Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering

BEE304Electromagnetic Theory
Third Semester (odd semester)

Course (catalog) description

The purpose of this course is to enable the students to have a sound knowledge about the theory and problems in Electromagnetic Fields.

Compulsory/Elective course: Compulsory for EEE students

Credit hours& contact hours: 3&45 hours

Course Coordinator : Mr.K.S.S.Prasad

Instructors : Mr.K.S.S.Prasad

Name of the in-structor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.K.S.S.Prasad	Second year EEE	KS 101	**04422290125**	Prasad.eee **@bharathuniv.ac.in**	12.30-1.30 PM

Relationship to other courses:

Pre –requisites **:**BEE101-Basic electrical and electronic engineering

Assumed knowledge :Study of electromagnetic fields ,electromagnetic waves and its application in various fields

Following courses : BEE601-Transmission and distribution

Syllabus Contents

UNITI ELECTROSTATICS 9

The field concept – sources of electromagnetic fields – Co-ordinate Systems– Coulomb's law – electric field intensity – electric field due to point charge, line charge, surface charge and volume charge distribution – electric flux density – Gauss's law – electric potential – potential gradient – divergence theorem – Poisson's and Laplace equations.

UNIT IIELECTROSTATICSAPPLICATIONS 9

Conductor and dielectrics – field due to dipole – moment – boundary conditions and conductor surfaces – capacitor – capacitance of system of conductors – energy density and pressure in electric fields – force between charges – charge in motion – conduction current – displacement current.

UNIT IIIMAGNETOSTATICS 9

Force on a current element – Biot Savart's law – force between current carrying conductors– Ampere's law – magnetic potential – boundary conditions at the magnetic surfaces – examples

UNITIV MAGNETOSTATICS APPLICATIONS 9

Faraday's law of electromagnetic induction – inductance of solenoids, toroids, transmission lines and cable – Mutual inductance of series and parallel circuits – energy stored in magnetic fields – electromagnets – forces and torques on closed circuits – magnetic circuits – examples.

UNIT V ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION9

Modified amperes circuital law – Maxwell's equation in point and integral forms – wave equation – plane waves in free space – polarization – reflection and transmission of waves – pointing theorems and slepain vector – energy in electromagnetic fields.

Text book(s) and/or required materials

T1. K.A.Gangadhar, "Field Theory" – Khanna Publishers, New Delhi. 1997

T2. William Hayt, "Engineering Electromagnetics" – McGraw Hill, New York 1996

Reference Books:

R1.S. Selly, "Introduction to electromagnetic fields" – McGraw Hill, 1958

R2. http://nptel.ac.in/downloads/115101005/

Computer usage:

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
		100
Professional subject	-	%

Broad area : Electrical Machines/**Electronics/**Power system/Control &Instrumentation**.**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 18	2 Periods
2	Cycle Test-2	September 2nd week	Session 19 to 35	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

The purpose of this course is to enable the students to have a sound knowledge about the theory and problems in Electromagnetic Fields.	Correlates to program out-come		
	H	**M**	**L**
CO1: Apply vector calculus to understand the behavior of static electric fields in standard configurations.	A	B,I,L	
CO2: To lay the foundations of electromagnetism and to understand the concepts of Electrostatics and their applications.	A,B	I,L	
CO3: To understand the concepts of Magneto statics and their applications.	A,B	I,L	
CO4: Apply the concepts of induction to evaluate inductance and applications.	A,B	I,L	
CO5: To understand the concept of Electromagnetic Fields, waves and wave propagation.	A,B	I,L	

H: high correlation, M: medium correlation, L: low correlation

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter

Draft Lecture Schedule

UNIT I	**ELECTROSTATICS**		
1.	The field concept – sources of electromagnetic fields	NO	T2,T1
2.	Co-ordinate Systems	YES	
3.	Coulomb's law – electric field intensity	YES	
4.	electric field due to point charge, line chargesurface charge and volume charge distribution	YES	
5.	electric flux density , Gauss's law	NO	
6.	electric potential , potential gradient	YES	
7.	divergence theorem	YES	
8.	Poisson's and Laplace equations.	YES	
9.	Example problems	YES	
UNIT II	**ELECTROSTATICSAPPLICATIONS**		
10.	Conductor and dielectrics	NO	T1
11.	field due to dipole moment	NO	
12.	Example problem	YES	
13.	boundary conditions and conductor surfaces	NO	
14.	Capacitor capacitance of system of conductors	YES	
15.	energy density in electric fields	YES	
16.	force between charges	YES	
17.	charge in motion	YES	
18.	conduction current – displacement current	YES	
UNIT III	**MAGNETOSTATICS**		
19.	Force on a current element	YES	T2
20.	Biot Savart's law,	YES	
21.	Biot Savart's law,(Applications)	YES	
22.	force between current carrying conductors	YES	
23.	Ampere's law	YES	
24.	magnetic potential	NO	
25.	magnetic potential	YES	
26.	boundary conditions at the magnetic surfaces	NO	
27.	Example problems	YES	
UNIT IV	**MAGNETOSTATICS APPLICATIONS**		
28.	Faraday's law of electromagnetic induction	NO	T2
29.	inductance of solenoids, toroids,	YES	
30.	inductanceof transmission lines and cable	NO	
31.	Mutual inductance of series and parallel circuits	YES	
32.	energy stored in magnetic fields	NO	
33.	electromagnets	NO	

34.	forces and torques on closed circuits	NO	
35.	magnetic circuits	NO	
36.	examples.	YES	
UNIT V	**ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION**		
37.	Modified amperes circuital law	NO	T1
38.	Maxwell's equation in point and integral forms –	YES	
39.	wave equation	YES	
40.	plane waves in free space	NO	
41.	polarization	NO	
42.	reflection and transmission of waves	NO	
43.	pointing theorems and slepain vector	NO	
44.	energy in electromagnetic fields	YES	
45.	Revision	YES	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Video Lectures.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies E

Cycle Test – I	-	05%
Cycle Test – II	-	05%
Model Test	-	10%
Attendance	-	05%
SEMINAR&ASSIGNMENT	-	05%
Final exam	-	70%

Prepared by: Mr.K.S.S.PRASAD **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) An ability to identify, formulate, and solve engineering problems.

c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to design and conduct experiments, as well as to analyze and interpret data.

e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) An ability to apply reasoning informed by the knowledge of contemporary issues.

g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) An ability to understand professional and ethical responsibility and apply them in engineering practices.

i) An ability to function on multidisciplinary teams.

j) An ability to communicate effectively with the engineering community and with society at large.

k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) An ability to recognize the need for,and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION
Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE
Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM
Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL
Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS
Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mr.K.S.S.Prasad	

Course Coordinator(Mr.K.S.S.PRASAD)

HOD/EEE
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