Academic Course Description

> **BHARATH UNIVERSITY**
> Faculty of Engineering and Technology
> Department of Electrical and Electronics Engineering
>
> **BEE305- ELECTRICAL MACHINES**
> **Third Semester, 2015-16 (Odd Semester)**

Course (catalog) description

This **course** examines the basic theory, characteristics, construction operation and application of rotating **electrical machines**. It includes the study of direct current motors, direct current generators, alternators, synchronous motors, polyphase induction motors and single phase motors.

Compulsory/Elective course: Compulsory for all circuit branch students

Credit hours   :   3 credits

Course Coordinator   :   Mr Gopikrishnan, Asst. Professor

Instructors   :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.K.SAKTHIVEL	All second Year Students	ECE block		ksakthivelme@gmail.com	9.00-9.50 AM
Mr. Gopikrishnan	All second Year Students	ECE block		Gopikrish87@gmail.com	12.45-1.15 PM

Relationship to other courses:

Pre –requisites   **:** Basic Electronics and Electrical Engineering

Assumed knowledge   : The students will have a physics and mathematics background obtained at a high school (or Equivalent) level. In particular, working knowledge of basic mathematics including Differentiation, integration and probability theories are assumed.

Following courses   : BEE301 Circuit Theory

SYLLABUS CONTENT

UNIT I   CIRCUITS AND TRANSFORMERS   9

Three phase circuits and transformers, Three phase balanced circuits with R-L-C loads, Power measurement in 3 Phase circuit, Two watt meter method, Principle of operation of Transformers, Equivalent circuit, Voltage regulation, Efficiency, Transformer connections.

method – and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES 6
Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Application – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS 6
Number system – Logic Gates – Boolean Algebra – De-Morgan's Theorem – Half Adder & FullAdder – Flip Flops.

Total No. of Periods: 30

TEXT BOOKS:
1. N.Mittle "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation',Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw Hill

REFERENCE BOOKS:
1. Edminister J.A. *"Theory and problems of Electric Circuits"* Schaum's Outline Series. McGraw Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. *"Engineering Circuit Analysis"*, McGraw Hill Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.

Computer usage: Nil

Professional component

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

Broad area : Circuit Theory | Electronics | Transmission Lines and Networks | Linear Integrated Circuits

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	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

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. This course emphasizes:	Correlates to program outcome		
	H	M	L
Outline the basics of electrical machines and analyze the characteristics of DC machines.	j	f	
Understand and implement speed control techniques for practical applications.	c	a	l
Describe the working of transformer and assess its regulation and efficiency on load and no-load .	d	i	
Know the working concept of different types of induction motor and analyze the operating behavior of induction motor using its performance indices.	k	a,g	
Explain the basics of synchronous machines and interpret performance characteristics.	k	g	b

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

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**CIRCUITS AND TRANSFORMERS**		
1.	Three phase circuits and transformers, Three phase balanced circuits with R-L-C loads	Yes	[T1]
2.	Power measurement in 3 Phase circuit,	Yes	
3.	Principle of operation of Transformers, Equivalent circuit	No	
4.	Voltage regulation, Efficiency,	Yes	
5.	Two watt meter method	Yes	
6.	Thevenin's theorem	Yes	
7.	Transformer connections	Yes	
UNIT II	**DC MOTORS**		
8.	Construction of DC motor	No	[T1]
9.	Principle of operation DC motor	No	
10.	Types, Characteristics	No	
11.	Starting, Speed control, Testing	No	
12.	Single phase Induction Motor	No	
13.	Single Phase Transformer, Testing	No	
UNIT III	**INDUCTION MOTORS**		
14.	Construction, Types	No	[T1]
15.	Principle of operation of 3 phase induction motors	No	
16.	Equivalent circuit.	No	
17.	Performance calculation,	No	
18.	power measurement by three-watt meter	yes	
19.	Starting and Speed control	No	
UNIT IV	**SYNCHRONOUS AND SPECIAL MACHINES**		
20.	Construction of synchronous machines, Types, Induced EMF	No	[T1]
21.	Voltage regulation of round rotor alternators	No	
22.	Brushless Alternators, Permanent magnet Synchronous machines	No	
23.	Reluctance machines.	No	
24.	Hysteresis motors, Stepper motor	No	
UNIT V	**TRANSMISSION AND DISTRIBUTION**		
25.	Structure of Electric Power systems, Generation	No	[T1]
26.	Sub Transmission and Distribution systems	No	
27.	EHVAC	No	
28.	EHVDC transmission systems	No	
29.	Substation layout	No	
30.	Insulators, Cables	No	

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.

- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.

- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	10%
Cycle Test – II	-	10%
Model Test	-	25%
Attendance	-	5%
Final exam	-	50%

Prepared by: Gopikrishna, Assistant professor , Department of EEE   **Dated : 10 -6-2017**

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

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

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

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: Graduates will gain knowledge regarding the various laws and principles associated with electrical systems.

PEO2: Graduates will gain knowledge regarding electrical machines and apply them for practical problems.

PEO3: Graduates will gain knowledge on electronic systems and various types' semiconductors.

PEO4: Graduates will acquire knowledge in using the concepts in the field of electrical engineering and digital electronics.

Course Teacher	Signature
Mr.K.Gopikrishna	

Course Coordinator	Academic Coordinator	Professor In-Charge	HOD/EEE
(Mr.K.Gopikrishna)	( )	(Dr.)	(Dr.S.Prakash)