

## Liverpool John Moores University

Title: Electrical Machines and Variable Speed Drives  
Status: Definitive  
Code: **6118MSE** (120767)  
Version Start Date: 01-08-2018

Owning School/Faculty: Electronics and Electrical Engineering  
Teaching School/Faculty: Electronics and Electrical Engineering

Team	Leader
Martin Jones	Y
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**Academic Level:** FHEQ6      **Credit Value:** 10      **Total Delivered Hours:** 26  
**Total Learning Hours:** 100      **Private Study:** 74

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	12
Practical	6
Tutorial	6

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Steady-state operation of Dc and AC machines	30	
Exam	AS2	Final exam (2hrs)	70	2

### Aims

*This module is intended to achieve the following programme aims within the field of Electrical Engineering:*

- *To introduce three-phase circuits and to further develop circuit analysis skills*

*relating to ac circuits.*

- *To develop an understanding of the operating principles of electrical machines.*
- *To introduce the principles of control of variable speed electric drives using power electronic converters.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Analyse single-phase and three-phase circuits
- 2 Analyse and appreciate steady-state operating characteristics of dc and induction machines.
- 3 Understand and discuss the operating principles of dc and ac variable speed drives
- 4 Perform standard laboratory tests on electrical machinery.

## **Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

DC & AC machines	4			
Exam	1	2	3	

## **Outline Syllabus**

*Single phase AC circuits: Phasors, real, apparent and reactive power, power factor.*

*Balanced three-phase systems: phase sequence, types of connection, powers.*

*Steady-state operation of dc machines: types, circuits and equations, speed-torque curve.*

*Steady-state operation of induction machines: operating principle, equivalent circuit, phasor diagram, torque-speed curve, losses and efficiency.*

*General drive considerations: operating quadrants, motoring, braking, regeneration.*

*Mechanical considerations: - load torque profiles, gearing.*

*Speed control of dc motors, armature voltage variation using power electronic converters*

*Speed control of induction machines –V/f control, soft starting, wye-delta starting.*

## **Learning Activities**

A series of lectures, tutorials and laboratory sessions.

## **Notes**

This level 6 module introduces the concepts and operating principles of rotating electrical machines and of variable speed drives commonly found in the industrial

manufacturing sector.