

## Faculty of Engineering & Technology

### Induction Machines

#### Information :

**Course Code :** EPR 445

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

#### Instructor Information :

Title	Name	Office hours
Professor	Rizk Mohamed El Sayed Hamouda	8
Teaching Assistant	Abeer Tharwat Said Awad	2

#### Area Of Study :

1. understand the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and basic characteristics of each of 3-ph Induction Motors.
2. understand the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and basic characteristics of each of 1-ph Induction Motors.
3. perform starting and speed control of both 3-ph Induction Motors and 1-ph Induction Motors.
4. develop practical skills of testing of Induction Motors.
5. Share ideas and work in a team or a group.

#### Course outcomes :

##### a. Knowledge and Understanding: :

1 -	Demonstrate knowledge and understanding of theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and basic characteristics of each of 3-ph Induction Motors.
2 -	Demonstrate knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of 1-ph Induction Motors.
3 -	Demonstrate knowledge and understanding of starting and speed control of both 3-ph Induction Motors and 1-ph Induction Motors.

##### b. Intellectual Skills: :

1 -	Analyze and solve operating conditions of 3-ph Induction Motors.
2 -	Analyze and solve operating conditions of 1-ph Induction Motors.
3 -	Analyze and solve operating conditions of starting and speed control of both 3-ph Induction Motors and 1-ph Induction Motors.
4 -	Decide and chose among different solution alternatives.
5 -	Evaluate obtained results both individually or as a part of team.

##### c. Professional and Practical Skills: :

1 -	develop practical skills and perform the required experiments to get the load characteristics of 3-ph Induction Motors.
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- 2 - develop practical skills and perform the required experiments to get the equivalent circuit parameters of 1-ph Induction Motors.

**d.General and Transferable Skills :**

- 1 - Write technical reports in accordance with standard scientific guidelines.
- 2 - Work in a self-directed manner.
- 3 - Work coherently and successfully as a part of a team in the Lab.
- 4 - Analyze problems and use innovative thinking in their solution.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Revision of 3-ph circuits and magnetic circuits.	5	3	2
Revision of DC Machines and 1-ph Transformers.	5	3	2
3-ph Induction Motors: Construction: stator windings of AC machines, Rotor types.	5	3	2
theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and load characteristics.	10	6	4
Analysis using circle diagram.	10	6	4
Experimental determination of IM parameters.	5	3	2
Starting and speed control of Induction Motors.	10	6	4
Double cage IM.	5	3	2
1-ph Induction Motors: Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and load characteristics.	10	6	4

**Teaching And Learning Methodologies :**

Lectures

Tutorials

E-Learning Program

Laboratories

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final Written exam	30.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.
Laboratory Tutorial	10.00	6	to assess the ability of implementing a simple electric circuit that shows knowledge and understanding of different technical issues.
Mid Term Exam 1	15.00	7	to assess the skills of problem solving, understanding of related topics.
Mid Term Exam 2	15.00	11	to assess the skills of problem solving, understanding of related topics.

Performance	10.00	14	To assess the performance of each student through the overall course
Quiz and Assignment 1	5.00	5	to assess the skills of problem solving, understanding of related topics.
Quiz and Assignment 2	5.00	9	to assess the skills of problem solving, understanding of related topics.

#### **Recommended books :**

1. "Electric Machinery fundamentals", S. J. Chapman, S. J., McGraw Hill Co., 4th edition, 2005.
2. "Principles of Electric Machines with Power Electronic Applications", M. E. El-Hawary, McGraw-Hill, most recent edition.
3. "Electric Machines, Drives and Power Systems", Theodore Wildi, Prentice Hall, most recent edition.