	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electronics and Communication Engineering**	Semester	**VI**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 304	**RF & Microwave Engineering**	**3**	**1**	**0**	**4**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To introduce principle of the RF behaviours of Passive Components as well the idea of Single- and multiport networks, Smith chart.		CO1	Able to acquire knowledge about RF behaviours of Passive Components, Single- and multiport networks and Smith chart.
	To introduce the fundamental concepts of Microwave waveguides, and RF filters.		CO2	Able to understand the working mechanism of Microwave waveguides and RF filters.
	To develop the idea of fundamental concept of microwave devices and sources.		CO3	Able to understand the concepts of microwave devices and sources.
	To develop the fundamental concept of microwave antenna and antenna parameters.		CO4	Able to gather the fundamental knowledge about microwave antenna and antenna parameters.
	To introduce some ideas about RADAR and Microwave communications along with navigation system.		CO5	Able to acquire the fundamental principle of the Microwave communications and electronic navigation system.
			CO6	

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CO1	**3**	**3**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
2	CO2	**3**	**3**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
3	CO3	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
4	CO4	**3**	**3**	**1**	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
5	CO5	**3**	**3**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**3**	**-**
6	CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	**Introduction** RF behaviours of Passive Components, Chip Components.	**03**	**CO1**
II	**Single- and multiport networks and Smith chart** Basic Definitions, Interconnecting Networks, Network Properties and Application, Scattering Parameters- Definition and Meaning Of S- Parameters, From Reflection Coefficients to Load Impedance, Impedance Transformation, Admittance Transformation, Parallel and Series Connection.	**08**	**CO1**
III	**Microwave waveguides, components and RF Filter** Introduction, Rectangular Waveguides, Rectangular Cavity Resonators, Microwave Hybrid Circuits: Waveguides Tees, Magic Tees, Directional Couplers, Basic Resonator and Filter Configurations, Special Filter Realizations.	**8**	**CO2**
IV	**Microwave devices and sources** Microwave Bipolar Transistors, Microwave Tunnel Diodes, Gunn Diodes, Klystrons and Magnetrons**.**	**10**	**CO3**
V	**Microwave Antennas** Antenna Characteristics: Radiation Pattern, Beam Width; Radiation Resistance and efficiency; Directivity and Gain, Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna. Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of centre-fed dipoles of length λ, 3λ/2 and 2 λ. Horizontal and Vertical antennas over a plane ground. Antenna Arrays: electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array.	**12**	**CO4**
VI	**RADAR and Microwave communications** Basic Radar, Simple Form of Radar Equation, Radar Block Diagram, Detection of Signal Noise, Receiver Noise & SNR, Transmitted Power, PRF, Antenna Parameters, Introduction to Doppler And MTI Radar, Simplified Microwave System, Microwave Repeaters, Diversity, Microwave Radio Stations, System Gain. **Electronic navigation** Instrument Landing System, Precision Approach Radar, Microwave Landing System, Satellite Navigation Systems (GPS).	**07**	**CO5**
	Total Hours	**48**	

Essential Readings

1. L. Samuel Y., "Microwave Devices and Circuits", PHI, 3rd Edition,2014
2. F. Gustrao, "RF & Microwave Engineering", Wiley, 2nd edition, 2012

Supplementary Readings

1. D. Annapurna and D. Sisir K., "Microwave Engineering", Tata McGraw-Hill, 3rd Edition, 2017
2. S. Merril I., "Introduction to Radar Systems", Tata McGraw-Hill, 3rd edition, 2014
3. R.S. Rao, "Microwave Engineering", PHI, 2nd Edition, 2012
4. D. M. Pozar, "Microwave Engineering", Wiley, 4th Edition, 2011
5. C. A. Balanis, "Antenna Theory: Analysis and Design", Wiley, 4th Edition, 2011