

EC 303 APPLIED ELECTROMAGNETIC THEORY

Course Plan			
Module	Course content	Hours	End Sem. Exam Marks
I	Review of vector calculus, Spherical and Cylindrical coordinate system, Coordinate transformation	1	0
	Curl, Divergence, Gradient in spherical and cylindrical coordinate system.	1	
	Electric field – Application of Coulomb’s law, Gauss law and Amperes current law (proof not required, simple problems only)	1	15
	Poisson and Laplace equations (proof not required, simple problems only), Determination of E and V using Laplace equation.	1	
	Derivation of capacitance and inductance of two wire transmission line and coaxial cable. Energy stored in Electric and Magnetic field.	2	
	Displacement current density, continuity equation. Magnetic vector potential. Relation between scalar potential and vector potential.	2	
II	Maxwell’s equation from fundamental laws.	1	15
	Boundary condition of electric field and magnetic field from Maxwell's equations	1	
	Solution of wave equation	1	
	Propagation of plane EM wave in perfect dielectric, lossy medium, good conductor, media-attenuation, phase velocity, group velocity, skin depth.	3	
FIRST INTERNAL EXAM			
III	Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence (parallel and perpendicular polarization), Snell’s law of refraction, Brewster angle.	4	15
	Power density of EM wave, Poynting vector theorem, Complex Poynting vector.	3	
	Polarization of electromagnetic wave-linear, circular and elliptical polarisation.	2	
IV	Uniform lossless transmission line - line parameters	1	15
	Transmission line equations, Voltage and Current distribution of a line terminated with load	2	
	Reflection coefficient and VSWR. Derivation of input impedance of transmission line.	2	
SECOND INTERNAL EXAM			
V	Transmission line as circuit elements (L and C).	2	20
	Half wave and quarter wave transmission lines.	1	
	Development of Smith chart - calculation of line impedance and VSWR using smith chart.	2	

	Single stub matching (Smith chart and analytical method).	2	
VI	Parallel-Plate Waveguide - TE & TM waves.	1	20
	The hollow rectangular wave guide – modes of propagation of wave- dominant mode, group velocity and phase velocity - derivation and simple problems only.	3	
	Attenuation in wave guides, guide wavelength and impedance -derivation and simple problems only.	3	
END SEMESTER EXAM			

Question Paper (End semester exam)

Maximum marks : 100

Time: 3 hours

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 50 % for theory and 50% for logical/numerical problems, derivation and proof.

