MCAST

MQF/EQF Level 4

MS4-A4-21

Advanced Diploma in Marine Engineering

Course Specification

Course Description

This programme is the first step for those who wish to embark on a career in the maritime sector, with opportunities being available both locally and internationally. The course introduces the basics of engineering related to marine vessels and is ideal for those who wish to be introduced into this sector and obtain a formal vocational qualification. After successful completion of the course, the learner will have formed sound theoretical and practical competences. This course includes work-related training and practice.

Programme Learning Outcomes

At the end of the programme the learner will be able to:

1. *Be familiar with relevant Shipping Industry Regulations and Legislation and Standards*
2. *Identify elements of marine engineering plant*
3. *Understand the application of mechanical engineering theory in a marine engineering environment*
4. *Follow operations and maintenance procedures as applicable to marine engineering.*

Entry Requirements

Any MCAST Level 3 Diploma
OR
4 SEC/O-Level/SSC&P (Level 3) passes
Compulsory: One subject from Engineering Technology or Design and Technology or Chemistry or Mathematics or Physics.

Key Information

Awarding Body – MCAST

Accreditation Status – Accredited via MCAST's Self Accreditation Process (MCAST holds Self-Accrediting Status as per 1st schedule of Legal Notice 296/2012)

Type of Programme: Qualification

MQF Level	Examples of Qualifications	'Qualification' Minimum Credits Required	'Award' Credits Required
Level 8	Doctoral Degree Third Cycle Bologna Process	NA	NA
Level 7	Masters Second Cycle Bologna Process	90-120	Less than 30
	Post-Graduate Diploma	60	
	Post-Graduate Certificate	30	
Level 6	Bachelor[23]/Bachelor (Hons.)[24] First Cycle Bologna Process	180-240	Less than 180
Level 5	Short Cycle Qualification	120	Less than 60
	Undergraduate Higher Diploma	90	
	Undergraduate Diploma	60	
	Undergraduate Certificate	30	
	VET Level 5 Programme[25]	60-120	
Level 4	Pre-Tertiary Certificate	30	Less than 120
	VET Level 4 Programme[26]	120	
	MATSEC Certificate	NA	
Level 3	VET Level 3 Programme[27]	60	Less than 60
	General and Subject Certificate	NA	
Level 2	VET Level 2 Programme[28]	60	Less than 60
	General and Subject Certificate	NA	
Level 1	VET Level 1 Programme[29]	40	Less than 40
	General and Subject Certificate	NA	
Introductory Level A	Preparatory Programme	30	Less than 30
Introductory Level B	Pre-entry Basic Skills Course	30	Less than 30

Table 1: Minimum number of credits for 'Qualifications' and parameters for 'Awards'

Fig.1: p56, Ministry for Education and Employment & National Commission for Further and Higher Education Malta (2016). *Referencing Report, 4th Edition*. NCFHE.

Total number of Hours: 3000

Mode of attendance: Full Time

Duration: 3 Years

Target audience for MCAST full-time courses is 16 to 65+

Target group: Students exiting compulsory education

The official language of instruction at MCAST is English. All notes and textbooks are in English (except for language courses which will be in the respective language being instructed). International candidates will be requested to meet English language certification requirements for access to the course.

This course will be offered at

MCAST has four campuses as follows:

MCAST Main Campus
Triq Kordin, Paola, Malta

All courses except for the Institute for the Creative Arts, Centre of Agriculture, Aquatics and Animal Sciences are offered here.

Institute for the Creative Arts
Mosta Campus
Misraħ Għonoq Tarġa Gap,
Mosta

Institute of Applied Sciences,
Centre of Agriculture, Aquatics and Animal Sciences,
Luqa Road, Qormi

Gozo Campus
J.F. De Chambray Street
MCAST, Għajnsielem
Gozo

Teaching, Learning and Assessment

The programmes offered are vocational in nature and entail both theoretical lectures delivered in classes as well as practical elements that are delivered in laboratories, workshops, salons, simulators as the module requirements dictate.

Each module or unit entails a number of in person and/or online contact learning hours that are delivered by the lecturer or tutor directly (See also section 'Total Learning Hours).

Access to all resources is provided to all registered students. These include study resources in paper or electronic format through the Library and Resource Centre as well as tools, software, equipment and machinery that are provided by the respective institutes depending on the requirements of the course or module.

Students may however be required to provide consumable material for use during practical sessions and projects unless these are explicitly provided by the College.

All Units of study are assessed throughout the academic year through continuous assessment using a variety of assessment tools. Coursework tasks are exclusively based on the Learning Outcomes and Grading Criteria as prescribed in the course specification. The Learning Outcomes and Grading Criteria are communicated to the Student via the coursework documentation.

The method of assessment shall reflect the Level, credit points (ECTS) and the schedule of time-tabled/non-timetabled hours of learning of each study unit. A variety of assessment instruments, not solely Time Constrained Assignments/Exams, are used to gather and interpret evidence of Student competence toward pre-established grading criteria that are aligned to the learning outcomes of each unit of the programme of study.

Grading criteria are assessed through a number of tasks, each task being assigned a number of marks. The number of grading criteria is included in the respective Programme Specification.

The distribution of marks and assessment mode depends on the nature and objectives of the unit in question.

Coursework shall normally be completed during the semester in which the Unit is delivered.

Time-constrained assignments may be held between 8 am and 8 pm during the delivery period of a Unit, or at the end of the semester in which the Unit is completed. The dates are notified and published on the Institute notice boards or through other means of communication.

