هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Electrical Machines
Course Code:	EE1371
Program:	Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	V3
Last Revision Date:	10-10-2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (7th level, 4th year)					
4. Course general Description:					
Transformers: performance characteristics, three-phase connections, autotransformers. DC machines: performance equations, generator, and motor characteristics, starting and speed control of motors. Synchronous machines: generator and motor operation. Three-phase induction motors: operation, performance calculations, starting, and speed control. Single-phase induction motors, Small synchronous motors.					
5. Pre-requirements for this course (if any)**:**					
EE1272, EE1222					
6. Co-requisites for this course (if any)**:**					
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7. Course Main Objective(s):					

1. Provide students with main features of three phase AC circuits.
2. Understand different ways of electric energy generation.
3. Learn structures of electric generators.
4. Understand electric generator and motor specifications and operation
5. Provide students with information related to different applications of transformers.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning	-	-
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	15
5.	**Others (specify)**	-
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
K1	Solve electrical engineering problems related to electrical machines.	1.3	Lectures	Quizzes, Midterm exam, and Final exam
K1	Recall the main methods to analyze and explain the performance of electric drives and describe the specs and their meanings of electrical machines and be able to summarize the characteristics of transformers.	1.1	Lectures	Quizzes, Midterm exam, and Final exam
K1	Calculate the efficiency of electric machines, and design a three phase machine and evaluate its performance.	1.3	Lectures	Quizzes, Midterm exam, and Final exam
K1	Evaluate the performance of an electrical machine.	1.6	Lectures	Quizzes, Midterm exam, and Final exam
K1	Criticize the use of a given electric machine in an inappropriate application.	1.8	Lectures	Quizzes, Midterm exam, and Final exam
2.0	**Skills**			
S1	Apply information related to the new aspects of electric machines, and calculate the performance specs of a given electric machine.	2.1	Lectures	Quizzes, Midterm exam, and Final exam
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
V3	Apply information related to the new aspects of electric machines, and calculate the performance specs of a given electric machine.	5.1	Lectures	Quizzes, Midterm exam, and Final exam

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Electric Drives.	4
2	**AC circuit concepts:** Single phase AC circuits, Balanced 3 phase circuits, Delta and Wye connections, 3 phase power measurements.	4
3	**Magnetic circuits:** Introduction, Magnetic Circuits Faraday's law, Inductance and magnetic energy..	8
4	**Transformers**: Ideal transformer, Actual transformer	4
5	Approximate equivalent circuits, voltage regulation, efficiency.	4
6	Determination of equivalent circuit (open circuit test & short circuit test) parameters.	4
7	Polarity, Autotransformer, three phase transformers.	4
8	**DC Machines**: Introduction, Basic principles of operation, generation of unidirectional voltage, types of DC machines.	4
9	Voltage and torque equations, No load characteristics of DC generator, Voltage buildup in shunt generator, load characteristics, voltage regulation, DC generator efficiency .	4
10	Speed regulation of DC motor, DC motor efficiency, Speed Torque characteristics of DC motor, motor starting, Applications of DC motors..	4
11	**Synchronous Machines:** Introduction, equivalent circuit of 3-Phase Induction motor, open circuit characteristics, short circuit characteristics, voltage regulation, Power angle characteristics, efficiency, Synchronous motor performance.	4
12	**Induction Motors:** Introduction, equivalent circuit of 3-Phase Induction motor, No load test, DC test, Blocked-Rotor test	4
13	Performance analysis of an Induction motor, Starting torque, Torque vs Speed	4
14	Single phase Induction motors equivalent circuit and Performance analysis, starting of single phase motors	4
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	7th week	20%
2.	Midterm 2	12th week	20%
3.	Quizzes	All Along	10%
4.	Project	13th to 14th week	10%
5.	Final Exam	Final Exam week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Electric Machinery Fundamentals, Stephen J. Chapman, McGraw-Hill, Inc, Fifth Edition, 2012
Supportive References	Zia A. Yamayee & Juan L. Bala. Jr, "Electromechanical Energy Devices and Power Systems", second edition, Schaum's Outlines, John Wiley & Sons, Inc, 1944.
Electronic Materials	Computer animations and online resources supplied by the instructor.
Other Learning Materials	- Lectures / discussions / handouts and few multimedia presentations - Introduction to computer-aided analysis and design

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One classroom: fits up to 25 students with white board.
Technology equipment (projector, smart board, software)	A laptop computer connected to a projector to display PowerPoint presentations
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students assessment	Students	Indirect
Quality of learning resources	Relevant Focus Group	Indirect
The extent to which CLOs have been achieved	Dept. Quality Committee	Direct

Assessment Areas/Issues	Assessor	Assessment Methods
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	