



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETC704	Microwave and Radar Engineering	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10	30	100 (60% Weightage)				

<b>Pre-requisite Course Codes</b>	ETC 404 Wave Theory and Propagation ETC 504 RF Modeling and Antenna
After successful completion of the course, student will be able to	
<b>Course Outcomes</b>	CO1 To Analyze the microwave passive circuit components and design the tuning and matching networks.
	CO2 Identify the state of art in microwave tubes and semiconductors and their uses in real life.
	CO3 Apply the microwave devices and RADAR for industrial and scientific purposes.

Module No.	Unit No.	Topics	Ref.	Hrs.
<b>1</b>	<b>Waveguides and Microwave Components</b>		1,4	10
	1.1	Frequency bands and characteristics of microwaves		
	1.2	Rectangular and circular waveguides, mode analysis		
	1.3	Resonators, reentrant cavities, scattering parameters, tees, hybrid ring, directional couplers, phase shifters, terminations attenuators, ferrite devices such as isolators, gyrators, and circulators.		
<b>2</b>	<b>Impedance Matching and Tuning</b>		1,2,5	08
	2.1	Lumped element matching		
	2.2	Single stub tuning, double stub tuning, triple stub tuning		
	2.3	Quarter wave transformer		
<b>3</b>	<b>Generation and Amplification of Microwaves</b>		1,2,5	10
	3.1	Two Cavity Klystron and Reflex Klystron		
	3.2	Helix Travelling Wave Tube and Backward Wave Oscillator		
	3.3	Cross Field Amplifier, Cylindrical Magnetron, and Gyrotrons		
<b>4</b>	<b>Semiconductor Microwave Devices</b> (construction, working, equivalent circuit and performance characteristics)		1,2	10
	4.1	Varactor, PIN, Tunnel, Point Contact, Schottky Barrier, Gunn, IMPATT, TRAPATT, and BARITT.		
	4.2	BJT, Hetro junction BJT, MESFET, and HEMT		
	4.3	Parametric Amplifiers		
<b>5</b>	<b>RADAR</b>		1,3	08
<b>5</b>	5.1	Basics of RADAR and RADAR range equation		
	5.2	<b>Types of RADAR:</b> Pulsed, Continuous wave and FMCW, Doppler,		



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		MTI, and Phased Array		
	<b>5.3</b>	Types of displays and Clutter		
	<b>5.4</b>	<b>Tracking RADAR:</b> Monopulse, Conical, Sequentiallobing		
<b>6</b>	<b>Microwave Applications</b>		1,3	06
	<b>6.1</b>	Microwave heating and bio-medical applications		
	<b>6.2</b>	Remote sensing RADAR, MSTRADAR, radiometer, instrumentation landing system, and RADAR based navigation		
			<b>Total</b>	<b>52</b>

## References:

1. David M Pozar, —*Microwave Engineering*|| , John Wiley & Sons, Inc. Hobokenh, New Jersey, Fourth Edition, 2012.
2. Samuel YLiao, —*Microwave Devices and Circuits*|| , Pearson Education, Third Edition
3. Merrill Skolnik, —*Introduction to RADAR Systems*|| , TataMcgraw Hill , Third Edition
4. Annapurna Das and Sisir K Das, —*Microwave Engineering*|| , Tata McGraw Hill, New Delhi, Second Edition, 2009
5. K. T. Matthew, —*Microwave Engineering*|| , Wileyindia, ,2011