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## MODULE DESCRIPTOR

### Module Title

Electrical Machines And Drives 2

|           |             |             |         |
|-----------|-------------|-------------|---------|
| Reference | EN4560      | Version     | 4       |
| Created   | May 2017    | SCQF Level  | SCQF 10 |
| Approved  | March 2004  | SCQF Points | 15      |
| Amended   | August 2017 | ECTS Points | 7.5     |

### Aims of Module

To provide the student with the ability to analyse the performance and operation of ac machines and drive systems, and to apply simulation techniques to aid this analysis.

### Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Apply 2-axis analysis to the performance of 3-phase synchronous and induction motors.
- 2 Understand and analyse the operation of AC drive systems as applied to 3-phase induction motors.
- 3 Utilise simulation tools to analyse the transient performance of AC machines.

### Indicative Module Content

Salient pole synchronous machines. Principles of operation, application and analysis. Two-axis analysis. Generalised machine theory. Application to the transient analysis of both synchronous and induction machines. AC drives: induction motor operation on variable-voltage variable frequency supplies, principles of self-commutated, variable-frequency inverter operation, control of output voltage, frequency and harmonics. Principles of braking and regeneration, slip energy recovery, stator voltage control, cycloconverters. Introduction to flux-vector control of ac machines Matlab and Simulink analysis of ac machines and drive systems in steady-state and transient operation.

### Module Delivery

This is a lecture-based course supplemented with tutorial sessions, laboratory work and student-centred learning.

| <b>Indicative Student Workload</b>   | Full Time  | Part Time  |
|--|------------|------------|
| Contact Hours  | 49         | 49         |
| Non-Contact Hours  | 101        | 101        |
| Placement/Work-Based Learning Experience [Notional] Hours                    | N/A        | N/A        |
| <b>TOTAL</b>   | <b>150</b> | <b>150</b> |
| <i>Actual Placement hours for professional, statutory or regulatory body</i> |            |            |

### ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

#### Component 1

|              |                    |            |     |                    |   |
|--------------|--------------------|------------|-----|--------------------|---|
| Type:        | Coursework         | Weighting: | 30% | Outcomes Assessed: | 3 |
| Description: | Laboratory report. |            |     |                    |   |

#### Component 2

|              |                          |            |     |                    |      |
|--------------|--------------------------|------------|-----|--------------------|------|
| Type:        | Examination              | Weighting: | 70% | Outcomes Assessed: | 1, 2 |
| Description: | Closed book examination. |            |     |                    |      |

### MODULE PERFORMANCE DESCRIPTOR

#### Explanatory Text

To pass the module, you must achieve at least a 40% weighted average mark in the exam and coursework. In addition you need to achieve at least 35% in both the individual exam and coursework components.

| Module Grade | Minimum Requirements to achieve Module Grade:                                  |
|--------------|--|
| <b>A</b>     | >70%   |
| <b>B</b>     | 60-69%   |
| <b>C</b>     | 50-59%   |
| <b>D</b>     | 40-49%   |
| <b>E</b>     | 35-39%   |
| <b>F</b>     | 0-34%  |
| <b>NS</b>    | Non-submission of work by published deadline or non-attendance for examination |

### Module Requirements

|                          |  |
|--------------------------|--|
| Prerequisites for Module | Electrical Machines and Drives 1 (EN3560) or equivalent. |
| Corequisites for module  | None.  |
| Precluded Modules        | None.  |

### INDICATIVE BIBLIOGRAPHY

|   |   |
|---|---|
| 1 | FITZGERALD, A.E., KINGSLEY, C. and UMANS, S.D., 2003.6th ed. Electric Machinery. Singapore: McGraw-Hill   |
| 2 | MOORTHI, V.R., 2005. Power Electronics. New Delhi: Oxford University Press.                               |
| 3 | ONG, CHEE-MUN., 1998. Dynamic Simulation of Electric Machinery. Upper Saddle River, NJ: Prentice Hall PTR |