# Module Proforma

**Approved, 2022.02**

## Summary Information

| | |
|---|---|
| **Module Code** | 7400ELE |
| **Formal Module Title** | Modelling and Control of Electric Machines and Drives |
| **Owning School** | Engineering |
| **Career** | Postgraduate Taught |
| **Credits** | 20 |
| **Academic level** | FHEQ Level 7 |
| **Grading Schema** | 50 |

## Module Contacts

### Module Leader

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|
| Obrad Dordevic | Yes | N/A |

### Module Team Member

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|

### Partner Module Team

| Contact Name | Applies to all offerings | Offerings |
|---|---|---|

## Teaching Responsibility

| LJMU Schools involved in Delivery |
|---|
| Engineering |

## Learning Methods

| Learning Method Type | Hours |
|---|---|

| | |
|---|---|
| Lecture | 22 |
| Tutorial | 22 |

## Module Offering(s)

| Offering Code | Location | Start Month | Duration |
|---|---|---|---|
| JAN-CTY | CTY | January | 12 Weeks |

## Aims and Outcomes

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|---|---|
| **Aims** | To develop an understanding of principles and acquire working knowledge of mathematical modelling of electrical machines. To introduce the principles of control of variable speed electric drives using power electronic converters. To introduce the concept of vector control as applied to induction machines. |

## Learning Outcomes

**After completing the module the student should be able to:**

| Code | Description |
|---|---|
| MLO1 | Analyse steady state behaviour of grid supplied and inverter supplied induction machines |
| MLO2 | Use basic Matlab functions to design programs for steady state analysis |
| MLO3 | Undertake modelling of various transients of grid-supplied and inverter-supplied ac machines |
| MLO4 | Use Simulink/Matlab to develop a working simulation programme for analysis of AC machine's dynamics |

## Module Content

| Outline Syllabus |
|---|
| 1. Steady state modelling of induction machines and supply:Principles of AC machine steady state modelling.Steady state characteristics of grid supplied induction machine.Variable-speed of operation using V/f control.Voltage source inverter - power circuit and operation in six-step mode.PWM control of a voltage source inverter.2. Transient modelling of induction machines:Modelling of a three-phase squirrel-cage induction machine in terms of phase variables.Common reference frame transformations: Model in arbitrary d-q reference frame.Concept of space vectors and induction machine model in terms of space vectors. Modelling of the three-phase sinusoidal power supply and voltage source inverter using space vectors.High-performance AC drives: The idea of vector control and field orientation possibilities in an induction machine. Principles of rotor flux oriented control. |

**Module Overview**

| Additional Information |
| --- |
| This level 7 module introduces the advanced concepts of electrical machine modelling and high performance dynamic control of variable speed AC drives.UNESCO Sustainable Development GoalsQuality EducationAffordable and Clean EnergyDecent Work and Economic GrowthIndustry, Innovation and InfrastructureSustainable Cities and CommunitiesResponsible Consumption and ProductionClimate ActionUK SPEC AHEP 4CEng. M1 Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.M2 Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.M3 Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.M4 Select and critically evaluate technical literature and other sources of information to solve complex problems.M6 Apply an integrated or systems approach to the solution of complex problems.M18 Plan and record self-learning and development as the foundation for lifelong learning/CPD. |

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Learning Outcome Mapping |
| --- | --- | --- | --- | --- |
| Report | Simulation | 100 | 0 | MLO4, MLO3, MLO2, MLO1 |