

Higher National Unit Specification

General information for centres

Unit title: Marine Engineering Systems

Unit code: D78P 35

Unit purpose: This Unit is about the operating principles of marine power plants, the function of a vessel's auxiliary machinery and the concepts of control systems from the point of view of the master of a vessel. It is primarily aimed at candidates who intend to seek sea-going employment as a Merchant Navy Deck Officer. However it could also be studied by someone with an interest in the subject area.

On completion of this Unit the candidate should be able to:

1. Describe the operating principles of marine power plants
2. Describe the function and operation of a vessel's auxiliary machinery
3. Use engineering terms and describe the concepts of control systems

Credit value: 1 HN Credit at SCQF level 8: (8 credit points at SCQF level 8)

SCQF (the Scottish Credit and Qualifications Framework) brings Scottish qualifications into a single framework of 12 levels ranging from SQA Access 1 to doctorates. The SCQF includes degrees; HNC/Ds; SQA National Qualifications; and SVQs. Each SQA Unit is allocated a number of SCQF credit points at a specific level. 1 SCQF point = 10 hours of learning. HN candidates are normally expected to input a further number of hours, matched to the credit value of the Unit, of non-contact time or candidate-led effort to consolidate and reinforce learning.

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. However it would be beneficial if candidates had achieved either a UK MCA 'Officer of the Watch' Certificate or equivalent, or the HNC *Nautical Science*.

Core skills: There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

Context for delivery: This Unit is included in the framework of the HND *Nautical Science*. It is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

Assessment: Assessment will be on a sample basis with all three outcomes being assessed by structured multiple choice questions under supervised conditions.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the operating principles of marine power plants

Knowledge and/or skills

- Describe diesel plant
 - (a) Diesel propulsion and associated systems
 - (b) Critical aspects and operational limitations of diesel engine operations
- Describe steam turbine plant
 - (a) The layout of steam turbine and associated plant
 - (b) Critical aspects and operational limitations of boiler and turbine operations
- Describe gas turbine plant
 - (a) The layout of gas turbine and associated plant
 - (b) Critical aspects and operational limitations of gas turbine operations
- Describe the transmission of power to the propulsion system
- The factors affecting fuel consumption
 - (a) Fuel consumption calculations
 - (b) Conservation of fuel
 - (c) Propeller pitch and slip

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can correctly:

- describe the operating principles of diesel and turbine plants
- explain factors affecting fuel consumption and accurately perform fuel calculations

Higher National Unit specification: statement of standards (cont)

Assessment guidelines

Outcome 1 will be sample assessed by means of structured multiple choice questions under supervised conditions on the operating principles of marine power plants, the factors affecting fuel consumptions and fuel calculations.

Outcome 2

Describe the function and operation of a vessel's auxiliary machinery

Knowledge and/or skills

- Describe the function and operational limitations of the following, and have an awareness of the relevant regulations:
 - (a) Auxiliary boilers
 - (b) Distillation and freshwater systems
 - (c) Pumps
 - (d) Refrigeration and air conditioning systems
 - (e) Ventilation
 - (f) Sewage treatment plant
 - (g) Oily water separation and oil filtering
 - (h) Incinerators
 - (i) Electrical power generation and distribution
 - (j) Stabilisers
- Describe steering and manoeuvring systems
 - (a) Ram and rotary systems
 - (b) Telemotor and transmission system
 - (c) Auxiliary and emergency steering systems
 - (d) Thrusters
 - (e) Relevant regulations

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can correctly:

- describe the function and operation of vessel's auxiliary machinery

Assessment guidelines

Outcome 2 will be sample assessed by means of multiple choice questions under supervised conditions on the operation of a vessel's auxiliary machinery.

Higher National Unit specification: statement of standards (cont)

Unit title: Marine Engineering Systems

Outcome 3

Use engineering terms and describe the concepts of control systems

Knowledge and/or skills

- Marine engineering terms
 - (a) Terms in common use consistent with use in UK regulations
- The concept of control systems
 - (a) Open and closed loops and their components
 - (b) Types of control action
 - (c) Practical shipboard applications
- Explain the need for and describe the function and operation of:
 - (a) Data loggers
 - (b) Mimic diagrams
 - (c) Analogue and digital displays
 - (d) Shipboard applications of the above
- Describe the principles of bridge control
 - (a) Principles of bridge control, including fail safe, fail run and safety interlocks for:
 - (i) Slow speed diesel engines
 - (ii) Medium speed diesel engines fitted with controllable pitch propeller or reversing gearbox
 - (iii) Steam turbines with associated boilers
 - (iv) Gas turbines
 - (v) Thruster systems
 - (b) Interchanging bridge and engine room control
 - (c) Requirements for plant monitoring and alarm systems for UMS Operations
 - (d) Integrated bridge systems

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can correctly :

- use marine engineering terms
- describe the operation of vessel monitoring and control systems

Higher National Unit specification: statement of standards (cont)

Assessment guidelines

Outcome 3 will be sample assessed by means of multiple choice questions under supervised conditions on control systems

Administrative Information

Unit code: D78P 35

Unit title: Marine Engineering Systems

Superclass category: XQ

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Higher National Unit specification: support notes

Unit title: Marine Engineering Systems

This part of the Unit is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

The content of this Unit forms part of the underpinning knowledge for an UK MCA *Chief Mate Certificate of Competency* and accordingly reflects the content of International Maritime Organisation's *Standards of Training Certification and Watchkeeping (STCW)*.

Guidance on the delivery of this Unit

Candidates will benefit most if this Unit is delivered during the final phase of the HND *Nautical Science* at which stage candidates will be best able to draw on the knowledge gained from the qualifications or Units recommended as prior knowledge as well as experience gained from service at sea.

Open learning

The preferred method of delivery is by attendance at college as the majority of candidates following this Unit will be on a training programme comprising alternating periods at college and at sea, the sea periods being utilised to put into practice knowledge and skills acquired.

Special needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs and Candidates for whom English is an Additional Language* (SQA, 2000).

General information for candidates

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- describe the function and operation of a vessel's auxiliary machinery
- use engineering terms and describe the concepts of control systems

Assessment will be on a sample basis with all three Outcomes being assessed by structured multiple choice questions under supervised conditions.

Acronyms

| | |
|------|---|
| BP | Brake Power |
| CPP | Controllable Pitch Propeller |
| DP | Delivered Power |
| EP | Effective Power |
| IP | Indicated Power |
| MCR | Maximum Continuous Rating |
| STCW | Standards of Training, Certification and Watchkeeping for Seafarers |