COURSE MODULES OF THE SUBECT TAUGHT FOR THE ACADEMIC YEAR 2025-26
EVEN SEMESTER

COURSE SYLLABI WITH COs

Academic Year:2025-26(Even Semester)							
Department: Electronics and Communication Engineering							
Course Code	**Course Title**	**Core/Elective**	**Prerequisite**	**Contact Hours**			**Total hrs./sessions**
				L	**T**	**P**	
BEC401	Electromagnetic Theory	Core	Vector Calculus	3	0	0	40
Objectives	**This course will enable students to:**						
	Study the different coordinate systems, Physical significance of Divergence, Curl and Gradient						
	Understand the applications of Coulomb's law and Gauss law to different charge distributions and the applications of Laplace's and Poisson's Equations to solve real time problems on capacitance of different charge distributions.						
	Understand the physical significance of Biot-Savart's, Ampere's Law and Stokes' theorem for different current distributions.						
	Infer the effects of magnetic forces, materials and inductance.						
	Know the physical interpretation of Maxwell's equations and applications for Plane waves for their behavior in different media.						
	Acquire knowledge of Poynting theorem and its application of power flow						
Topics Covered as per Syllabus							
Module-1							
Revision of Vector Calculus, Coulomb's Law, Electric Field Intensity and Flux density: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge due to Sheet of charge, Electric flux density, Numerical Problems							
Module-2							
Gauss's Law and Divergence: Gauss 'law, Application of Gauss' law to Point Charge, line charge, Surface charge and Volume Charge, Point (differential) form of Gauss law, Divergence. Maxwell 's First Equation (Electrostatics), Vector Operator ▼and divergence theorem, Numerical Problems. Energy expended or work done in moving a point charge in an Electric field, The line integral, Current and Current density, Continuity of current.							
Module-3							
Poisson's and Laplace's Equations: Derivation of Poisson 's and Laplace 's Equations, Examples of the solution of Laplace 's equation, Numerical problems on Laplace's equation. **Steady Magnetic Field:** Biot- Savart Law, Ampere 's circuital law, Curl, Stokes 'theorem, Magnetic flux and magnetic flux density.							

Module-4

Magnetic Forces: Force on a moving charge, differential current elements, Force between differential current elements, Numerical problems. **Magnetic Materials:** Magnetization and permeability, Magnetic boundary conditions, the magnetic circuit, problems.

Module-5

Faraday's law of Electromagnetic Induction –Integral form and Point form, Numerical problems. Inconsistency of Ampere's law with continuity equation, displacement current, Conduction current, Derivation of Maxwell equations in point form, and integral form, Maxwell's equations for different media, Numerical problems. Uniform Plane Wave: Wave propagation in free space, Uniform plane wave, Derivation of plane wave equations from Maxwell's equations, Poynting's Theorem and wave power, Skin effect or Depth of penetration, Numerical problems.

Suggested Learning Resources: Textbook. Hayt and J.A. Buck, ―Engineering Electromagnetics, 8th Editon, Tata McGraw Hill, 2014, ISBN9789339203276.

Reference Books:

1. Elements of Electromagnetics – Matthew N.O., Sadiku, Oxford University press, 4thEdn.
2. Electromagnetic Waves and Radiating systems – E. C. Jordan and K.G. Balman, PHI, 2ndEdn.
3. Electromagnetics Joseph Edminister, Schaum Outline Series, McGraw Hill.
4. N. Narayana Rao, Fundamentals of Electromagnetics for Engineering, Pearson

Web links and Video Lectures (E Resources):

- NPTEL Video lectures: https://youtu.be/pGdr9WLto4A
- NPTEL Video lectures: https://youtu.be/xn2IpxI991M

Course Outcomes	At the end of the course, the student will be able to: 1. Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume. 2. Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distributions by using Divergence Theorem. 3. Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations 4. Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits. 5. Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem

Internal Assessment Marks:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Three tests are conducted; each test shall be conducted for 40 marks. The average of the two tests shall be scaled down to 25 marks.
- Any two assessment methods are conducted then the sum of the two assessments shall be scaled down to 25 marks

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BEC401	Title:	Electromagnetic Theory										
List of Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO-1	3	3	2	-	-	-	-	-	-	-	2	2	1
CO-2	3	3	2	-	-	-	-	-	-	-	2	2	1
CO-3	3	3	2	-	-	-	-	-	-	-	2	2	1
CO-4	3	3	2	-	-	-	-	-	-	-	2	2	1
CO-5	3	3	2	-	2	-	-	-	-	-	2	3	1

Note: 3-Strong Contribution 2-Average Contribution 1-Weak Contribution

Signature of the Faculty **HOD**