Academic Course Description

BHARATH UNIVERSITY

Faculty of Engineering and Technology

Department of Electronics and Communication Engineering

BEE305- ELECTRICAL MACHINES

Third Semester, 2017-18 (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 & contact hours : 3 & 45

Course Coordinator : Ms Anitha SampathKumar, Assoc. Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms Anitha Sampath Kumar	All second Year Students	SA block			12.45-1.15 PM
Mr. Gopikrishnan	All second Year Students	SA block		Gopikrish87@gmail.com	12.45-1.15 PM

Relationship to other courses:

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

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

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.

UNIT II DC MOTORS **9**

Construction, Operating principle of motor, Types, Characteristics, Starting, Speed control, Testing.

UNIT III INDUCTION MOTORS **9**

Construction, Types, Principle of operation of 3 phase induction motors, Equivalent circuit, Performance calculation, Starting and Speed control.

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES **9**

Construction of synchronous machines, Types, Induced EMF, Voltage regulation of round rotor alternators. Brushless Alternators, Permanent magnet Synchronous machines, Reluctance machines, Hysteresis motors, Stepper motor.

UNIT V TRANSMISSION AND DISTRIBUTION **9**

Structure of Electric Power systems, Generation, Transmission, Sub Transmission and Distribution systems, EHVAC and EHVDC transmission systems, Substation layout, Insulators, Cables.

Total No of periods: 45

Text Books:

1. Nasar S.A., " Electric Machines and Power Systems ", Vol. 1, McGraw Hill Inc., New Delhi, 1995.

2. Wadhwa C.L., " Electrical Power Systems ", Wiley eastern Ltd., India, 1985.

REFERENCE :

1. www.ceecs.fau.edu

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	
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	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignments/Seminar/online test/quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Ms. Anitha Assoc. Professor , Department of EEE **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / 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 hardware and software 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: PREPARATION

Electronics Engineering graduates are provided with a strong foundation to passionately apply the fundamental principles of mathematics, science, and engineering knowledge to solve technical problems and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of Engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE

Electronics engineering graduates have proficiency to enhance the skills and experience to apply their engineering knowledge, critical thinking and problem solving abilities in professional engineering practice for a wide variety of technical applications, including the design and usage of modern tools for improvement in the field of Electronics and Communication Engineering.

PEO3: PROFESSIONALISM Electronics Engineering Graduates will be expected to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector.

PEO4: SKILL

Electronics Engineering Graduates will become skilled in soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, interpersonal relationship, group discussion and leadership ability to become a better professional.

PEO5: ETHICS

Electronics Engineering Graduates are morally boosted to make decisions that are ethical, safe and environmentally-responsible and also to innovate continuously for societal improvement.

Course Teacher	Signature
Ms.Anitha Sampathkumar	

Course Coordinator **HOD/ECE**