

22ECPE616		RF&EMI/EMC TESTING			SEMESTER VI					
PRE-REQUISITE				CATEGORY		PE		Credit		3
				Hours/Week		L	T	P	TH	
1.	Physics for electromagnetism					3	0	0		3
Course Objectives:										
1.	To know the RF equipment's needed for testing.									
2.	To explain the concepts of EMI and EMC in electrical circuits and their characteristics.									
3.	To introduce the importance of measuring equipment's.									
4.	To impart the knowledge on grounding and shielding measures and design aspects.									
5.	To expose basic concepts of standards and regulations									
Unit I	RF EQUIPMENT FOR MEASUREMENT AND ANTENNA MEASUREMENT					9	0	0		9
Spectrum Analyzer- Principle, Measurement procedure, Network Analyzer- Principle, Measurement procedure, Calibration. Antenna Measurement: Reflection coefficient, Return loss of different antennas, Measurement with Spectrum and Network Analyzer, Gain Measurement, Radiation pattern measurement in both Indoor and Anechoic chamber, Test ranges.										
Unit II	EMC FUNDAMENTALS					9	0	0		9
Definition of EMI and EMC, Sources and Simulators, Propagation Methods, Basic Aspects of EMI in System Environment, cross talk or near field coupling, EM coupling in Far field, EM topology and grounding, Filtering, Shielding.										
Unit III	EMI FROM APPARATUS, CIRCUITS AND OPEN AREA TEST SITES					9	0	0		9
Electromagnetic emissions, noise from relays and switches, nonlinearities in circuits, passive intermodulation, transients in power supply lines, electromagnetic interference. Open area test sites and measurements, open-area test site, normalized site attenuation, antenna factor measurement.										
Unit IV	RADIATED AND CONDUCTED INTERFERENCE MEASUREMENT					9	0	0		9
Anechoic chamber, TEM cell, giga-Hertz TEM Cell, comparison of test facilities, characterization of conduction currents /voltages, conducted EM noise on power lines, conducted EMI from equipment, immunity to conducted EMI, detectors and measurements.										
Unit V	EMC STANDARDS					9	0	0		9
Overview of EMC Standards, Radiated and Conducted Emission (RE/CE) Standards, Radiated and Conducted Immunity (RI/CI) Standards, Electrostatic Discharge (ESD) Standards.										
										Total (45L)= 45 Periods

Text Books:	
1.	IET Electrical Measurement Series, "Microwave Measurements" 3rd Edition.
2.	Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons, 2009.
Reference Books:	
1.	V.P. Kodali, Engineering Electromagnetic Compatibility, 2/e, Wiley-IEEE Press, 2001.
2.	Dipak L. Sengupta and Valdis V. Liepa, "Applied Electromagnetics and Electromagnetic Compatibility", John Wiley & Sons.
3.	C. R. Paul, Introduction to Electromagnetic Compatibility, John Wiley and Sons, 2013.
4.	EMI/EMC Tesing, Society of Applied Microwave Electronics Engineering and Research
E-References:	
1.	http://edocs.soco.agilent.com
2.	https://archive.nptel.ac.in/courses/108/106/108106138/
3.	https://courseware.cutm.ac.in/courses/electromagnetic-compatibility/

Course Outcomes: Upon completion of this course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Explain the basics of RF measurement and Experience testing of RF components.	L4
CO2	Find the source of Electromagnetic interference.	L4
CO3	Predict the proper grounding, Shield and safety equipment's.	L3
CO4	Analyze the test conditions for the EUT.	L4
CO5	Explain the measurements with help of testing procedures and explain the standards for EMI/EMC.	L2

COURSE ARTICULATION MATRIX

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1		2	3	3	3						2		3	2	3
CO2		2	3	3	2						2		3	2	3
CO3		2	3	2	3						2		2	2	2
CO4		2	2	3	3						2		2	2	2
CO5		2	3	3	3						2		3	2	3
Avg		2	2.8	2.8	2.8						2		2.6	2	2.6
3/2/1 - indicates strength of correlation (3-High,2- Medium,1- Low)															