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	V

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 303	**Electromagnetic Waves & Radiating Patterns**	**3**	**1**	**0**	**4**	**50**	**50**	**100**	**200**

Course Objectives	
	To introduce principle of Electrostatic and Magnetostatic field as well as significance of Maxwell's equations
	To teach the concept of electromagnetic wave in different environment and development of their conceptual idea
	To teach the idea of fundamental concept of radiation
	To introduce the fundamental concepts of Transmission line and its application as antenna.

Course Outcomes		
	CO1	Able to acquire knowledge about Electrostatic and Magnetostatic fields
	CO2	Able to gather knowledge about Maxwell's equations and its consequences
	CO3	Able to understand the Electromagnetic wave and its governing concepts
	CO4	Able to understand the mechanism of field Radiation and its application
	CO5	Able to acquire the fundamental principle of the Transmission line and antenna with their applications
	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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
2	CO2	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
3	CO3	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
4	CO4	**3**	**3**	**1**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**2**	**-**
5	CO5	**3**	**3**	**2**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**3**	**-**
6	CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	**Electrostatic Fields** Divergence Theorem, Poisson's and Laplace's equation in various co-ordinate systems, solution of single dimensional Laplace equation, Conditions at a boundary between dielectrics, Electrostatic uniqueness theorem, capacitance, Calculation of capacitance for simple rectangular, Cylindrical and spherical geometries. Effect of multi-layer dielectrics, Energy and Mechanical forces in electric fields, Method of Electrical images for a point charge in the neighbourhood of infinite conducting plane, Application of image method for transmission line capacitance calculations.	**05**	**CO1**
II	**Magnetic Fields** Ampere's work law in differential vector form, Ampere's law for a current element. Magnetic vector Potential, Magnetic scalar Potential, Magnetic dipole, Energy and Mechanical forces in magnetic fields, Image of current carrying conductor in the neighbourhood of a magnetic plane.	**05**	**CO1**
III	**Maxwell's Equations** Introduction, The Equation of Continuity For Time-Varying Fields, Inconsistency Of Ampere's Law, Maxwell's Equation, Condition at a Boundary Surface.	**05**	**CO2**
IV	**Electromagnetic Waves** Solution For Free-Space Conditions, Uniform Plane Waves & Propagation, The Wave Equations For A Conducting Medium, Sinusoidal Time Variations, Conductors And Dielectrics, Polarization, Reflection By A Perfect Conductor Normal Incidence & Oblique Incidence, Reflection By A Perfect Dielectric — Normal Incidence & Oblique Incidence, Reflection At The Surface Of A Conductive Medium.	**12**	**CO3**
V	**Radiation** Potential Functions And Electromagnetic Field, Potential Functions For Sinusoidal Oscillations, Alternating Current Element, Power Radiated By Current Element, Application To Short Antennas, Radiation From A Monopole Or Dipole.	**9**	**CO4**
VI	**Transmission Line Analysis** Need For Transmission Line Theory, Examples Of Transmission Lines, Equivalent Circuit Representation, Theoretical Foundation, Circuit Parameters For A Parallel Plate Transmission Line, General Transmission Line Equation, Microstrip Transmission Lines, Terminated Lossless Transmission Line, Special Termination Conditions, Sourced And Loaded Transmission Line. **Antenna Fundamentals** Directional Properties Of Dipole Antennas, Two Element Array, Linear Arrays, Multiplication Of Patterns, Binomial Array, Antenna Gain, Effective Area, Transmission Loss Between Antennas, Space Communications	**12**	**CO5**
	Total Hours	**48**	

Essential Readings

1. Sadiku, "Elements of Electromagnetics", Oxford, 6th Edition, 2007
2. Hayt, William Hart, "Engineering Electromagnetic", Tata McGraw-Hill,6th Edition, 2017

Supplementary Readings

1. Reitz & Milford, "Foundations of Electromagnetic Theory", Addison-Wesley Pub., 4th Edition,2014
2. Jordan E. C. and Balmain K. G., "Electromagnetic Waves and Radiating Systems", Prentice Hall, 2nd Edition, 1964
3. K. D. Prasad, "Antenna & Wave Propagation", Satya Prakashan, 2nd edition,2009
4. Kraus John D., Marhefka Roland J. and Khan Ahmed S., "Antennas and Wave Propagation", Tata McGraw-Hill, 5th Edition,2017
5. Balanis Constantine A., "Antenna Theory, Analysis and Design", John Wiley & Sons, 4th Edition, 2016
6. Harish A. R. and Sachindananda M., "Antennas and Wave Propagation", Oxford University Press, 1st Edition, 2006