Certain circumstances (such as but not limited to the Covid 19 pandemic) may lead Institutes and Centres to hold teaching and assessment remotely (online) as per MCAST QA Policy and Standard for Online Teaching, Learning and Assessment (Doc 020) available via link https://www.mcast.edu.mt/college-documents/

The Programme Regulations referenced below apply. (DOC 004* available at: link https://www.mcast.edu.mt/college-documents/

Total Learning Hours

The total learning hours required for each unit or module are determined as follows:

Credits (ECTS)	Indicative contact hours	Total Student workload (hrs)	Self-Learning and Assessment Hours
1	5 – 10 hrs	25 hrs	20-15 hrs*
2	10 – 20 hrs	50 hrs	40-30 hrs*
3	15 – 30 hrs	75 hrs	60-45 hrs*
4	20 – 40 hrs	100 hrs	80-60 hrs*
6	30 – 60 hrs	150 Hrs	120-90 hrs*
9	45 – 90 hrs	225 hrs	180-135 hrs*
12	60 – 120 hrs	300 hrs	240-180 hrs*

* The 'Self-Learning and Assessment Hours' amount to the difference between the contact hours and total student workload.

Grading system

All MCAST programmes adopt a learner centred approach through the focus on Learning Outcomes. The assessment of MCAST programmes is criterion-referenced and thus assessors are required to assess learners' evidence against a pre-determined set of Learning Outcomes and assessment criteria.

For a student to be deemed to have successfully passed a unit, a minimum of 50% (grade D) must be achieved. In case of part time programmes, the student must achieve a minimum of 45% to successfully pass the unit.

All units are individually graded as follows:
A* (90-100)
A (80-89)
B (70-79)
C (60-69)
D (50-59)
Unsatisfactory work is graded as 'U'.

Work-based learning units are graded on a Pass/Fail basis only.

Detailed information regarding the grading system may be found in the following document: DOC 004* available at: link https://www.mcast.edu.mt/college-documents/

Intake Dates

•MCAST opens calls for application once a year between July and August of each year for prospective applicants residing in MALTA.
•Applications to full-time courses from international students not residing in MALTA are accepted between April and Mid-August.
•For exact dates re calls for applications please follow this link
https://www.mcast.edu.mt/online-applications-2/

Course Fees

MCAST course are free for Maltese and EU candidates. International candidates coming from outside the EU need to pay fees for the respective course. Course fees are set on a per-level and course duration basis. For access to course fee structure and payment methods please visit https://www.mcast.edu.mt/fee-payments-for-non-eu-candidates/.

Method of Application

Applications to full-time courses are received online via the College Management Information System. Candidates can log in using Maltese Electronic ID (eID) or European eIDAS (electronic identification and trust services) to access the system directly and create an account as the identity is verified electronically via these secure services.

Non-EU candidates need to request account creation though an online form by providing proof of identification and basic data. Once the identity is verified and the account is created the candidate may proceed with the online application according to the same instructions applicable to all other candidates.

Non-EU candidates require a study visa in order to travel to Malta and joint the course applied for. For further information re study-visa please access https://www.identitymalta.com/unit/central-visa-unit/.

For access to instructions on how to apply online please visit https://www.mcast.edu.mt/online-applications-2/

Contact details for requesting further information about future learning opportunities:

MCAST Career Guidance
Tel: 2398 7135/6
Email: career.guidance@mcast.edu.mt

Current Approved Programme Structure

Unit Code	Unit Title	ECTS	Year	Semester
ETMTH-406-1617	Mathematics for Mechanical and Construction Engineering	6	2	YEAR
ETH&S-406-1508	Safety and Environment	6	1	YEAR
ETMTS-406-1503	Materials Selection	6	1	YEAR
ETMEC-406-1510	Pneumatics and Hydraulics	6	2	YEAR
ETMTS-406-1504	Statics and Strength of Materials	6	3	YEAR
ETCDN-406-1501	Computer Aided Design	6	1	YEAR
ETMEC-406-1511	Thermofluids	6	3	YEAR
ETMEC-406-1512	Engineering Dynamics	6	1	YEAR
ETE&E-406-1501	Electrical Power and Electronics	6	2	YEAR
ETELX-406-1517	Fundamentals of Control Systems and Transducers	6	3	YEAR
ETMRN-406-1517	Ship Management	6	1	YEAR
ETPRJ-412-1514	Project Design Implementation and Evaluation	12	3	YEAR
ETMEC-406-1513	Installing and Commissioning Engineering Equipment	6	3	YEAR
ETMEC-406-1514	Engineering Practice*	6	1&2	YEAR
ETMEC-406-1518	Monitoring and Fault Diagnosis of Engineering Systems	6	2	YEAR
CDKSM-406-1901	Mathematics for Mechanical Engineering	6	1	YEAR
CDKSK-406-2001	English	6	2	YEAR
CDKSK-404-1915	Employability and Entrepreneurial Skills	4	2	YEAR
CDKSK-402-2104	Community Social Responsibility	2	2	YEAR
ETCMP-406-1622	**Apprenticeship Unit : Vocational Competences in Marine Engineering	6	2&3	YEAR
	Total ECTS	**120**	**/**	**/**

*closes during the second year

**closes during the third year

ETMTH-406-1617: Mathematics for Mechanical and Construction Engineering

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit has been designed to build upon previous theoretical mathematical knowledge, to be used in a more practical context. Furthermore, it acts as an essential basis for the successful completion of other units within the program of study. Delivery of the unit should be set within the engineering context.

The learner will be able to understand and apply algebraic techniques to manipulate expressions and solve algebraic equations commonly found in engineering. This includes linear simultaneous equations, logarithmic equations, exponential equations and series. Furthermore, the learner will also learn that algebraic equations can also have complex roots whenever an algebraic expression is found not to have real roots.

