KADI SARVA VISHWAVIDYALAYA

B.E. Semester : V
Electronics & Communication Engineering
Subject Name: Electromagnetics Theory
Subject Code : EC-503 **W.E.F 2014-15**

A. Course Objective:

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Electromagnetics.
- To address the underlying concepts and methods behind Electromagnetics.

B. Teaching / Examination Scheme:

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EC-503	**Electromagnetics Theory**	**4**	**0**	**0**	**4**	**4**	**3**	**70**	**30**	**20**	**0**	**120**

C. Detailed Syllabus:

1. **Introduction to Vector Algebra and Vector Calculus**
   Scalars & Vectors, Dot & Cross Products, Three dimensional Coordinate Systems – Cartesian, Cylindrical and Spherical and coordinate systems conversions, Review of Line, Divergence and Gradient-Meaning of Divergence theorem & Stoke's theorem, Surface & Volume Integral-Definition of Curl

2. **Electrostatics**
   Coulomb's Law & Electric Field Intensity, Coulomb's Law & Field due to Different Charge Distributions, Electric Flux Density ,Gauss's Law and Divergence, Concept of electric Flux Density ,Gauss's Law and its Applications, Differential Volume Element, Divergence, Maxwell's First Equation and Divergence theorem for Electric Flux Density Energy & Potential, Energy expanded in moving a point charge in electrical field, Line Integral, Definition of potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, Dipole, Energy density in electrostatics field
3. **Conductors, dielectrics and capacitance**
   Definition of currents and current density, continuity eqn., metallic conductors and their properties, semiconductors, dielectric materials, characteristics, boundary conditions, Capacitance of a parallel plate capacitor.
4. **Poisson's and Laplace equation**
   Poisson's and Laplace eqn., Uniqueness theorem, examples of solution of Laplace and Poisson's eqns.
5. **Magnetostatics**Biot-Savart Law, Ampere's Circuital Law, Application of Ampere's Circuital law for an infinitely long coaxial transmission line, solenoid and toroid, Point form of Ampere's Circuital law , Concept of flux density Scalar and Vector magnetic potential, Stoke's theorem for magnetic field Point and integral forms of Maxwell's equations for steady electric and magnetic fields

6. **Time Varying Fields and Maxwell's Equations**
   Faraday's law, Displacement current, Maxwell's equations in point and integral forms for time varying fields
7. **Electromagnetic Waves: The Uniform Plane Waves**
   Wave motion in free space, Perfect dielectric,Poynting vector, Power consideration, Propagation in good conductor, Phenomena of skin effect, Reflection of uniform plane waves, Plane waves at normal incidence and at oblique incidence, Standing wave Ratio

D. Lesson Planning :

SR. No.	No. of Hours	% Weight-age in Exam	Topic
1	08	**15**	**Introduction to Vector Algebra and Vector Calculus** Scalars & Vectors, Dot & Cross Products, Three dimensional Coordinate Systems – Cartesian, Cylindrical and Spherical and coordinate systems conversions, Review of Line, Divergence and Gradient-Meaning of Divergence theorem & Stoke's theorem, Surface & Volume Integral-Definition of Curl
2	11	**15**	**Electrostatics** Coulomb's Law & Electric Field Intensity, Coulomb's Law & Field due to Different Charge Distributions, Electric Flux Density ,Gauss's Law and Divergence, Concept of electric Flux Density ,Gauss's Law and its Applications, Differential Volume Element, Divergence, Maxwell's First Equation and Divergence theorem for Electric Flux Density Energy & Potential, Energy expanded in moving a point charge in electrical field, Line Integral, Definition of potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, Dipole, Energy density in electrostatics field
3	08	**15**	**Conductors, dielectrics and capacitance** Definition of currents and current density, continuity eqn., metallic conductors and their properties, semiconductors, dielectric materials, characteristics, boundary conditions, Capacitance of a parallel plate capacitor.
4	05	**15**	**Poisson's and Laplace equation** Poisson's and Laplace eqn., Uniqueness theorem, examples of solution of Laplace and Poisson's eqns.
5	10	**15**	**Magnetostatics** Biot-Savart Law, Ampere's Circuital Law, Application of Ampere's Circuital law for an infinitely long coaxial transmission line, solenoid and toroid, Point form of Ampere's Circuital law , Concept of flux density Scalar and Vector magnetic potential, Stoke's theorem for magnetic field Point and integral forms of Maxwell's equations for steady electric and magnetic fields

6	06	**10**	**Time Varying Fields and Maxwell's Equations** Faraday's law, Displacement current, Maxwell's equations in point and integral forms for time varying fields
7	12	**15**	**Electromagnetic Waves: The Uniform Plane Waves** Wave motion in free space, Perfect dielectric,Poynting vector, Power consideration, Propagation in good conductor, Phenomena of skin effect, Reflection of uniform plane waves, Plane waves at normal incidence and at oblique incidence, Standing wave Ratio
TOTAL	**60**	**100**	

E. Instructional Method And Pedagogy (ANNEXURE-I)

F. Students Learning Outcomes :

On successful completion of the course

- The student can identify different areas of Electromagnetics and its application area. Can find the applications of all the areas in day to day life. Can identify the operations, working, construction, material etc. Aspects of Conductors, dielectrics and capacitance etc.

G. Recommended Study Materials:

Text &Reference Books:

1. W H. Hayt & J A Buck, "Engineering Electromagnetics", TATA MC Graw Hill,7thEdition.
2. Matthew Sadiku, "Elements of Eletromagnetics", Oxford University Press, 4th edition.
3. J.D.Kraus- Electromagnetics, McGraw Hill