MCAST

MQF/EQF Level 5

EE5-01-21

Undergraduate Diploma in Foundations of Engineering

Course Specification

Course Description

The aim of this course is to provide learners with the competence required to be able to join the Bachelor of Engineering programme through the enhancement of knowledge, skills and competences in mathematics and physics. The programme also includes study units in electrical engineering, mechanical engineering, materials science and programming through sound theoretical and extensive hands-on approaches. This programme can also act as an exit point at MQF Level 5 for Advanced Diploma graduates, thus enabling successful candidates to achieve middle management engineering positions.

Programme Learning Outcomes

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

1. *Understand physics relating to Engineering Technology.*
2. *Use mechanical and electrical engineering principals to perform engineering functions.*
3. *Select the best materials for specific tasks, based on their chemical and physical properties.*
4. *Use mathematical principles to solve engineering problems.*

Entry Requirements

Any MQF Level 4 (120 Credits) Qualification in an Engineering, Science or ICT field
OR
2 A-Level passes and 2 I-Level passes
Compulsory A-Levels: Physics or Mathematics (Pure or Applied)

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 Programe: 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: 1500 hours

Mode of attendance: Fully Face-to-Face Learning

Duration: 1 Year

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

Target group: Learners who have completed 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 005 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 005 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	Semester
ETENG-506-1901	Mathematics for Engineers	6	Year
ETENG-506-1902	Further Mathematics for Engineers	6	Year
ETENG-506-1903	Advanced Physics	6	Year
ETENG-506-1904	Thermal Properties of Matter and Wave Theory	6	Year
ETELE-506-1901	Fundamentals of Electrical Engineering	6	Year
ETELE-506-1902	Fundamentals of Electronics Engineering	6	Year
ETENG-506-1905	Principles of Mechanics	6	Year
ETENG-506-1906	Workshop Practice	6	Year
ETENG-503-1907	Technical English	3	Year
ETENG-506-1908	Fundamentals of Materials and Chemistry for Engineers	6	Year
ETENG-503-1909	Introductory Programming for Engineers	3	Year
Total ECTS		**60**	/

ETENG-506-1901: Mathematics for Engineers

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

Learners reading for an Engineering degree require a solid mathematical knowledge in order to be able to deal with new technologies and challenges. Further, numerical methods are essential tools for any engineer, since not every engineering situation can be solved using analytical methods. Indeed, such is the computational power today that it is more worth it to solve problems using numerical methods even if they can be solved analytically.

This unit is designed to provide students with the required working knowledge, skills and competencies for furthering their studies on engineering pre-degree and degree courses. This study unit covers the use of number systems, arithmetic algebra, solving polynomials, indices, logarithms, series, use of simultaneous equations and partial fractions. Additionally, it gives the opportunity for learners to investigate curve fitting and various geometric properties.

This study unit also covers trigonometric identities and functions. Additionally, it allows students to apply the standard differential coefficients, basic principles of integration. The aim of this module is thus to allow learners revise their mathematical skills and bridge the gap to the necessary level in the subject, thus preparing them for use it in engineering practice.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Apply algebraic relationships and topics to solve and manipulate expressions.*
2. *Use graphical methods to investigate and solve the geometric properties of various curves and surfaces.*
3. *Apply trigonometric identities and functions.*
4. *Apply standard differentiation and integration techniques to solve problems.*
5. *Compute limits of sequences and convergence and approximate sums of series.*

ETENG-506-1902: Further Mathematics for Engineers

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

This unit has been designed as a continuation of the previous theory-enriched practical mathematical unit entitled Mathematics for Engineers. Therefore, it is assumed that the student has successfully completed the previous unit prior commencing to Further Mathematics for Engineers. Additionally, this unit is designed to provide students the foundation needed for the successful completion of other various units covered within the electrical and mechanical engineering courses.

This study-unit covers important topics in mathematics, including complex numbers, vectors, matrices and their operations. Further, it introduces students to the study of probability and counting techniques such as permutations and combinations. The unit content shall be covered through many practical hands-on exercises so to reinforce students` understanding of the subject.

Courses in mathematics are often regarded by students as a difficult academic requirement. Such difficulty stems from the extent to which reasoning from fundamentals, as distinguished from rote learning, is required. The aim of this module is structured in a way that it will serve for learners a means of useful remedial work and encourage self-motivation in solving complex mathematical problems, thus preparing them for use in engineering practice. The unit fills in additional gaps in their knowledge that they may have form other previous courses.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Represent analytically and compute vector algebra for the presentation of lines and planes.*
2. *Solve equations involving complex numbers.*
3. *Use matrix algebra and related operations to solve a set of linear equations.*
4. *Apply various techniques to determine the possible outcomes of an experiment.*

ETENG-506-1903: Advanced Physics

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

Physics is a fundamental discipline related to various research areas including mechanics, heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms. Learners reading for an Engineering degree require a strong knowledge of physics in order to be able to deal with new scientific technologies and challenges. Further, engineers are renowned for their power of problem-solving capabilities. This unit puts great emphasis in providing learners with tools and methods for solving increasingly challenging problems, thus allowing learners to broaden their skills and amplify their drive in for research and discovery.

