MQF Level 7

# AS7-11-23

## Master of Science in Applied Environmental Science (General)

## Course Specification

# Course Description

The Master of Science in Applied Environmental Science 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. Students will be exposed to a wide variety of environmental issues, with topics related to the analysis, understanding and management of human-environmental systems by exploring the basics of system analysis and ecosystem theory. By understanding human-environmental interactions through land-use conflicts between agriculture, environmental protection, urban expansion, water management, tourism etc., students will be able to link advanced methods of system analysis and ecological modelling with modern methods of natural resource management. Issues associated with the relationship between material/energy resources, the environment and sustainable development will be a recurring theme in this programme.

# Programme Learning Outcomes

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

1. *Demonstrate a strong applied background in natural resource environment, environmental quality, and analysis.*
2. *Be familiar with computational tools for spatial analysis together with data management, statistics and modelling which have become essential tools in the environmental field.*
3. *Identify how research methods can help practitioners innovate and inform policy decisions.*
4. *Evaluate the local, regional and global scale of environmental problems.*
5. *Evaluate the performance of environmental technologies and incorporate innovative solutions to solve challenges related to the natural and urban environment.*
6. *Design and carry out research using appropriate data collection strategies and analyses methods to develop solutions to environmental problems and sustainability challenges.*

# Entry Requirements

- First degree (Level 6) in Engineering; Environment; physics; geography; biology; chemistry or any related field OR
- Relevant degree (Level 5) qualification and adequate professional experience are also considered
- Mature students: Mature students must be 27 years or older

# 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<br>Third Cycle Bologna Process | NA | NA |
| Level 7 | Masters<br>Second Cycle Bologna Process | 90-120 | Less than 30 |
| | Post-Graduate Diploma | 60 | |
| | Post-Graduate Certificate | 30 | |
| Level 6 | Bachelor[23]/Bachelor (Hons.)[24]<br>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: Full Time and Part Time

Duration: FT 3 Semesters; PT 5 Semesters

Target audience for MCAST full-time courses is 19 to 65+

Target group: further and higher education learners (postgraduate students) and workers from the industry (with necessary entry requirements).

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. (DOC005 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

## Full-Time

| Unit Code | Unit Title | ECTS | Year | Semester |
|---|---|---|---|---|
| ASENV-706-2301 | Practical Environmental Analysis | 6 | 1 | 1 |
| ASENV-706-2302 | Natural Resource Management | 6 | 1 | 1 |
| ASENV-706-2303 | Data Management, Statistics and Modelling | 6 | 1 | 1 |
| ASENV-706-2304 | Environmental Quality | 6 | 1 | 1 |
| ASENV-706-2305 | Environmental Policy | 6 | 1 | 1 |
| ASENV-706-2306 | Spatial Analysis | 6 | 1 | 2 |
| ASENV-706-2307 | Basic of Quantitative and Qualitative Research Methods | 6 | 1 | 2 |
| Elective Unit 1* | | 6 | 1 | 2 |
| Elective Unit 2* | | 6 | 1 | 2 |
| Elective Unit 3* | | 6 | 1 | 2 |
| ASDIS-730-2201 | Dissertation | 30 | 1 | 3 |
| **Total ECTS** | | 90 | / | / |

## Part-Time

| Unit Code | Unit Title | ECTS | Year | Semester |
|---|---|---|---|---|
| ASENV-706-2301 | Practical Environmental Analysis | 6 | 1 | 1 |
| ASENV-706-2303 | Data Management, Statistics and Modelling | 6 | 1 | 1 |
| ASENV-706-2305 | Environmental Policy | 6 | 1 | 1 |
| ASENV-706-2306 | Spatial Analysis | 6 | 1 | 2 |
| ASENV-706-2307 | Basic of Quantitative and Qualitative Research Methods | 6 | 1 | 2 |
| Elective Unit 1* | | 6 | 1 | 2 |
| ASENV-706-2302 | Natural Resource Management | 6 | 2 | 1 |
| ASENV-706-2304 | Environmental Quality | 6 | 2 | 1 |
| Elective Unit 2* | | 6 | 2 | 2 |
| Elective Unit 3* | | 6 | 2 | 2 |
| ASDIS-730-2201 | Dissertation | 30 | 2 | 3 |
| **Total ECTS** | | 90 | / | / |

* Elective Unit 1

Learners are to choose one of the following units:

| Unit Code | Unit Title | ECTS |
|---|---|---|
| ASERM-706-2301 | Renewable Energy and Green Technologies | 6 |
| ASWRM-706-2301 | Hydrology | 6 |
| ASURS-706-2301 | Urban Planning | 6 |