This unit was also designed to deal with geometric and trigonometric analysis to give an extra tool to the learner in how to deal with sides, angles, perimeters, areas and volumes. Furthermore, the learner will also know how to find the surface area of irregular shapes by applying numerical integration and by definite integration. All of this will be applied to engineering contexts.

Part of the syllabus will deal directly with graphical techniques in which the learners will further their studies by introducing higher order equations, trigonometric and logarithmic equations. They will also learn how to solve equations graphically and hence how to find the gradient at a point by using differential calculus.

On successful completion of the unit the learner will be equipped with sufficient mathematical skills to be able to deal with mathematical competencies found in the vocational units at level 4 and even further studies at higher levels.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Apply algebraic techniques to manipulate expressions and solve equations.*
2. *Apply techniques to manipulate complex numbers and series.*
3. *Apply trigonometric techniques to solve engineering problems.*
4. *Apply geometric techniques to solve engineering problems.*
5. *Apply graphical techniques to solve equations.*
6. *Apply calculus to solve practical problems.*

ETH&S406-1508 – Safety and Environment

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

The unit will deal with the topic of Safety and the Environment as it affects aspects of Marine operations and Engineering. Learners will become familiar with concepts of Health and Safety and accident prevention such as the degree of risk being associated and dependant on the likelihood of the accident/incident occurring and the probable severity of the consequence of that accident or incident. In addition, the specifics of legislative needs of PPE, confined space and noise will be considered. It is essential that reflecting current legislation that those employed within Marine operations and engineering is aware of the responsibilities that exist through their own actions and the actions of others. With a particular aspect towards this specialist area; a study of Health and Safety allows learners to appreciate and contextualise the satisfying of not only statutory legal or contractual requirements, but also of how to provide a safe environment for themselves, perhaps those who may be in their employment, other workers and the general public. The responsibility for safe procedures, planning and actions are underpinned throughout this Unit and the learner will benefit from the study of safe working practices with a particular emphasis in their vocational area. The knowledge and skills derived from this Unit are transferable across other areas of employment where the learner will be exposed to risk and environmental hazards through the use of tools, plant, machinery, working within enclosed spaces or with exposure to noise and general engineering environments. The areas addressed within the Unit provide for the learner to achieve best practice and safe working leading to them achieving standards making them responsible and safe employees.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the current Health and Safety legislation covering employers and employees.*
2. *Explain the handling, storage and disposal of dangerous substances.*
3. *Explain work equipment safety requirements.*
4. *Carry out a suitable risk assessment within a workplace environment.*

ETMTS-406-1503: Materials Selection

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Note: This document adheres to the language, format, and content contained in the STCW Code and in the SQA Engineering Framework.

STCW Code Requirements
Excerpts from Standards of Training, Certification and Watch keeping manual, published by International Maritime Organization)
References: Table A-III/1 "Marine engineering at operational level", (page 144,145: STCW including 2010 Manila Amendments- STCW Convention and STCW Code- 2011 Edition

Competence:
Operate main and auxiliary machinery and associated control systems.
Knowledge, understanding and proficiency:

- Basic construction and operating principles of machinery systems.
- Preparation, operation, fault detection and necessary measures to prevent damage to machinery items.

Criteria for evaluating competence:

- Construction and operating mechanisms can be understood and explained with drawings/instructions .
- Deviations from the norms as stated in operating manuals are promptly identified.
- The output of plant and engineering systems consistently meets requirements.

Designing and producing an engineering component involves several activities: selection of material, specifying dimensions, color and surface finish, choosing a manufacturing process to achieve prescribed accuracy, and meeting special customer requirements.

Engineering raw material --- ores and minerals --- are finite resources and are being consumed at ever-increasing rates. It is the engineer's responsibility to select the most appropriate materials and use them efficiently in minimum quantities and with minimum impact on the environment during extraction, refining and production.

Selection of the right material at the appropriate price is important as it leads to lower manufacturing cost, reduced in-service failures, safety while handing etc., all resulting in lower product cost and customer acceptability. Furthermore, there are other considerations such as aesthetics, recycle-ability etc. which influence selection. To satisfy all the above parameters, engineers have to deal with and understand the use of a large number of materials.

It is expected that, from this Unit, the learner will understand the need for mechanical components to be designed, manufactured and maintained in a safe and efficient manner. It would be an advantage if candidates had the core skills of critical thinking, reviewing and evaluation, as well as an understanding of physics and chemistry to the desired level

Learning Outcomes

On completion of this unit the learner will be able to

1. *Have an understanding of material properties and testing.*
2. *Apply material science concepts to assess suitability for a range of components.*
3. *Investigate materials and components with the aim of establishing their basic properties.*

ETMEC-406-1510: Pneumatics and Hydraulics

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Our lives would be very different today, if early civilisations had not recognised the potential of using air and water to do the work. From the first waterwheels to the sophisticated applications we see today, fluid power has enabled us to do what was considered impossible in many instances. Now with computer interfaces, new materials and imaginative technologies, many things related to pneumatics and hydraulics can be achieved.

This unit is designed to allow the students to gain a Knowledge and Understanding of Pneumatics and Hydraulic Fluid power systems.

Students will also have the opportunity to design a fluid power system and develop an understanding of the Construction, Function and the Components of Fluid power systems.

This unit will complement the capabilities of the future marine engineer, in developing an overall competency in all associated marine engineering areas of work.

Any practical work undertaken, should be carried out in a manner that complies with all necessary health and safety requirements

Learning Outcomes

On completion of this unit the learner will be able to

1. *Identify the main components of Pneumatic and Hydraulic and the function and operation of pneumatics and hydraulic components, equipment and plant.*
2. *Design, Construct and test a pneumatic or hydraulic circuit.*
3. *Demonstrate fault finding competence on a fluid power system.*

ETMTS-406-1504: Statics and Strength of Materials

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Note: This document adheres to the language, format, and content contained in the STCW Code and in the SQA Engineering Framework.

