FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

## Faculty of Engineering & Technology

## Induction Machines

**Information :**

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| **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 :**

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| **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 :**

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| Lectures |
| Tutorials |
| Laboratories |

**Course Assessment :**

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

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|---|---|---|---|
| o Participations | 10.00 | | |

**Recommended books :**

ñElectric Machinery fundamentalsò, Chapman, S. J., 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.