This unit is designed to provide learners with the required working knowledge, skills and competencies for furthering their studies on engineering pre-degree and degree courses. This study unit covers the core concepts pertaining to electricity including electrostatic and magnetic fields, capacitance, inductance, and fundamentals of electronics. Additionally, this study unit covers mechanics as well. It reviews dynamics, statics, equilibrium of forces, gravitational theory, rotational dynamics.

The aim of this unit is thus to equip learners with the foundations required for other courses and bridge the gap to the necessary level in the subject, thus preparing them for its use in context during engineering practice.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Apply fundamentals of mechanics to solve an engineering problem dealing with kinematics.*
2. *Examine and solve static and dynamic problems using the principles of mechanics.*
3. *Examine and solve problems related to electrostatics and electromagnetic induction.*
4. *Apply electrical engineering principles for investigating circuits.*

ETENG-506-1904: Thermal Properties of Matter and Wave Theory

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

This study-unit deals with the two topics, related to the thermal properties of matter and wave theory. Matter is a substance that has mass and occupies space. The thermal properties of matter covered in this study-unit include thermodynamics, temperature, heat and energy. The principals of thermodynamics are based on our everyday experiences and experimental observations. The wave theory assumes that energy spreads out from a source as waves. Further it is considered that wave theory can be used in a problem of light which is a form of energy that stimulates our sense of vision. The wave theory topic deals with geometrical optics, interference, diffraction, polarisation and wave various applications.

Additionally, this unit is designed to provide learners with the foundations needed for the successful completion of other units covered within the electrical and mechanical engineering courses.

Through practical experiments, this unit is structured in a way to support learners in understanding the basic concepts of thermodynamics. Additionally, it shall support learners in solving basic engineering problems related to wave theory.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Investigate simple engineering problems through the application of thermodynamic laws.*
2. *Investigate and solve simple heat transfer engineering problems.*
3. *Calculate geometrical parameters for the design of optical devices.*
4. *Apply essential theories to explain and calculate the properties of waves.*

ETELE-506-1901: Fundamentals of Electrical Engineering

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

This unit presents the fundamental concepts of both DC and AC circuit analysis. The operation of fundamental electrical components such as resistors, capacitors and inductors are studied for DC, transient and steady-state AC conditions. The basics of single-phase and three-phase AC electrical systems are presented including their application within resonant and star-delta systems. The most commonly used electrical machines in industrial applications are reviewed and their operation under typical operating conditions is analyzed. The unit also includes practical instrumentation as required for the experimental validation of both DC/AC electrical systems.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Understand the fundamentals of DC Circuits.*
2. *Understand the theory and application of capacitors and inductors in DC Circuits.*
3. *Understand the fundamentals of AC Circuits.*
4. *Evaluate the operation of DC and AC Electrical Machines.*
5. *Evaluate experimentally the performance of an Electrical System.*

ETELE-506-1902: Fundamentals of Electronics Engineering

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

This unit presents the fundamental concepts of analogue and digital electronic circuits. The basic passive and active components used are studied along with their application in practical circuits. Analysis of amplifier circuits based on both discrete and integrated components is carried out, for both single and multiple stage designs. The design of linear and switching power supply topologies is also investigated in this unit. Schematic and PCB layout design and implementation of both analogue and digital circuits is also studied. The unit aims to provide the learner with the required theoretical and practical skills to design, analyze and evaluate a wide range of electronic circuits.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Understand the fundamentals of Basic Electronic Components.*
2. *Understand the fundamentals of Amplifier Circuits.*
3. *Understand the fundamentals of Digital Electronics.*
4. *Understand the fundamentals of Power Supply Circuits.*
5. *Evaluate the performance of an Electronic System.*

ETENG-506-1905: Principles of Mechanics

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

Mechanical engineering is an essential matter in everyday life. Be it the design of plastic toys with high safety to aviation vehicles that need to resist atmospheric extremes, engineering can predict, analyse or improve any requirement of these products.

With this unit the learners are exposed to the principles of mechanics that will provide the learners with the essential tools to analyse and predict mechanical engineering situations. This unit builds on units covered at lower level and helps the learners acquaint themselves with further mechanics. At the base of any mathematical model there is the proper use of units and quantities, hence the learner is trained to choose the correct units and quantities that will represent a situation. Later in the unit the learner will be competent to use equations and vectors to represent various engineering situations.