STCW Code Requirements
Excerpts from Standards of Training, Certification and Watch keeping Manual, published by International Maritime Organisation.
(Reference: Table A-III/1 "Marine engineering at operational level" (page 148: STCW including 2010 Manila Amendments- STCW Convention and STCW Code- 2011 Edition)
Competence:
Maintenance and repair of shipboard machinery and equipment.
Knowledge, understanding and proficiency:

- Appropriate basic mechanical knowledge and skills
- Design characteristics and selection of materials in construction of equipment

Criteria for evaluating competence:

- Re-commissioning and performance testing is in accordance with manuals and good practice
- Selection of materials and parts is appropriate.

Statics and strength of materials is the study of the behavior of structural members under application of external forces. The laws of statics help to calculate and determine the ability of the members to withstand these forces.

Ship structures such as hull frames, cargo tanks and double bottoms are subject to mechanical forces as well as fluid pressures. The unit discusses the various types of loading that could come on frames and structures. The learners are to relate these structures with shipboard examples such as the engine room crane supported at the ends and carrying heavy loads in the middle or towards one end. Using the understanding of statics, the learner should be able to relate the knowledge gained to shipboard examples such as:

a) Sizing calculations in order to estimate safe dimensions of structural members such as beams and frames, and components such as shafts and bolts subjected to various forms of loading.
b) Calculations of safe working loads of equipment such as hooks and slings.
c) Direct, shear and torsional stresses on bolts, rivets and other fasteners.

It is expected that, from this Unit, the learner will understand the need for materials and components on board ships to be selected, designed and operated in a safe and efficient manner.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Develop the knowledge required to apply the principles of statics to mechanical systems*
2. *Understand how these principles are relevant in a Marine engineering environment.*
3. *Comply with the requirements stated in STCW code above.*

The Unit also provides the candidates with a base from which future advanced work in marine engineering may be undertaken.
Outcome 1: Explain the effects of, and solve problems related to framed structures and beam sections that are acted upon by moments, and the forces of tension, compression and shear.
Outcome 2: Explain and solve problems relating to shear forces and bending moments on simply supported and cantilever beams; explain and solve problems relating to the theory of bending.
Outcome 3: Explain and solve problems on the theory of torsion for members of circular section.

ETCDN-406-1501: Computer Aided Design

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Computer-Aided Design (CAD) technology has nowadays become part and parcel of product development. Although ideas start on paper, at one point during the product development process, they have to be translated into three-dimensional (3D) virtual models, using CAD. There are various reasons for going in this route, in particular the rapidity of obtaining two-dimensional (2D) accurate detailed drawings directly from CAD 3D models. Other benefits are related to the possibility of sharing CAD models with other computer-aided engineering applications (e.g. simulation of plastic melt flow behaviour in an injection mould for a product component modelled in CAD).

This is a learning-by-doing type of unit and it will provide learners with the opportunity to apply the skills they have learnt to produce a wide range of drawing layouts, accurate detailed drawings, 3D virtual and physical models. The advantages of using CAD technology in modern product development will be explained at the outset of this unit. Learners will acquire knowledge on the software and hardware requirements needed to run and use effectively a CADD package. One of the most widely used CAD software used for engineering applications is *Autodesk® Inventor®*. Although this software will be employed in this unit, by the end of this study unit, learners will be able to acquire knowledge on the underlying principle of and the basic skills to apply 2D and 3D modelling functions found across different CAD software packages (e.g. *SolidWorks*). Exemplars of such skills include the ability to use CAD to create and edit 2D constrained geometric entities as basis for 3D modelling, and the ability to use CAD to generate 3D virtual models of single components or an assembly of components. In addition, learners will be able to independently select the appropriate CAD functions for the task at hand.

Furthermore learners will be equipped with the necessary skills to independently generate different types of accurate drawings with all required dimensions and other basic information deemed useful for the realisation of a product during the manufacturing phase. Last but not least, learners will gain knowledge on how to obtain a 3D physical prototype models on a 3D printer directly from the corresponding 3D virtual model.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Describe the advantages of using CAD in product development and the basic hardware and software requirements to install and use a CAD software package.*
2. *Use CAD to create and edit 2D geometric entities as basis for 3D virtual modelling.*
3. *Use CAD to generate 3D virtual models of single components or an assembly of components.*
4. *Use CAD to generate different types of drawings and produce physical prototypes directly from 3D virtual models.*

ETMEC-406-1511: Thermofluids

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Note: This document adheres to the language, format, and content contained in the STCW Code and in the SQA Engineering Framework.

STCW Code Requirements

Excerpts from Standards of Training, Certification and Watchkeeping Manual, published by the International Maritime Organisation)
References: Table A-III/1 "Marine engineering at operational level",(page 144,145: STCW including 2010 Manila Amendments- STCW Convention and STCW Code- 2011 Edition

Competence:

Operate main and auxiliary machinery and associated control systems.
Knowledge, understanding and proficiency:

Basic construction and operating principles of machinery systems.

- Preparation, operation, fault detection and necessary measures to prevent damage to machinery items.

Criteria for evaluating competence

- Construction and operating mechanisms can be understood and explained with drawings/instructions .
- Deviations from the norms as stated in operating manuals are promptly identified.
- The output of plant and engineering systems consistently meets requirements.

Thermofluids knowledge Is essential to understand the operating principles of marine machinery. The energy for conventional ship propulsion and electrical power generation is derived from the use of engines and turbines. These machines convert the chemical energy released by fuel combustion into mechanical energy. The efficiency of energy conversion is based on certain thermodynamic principles.

