

# LECTURE 1



# Single Phase Induction Motor



# CHAPTER OUTLINE

1 Introduction

2 Overview of single phase IM

3 Overview of Three-Phase IM

4 Construction

5 Principle of Operation

6 Equivalent Circuit

- Armature reaction
- Power Flow, Losses and Efficiency
- Torque-Speed Characteristics

3.7 Speed Control

# 1 INTRODUCTION

- A induction machine can be used as either a **induction generator** or a **induction motor**.
- IM transform **electrical energy** into **mechanical energy**
- IM is a type of asynchronous **AC motor** where power is supplied to the rotating device by means of **electromagnetic**

# 1 INTRODUCTION (Cont.)

- popularly used in the industry and are used worldwide in many residential, commercial, industrial, and utility applications.

- **Main features:** cheap and low maintenance  
(absence of brushes)

**Main disadvantages:** speed control

is not easy

NJ  
FKEE, UMP

## 2 OVERVIEW OF SINGLE PHASE IM

- Construction : similar to  $3\phi$  induction motor
- A single-phase motor is a rotating machine that has both main and auxiliary windings and a squirrel-cage rotor.
- Supplying of both main and auxiliary windings enables the single-phase machine to be driven as a two-phase machine.



## **3.2 OVERVIEW OF SINGLE PHASE IM**

- Home air conditioners
- Kitchen fans
- Washing machines
- Industrial machines
- Compressors
- Refrigerators

*Note :*

*At stator :*  $n_s = \frac{120f}{p}$

$$\therefore f = \frac{n_s p}{120} \quad \dots\dots(i)$$

*At Rotor :*  $n_s - n_r = \frac{120f}{p}$

$$\therefore f = \frac{(n_s - n_r) p}{120} \quad \dots\dots(ii)$$

*(ii) ÷ (i) :*  $f_r = s.f$