* Elective Unit 2

Learners are to choose one of the following units:

| Unit Code | Unit Title | ECTS |
|---|---|---|
| ASERM-706-2302 | Food-Energy-Water Nexus | 6 |
| ASWRM-706-2302 | Water Treatment | 6 |
| ASURS-706-2302 | Resource Management | 6 |

* Elective Unit 3

Learners are to choose one of the following units:

| Unit Code | Unit Title | ECTS |
|---|---|---|
| ASERM-706-2303 | Ecotoxicology | 6 |
| ASWRM-706-2303 | Water System Engineering | 6 |
| ASURS-706-2303 | Solid Waste Management Technologies | 6 |

# ASENV-706-2301: Practical Environmental Analysis

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Face to Face
Total Learning Hours: 150

## Unit Description

Practical environmental analysis merges the theoretical and practical aspects attributed to the collection of in-situ and ex-situ environmental data. Such information is important to understand different types of pollution and the implications on different environmental resources, such as air, water and land, and how such impacts can be controlled and mitigated by effective environmental management.

Key areas that will be covered in this weeklong interactive unit include the design and execution of environmental sampling and monitoring programmes, coupled with the application of different analytical techniques to assess the state of the natural environment.

Participants will be provided with an overview of the natural and anthropogenic processes in which pollutants are transferred in terrestrial and aquatic ecosystem and the application of the standard methods used to quantify the amount of these substances within different environmental scenarios.

## Learning Outcomes

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

1. *Describe the main aims of sampling, surveying and monitoring for different environmental systems.*
2. *Evaluate the different techniques used in environmental analysis.*
3. *Understand different analytical techniques in relationship to the various classes of pollutants.*
4. *Apply and appraise different in-situ and ex-situ techniques to collect environmental data.*
5. *Review different data analysis techniques used in the interpretation of field data.*

# ASENV-706-2302: Natural Resource Management

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

Natural resource management aims to enable analysis, understanding and management of human-environmental systems. The unit also defines the basics of system analysis and ecosystem theory as well as analyses human-environmental interactions through land-use conflicts between agriculture, environmental protection, urban expansion, water management, tourism amongst other sectors. Nature conservation and biological diversity will be considered in significant detail as well as system analysis and ecological modelling.

## Learning Outcomes

**On completion of this unit the learner 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-706-2303: Data Management, Statistics and Modelling

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

The unit data management, statistics and modelling provides a thorough understanding of applying a number of data management functions for the organisation and manipulation data and using data in environmental decision-making. The unit also considers basic statistical tools useful for environmental issues. In addition, there will be a focus on data modelling and presentation through graphs and other related tools.

## Learning Outcomes

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

1. *Understand a number of data management functions including searching and sorting and related functions.*
2. *Perform data interpolations and extrapolations.*
3. *Understand the concepts of identifying and eliminating skewed data.*
4. *Understand probability and use of probability in environmental management scenarios.*
5. *Learn the ability to understand and work with random variables.*
6. *Understand basic data modelling tools.*
7. *Use of spreadsheets software to model and represent data.*

# ASENVASENV-706-2304: Environmental Quality

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

The major chemical and biochemical processes that control the concentration and dispersion of substances in natural and impacted environments will be the focal point of this unit. By evaluating the principles and application of quantitative chemical analysis and environmental monitoring, participants will be able to apply diverse chemical principles in the explanation of environmental phenomena.

Participants will appreciate the need for high quality environmental chemical analysis and the importance of selecting and utilising appropriate analytical methods and techniques for monitoring. This will allow for a better understanding of the factors that control physical, chemical and biological processes, and the interactions between the different environmental components (air, water, and soil) for adequate environmental management.

Through the practical component of this units, participants will acquire enhanced laboratory skills in using classical analytical methods and modern spectrometric and chromatographic techniques, which are widely employed in environmental monitoring and analysis.

## Learning Outcomes

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

1. *Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.*
2. *Apply basic chemical concepts to analyse chemical processes involved in different environmental problems.*
3. *Review simple and advanced analytical tools to measure the chemical composition and concentration of different types of pollution in the different environmental systems.*
4. *Analyse data from spectroscopic techniques to provide analytical information about chemical substances in different environmental systems.*
5. *Use chromatographic techniques to analyse chemical substances in different environmental systems.*

# ASENV-706-2305: Environmental Policy

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

The need for better environmental protection and a balance between the environment and economy is increasingly being felt by citizens and is increasingly being acknowledged by public institutions as well as the private sector. This unit in Environmental Policy aims to engage participants to discover how to respond to environmental concerns through the development of policy, regulation, and governance. The unit focuses on environmental policy development and implementation, methods of policy analysis and political, administrative, legal and economic issues in environmental policy.