This unit discusses the laws applicable to gases and vapours during the processes of expansion and compression in engines, turbines and compressors. A sound understanding of thermofluids will enable the learner to design and operate the above machinery at optimum efficiency.

The unit progresses to the theory and practice of steam power plant operation which is of importance to the engineer as many plants are steam driven. The properties of steam and the energy transfer in the various components of a power plant are dealt with.

Many engineering applications such as hydraulic jets, combustion chambers, mixing tanks, centrifugal pumps etc. involve controlled flow of the working fluid, be it liquid or gas. Continuity and momentum principles governing flow through pipes and vanes are therefore discussed.
This unit also covers the behavior of hydrostatic pressure and boyancy. The knowledge of hydrostatic pressure helps the engineer to understand the need to maintain the integrity and sheet-metal thickness on tank bottoms, valve bodies and other equipment under pressure.
It would be an advantage if candidates had a knowledge and understanding of physics, mathematics and marine engineering systems to the desired level.

Learning outcomes

On completion of this unit the learner will be able to

This Unit is designed to present an application-oriented delivery of thermofluids, and enables candidates to:

1. *Develop the knowledge required to apply thermodynamic principles to hydrostatics, hydrodynamics and heat engines.*
2. *Understand how these principles are relevant in a Marine engineering environment.*
3. *Comply with the requirements stated in STCW code above.*

The Unit will also provide the candidates with a base from which future advance work in marine engineering may be undertaken.
Knowledge of the subject of thermo fluids will enable the learner to:

a) Understand and evaluate the parameters that explain the characteristics of thermodynamic systems.
b) Understand and evaluate the properties of steam with respect to efficient power plant operation.
c) Evaluate the thermodynamic performance of boilers, condensers and other power plant components
d) d)Understand effect of hydrostatic pressure on submerged and floating bodies

Outcome 1
Apply the Gas Laws to closed and open (non-flow and flow) systems and evaluate the work done.

Outcome 2

i) Determine steam conditions from the use of steam tables and solve related problems

ii) Study energy transfer principles for steam power plant components

Outcome 3

i) Explain the effects of hydrostatic pressure and solve problems related to hydrostatic pressure

ii) Apply energy, continuity and momentum principles to steady flow processes

ETMEC-406-1512: Engineering Dynamics

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Note: This document adheres to the language, format, and content contained in the STCW Code and in the SQA Engineering Framework.

STCW Code Requirements
Excerpts from Standards of Training, Certification and Watch keeping Manual, published by International Maritime Organization.

(Reference: Table A-III/1 "Marine engineering at operational level" (page 148: STCW including 2010 Manila Amendments- STCW Convention and STCW Code- 2011 Edition)
Competence:
Maintenance and repair of shipboard machinery and equipment.
Knowledge, understanding and proficiency:

- Appropriate basic mechanical knowledge and skills
- Design characteristics and selection of materials in construction of equipment

Criteria for evaluating competence:

- Re-commissioning and performance testing is in accordance with manuals and good practice
- *Selection of materials and parts is appropriate*.

Dynamics studies the motion of bodies when forces are applied on them. The Laws of dynamics predict the position, velocity and acceleration of these bodies at every instant in time. Dynamics also studies the transfer of energy from one form to another to produce the desired output such as work, fluid pressure, or velocity change.

In this section, the teaching should relate to shipboard examples, such as the dynamics of engine flywheels, components of diesel engines, compressors, and other rotating/reciprocating machinery.
It is expected that the learner will understand from this unit the need for ships equipment to be designed and operated to produce the desired output safely and efficiently. It would be an advantage if candidates had a knowledge and understanding of physics and mathematics to the desired level.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Develop the knowledge required to apply the principles of dynamics to mechanical systems.*
2. *Understand how these principles are relevant in a Marine engineering environment.*
3. *Comply with the requirements stated in STCW code above.*

The Unit also provides the candidates with a base from which future advanced work in marine engineering may be undertaken

ETE&E-406-1501: Electrical Power and Electronics

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit – Electrical Power – is designed to be delivered as an introductory course on electrical engineering. Electrical Power expects little familiarity with the electrical concepts. For most parts, the unit deals with theoretical aspects of the basics of electrical engineering. However, in parts the unit also intends to engage the learners by means of numerical problem solutions with the view of reinforcing the underlying concepts.

Initial part of this unit – the learning outcome 1 – initiates the learners in the very basic electrical concepts. Direct Current (DC), as is the common practice, is used hence. It is essential that all the concepts covered in this outcome are absorbed as this will form a crucial link when learning the basic and advanced alternating current (AC) circuits. Learning outcome 2 allows learners to solve numerical problems of resistive DC circuits.

Learning outcomes 3 and 4 deals in the basics of magnetism and electromagnetism respectively. Apart from theoretical concepts, learners will also be learning the numerical problem solving on these subject areas. It is important to note that these learning outcomes are absolutely important in learning the working principles of electrical machines.
Learning outcome 5 introduces learners with the basics of AC circuits in general and series AC circuits in particular. One important segment of this learning outcome is the phasor representation of the AC quantities. Phasors are also part of the learning outcome 6 which introduces the basics of AC transformers, construction, and solution of numerical problems.

