

## 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	Hany Mohamed Hasanien Mohamed	2
Assistant Lecturer	Ahmed Moreab Hussien Mohamed	7
Teaching Assistant	Shahd Muhammed Anwer Muhammed Hamed	
Teaching Assistant	Abeer Tharwat Said Awad	2

#### Area Of Study :

Upon successful completion of the course, the student should be able to:

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. Demonstrate starting methods and speed control of both 3-ph Induction Motors.
3. Understand the construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and basic characteristics of each of 1-ph Induction Motors.
4. Demonstrate starting methods and speed control of 1-ph Induction Motors.
5. develop practical skills of testing of Induction Motors.

#### Description :

3-ph Induction Motors: Construction, theory of operation, equivalent circuit, voltage, current, power and torque equations, Load (Torque/Slip) characteristics, Circle diagram, Starting methods, Speed control, Testing and experiments, and Double cage IM. 1-ph Induction Motors: Construction, theory of operation, equivalent circuit, voltage, current, power and torque equations, Load (Torque/Slip) characteristics, Starting methods, Testing and experiments. Induction generator, Induction regulator, Induction type phase shifter

#### Course outcomes :

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

1 -	a1. Demonstrate the construction, theory of operation, equivalent circuit, and characteristics of 3-ph induction motors.
2 -	a2. Demonstrate knowledge and understanding of starting and speed control of both 3-ph induction motors.
3 -	a3. Describe the construction, theory of operation, equivalent circuit, and characteristics of 1-ph induction motors.
4 -	a4. Demonstrate knowledge and understanding of starting of 1-ph induction motors.

##### **b. Intellectual Skills: :**

1 -	b1. Apply knowledge of electromagnetic fields to analyze related problems
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2 -	b2. Analyze operating conditions of 3-ph induction motors.
3 -	b3. Analyze starting methods and speed control of both 3-ph Induction Motors.
4 -	b4. Evaluate the performance of 1-ph induction motors.
5 -	b5. Analyze starting methods of both 1-ph Induction Motors.
6 -	b6. Choose among different solution alternatives.

**c. Professional and Practical Skills: :**

1 -	c1. Perform the required experiments to get the load characteristics of 3-ph induction motors.
2 -	c2. Perform the required experiments to get the load characteristics of 1-ph induction motors.

**d. General and Transferable Skills: :**

1 -	d1. Work coherently and successfully as a part of a team in the Lab.
2 -	d2. Work in stressful environment and within constraints.
3 -	d3. Communicate effectively.
4 -	d4. Effectively manage tasks, time, and resources.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Revision of 3-ph circuits and magnetic circuits.	6	3	3
Revision of 1-ph Transformers.	6	3	3
3-ph Induction Motors: Construction: stator windings of AC machines, Rotor types.	18	9	9
theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and load characteristics.	12	6	6
Analysis using circle diagram.	12	6	6
Experimental determination of IM parameters.	6	3	3
Starting and speed control of Induction Motors.	12	6	6
Double cage IM.	6	3	3
1-ph Induction Motors: Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, and load characteristics.	12	6	6

**Teaching And Learning Methodologies :**

Lectures
Tutorials
Laboratories

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		
o In Class Quizzes	10.00		
o Lab	10.00		
o Mid-Term exams	30.00		

o Participations

10.00

**Recommended books :**

1. "Electric Machinery fundamentals", S. J. Chapman, McGraw Hill Co., 4th edition, 2005 (Text Book).
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.