MQF Level 7

AS7-07-21

Master of Science in Environmental Engineering

Course Specification

Course Description

The Master of Science in Environmental Engineering programme takes an interdisciplinary approach into the investigation of processes that control the earth and its environment. The programme will deliver all necessary knowledge and skills to seize opportunities presented by new developments in areas such as global cycles, biogeochemistry, sustainable technologies, waste and water treatment, environmental pollution assessment and remediation, and natural hazard. A special focus on environmental auditing and impact assessment shall be made, particularly in water, energy, noise and traffic auditing.

Programme Learning Outcomes

At the end of the programme the students are able to;

1. *Evaluate the performance of an engineering system and incorporate innovations or implement new technologies.*
2. *Enhance environmental protection.*
3. *Collect, construct and evaluate environmental impact data.*
4. *Apply knowledge in the fields of energy efficiency, waste water treatment, marine protection and water resource management.*
5. *Use logic and reasoning to identify the strengths and weaknesses of alternative environmental sustainability solutions.*

Entry Requirements

Relevant degree;

- MQF Level 5 qualification and adequate professional experience are also considered.

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: 2250

Mode of attendance: Part Time

Duration: 3 Years

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. (DOC016 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 016 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/

Academic qualification leading to a Regulated Profession

Council for Professions Complementary to Medicine
St. Luke's Hospital,
Ex-OPD (Level 1), St. Luke's Square,
Gwardamangia PTA 1010

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
ASENV-706-1801	Introduction to Environmental Engineering	6
ASENV-706-1802	Environmental Impact Assessment	6
ASENV-706-1803	Environmental and Soil Science	6
ASENV-706-1804	Ecosystem Analysis and Management	6
ASENV-706-1805	Energy Efficiency and the Environment	6
ASENV-706-1806	Marine Pollution	6
ASENV-706-1807	Renewable Energy Technologies	6
ASENV-706-1808	Air Pollution and Monitoring	6
ASENV-706-1809	Sustainable Urban Transport	6
ASENV-706-1810	*Water Resources and the Environment	6
ASENV-706-1811	*Water Contamination and Remediation	6
CDDIS-730-1801	Dissertation	30
	Total ECTS	90

Choose one of the following Electives:

*Water Resources and the Environment
*Water Contamination and Remediation

ASENV-706-1801: Introduction to Environmental Engineering

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

A survey of the sources, measurement techniques and treatment technologies that relate to environmental pollution resulting from human activities. This unit is technology-focused but also touches on topics related to the implementation of technology in the real world such as public perception, policy and legislation, and choosing between technological alternatives. Topics include water pollution, air pollution, solid waste, the fate and transportation of pollutants in the environment, and pollution prevention. The consideration of each area includes the general background and key concepts, detailed design examples, and current topics.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the basic mechanisms of environmental problems.*
2. *Apply environmental management principles.*
3. *Implement the fundamental concepts of mass balance.*
4. *Explain air pollution and the fundamentals of climate change.*
5. *Understand the importance of water and identify the problems of water pollution.*
6. *Explain the problem of land pollution.*
7. *Understand the basic mechanisms of green design.*
8. *Analyse and interpret the importance of public participation in environmental management.*

ASENV-706-1802: Environmental Impact Assessment

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit will attempt to: describe the necessity of Environmental Impact Assessment (EIA), define the base influential parameters of EIA, recognise the main environment attributes, describe the baseline environment, use adequate prediction and methods of assessment of impacts and introduce public participation in the environmental decision making process.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the basic mechanisms of sustainable development.*
2. *Understand the basic concepts of environmental impact assessment.*
3. *Define the detailed contents of an EIA.*
4. *Recognise the main environmental attributes.*
5. *Describe the baseline environment based on the environmental setting, selected parameters, monitoring of physical environmental parameters, collection and interpretation of baseline data for various environmental attributes.*
6. *Use adequate prediction and methods of assessment of impacts on various aspects of the environment.*
7. *Understand public participation in the environmental decision making process.*
8. *Prepare an environmental management plan.*

ASENV-706-1803: Environmental and Soil Science

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit represents a comprehensive study related to the origin of soils; chemical, morphological and physical soil properties; the principles of soil classification and soil mapping through Geographic Information Systems technology (GIS). GIS is a powerful data visualisation and analysis tool and this unit is designed to introduce students to the advanced concepts of geographic information science related to the fields of reserve planning, environmental science, natural resources, and ecology for the purpose of spatial analysis and the geo-visualisation of environmental issues.

