

**Semester Plan (Theory)**  
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**Jr. Instructor (Tech) Electronics**

**Technology** : Electronics

**Semester** : 7th

**Subject Name:** Microwave, Radar & Navigation Aids (66872)

**Subject Code** : 66872

<b>WEEK</b>	<b>MAIN TOPICS</b>	<b>SPECIFIC OBJECTIVES</b>	<b>REMARKS</b>
1 <sup>st</sup> week	1. Understand the concept of microwave	1.1. Define the term microwave. 1.2. Mention the application of microwave with frequency range 1.3. List the characteristics of microwave 1.4. Mention the problems associated with conventional tubes at UHF. 1.5. Describe the characteristics of tubes for ultra high frequency. 1.6. Describe the basic principles of acorn tube. 1.7. Describe the basic principle of disk seal tube.	
2 <sup>nd</sup> week	2. Understand the features of wave guide.	2.1. Define the term wave guide. 2.2. List advantages of wave guide over coaxial line. 2.3. Mention different modes of a wave guide. 2.4. Describe phase velocity and group velocity in a wave guide. 2.5. Describe the field pattern of TE <sub>10</sub> , TE <sub>20</sub> and TM <sub>11</sub> modes. 2.6. Explain the methods of mode excitation in rectangular wave guide. 2.7. Describe behavior field pattern and disadvantages of circular wave guide. 2.8. State the relationship between cut-off wave guide length & free space wave length.	Class Test
3 <sup>rd</sup> week		3.1. Describe the construction and function of basic microwave components, (i) wave guide tees, (ii) magic tee, (iii) isolating device, (iv) adjustable phase shifter, (v) hybrid ring (rat-race), (vi) coupling probes, (vii) coupling loops, (viii) wave guide flanges, (ix) rotating	Quiz Test

<b>WEEK</b>	<b>MAIN TOPICS</b>	<b>SPECIFIC OBJECTIVES</b>	<b>REMARKS</b>
	3. Understand the concept of microwave components.	joints,(x) travelling detector, (xi) mode suppressors, (xii) irises, (xiii) tuning posts and screws. 3.2. Describe the working principle of wave meters. 3.3. Describe the working principle of directional couplers. 3.4. Describe the constructions two of isolators and circulators. 3.5. Describe the principle of isolators and circulators. 3.6. Describe the principle of operation of cavity resonator.	
4 <sup>th</sup> week	4. Understand the features of klystron tube.	4.1. Describe the construction and operation of two cavity klystron tube. 4.2. Describe schematic diagram for klystron amplifier. 4.3. Describe the construction and operation of multi cavity klystron tube. 4.4. Mention the performance and application of multi cavity klystron tube. 4.5. Describe the construction and operation of reflex klystron tube. 4.6. Mention the performance and applications of reflex klystron tube.	
5 <sup>th</sup> week	5. Understand the features of magnetron and travelling wave tube.	5.1. Describe constructional features of cavity magnetron. 5.2. Describe the mechanism of oscillations in a magnetron. 5.3. Describe the construction and operation of travelling wave tube. 5.4. Mention performance, properties and applications of travelling wave tube.	
6 <sup>th</sup> week	6. Understand the basic concept of microwave measurements.	6.1. Describe the method of measurements of low microwave power by bolometer and microwave thermocouple. 6.2. Describe the method of measurement of medium and high microwave power by calorimeterwattmeter measuring system. 6.3. Describe the method of measurement of microwave frequency and wavelength. 6.4. Describe the method of measurement of standard wave ratio. 6.5. Describe the method of measurement of impedance. 6.6. Describe the method of measurement of	Class Test & Quiz Test

