

Marine Electrical Systems

Module Information

2022.01, Approved

Summary Information

Module Code	5309MECH
Formal Module Title	Marine Electrical Systems
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	22
Practical	6
Tutorial	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	The aim of this module is to provide a comprehensive introduction to Marine Instrumentation and stand-alone Electrical Power systems. The module will focus on electrical principles, construction and operation of marine instrumentation, A.C. and D.C. motors and generators, and the associated distribution and protection systems.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Demonstrate an understanding of the characteristics and practical interfacing requirements of sensors and actuators used in Marine Plant.
MLO2	2	Select appropriate sensors and actuators for a given application and demonstrate an understanding of their characteristics and drive requirements.
MLO3	3	Solve problems related to the principles of magnetism and electromagnetic induction.
MLO4	4	Demonstrate knowledge of the principles and application of motors and generators operated on D.C. and A.C. and solve related problems.
MLO5	5	Identify typical arrangements of marine D.C. and A.C. distribution systems and solve related problems.

Module Content

Outline Syllabus	<p>1. Sensors: a. Measured Physical Quantity - Temperature, Position, Displacement and Velocity, Acceleration, Pressure and Force, Fluid Flow Rates. b. Transducer Types - Resistive, Capacitive, Inductive, Piezo Electric.c. Signal Type - Analogue, Digital. Logic gates. d. Characteristics - Range and Span, Sensitivity, Precision, Accuracy, and Repeatability.2. Actuators:a. Electro-mechanical - Motors, Solenoids.b. Pneumatic and Hydraulic. c. Mechanisms (Connection of loads to actuators) - Screws, Racks, Gears, Linkages. d. Pumps.e. Heating and Cooling - Peltier and Thermo-electric devices, Resistive heaters. f. Loading - Mechanical loads on electro-mechanical, pneumatic and hydraulic actuators. Thermal loads on heaters/coolers. Fluid loads on pumps. Fail safe, Fail Set. 3. Power Systems Theory: a. Systems analysis - A.C. waveform, phasor diagrams and power factor. b. Single phase and three phase A.C. circuits.c. Principles of electromagnetic induction. 4. Motors (A.C. and D.C.):a. Types, construction, operation, application. 5. A.C. Generators:a. Type, construction, operation, b. Load/speed control, excitation, protection. 6. Electrical Distribution: a. Types of Installation - Rules and regulations. Associated Standards. Switchboard and distribution arrangements of marine ac and dc systems. Earthed and insulated neutral systems. Safety precautions (CoSWP), High Voltage precautions. Cause, detection and prevention of earth faults. b. Power generation - Generator synchronization. Generator rating and capability. Protection. c. Transformers. 7. Storage Batteries</p>
Module Overview	
Additional Information	<p>This module builds on the knowledge gained from the level 4 module 4307MECH Mechatronics 1 and is designed to give Marine Engineering students a comprehensive understanding of the electrical systems, sensors and control equipment utilised in the marine engineering sector. It provides partial fulfilment of the MCA Certificate of Competency meeting STCW Reg - III/1 Engineer Officer of the Watch requirements. The focus of the module is concerned with the safe and efficient operation of plant, the correct use of equipment provided for the safety of the ship and the protection of the environment. This module incorporates content that relates to the following UN Sustainable Development Goals : SDG7 - This module considers the generation, control and management of affordable, reliable, sustainable and modern marine energy systems. SDG9–This module provides students with an understanding of developing resilient electrical infrastructure and the adoption of innovative marine electrical plant in regards to energy consumption and electrical waste (IMO MARPOL Annex VI – e-waste). SDG14 – This module considers the sustainability and conservation of the marine environment by the use of efficient shipboard electrical systems.</p>

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Centralised Exam	Examination	70	3	MLO2, MLO4, MLO5
Test	VLE Tests	30	0	MLO1, MLO3

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Philip Davies	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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