The unit also aims to show that an everyday situation is a combination of correlated factors. Hence the outcomes of the units overlap to demonstrate cause and effect on the dynamics and statics of an object

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Use and modify scalar and vector quantities to model engineering problems.*
2. *Create mathematical models of real-life dynamic situations.*
3. *Learn the basics to model a static problem.*
4. *Become familiar with mechanical energy principles and how these are related.*

ETENG-506-1906: Workshop Practice

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

Any customer product relies on the production of goods by converting raw material into single products or a combination of products. Any goods production depends on the fabrication of metals, being the components directly like aviation components, or moulds and presses to produce cosmetic packaging, medicine container or toys. Metal fabrication includes a multitude of disciples and new technology brings out new fabrication equipment and procedures that satisfy customer demand.

Although metal fabrication is vast and is ever evolving the core of fabrication can be synthesised into; converting a complex component into simple shapes connected and produce the components to required dimension. This unit will explore conventional fabrication techniques and will introduce the learner to basic manufacturing procedures. Indirectly the learner will start converting products into a series fabrication sequences. The unit will also show the importance of dimensions and will appreciate the necessities of dimensional tolerance. During the unit delivery the learner must be made aware of good workshop attitude to respect oneself safety and that of others. Also, the learner will become familiar with terminology used in metal fabrication workshop.

Being mostly a practical unit, it will help the learner in understanding other units like mass production, polymer engineering and robotics. The learner will also be able to design components with good fabrication properties and avoid unnecessary cost with complex shapes or unnecessary dimensional tolerances.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Recall basic practices required to work in a manufacturing workshop.*
2. *Describe sheet metal working practices and machinery.*
3. *Show how simple components can be fabricated using conventional machining equipment.*
4. *Deal with basic NC and CNC practices.*

ETENG-503-1907: Technical English

Unit level (MQF): 5

Credits: 3

Delivery Mode: Face to Face

Total Learning Hours: 75

Unit Description

This unit is targeted at learners proceeding from a Level 4 vocational programme (therefore taking into account completion of Level 4 Key Skills English) as well as those whose entry level is directly at Level 5.

This unit is intended to focus on the development of technical english and to equip students with the knowledge, skills and competences required during their undergraduate studies. In a world where English is acknowledged as the international language of science and engineering, this unit aims at improving the ability to speak, listen, read and write in English. 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 within their specific area of study and to prepare them for more rigorous academic thinking, research and writing as demanded by tertiary education.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Communicate in clear, effective and appropriate spoken English in a technical context.*
2. *Comprehend written texts and visuals of a technical nature to analyse and evaluate source information.*
3. *Understand technical texts presented orally.*
4. *Produce texts of a technical nature using appropriate language and style.*

ETENG-506-1908: Fundamentals of Materials and Chemistry for Engineers

Unit level (MQF): 5

Credits: 6

Delivery Mode: Face to Face

Total Learning Hours: 150

Unit Description

The aims of this unit are to give fundamental knowledge about type of materials, their usage, properties and characteristics, which are important in engineering design. It is also aimed to give a theoretical background about the analysis of behaviour of engineering materials by emphasizing important relationships between internal structure and properties. It also hints at ways of modifying and control the material microstructures and especially mechanical properties (toughness, strength, fatigue and creep resistance).

This unit first introduces the learner to chemistry by emphasizing the classification of the materials, atomic structure, periodic table, molecular structure, bonding in solid materials, structure of crystalline solids, mechanical properties of the materials, phase diagrams, thermal processing of metal alloys, electrochemical properties, corrosion and electroplating.

It then proceeds to describe various kinds of materials (metals, polymers, and ceramics, as well as composites and semiconductors), and account for their characteristics specifically for the relationship between the structure and mechanical properties of various materials.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Identify the differences between atoms, molecules and different types of chemical bonds.*
2. *Understand in depth the atomic structure, molecules and moles.*
3. *Apply the underlying principles to describe corrosion, galvanic cells, batteries, electrolysis and electroplating.*
4. *Evaluate the relationship between structures of crystalline solids, imperfections and diffusion to mechanical properties and failure modes.*

ETENG-503-1909: Introductory Programming for Engineers

Unit level (MQF): 5

Credits: 3

Delivery Mode: Face to Face

Total Learning Hours: 75

Unit Description

This unit is intended for novice programmers, enrolled in engineering courses, who need to build a solid foundation of software development concepts. This will be carried out using the C programming languages, from which the students can then progress to more advanced concepts or to other languages built upon C. C is a powerful procedural-based programming language which has spread from its inception to many systems and applications. C has subsequently influenced a number of other programming languages such as C++ and Java.

This unit is divided into a number of sections. Each section introduces a programming concept which is explored using the C language. The unit starts with describing the primary data types, which is then followed by condition statements. Subsequently loops are explored. At this stage the learner is introduced to the concepts of structured programming, after which, arrays, strings are covered.

Learning Outcomes

Upon completing the unit, learners should be able to:

1. *Understand basic C terminology, including data types.*
2. *Implement C applications using conditions and loops.*
3. *Develop structured C applications.*
4. *Enhance C applications using arrays, pointers and strings.*