Learning Outcomes

On completion of this unit the student will be able to:

1. *Basic electrical concepts;*
2. *DC resistive networks;*
3. *Basics of magnetism;*
4. *Basics of electromagnetism;*
5. *Basic AC circuits;*
6. *Basics of transformer.*

ETELX-406-1517: Fundamentals of Control Systems and Transducers

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit aims to give learners an understanding of basic principles of electronic control systems and circuits. It is delivered with a high practical content which will build learners' confidence in their ability to design, operate and test electronic control systems.
The learners are first introduced to the concept of an electronic system in terms of input, process and output.
The learners then move on to study the main components that constitute an electronic control system and the flow of signals through the system including the concept of feedback.
The operation and application of a range of analogue and digital sensors transducers and actuators used on the inputs and outputs of electronic systems are then introduced to the learner.
The operation and behaviour of open loop, closed loop and on / off control are then studied. Finally, the learners will be introduced to the construction and operation of simple control circuits using the sensors, transducers, actuators and control strategies previously studied.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Explain the purpose, structure and operation of an electronic system.*
2. *Explain the main components that constitute an electronic control system and the flow of signals through the system.*
3. *Explain the operation, technical characteristics and application of analogue and digital sensors, transducers and actuators.*
4. *Use simple mathematical modelling to describe the operation and behaviour of sequential, open loop, closed loop and on / off control systems.*
5. *Construct and operate simple control closed loop control circuits using sensors, transducers, actuators and control strategies to meet a given specification.*

ETMRN-406-1517: Ship Management

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

MCAST diploma in Mechanical Engineering at MQF level 4 provides learners with the opportunities of training, education, and career progression in the field of merchant shipping as a marine engineer. This unit – Ship Management – is designed to support articulation, at basic level, of this programme of studies with the maritime industry and merchant ships. Knowledge areas covered in this unit are considered to be rudimentary for a career in the merchant shipping with emphasis on the management of merchant ships, and therefore, the delivery of this unit anticipates very little or no familiarisation with the shipping industry. The unit contents and successful completion of its learning outcomes are hence deemed essential for career progression.

There are six learning outcomes of this unit. Generic constructional features of merchant ships are covered in learning outcome 1 followed by learning outcome 2 which deals with the most common types of deep sea and offshore vessels. Understanding pertaining to regulations of shipping business in general and ships in particular is covered in learning outcome 3. Economic aspects of world's merchant ships and shipping are touched in learning outcome 4 which should also prove helpful in understanding the economic significance of shipping at international and national level. Learning outcome 5 introduces the seaborne trade covering major trades such as bulk, specialised cargoes, and general cargoes in conjunction with the introduction to ship finances.

In the end, learning outcome 6 deals with the basics of quality and related topics which are essential for the commercial success of ship management.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Demonstrate understanding and knowledge of the constructional features of ships.*
2. *Demonstrate understanding and knowledge of different types of ships.*
3. *Demonstrate understanding and knowledge of the maritime regulatory and advisory bodies.*
4. *Demonstrate understanding and knowledge of maritime transportation.*
5. *Demonstrate understanding and knowledge of seaborne transportation system.*
6. *Demonstrate understanding and knowledge of quality management.*

ETPRJ-412-1514: Project Design Implementation and Evaluation

Unit Level (MQF/EQF): 4
Credits: 12
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 300

Unit description

The objectives of this unit are based on the understanding that projects, in their various forms, are encountered in every facet of the maritime sector. Engineers are often involved in identifying and putting plans of action in place, for a plethora of marine engineering situations.

The unit will bring together the knowledge and skills base from other subjects undertaken within the course. And apply these capabilities in addressing an area of topical interest within the marine engineering environment. This will take the form of a project undertaking which takes an identified area of consideration, through to the practical conclusion of objectives.

The areas from which the project area will be specified, are at the discretion of the institution supervising the project, but generally should relate to either of the topics noted below:

- Modification of marine engineering product / component
- Specification and design of an adapted marine related system.
- Alteration of plant layout or refinement of maintenance arrangements.
- Testing methodologies applied to marine engineering – system / component / product.

With effective reporting , control and feedback, throughout the life of the project. Students will have the reassurance that what they are delivering is technically meaningful, but in the same instance gives them the opportunity to increase their communications skills in a manner that benefits their level of professionalism in addressing a project in future.

A key point to note, whatever type of project is undertaken, it is important to realise that the actual topic must be deliverable and realistic in nature.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Interpret and use engineering drawings and specifications to consider feasibility for potential project topics.*
2. *Specify a project and confirm end objectives.*
3. *Plan and monitor the project.*
4. *Implement project plan within agreed timescales.*
5 *Analyse and present the project findings, using verbal, written and ICt skills in an engineering context.*

ETENG-406-1518: Installing and Commissioning Engineering Equipment

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit identifies the basic principles, commonly used processes and elements that are essential to most maintenance, installation and commissioning activities. It takes into account the fact that some industries and organisations employ engineering staff who perform both of these activities, whereas others, particularly specialist contractors for installation and commissioning, may only cover a limited range. The content of this unit can be applicable to both situations as it is considered essential for all candidates to have a wide range of engineering knowledge and experience.

It covers basic maintenance, installation and commissioning requirements including the processes and organisations dealing with them. It also includes components, tools and equipment that are commonly associated with the installation and commissioning of plant and machinery and the ways in which they are used and applied.

The learner is expected to achieve a level of understanding of all maintenance, installation and commissioning strategies that will enable progression to higher level courses, and enable them to become familiar with the events terminology and practices that they will need as part of their normal work.

Finally, learners will be made aware that, as an installation or commissioning engineer, before leaving new equipment with an owner, a suitable handover must take place ensuring that owners are ready to be left with new equipment. The end of this unit will take learners through this process to ensure that they are knowledgeable and fully aware of this handover process.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Demonstrate the installation and commission of different mechanical equipment.*
2. *Demonstrate the installation and commission of different electrical and electronic equipment.*
3. *Install and commission different types of equipment commonly used on an engineered system.*
4. *Describe the handover process of new equipment.*

ETMEC-406-1514: Engineering Practice

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit seeks to provide practical experience in applying basic engineering work practice across a range of workshop, maintenance and assembly skills.

