

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Electrical Engineering
 (Applicable from the academic session 2018-2019)

Name of the course		ELECTRO MAGNETIC FIELD THEORY	
Course Code: PC-EE 303		Semester: 3rd	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs/week		Mid Semester Exam: 15 Marks	
Tutorial: 0 hr/week		Assignment & Quiz: 10 Marks	
Practical: 0 hrs/week		Attendance: 05 Marks	
Credit Points: 3		End Semester Exam: 70 Marks	
Objective:			
1.	To learn the basic mathematical tools to deal with Electromagnetic field.		
2.	To understand properties and application of Electric and magnetic field.		
3.	To analyze electromagnetic wave propagation in transmission line.		
4.	To acquire problem solving skills related to Electromagnetic field.		
Pre-Requisite			
1.	Basic Electrical Engineering (ES-EE-101)		
2.	Mathematics (BS-M-102, Bs-M202)		
3.	Physics (BS-PH 101)		
Unit	Content	Hrs	Marks
1	Introduction: Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems	4	
2	Introduction to Vector calculus: DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Stokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem. Solution of problems	4	
3	Electrostatic field: Coulomb's law, field intensity, Gauss's law, Electric potential and Potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field. Boundary conditions: Dielectric-dielectric, Conductor – dielectric, Conductor-free space. Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation. Solution of problems	8	
4	Magneto static fields: Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, Magnetisation in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic material. Solution of problems	8	
5	Electromagnetic fields: Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields. Solution of problems	6	
6	Electromagnetic wave propagation: Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect,	6	

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	Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Polarisation. Solution of problems		
7	Transmission line: Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation. Solution of problems	4	

Text books:

1. Elements of Electromagnetic, Mathew N.O. Sadiku, 4th edition, Oxford university press.
2. Engineering Electromagnetic, W.H. Hyat & J.A. Buck, 7th Edition, TMH
3. Theory and problems of Electromagnetic, Edminister, 2nd Edition, TMH
4. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University