## Learning Outcomes

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

1. *Master core concepts in environmental policy, law, and economics in relation to the design and evaluation of environmental policy.*
2. *Apply system concepts and methodologies to analyse and understand interactions between social and environmental processes.*
3. *Use critical thinking in the development and implementation of environmental policy*
4. *Evaluate methods and instruments for environmental policy analysis.*
5. *Explore the communication of environmental policy.*

# ASENV-706-2306: Spatial Analysis

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Face to Face
Total Learning Hours: 150

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## Unit Description

The graphical representation and analysis of environmental spatial data has become an essential tool in the management of our natural and urban environment. Geographic Information Systems (GIS) are increasing being utilised by public agencies and research organisations to assist with resource and environmental management decision making. This unit will provide a practical basis for participants to be able to initially manage environmental spatial data for analysis as well as access available digital spatial data, to the application of various analytical spatial tools through to the graphical representation of the data. Participants in this weeklong interactive unit will be engaged in a practical project in their chosen environmental field.

## Learning Outcomes

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

1. *Understand fundamental concepts in Graphic Information Systems (GIS).*
2. *Be familiar with different projection systems, datums, spheroids and coordinate systems.*
3. *Understand the difference between digital and analogue spatial data and methods used to convert analogue into digital data.*
4. *Capture, storage, manipulate, analyse, and present both vector and raster data*
5. *Combine spatial and tabular data in GIS to conduct spatial analysis of large datasets.*
6. *Search and download geographic or spatial data from public online repositories and import and export different data types.*
7. *Compute basic statistical analysis with spatial data.*
8. *Derive topographic information from spatial elevation data.*

# ASENV-706-2307: Basic of Quantitative and Qualitative Research Methods

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

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## Unit Description

This unit will give the candidate core academic research skills and insights into correct research practices and methods of data enquiry. It provides the participant with the opportunity to understand and master excellently the main basic concepts in applied research and development methods. The processes learned will direct the participant to collect and analyse data in quantitative and/or qualitative research. This course is linked to the participant's design and piloting of the research project.

## Learning Outcomes

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

1. *Identify a research theme.*
2. *Carry out an early literature review on existing research/knowledge on the theme.*
3. *Suggest research objective/s and possibly a research question.*
4. *Recommend a suitable research methodology and justify own choice.*

# ASWRM-706-2301: Hydrology

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

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## Unit Description

This unit is designed to provide participants with an understanding of hydrological processes in semi-arid coastal regions. The unit deals with hydrological cycle and catchment water balances, rainfall and evapotranspiration, soil water, surface water flow, and hydrogeology and then delves into water quality of ground and surface waters, monitoring and groundwater vulnerability and protection.

## Learning Outcomes

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

1. *Understand water flow and mass transport processes, and represent these processes with mass, momentum, and energy conservation equations, and apply those equations in assessing water quantity and quality in surface and groundwater systems.*
2. *Understand rainfall-runoff processes and the formation of streamflow hydrographs.*
3. *Compute evaporation rates from evaporation pans, water bodies and plant evapotranspiration.*
4. *Describe hydrogeologic definitions and fundamental concepts of groundwater occurrence and flow.*
5. *Understand water chemistry fundamentals relevant to groundwater quality and the principles of pollutant transport in groundwater.*
6. *Design a monitoring program for ground and surface waters and implement and groundwater vulnerability assessment.*

# ASWRM-706-2302: Water Treatment

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

Water is known to dissolve a large range of natural and anthropogenic substances. The world's increasing population together with the contamination of natural waters means that most natural water resources require some form of treatment before potable use and the wastewater generated by our communities require treatment before being discharged safely into the environment.

This unit introduces the fundamental principles of water treatment and process selection, including an overview of physical, chemical, and microbiological quality of water, the removal of select contaminants from water through physical and chemical treatment methods and then focuses on wastewater treatment and reclamation. Participants will also learn to assess designs based on process effectiveness, greenhouse gas emissions and the potential for resource recovery.

