

Liverpool John Moores University

Title: Marine Electrical Systems
Status: Definitive
Code: **5109MECH** (121300)
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering
Teaching School/Faculty: Engineering

| Team | Leader |
|----------------------|--------|
| Christian Matthews | Y |
| Mohamed Kara-Mohamed | |
| Philip Davies | |

Academic Level: FHEQ5 **Credit Value:** 20 **Total Delivered Hours:** 68
Total Learning Hours: 200 **Private Study:** 132

Delivery Options

Course typically offered: Semester 2

| Component | Contact Hours |
|-----------|---------------|
| Lecture | 22 |
| Online | 22 |
| Tutorial | 22 |

Grading Basis: 40 %

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|----------|-------------------|-------------|---------------|---------------|
| Exam | AS2 | Examination | 60 | 2 |
| Test | AS1 | Portfolio | 40 | |

Aims

The aim of this module is to provide a comprehensive introduction to Marine Instrumentation and Electrical Engineering, the module will concentrate on the principles, construction and operation of marine instrumentation, ac and dc motors and generators, and associated distribution and protection systems.

Learning Outcomes

After completing the module the student should be able to:

- 1 Select appropriate sensors for an application and demonstrate an understanding of their characteristics and practical interfacing requirements.
- 2 Select appropriate actuators for an application and demonstrate an understanding of their characteristics and drive requirements
- 3 Explain the principles of magnetism and electromagnetism induction and solve related problems
- 4 Demonstrate knowledge of the principles and application of dc, ac motors and generators and solve related problems
- 5 Discuss typical arrangements of marine dc and ac distribution systems and solve related problems

Learning Outcomes of Assessments

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

| | | | | | |
|-------------|---|---|---|---|---|
| Examination | 1 | 2 | 3 | 4 | 5 |
| VLE Test | 1 | 2 | 3 | 4 | 5 |

Outline Syllabus

Sensors

- *Measured Physical Quantity*
 - o *Temperature*
 - o *Position, Displacement and Velocity*
 - o *Acceleration*
 - o *Pressure and Force*
 - o *Fluid Flow Rates*
- *Tranducer Types*
 - o *Resistive*
 - o *Capacitive*
 - o *Inductive*
 - o *Piezo Electric*
- *Signal Type*
 - o *Analogue*
 - o *Digital*
- *Characteristics*
 - o *Range and Span*
 - o *Sensitivity*
 - o *Precision, Accuracy, Repeatability*

Actuators

- *Electro-mechanical*
 - o *Motors*

o Solenoids

- *Pneumatic and Hydraulic*
- *Mechanisms (for connecting loads to actuators)*
 - o *Screws*
 - o *Racks*
 - o *Gears*
 - o *Linkages*
- *Pumps*
- *Heating and Cooling*
 - o *Peltier and Thermo-electric devices*
 - o *Resistive heaters*
- *Loading*
 - o *Mechanical loads on electro-mechanical, pneumatic and hydraulic actuators*
 - o *Thermal loads on heaters/coolers*
 - o *Fluid loads on pumps*

Power (10 credits)

- *AC waveform, phasor diagrams and power factor*
- *Single phase and three phase ac circuits*
- *Principles of electromagnetic induction*
- *AC and DC motors*
 - o *Type*
 - o *Construction*
 - o *Operation*
 - o *Application*
- *AC generators*
 - o *Type*
 - o *Construction*
 - o *Operation*
 - o *Load/speed control*
 - o *Excitation*
 - o *Protection*
 - o *Synchronizing*
- *Switch boards and distribution arrangements of marine dc and ac systems*
- *Transformers*

Learning Activities

A series of lectures and tutorials.

Notes

The module is designed to give Marine Engineering students a comprehensive understanding of electrical and control equipment and systems heavily utilised in the

marine engineering sector.