Topics include conservation needs using remote sensing, digital image processing, data structures, database design, landscape ecology and metrics, wildlife home range and habitat analysis, suitability modelling, terrain and watershed analysis and spatial data analysis.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Outline the soil genesis and classification, soil properties and processes, soil mapping and geo statistics.*
2. *Evaluate critically the importance of soil resources in certain sectors, as well as the implementation of environmental issues.*
3. *Identify GI Science concepts and understand how these are used to gather, manage, quality check, process, analyse, model, and interpret environmental spatial data.*
4. *Evaluate critically the environmental GIS data and information produced by the government, agencies, industry, academia, and popular media.*
5. *Identify environmental spatial data required for particular tasks and locate*

environmental spatial data that is available and has been quality assessed.

6. *Use commonly available GIS and remote sensing software to view, assess, and present spatial datasets:*
7. *Develop, analyse and produce research to examine a real-world environmental issue of interest for the final project.*
8. *Present products of own environmental analyses in written and oral/visual form.*

ASENV-706-1804: Ecosystem Analysis and Management

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

To enable analysis, understanding and management of human-environmental systems; define the basics of system analysis and ecosystem theory; analyse human-environmental interactions through land-use conflicts between agriculture, environmental protection, urban expansion, water management, tourism etc.; define a crucial concept in nature conservation – biological diversity; and link advanced methods of system analysis and ecological modelling with modern methods of natural resource management.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the basics of human-environmental systems interaction.*
2. *Understand the basic concepts of system analysis and ecosystem theory.*
3. *Analyse human-environmental interactions using various examples.*
4. *Understand biological diversity in relation to environmental engineering.*
5. *Recognise advanced methods of system analysis and ecological modelling with modern methods of natural resource management.*
6. *Perform ecosystem service assessments.*

ASENV-706-1805: Energy Efficiency and the Environment

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit attempts to highlight the basic issues associated with the relationship between material/energy resources, the environment and sustainable development. The potential directions for technological changes on the greater efficiency of energy utilisation, exploitation of renewable energy, adoption of cleaner environmental practices in waste reduction that can lead to sustainable development will be explored. The management of energy and the environment towards sustainability will be introduced.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Identify energy consuming equipment within a building and in the building envelope, and research all possible energy conservation measures in the areas of HVAC, lighting, motors, building envelope, and other building equipment.*
2. *Identify and operate various data acquisition, monitoring, auditing, and system balancing equipment for energy analysis.*
3. *Analyse possible energy conservation measures for performance, including the interactive effects of multiple ECMs.*
4. *Compare occupancy schedules to operating schedules and recommend appropriate adjustments to optimise building and energy usage and calculate energy savings.*
5. *Analyse energy consumption, including an analysis of the viability of switching to alternative/renewable fuels.*

6. *Investigate energy usage scenarios to determine the optimal rate from energy suppliers or to determine if the customer qualifies for an alternative rate.*
7. *Analyse the opportunities for improving the operation, maintenance and energy efficiency of each energy system and piece of equipment at a building site.*
8. *Recognise the results of the ECM analyses by energy savings, economic savings and environmental impacts.*

ASENV-706-1806: Marine Pollution

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit will provide a full understanding of marine pollution. The different sources and types of contamination will be detailed, including chemical, physical and biological pollution. Students will study the dispersion of this contamination and the main contaminated areas. The effects on the organisms and on the health of the ecosystems, and the treatments and possible solutions will also be developed.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Identify the main sources of marine pollution.*
2. *Identify the main pollutant activities.*
3. *Identify the impacts in society and ecosystem health.*
4. *Identify the types, origin and effects of each pollutant.*
5. *Recognise the methods of remediation pollution.*
6. *Identify the main international agreements related to marine pollution in the last 25 years.*

ASENV-706-1807: Renewable Energy Technologies

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

Current environmental issues, climate change, global social injustice, and the impacts of these on ecosystems and societies have led us to radically rethink our current energy systems. It is necessary for us to understand how humanity became so dependent upon fossil fuels, and it is even more important for us to understand what other alternative energies exist.