The unit will provide the student with a range of practical competence in using hand tools, lathes, drilling and milling machinery and welding and jointing techniques and applications. This should complement other units being undertaken within the course. And provide students with an ability to deal with fabrication and repair operations typical on ships.

The assessment requirements of the unit will address stipulations set by the MNTB [Merchant Navy Training Board] for basic engineering workshop skills. All practical work undertaken, should be in accordance with relevant Health and Safety legislation. As it relates to dis-mantling, maintaining, repairing and re-assembling shipboard plant and fixtures and fittings

It is expected that by practising such skills, the future marine engineer, will display proficiency at a level that will allow a gradual increase in skills in unison with the students knowledge base.

The assessment requirements for the unit would be compiled into a form of log book, that would allow tutors to sign off compliant work and undertaken in each of the defined assessment criteria areas of work.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Use and care for hand and power tools within a marine engineering environment.*
2. *Work with measuring and calibration equipment in undertaking engineering tasks.*
3. *Operate drilling, vertical milling and central lathe machinery in undertaking engineering tasks.*
4. *Demonstrate an array of welding and jointing techniques in the production of marine engineering components.*

ETMEC-406-1518: Monitoring and Fault Diagnosis of Engineering Systems

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

Condition monitoring and diagnosing faults are both used to ascertain whether possible failure mechanisms exist in engineering systems. The methods used by engineers encompass automated monitoring systems all the way down to the use of human senses; touch, smell, sight, and hearing. This unit gives students an awareness of the basic principles of monitoring engineering systems and fault diagnosis and introduces students to the practice of condition monitoring.

This unit looks at monitoring engineering systems and diagnosing faults and examines how recent technological and environmental issues have had an impact on the maintenance of today's engineering world. The unit will give students an awareness of how and what is needed to protect them and their colleagues while working and concentrates on the measures of safety required when completing monitoring activities, especially activities for isolation of machinery and services.

Students will become familiar with the use of a wide range of tools used for monitoring activities and will gain the knowledge and skills needed for sourcing and identifying engineering system faults. Students must select the correct monitoring technique and equipment based on the conditions that they are set.

Students will set up the correct equipment to monitor and use it to diagnose condition monitoring on engineering systems. Students will utilise a range of methods and techniques to diagnose faults, and use a range of diagnostic apparatus and tooling. Following successful diagnosis students can then identify the fault and examine the likely cause.

Learning Outcomes

On completion of this unit the learner will be able to

1. *Identify relevant requirements under health and safety regulations used in monitoring and fault diagnosis of engineering systems.*
2. *Explain the importance of regularly monitoring systems and their reliability.*
3. *Gain experience using monitoring and test equipment.*
4. *Complete fault diagnosis on engineering systems.*

ETH&S-406-1508: Safety and the Environment

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

The unit will deal with the topic of Safety and the Environment as it affects aspects of Marine operations and Engineering. Learners will become familiar with concepts of Health and Safety and accident prevention such as the degree of risk being associated and dependant on the likelihood of the accident/incident occurring and the probable severity of the consequence of that accident or incident. In addition the specifics of legislative needs of PPE, confined space and noise will be considered. It is essential that reflecting current legislation that those employed within Marine operations and engineering is aware of the responsibilities that exist through their own actions and the actions of others. With a particular aspect towards this specialist area; a study of Health and Safety allows learners to appreciate and contextualise the satisfying of not only statutory legal or contractual requirements, but also of how to provide a safe environment for themselves, perhaps those who may be in their employment, other workers and the general public. The responsibility for safe procedures, planning and actions are underpinned throughout this Unit and the learner will benefit from the study of safe working practices with a particular emphasis in their vocational area. The knowledge and skills derived from this Unit are transferable across other areas of employment where the learner will be exposed to risk and environmental hazards through the use of tools, plant, machinery, working within enclosed spaces or with exposure to noise and general engineering environments. The areas addressed within the Unit provide for the learner to achieve best practice and safe working leading to them achieving standards making them responsible and safe employees.

Learning Outcomes

On completion of this unit the student will be able to

1. *Explain the current Health and Safety legislation covering employers and employees*
2. *Explain the handling, storage and disposal of dangerous substances*
3. *Explain work equipment safety requirements*
4. *Carry out a suitable risk assessment within a workplace environment*

ETMEC-406-1513: Installing and Commissioning Engineering Equipment

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit description

This unit identifies the basic principles, commonly used processes and elements that are essential to most maintenance, installation and commissioning activities. It takes into account the fact that some industries and organisations employ engineering staff who perform both of these activities, whereas others, particularly specialist contractors for installation and commissioning, may only cover a limited range. The content of this unit can be applicable to both situations as it is considered essential for all candidates to have a wide range of engineering knowledge and experience.

It covers basic maintenance, installation and commissioning requirements including the processes and organisations dealing with them. It also includes components, tools and equipment that are commonly associated with the installation and commissioning of plant and machinery and the ways in which they are used and applied.

The learner is expected to achieve a level of understanding of all maintenance, installation and commissioning strategies that will enable progression to higher level courses, and enable them to become familiar with the events terminology and practices that they will need as part of their normal work.

Finally, learners will be made aware that, as an installation or commissioning engineer, before leaving new equipment with an owner, a suitable handover must take place ensuring that owners are ready to be left with new equipment. The end of this unit will take learners through this process to ensure that they are knowledgeable and fully aware of this handover process.

Learning Outcomes

On completion of this unit the student will be able to

1. *Demonstrate the installation and commission of different mechanical equipment*
2. *Demonstrate the installation and commission of different electrical and electronic equipment*
3. *Show ability to install and commission different types of equipment commonly used on an engineered system*
4. *Describe the handover process of new equipment*

CDKSK-406-2001: English

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit Description

The main objective of this unit is to prepare students to use the English language to understand, analyse, organise and communicate specific technical knowledge by inferring meaning from, and using, embedded information, being able to evaluate information critically and communicate through different types of texts, as required by various but often specific technical contexts within the selected field of study.