WEEK	MAIN TOPICS	SPECIFIC OBJECTIVES	REMARKS
		attenuation..	
7 <sup>th</sup> week	<b>Middle Term Exam</b>	1 <sup>st</sup> – 6 <sup>th</sup> Chapter	Model Test
8 <sup>th</sup> week	7. Understand the features of microwave antennas.	7.1. Mention the characteristics of microwave antennas. 7.2. Describe the construction of horn antennas. 7.3. Describe the operation of antennas with parabolic reflectors. 7.4. Describe the function of feed antennas. 7.5. Describe the operation of dielectric lens antenna.	
9 <sup>th</sup> week	8. Understand the concept of semi conductor microwave devices.	8.1. Describe the construction, performance and application of microwave transistor. 8.2. Describe the construction, operation and characteristic of varactor diode. 8.3. Describe the basic principle of parametric amplifiers. 8.4. Describe the constructional features and applications of gun diode. 8.5. Describe the theory of microwave amplification by stimulated emission of radiation (MASER). 8.6. Describe the theory of microwave amplification solid state RUBY MASER 8.7. Describe the construction and performance of IMPATT/TRAPATT (impact avalanche and transit time) and Gun diode.	
10 <sup>th</sup> week	9. Understand the basic concept of radar.	9.1. Describe the basic principle of radar. 9.2. Express the deduction of the radar range equation. 9.3. Mention the factors influencing maximum range. 9.4. Mention the effect of noise. 9.5. Describe power and frequencies used in radar. 9.6. Mention different types of radar. 9.7. List the special considerations in radar receiver.	
11 <sup>th</sup> week	10. Understand the features of radar system.	10.1. Describe the operation of basic pulse radar system. 10.2. Describe the working principle of Duplexer. 10.3. Describe the working principle of moving target indicator (MTI).	Class Test

<b>WEEK</b>	<b>MAIN TOPICS</b>	<b>SPECIFIC OBJECTIVES</b>	<b>REMARKS</b>
		<p>10.4. Describe the basic principle of tracking radar system and search radar system.</p> <p>10.5. Describe the working principle of Doppler radar.</p> <p>10.6. Mention the advantages and limitations of CW Doppler radar.</p> <p>10.7. Describe the working principle of FM CW radar.</p> <p>10.8. Describe the radar antenna scanning pattern.</p> <p>10.9. Describe the Precision approach radar (PAR).</p> <p>10.10. Explain hazards due to microwave radiation.</p>	
12 <sup>th</sup> week	11. Understand the features of Tracking and Imaging Radar .	<p>11.1. Describe the function of Tracking and Imaging Radar.</p> <p>11.2. Describe the working principle of Monopulse tracking.</p> <p>11.3. Describe the working principle Conical scan and sequential lobbing.</p> <p>11.4. Describe the working principle Low angle tracking.</p> <p>11.5. Describe the working principle Air Surveillance Radar, 11.6. Describe the working principle Introduction to Synthetic aperture radar (SAR).</p>	
13 <sup>th</sup> week	1. 12. Understand the features of Radar Display	<p>12.1. Define the Radar Display.</p> <p>12.2. Describe the function of basic Radar Display.</p> <p>12.3. Describe the function of A-scope/A-display. B-scope &amp; C-scope</p> <p>12.4. Describe the function of PPI (Plan position indicator) Display.</p> <p>12.5. Describe the function of Beta Scan Scope Display.</p> <p>12.6. Mention the limitations of A-scope, B-scope &amp; C-scope</p> <p>12.7. Mention performance, properties and applications of A-scope, B-scope &amp; C-scope PPI Display.</p>	
14 <sup>th</sup> week	13. Understand the basic concept of radio aids.	<p>13.1. Describe the basic principles of radio direction finding.</p> <p>13.2. Derive the equation of resultant voltage of a rectangular loop antenna.</p> <p>13.3. Mention the step for finding the direction</p>	

<b>WEEK</b> <b>K</b>	<b>MAIN TOPICS</b>	<b>SPECIFIC OBJECTIVES</b>	<b>REMARKS</b>
	14. Understand the basic concept of navigation aids.	by loop antenna. 13.4. Describe the construction and application of loop, modified loop and Adcock antenna. 13.5. Explain the basic principle of very high frequency omnidirectional range (VOR). 13.6. Describe the operation of distance measuring equipment (DME).  14.1. Describe the working principle of instrument landing system (ILS). 14.2. Describe the working principle of Ground Control Approach (GCA). 14.3. Describe the basic principle of marker beacons and transponders.	

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