**MEC 2201 Electrical Engineering for Mechanical Engineers**

| **Hours requirement of the course** | | | | **Weighted Total Mark** | **Weighted Examination Mark** | **Weighted Continuous Assessment Mark** | **Total Credit Units** |
|---|---|---|---|---|---|---|---|
| LH | PH | TH | CH | WTM | WEM | WCM | CU |
| 45 | 30 | 00 | 60 | 100 | 60 | 40 | 4 |

**Rationale**

The course is designed to help students understand the concepts of electrical generation, transmission, distribution and usage, electrical drives, electrical instrumentation and measurements in relation to industrial applications. The course examines how Mechanical Engineers can understand and handle electrical engineering problems which they come across within their operational areas.

**Objectives**

- Appreciate the relevance of course to Mechanical Engineers.
- Gain thorough knowledge on the science behind the constructional features of electro-mechanical machines.
- Able to specify the most suited machines for given applications.
- Explain various parameters that affect (and how they affect) different output variables of electro-mechanical machines.
- Practically test the serviceability of electro-mechanical machines and evaluate their efficiency.
- Provide a comprehensive comparison of group and individual electric drives, the mounting for different drives and motor enclosures for drives.

**Learning Outcomes**

At the end of the course students should be able appreciate different components and types of an electrical system and usage in the industrial environment. Theoretically will be able to analytically think to plan, install, operate, maintain service and repair electrical industrial drives such as electrical motors, switch gears etc.

**Model of Delivery**

The course will be taught by using lectures, tutorial, practical session (laboratories) and reading assignments

**Method of Assessment**

The method to be used to assess students is outlined as follows:

a. **Continuous Assessment broken down as follows**

- **Individual and/or group assignments: 5%**
- **Supervised class tests (at least two in a Semester): 15%**
- **Laboratory practical work (students writing reports): 20%**

Total for Continuous Assessment: *40%*

b. **Final Examination marked out of 100% contributes: *60%***

- Overall Assessment (Total) 100% **Course Contents**

The course contents are outlined as follows:

- **Instrumentation and Measurement: 4 hours**

Concepts of electrical measurements and types of transducers; Electrical measuring instruments especially those used in power systems and industries

- **Fundamentals of Energy conversion: 6 hours**

Constructional features and principles of operation of DC machines; induction machines construction features and principles of operation; Synchronous machines construction and principles of operation

- **Power Systems: 6 hours**

Components and types of power systems; Calculations of power, voltage and current at generation and load side; transmission and distribution of power and networks; switching and protection

- Induction Machines: 5 hours

**> Construction and production of torque (3-phase rotating flux); slip and its effect on rotor emf rotor impedance, rotor current and frequency, and torque; the torque- slip characteristics; induction motor losses and efficiency; induction motor starters e.g. direct-on-line, star-delta, autotransformer, resistance, electronic starters; the forward and reverse connection; single phase induction motors.**

- **The Synchronous Machines: 6 hours**

Construction and operation of synchronous machines; advantages of synchronous machines over induction machines; starting techniques of synchronous machines; excitation characteristics of synchronous machines; the V-characteristics

- **Electronic control circuits and devices 3 hours**

There are extra laboratory hours attached to each topic given above

**Recommended Reference Books**


1. J. Shepherd, A. H. Morton and L. F. Spence, "Higher Electrical Engineering", 1985

2. Bhag S. Guru and Huseyin R. Hiziroglu, "Electric Machinery and Transformers", 3rd edition 2001

3. Stephen J. Chapman, "Electric Machinery Fundamentals", 2nd Edition

4. Alan Symonds, "Electrical Power Equipment and Measurements: with heavy current electrical applications", 2nd edition

5. Stefan F. Jurek, "Electrical Machines for Engineers and Technicians"