The emphasis is on the processes needed to transition from use of the English language in General Education to that required for access to Higher Education.

In particular, L4 Key Skills English is targeted at learners who have completed Foundation College programmes (Levels 1 to 3) and seek to further their studies at Technical or Degree level.

In this respect, this unit recognises the necessity to meet two linguistic demands at this threshold level; strengthening students' linguistic competences to be able to communicate more specifically within their vocational area and stream and to prepare them for more rigorous academic thinking, research and writing as necessitated by degree courses.

Being introduced at this level are core and elective unit outcomes. Reading and writing outcomes are core components in this syllabus while listening and speaking are elective components. Every L4 programme must deliver the two core outcomes and any one of the two elective learning outcomes. The elective criteria to be assessed cannot be selected from and across both outcomes.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Read technical texts effectively to improve knowledge of the subject area;*
2. *Understand information presented orally in the form of recordings, or talks, discussions, seminars, interviews or presentations;*
3. *Demonstrate own understanding of the subject matter via oral presentation, mock interviews or similar oral delivery;*
4. *Write a research paper or technical report demonstrating cohesion, structure and appropriate style.*

CDKSM-406-1901: Mathematics for Mechanical Engineering

Unit Level (MQF/EQF): 4
Credits: 6
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 150

Unit Description

This unit provides a framework for learners to develop mathematical thinking skills further to the level-3-unit specification to solve problems related to real-life situations. Learners also develop skills, attributes and knowledge that contribute to their personal growth and effectiveness within their training and work environment and within the community.

The unit is designed to adapt to the needs of a particular field of study namely mechanical engineering.

To reach this goal, the unit is divided into four learning outcomes which are related to statistics, graphical representation, trigonometry and finance. Through these different areas, learners will be able to develop the effective skills for information processing, reasoning, evaluation creative thinking and enquiry, all of which are fundamental skills for the problem-solving process. This will prepare learners in applying and evaluating a range of strategies to solve real-life problems. The content in this unit enables learners to synthesise and evaluate real-life situations. Through this unit the learner will also learn to present and communicate results and conclusions effectively.

On successful completion of the unit the learner will be equipped with mathematical thinking skills which make them aware of and understand their thought process and to reassess and identify areas for development. Learners learn to evaluate, reflect about their strategies, understand and verify results when solving problems. These skills will equip learners with managerial skills, to further their studies and for work employability.

Learning Outcomes

On completion of this unit the student will be able to

1. *Demonstrate visual and logical techniques in evaluating graphical representations and communication skills in presenting the results effectively.*
2. *Apply information processing skills to solve problems in a relevant statistical context.*
3. *Demonstrate evaluation and communication skills in solving and presenting problems applied to costing methods and techniques.*
4. *Apply thinking skills in geometric and trigonometric areas related to engineering contexts.*

CDKSK-404-1915: Employability and Entrepreneurial Skills

Unit Level (MQF/EQF): 4
Credits: 4
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 100

Unit Description

This unit complements the vocational and key skill units at Level 4 and provides an opportunity for learners to enhance their employability and entrepreneurial skills.

Quite often, learners tend to focus most on technical skills and competences required in a certain trade which enable them to access employment. On the other hand, employers expect employees to be appropriately skilled to follow instructions, take initiative, work effectively in a team, take a lead when necessary and more. In view of this the unit starts with an introduction to the 4th industrial revolution and proceeds to the transversal skills necessary to find employment, retain employment and advance at the place of work. Learners will be able to highlight their strengths and identify the areas that require improvement.

The rest of the unit focuses on entrepreneurial skills, a skill which is one of the most important transversal skills identified by UNESCO. Learners are introduced to methods which can be used to generate new and innovative business ideas and methods which help them evaluate ideas and choose the most feasible. Furthermore, learners will cover the various stages of product and/or service development, including market analysis, processes, pricing strategy, promotion and resources required.

Learners will work in a small team and by the end of the unit they will have the opportunity to develop a business idea which is commercially viable. Furthermore, they will present the idea to prospective investors/stakeholders.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand the employability skills required for Industry 4.0*
2. *Use idea generation techniques to come up with ideas and evaluate chosen ideas*
3. *Understand the various stages of product and/or service development*
4. *Work in a team to develop a business idea which is commercially viable*

CDKSK-402-2104: Community Social Responsibility

Unit Level (MQF/EQF): 4
Credits: 2
Delivery Mode: Fully Face-to-Face Learning
Total Learning Hours: 50

Unit Description

This unit focuses on Community Social Responsibility and provides an opportunity for learners to better understand themselves and the others and to establish goals in life. Community social responsibility enables learners to understand their strengths and areas for improvement and prepares them for life, employment and to become active citizens in society.

Moving away from traditional delivery of other units, learners will be empowered to take ownership of their learning process. Hence, community social responsibility will be delivered through a combination of workshops, small-group sessions with mentors and various opportunities to reflect.

The set of sessions will tackle community social responsibility skills and will mostly focus on the self, the ability to work independently and important values in life. The second set of sessions will address interpersonal skills and will focus on working with others, dealing with diversity and conflicts. Furthermore, at the end of the sessions, the learners will be introduced to the importance of active citizenship in life.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Identify personal goals through self-reflection.*
2. *Evaluate how collaboration with others can be more effective.*
3. *Explain the importance of giving and receiving feedback.*
4. *Contribute actively to make a difference in society.*

For further information, please contact us on information@mcast.edu.mt