. Can find the applications of all the areas in day to day life. Can identify the operations, working, construction, material etc.

TEXT & REFERENCE BOOKS:

1. Microwave Engineering, David M. Pozar, Wiley India 3rd Edition
2. Microwave Devices And Circuits, Samuel Liao, PHI
3. Microwave Engineering, Annapurna Das, Sisirk. Das, TMH 2nd Edition
4. Microwave Engineering, Manojit Mitra, Dhanpatrai & Co.
5. Microwave And Radar Engineering, M Kulkarni, Umesh Publishers
6. Microwave Engineering, Sanjeev Gupta Khanna Pub.

List of Experiments(Not limited to following. Subject teacher may modify the same):

Sr. No.	Name of Experiment
1.	To study different types of microwave component.
2.	To set the Microwave bench for optimum operation.
3.	To study characteristics of the reflex klystron tube and to determine its electronic tuning range.
4.	To determine the frequency & wavelength in a rectangular waveguide working in TE ₁₀ mode.
5.	To determine the standing wave ratio and reflection coefficient.
6.	To study magic Tee & measure its various parameters.
7.	To study Isolator and Circulator & measure their various parameters.
8.	To study the function of multi-hole directional coupler by measuring the following parameters and measure the coupling factor and directivity.
9.	To plot the radiation pattern & find out the gain of a waveguide Antenna.
10.	To study the V-I characteristics of Gunn Diode.
11.	To study Attenuators.
12.	To measure unknown impedance with smith chart.
13.	To measure the polar pattern and the gain of a waveguide horn antenna.