



Electronic &  
Electrical  
Engineering.

## EEE6200 AC MACHINES

Credits: 15

### Course description including aims

1. To introduce the principle of operation of conventional AC machines.
2. To provide an insight into the operating characteristics of synchronous and induction machines.
3. To introduce the principle of operation of synchronous and switched reluctance machines, and discuss their operating characteristics.

### Outline syllabus

**Introduction to AC machines:** magnetic circuits, properties of soft magnetic materials, flux linkage, inductance and energy, determination of forces and torques. **Polyphase rotating machines:** two-axis three-winding machine, general multi-winding machine, matrix form, electromagnetic torque, synchronous machine topology, induction machine topology, phase and dq axis transformations. **Sinusoidal windings:** single layer windings, double layer windings, fractional-slot windings. **Synchronous machines:** modeling and equivalent circuits, steady state and transient performance and operating characteristics of non-salient pole machines, effects of rotor saliency and steady state operating characteristics of salient pole machines. **Induction machines:** modeling and equivalent circuits, steady state and transient performance and operating characteristics. **Synchronous reluctance machines:** principle of operation, modeling and equivalent circuits, steady state and transient operating characteristics. **Switched reluctance machines:** principle of operation, steady state and transient performance and operating characteristics.

### Time allocation

36 lectures.

### Recommended previous courses

First degree or equivalent in Electronic and Electrical Engineering

### Assessment

3-hour examination, answer 4 questions from 6.

## Recommended books

Say M. G.                    *ALTERNATING CURRENT MACHINES*    (Longman Scientific & Technical)  
Nasar S. A.                *ELECTROMECHANICS AND ELECTRIC MACHINES*    (John Wiley & Sons)  
Jones C. V.    *THE GENERALISED THEORY OF MACHINES*                    (Butterworths)  
Miller T. J. E. *SWITCHED RELUCTANCE MOTORS AND THEIR CONTROL*                    (Magna  
Physics Publishing)

## Objectives

By the end of this module successful students will be able to:

1. Demonstrate an understanding of the principle of operation of conventional synchronous and induction machines.
2. Demonstrate an understanding of the modelling techniques employed in synchronous and induction machines.
3. Predict and demonstrate an understanding of the steady state and transient operating characteristics of conventional synchronous and induction machines.
4. Demonstrate an understanding of the principle of operation of synchronous and switched reluctance machines.
5. Predict and demonstrate an understanding of the steady state and transient operating characteristics of synchronous and switched reluctance machines.