This unit will examine the technical, economic, and political aspects of renewable energy and students will learn about the successes and failures of implementing alternative energies at the local, national, and regional levels.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the basics of energy systems.*
2. *Explain the importance of res.*
3. *Define the possibilities for res utilisation.*
4. *Analyse and interpret the importance of res in the energy system using SWOT and best practices.*

ASENV-706-1808: Air Pollution and Monitoring

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

To describe air pollution sources, atmospheric transport, dispersion and transformation processes, deposition, uptake and impacts on human health and the environment and to introduce techniques of air pollution detection and monitoring as well as to familiarise unit participants with the equipment used for this purpose.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the mechanisms of air pollution.*
2. *Carry out a basic assessment of the health-affecting air pollutants.*
3. *Present contemporary global environmental issues such as climate change and ozone holes.*
4. *Propose solutions for environmental problems with emphasis on air pollution.*
5. *Apply working knowledge of mathematics, science, and engineering science to understand air pollution, and identify possible environmental engineering interventions.*
6. *Determine the political and economic actors in relation to solving air pollution problems from a local to regional and global scale.*
7. *Relate health and safety needs in terms of air pollutants.*
8. *Analyse, interpret, and communicate environmental data related to urban air pollution.*

9. *Conduct the relevant measurements of key air pollutants.*
10. *Evaluate the key air pollutants and their environmental impact from important sectors.*
11. *Use procedures and methods for hydrocarbons and heavy metal particles for air concentration detection in urban areas.*
12. *Asses the effect of possible preventive measures that can be utilised in environmental engineering.*

ASENV-706-1809: Sustainable Urban Transport

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit explores the relationships between transportation infrastructure, technology, and energy consumption, with a focus on the potential impacts of alternative futures for transportation and energy systems. We will couple lectures, literature review, and class discussions with scenario and data analysis.

Learners will explore the potential changes in well-to-wheel energy consumption and greenhouse gas emissions associated with alternative energy scenarios applied to specific transportation subsectors.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Understand the trends and problems of the transport sector.*
2. *Define and understand the different alternative fuels.*
3. *Evaluate the possibilities for alternative fuels.*
4. *Explain air pollution reduction.*
5. *Understand the comprehensive strategies to reduce long-term transportation energy use and GHG emissions.*
6. *Analyse and interpret the importance of sustainable urban transport.*

ASENV-706-1810: Water Resources and the Environment

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit provides a multi-disciplinary understanding of water resources and environmental issues. It's designed to develop the knowledge and skills necessary to plan and manage resources within the context of climate change and the environment. With growing worldwide issues over water resources, this sector is becoming ever more important.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Determine the water resources in a certain location.*
2. *Estimate the hydro-potential for energy use and its impact of the environment.*
3. *Plan efficient and sustainable water use in all aspects of modern life.*
4. *Understand the methods and techniques used for water purification and recycling.*
5. *Implement measures for water purification and recycling in industrial facilities and in everyday life.*
6. *Project water consumption quantity based on the latest technology demands in a particular industrial facility.*
7. *Evaluate the impact of water consumption on the local environment.*

ASENV-706-1811: Water Contamination and Remediation

Unit Level (MQF/EQF): 7

Credits: 6

Delivery Mode: Fully Face-to-Face Learning

Total Learning Hours: 150

Unit Description

This unit on water contamination and remediation exposes the different contaminants that can be present in the water and the treatments normally used to depurate it. The depuration of water can involve methods to depurate drinking water or techniques that permit the return of the water after its use for different processes to the environment in the appropriate conditions.

Learning Outcomes

Upon successful completion of this unit, learners will be able to:

1. *Investigate the properties of the water molecule.*
2. *Understand the water cycle.*
3. *Identify the uses of water.*
4. *Evaluate the different types of contamination experienced by water.*
5. *Explain the different methods of obtaining water for consumption.*
6. *Describe the different steps of sewage treatment.*