



**MUTAH UNIVERSITY**  
**Faculty of Engineering**  
**Department of Electrical Engineering**



**Course Syllabus**  
**Study Plan 2021: Communication Track**

Course Code	Course Name	Credits	Contact Hours
0401370	Electric Machines and Power Systems	3	3 T

#### INSTRUCTOR/COORDINATOR

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<b>Office Hours</b>	9:00-10:00 (Sun, Tues, Thurs )

#### TEXTBOOK

<b>Title</b>	Electric machinery fundamentals
<b>Author/Year/Edition</b>	S. Chapman/ 5 <sup>th</sup> edition / McGrawHill
<b>Other Supplemental Materials</b>	
<b>Title</b>	Electrical machines, drives, and power systems
<b>Author/Year/Edition</b>	Theodore Wildi. 5th ed

#### SPECIFIC COURSE INFORMATION

##### A. Brief Description of the Content of the Course (Catalog Description)

This course is offered for the electrical engineering students communication track.

**Course Aim:** To provide students with a comprehensive understanding of electrical machines, encompassing the fundamental concepts, working principles, design, and operation of synchronous, induction, and DC machines. Additionally, the course aims to introduce the students to the electrical power system and its analysis, including its interconnections with rotating electrical machines, transformers and transmission lines.

##### B. Pre-requisites (P) or Co-requisites (C)

Electric Circuits (2) (0401212) (P)

##### C. Course Type (Required or Elective)

**Required**



## SPECIFIC GOALS

### A. Course Learning Outcomes (CLOs)

**CLO1:** The ability to understand the principles of operation of electrical machines [1].

**CLO2:** Ability to understand the fundamental characteristics of various types of machines and understand the concept of equivalent circuit [1].

**CLO3:** To be familiar with the concept of power system concepts: generation, transmission, and distribution [1].

**CLO4:** To be familiar with the symmetrical and unsymmetrical faults and the ability to understand the basics of power system protection [1].

### B. Student Learning Outcomes (SOs) Addressed by the Course

1	2	3	4	5	6	7
✓						

## BRIEF LIST OF TOPICS TO BE COVERED

List of Topics	No. of Weeks	Contact Hours
Introduction to electric machines	1	3
Electromagnetism: Magnetic field concepts; Magnetic circuits; Transformers: Ideal transformers; Induced voltages and currents, Practical transformers; Open and Short circuit tests; equivalent circuits, voltage regulation	1	3
Transformers: efficiency; concepts of three phase transformers.	1	3
DC Generators and Motors: Construction, field excitation and armature reaction.	1	3
DC Generators and Motors: Classification, shunt, series and compound dc motors. Speed - torque characteristics,	1	3
Synchronous Machines: Principles of motor operation, starting of synchronous motors, power, losses and efficiency calculations. V-curves, phasor diagrams, power factor correction	2	6
Synchronous Generators: Construction, equivalent circuits, phasor diagrams, voltage regulation.		
Induction Motors: Three-phase Induction Motors: Rotating magnetic field, slip and rotor speed, equivalent circuits and phasor diagrams, speed control and speed regulation	1	3
Introduction to Power System: Generation of electrical power: Various types of conventional and non-conventional generation plants, Single-line diagram and impedance diagram of power systems. Per-unit quantities. Components of a power system: Generation, Transmission and Distribution	1	3
Transmission line parameters calculations : - resistance, inductance and capacitance	1	3

Characteristics and performance of power transmission lines: transmission line types (short, medium and long lines) equivalent circuits and calculations, power flow through transmission lines, transmission efficiency	1	3
Symmetrical fault and Unsymmetrical fault - single line to ground fault - double line to ground fault - line to line fault - one open line fault - double open line fault	1	3
Basic Protection. Basic principles and components of protection including fuses. Operating principles of overcurrent relays. Instantaneous and time grading relays.	2	6
<b>Total</b>	<b>14</b>	<b>42</b>

<b>EVALUATION</b>		
<b>Assessment Tool</b>	<b>Due Date</b>	<b>Weight (%)</b>
Mid Exam	According to the university calendar	30
Course Work (Homeworks, Quizzes, Projects, ...etc.)	One week after being assigned	20
Final Exam	According to the university calendar	50

**ABET's Students Learning Outcomes (Criterion # 3)**

ABET 1-7		
1.	✓	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2.		an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3.		an ability to communicate effectively with a range of audiences.
4.		an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5.		an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6.		an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7.		an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.