Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering
BEE401 & ELECTRICAL MACHINES-II

Fourth Semester (Even Semester)

Course (catalog) description

To give the students a fair knowledge on the working of various Ac machines and the characteristics.

Compulsory/Elective course : Compulsory for EEE students

Credit hours & contact hours : 3 & 45 hours

Course Coordinator : MRS. Anitha Sampath kumar

Instructors : MRS. Anitha Sampath kumar

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@. bharathuniv.ac in	Consultation
MRS .Anitha Sampath kumar	Second year EEE	KS 101	**04422290125**	Anitha.eee@ bharathuniv.ac in	**12.30 PM – 1.30PM**

Relationship to other courses:

Pre –requisites **:** BEE302 - Electrical Machines – I
Assumed knowledge : Knowledge based on Electrical Machines

Syllabus Contents

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – EMF, MMF, ZPF –Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics .

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for Constant power input, constant excitation and constant power developed.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests -Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.

UNIT IV SINGLE PHASE INDUCTION MOTOR AND STARTING METHOD 9

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors .Need for starting – Types of starters – Rotor resistance, Autotransformer and Star-delta starters – Speed control method

UNIT V FRACTIONAL HORSE POWER MOTOR 9

Shaded pole induction motor - Linear reluctance motor - Repulsion motor - Hysteresis motor - AC series motor-variable reluctance motor -permanent magnet stepper motor –hybrid stepper motor- permanent magnet D.C motor- permanent magnet A.C motor .

Text book(s) and/or required materials

T1. .D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

T2. P.S. Bhimbra, 'Electrical Machinery', Khanna Publishers, 7th Edition, 2011.

T3. B.R Gupta," Fundamentals of Electric Machines ". New Age International (P) Limited 3rd Edition 2005

Reference Books:

R1. . A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

R2 . J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons,2002.

Computer usage: Nil

Professional component

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

Broad area : Circuit Theory | **Electrical Machines**| Electronics | Power System| Control &Instrumentation

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2nd week	Session 1 to 18	2 Periods
2	Cycle Test-2	March 2nd week	Session 19 to 39	2 Periods
3	Model Test	April 3rd week	Session 1 to 45	3 Hrs

4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To give the students a fair knowledge on the working of various Ac machines and the characteristics.	Correlates to program outcome		
	H	**M**	**L**
CO1: To impart knowledge on Construction and performance of salient and non – salient type synchronous generators.	a,b,f	C,g,h	D,e,I,j,k,l
CO2: To impart knowledge on Principle of operation and performance of synchronous motor	a,f	B,c,g,h	D,e,I,j,k,l
CO3: To impart knowledge on Construction, principle of operation and performance of induction machines.	a,f	B,c,g,h	D,e,I,j,k,l
CO4:To impart knowledge on Starting and speed control of three-phase induction motors	a	B,c,f,g,h	D,e,I,j,k,l
CO5: To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.	a	B,c,g,h	D,e,I,j,k,l,f

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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**SYNCHRONOUS GENERATOR**		
1.	Constructional details – Types of rotors	YES	[T1]
2.	Emf equation – Synchronous reactance	YES	
3.	Armature reaction Voltage regulation	YES	
4.	Voltage of excitation and mechanical input – Two reaction theory	YES	
5.	Determination of direct and quadrature axis synchronous reactance using slip test	YES	
6.	Operating characteristics .regulation – EMF	YES	
7.	MFM	YES	
8.	ZPF –Synchronizing and parallel operation	YES	
9.	Synchronizing torque - Change	YES	
UNIT II	**SYNCHRONOUS MOTOR**		
10.	Principle of operation – Torque equation	YES	[T1]
11.	Operation on infinite bus bars	YES	
12.	Operation on infinite bus bars - V-curves	YES	
13.	Power input and power developed equations	YES	
14.	Starting methods	YES	
15.	Current loci for Constant power input	YES	
16.	Current loci for Constant power input	YES	
17.	constant excitation and constant power developed	YES	
18.	constant excitation and constant power developed	YES	
UNIT III	**THREE PHASE INDUCTION MOTOR**		
19.	Constructional details – Types of rotors	YES	[T1]
20.	Principle of operation – Slip	YES	
21.	Equivalent Load test circuit – Slip	YES	
22.	torque characteristics - Condition for maximum torque	YES	
23.	Losses and efficiency –- No load and blocked rotor tests	YES	
24.	Separation of no load losses	YES	
25.	Double cage rotors	YES	
26.	Induction generator	YES	
27.	Synchronous induction motor	YES	
UNIT IV	**SINGLE PHASE INDUCTION MOTOR AND STARTING METHOD**		

28.	Constructional details of single phase induction motor	YES	[T1]
29.	Double revolving field theory and operation	YES	
30.	Equivalent circuit	YES	
31.	No load and blocked rotor test – Performance analysis	YES	
32.	Starting methods of single-phase induction motors	YES	
33.	Need for starting – Types of starters	YES	
34.	Rotor resistance	YES	
35.	Autotransformer and Star-delta starters	YES	
36.	Speed control method	YES	
37.	Problems solved	YES	
UNIT V	**FRACTIONAL HORSE POWER MOTOR**		
38.	Shaded pole induction motor	YES	[T1]
39.	Linear reluctance motor	YES	
40.	Repulsion motor	YES	
41.	Hysteresis motor	YES	
42.	AC series motor-variable reluctance motor	YES	
43.	permanent magnet stepper motor	YES	
44.	permanent magnet A.C motor	YES	
45.	Test	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	-	05%
Cycle Test – II	-	05%
Model Test	-	10%
Attendance	-	05%
SEMINAR&ASSIGNMENT	-	05%
Final exam	-	70%

Prepared by: **Dated :**
MRS. Anitha Sampath kumar

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
Mrs .Anitha Samapthkumar	

Course Coordinator
(Mrs .Anitha Samapthkumar)

HOD/EEE
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