ADVANCED DIPLOMA OF
MECHANICAL ENGINEERING TECHNOLOGY

MODULE DETAILS	**Module 4: AC Electrical Motors and Drives** Nominal duration: 2 weeks (24 hours total time commitment) This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), the time necessary to complete the assignments, and further study.
MODULE PURPOSE	Electrical motors are one of the most important components in any type of industry. Whatever the type of mechanism, be that mechanical, pneumatic or hydraulic, the energy to drive them is mostly is derived through a motor. A motor is nothing but a converter of electrical energy to mechanical energy with a rotational output. In this module you will be given an understanding of the basic principles involved in producing a driving torque using motors, and of the various types of motors used in industry. You will learn about an induction motor which is often called 'the workhorse of industry', its constructional details, and how to select a motor appropriate to your needs. Oftentimes the driven equipment requires to be reversed and the speed needs to be varied. This module will discuss the operation of motors such as staring, reversing and speed control. A motor has a large mechanical component in its design and failures are mostly because of wrong application, improper maintenance of mechanical parts, and problems with the driven equipment. This module will provide an insight into the maintenance aspects of motors and how to avoid motor failures. The failure of a single motor can cause an entire production line to stop and the consequential losses can be way too high compared to the cost of repairing the motor itself. Therefore all efforts must be made to maintain the motors properly and avoid failures. Electronic speed control using Variable Frequency Drives is a method commonly adopted to control the speed of AC motors. This module will discuss the basic principle of variable frequency method of speed control, applications of such control in the industry, and how to match the drive with the driven equipment.
PRE-REQUISITE MODULES/UNIT(S)	NONE
ASSESSMENT STRATEGY	To evaluate the achievement of the learning outcomes, written assignments and practical exercises are set.

SUMMARY OF LEARNING OUTCOMES

1. Explain how torque is produced in an electrical motor
2. Examine the basic principles, construction, starting and speed control of ac motors
3. Select ac motors for a given application and troubleshoot motor problems
4. Explain the principle and selection of variable speed drives for ac motors

Learning Outcome 1 **Explain how torque is produced in an electrical motor**

Assessment criteria

1.1. Examine and discuss the basic relationship between magnetism, electric current and force

1.2. Explain motor parameters such as torque, inertia, efficiency, and power

1.3. Explain how an electric motor produces torque

1.4. List the different types of motors and explain their suitability in different applications

Learning Outcome 2 **Examine the construction and control of ac motors**

Assessment criteria

2.1. Identify the important components of a motor

2.2. Examine the relation between supply frequency, number of poles and speed of an ac motor

2.3. Explain the reversal of direction of a 3-phase ac motor and the basic principle

2.4. Examine the efficiency of an ac motor and the types of losses involved

Learning Outcome 3 **Select ac motors for a given application and troubleshoot motor problems**

Assessment criteria

3.1. Explain motor induction torque/speed curves and the salient points on the curves

3.2. Explain the important points to be considered for motor selection

3.3. List problem areas in a motor and maintenance needs

3.4. Identify probable causes for a motor failure

Learning Outcome 4	**Explain the principle and selection of Variable Speed Drives for ac motors**
Assessment criteria	4.1. Examine the need for speed control and the control approach used in ac machines
	4.2. Explain the principle of a Variable Speed Drive for ac motors
	4.3. Examine the torque/speed/power curves of a typical VSD
	4.4. Explain the criteria for selecting a VSD for a given application

Delivery Mode
A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoint slides, notes, reading and study materials (in PDF, HTML and Word format) accessed through the Moodle Learning Management System (LMS).