## Learning Outcomes

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

1. *Evaluate a given source of water in terms of its physical, chemical, and microbiological quality in relation to a specific application.*
2. *Understand the fundamental principles of water treatment.*
3. *Describe physical and chemical treatment methods associated with the removal of specific constituents from water.*
4. *Understand the main processes involved in wastewater treatment and describe the various options for tertiary and advanced treatment processes for the reclamation of wastewater by application.*
5. *Evaluate water treatment process trains by process effectiveness, by life cycle cost, carbon emissions and the potential for resource recovery.*

# ASWRM-706-2303: Water System Engineering

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

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## Unit Description

The objective of this unit is to allow participants to design a basic water system from source, through to storage and distribution. This will involve understanding how to evaluate the availability and suitability of various water sources, including groundwaters, surface waters, harvested rainwater and reclaimed wastewaters, and be able to specify water treatment requirements for specific applications. Participants will then be thought how to specify water storage requirements and finally design a basic water distribution network to supply the required quality and quantity of water to a community.

## Learning Outcomes

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

1. *Identify different water users and specify their requirements in terms water quantity and quality.*
2. *Evaluate the availability of groundwater, surface water, harvested rainwater and reclaimed wastewater to meet the requirements of a specific use application.*
3. *Construct a process flow diagram for the water treatment process to obtain a water quality suitable for specific applications.*
4. *Describe the requirements of the recast Drinking Water Directive, including understanding the risk-based approach to water safety.*
5. *Specify the water storage requirements to meet the water demand of a community.*
6. *Design a basic water network system including the sizing of pipes and pumps and being able to attribute operational costs to the treatment and pumping of supplied water.*

# ASERM-706-2301: Renewable Energy and Green Technologies

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

It is important to understand how humanity became so dependent upon fossil fuels, and it is even more important to understand what other alternative energies exist. This unit will examine the technical, economic, and political aspects of renewable energy and participants will evaluate the successes and failures of implementing alternative energies at the local, national, and regional levels. The basic principles governing green technologies, coupled with a firm understanding of sustainability issues will also be an important focal point in this unit.

This unit highlights 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

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

1. *Understand the basic principles of renewable energy and green technologies.*
2. *Assess the relevance of renewable energy sources in different sectors.*
3. *Explore the methods of reducing carbon dioxide levels in atmosphere.*
4. *Evaluate the importance of life cycle assessment of various energy technologies.*
5. *Understand national and international regulations and framework conditions for renewable energy systems.*

# ASERM-706-2302: Food-Energy-Water Nexus

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

Water, energy and food are essential for human well-being, poverty reduction and sustainable development. So much so that these three resources are nowadays considered holistically as the Food-Energy-Water Nexus. A nexus enables a better understand of the complex and dynamic interrelationships between water, energy and food. In turn, this will enable the use and manage of such resources sustainably.

Global projections indicate that demand for freshwater, energy and food will increase significantly over the next decades under the pressure of various factors, leading to problems of environmental degradation and in some cases, resources scarcity.

The nexus implies that a decision associated with one resource will have implications even on the other resources. The concept attributed to the nexus will be discussed in relation several Sustainable Development Goals: 2 (zero hunger), 6 (clean water and sanitation), 7 (affordable and clean energy), 9 (industry, innovation and infrastructure), and 12 (responsible consumption and production).

## Learning Outcomes

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

1. *Identify the roles of each resource as it relates to the others within the nexus.*
2. *Assess the cross-sector linkages and processes within the nexus.*
3. *Evaluate factors involved in food production, based on the roles of energy and water in that production.*
4. *Understand the nexus across local to global scales and identify cross-scalar connections.*
5. *Review global regulation, policy and governance processes and issues that are relevant to the implementation and management of green and sustainable practices.*

# ASERM-706-2303: Ecotoxicology

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

Ecotoxicology is the study of the fate and effects of contaminants in ecosystems. Participants will understand the environmental consequences of human activities by applying basic toxicological and eco-toxicological concepts and the most important working methods within this topic. By studying the effects of different classes of pollutants on individual organisms and on species in food webs, participants will be able to predict the negative implications on entire populations, ecosystems and on human food resources.

The unit will provide an understanding of experimental design and analysis, designing and performing ecotoxicological research, as well as provide a platform to carry out ecotoxicity testing and risk assessment on different chemicals that may be used, disposed, or otherwise reach the environment.

## Learning Outcomes

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

1. *Understand the basic principles of toxicology.*
2. *Explain discharge, transport and degradation of various classes of environmental contaminants to or in the environment.*
3. *Evaluate the mechanisms underlying the uptake, metabolism, elimination and effects in humans and animals.*
4. *Describe the toxicological impacts at the species, population, community and ecosystem levels.*
5. *Appraise the general principles for environmental risk assessment of chemicals.*
6. *Analyse ecotoxicological tests in different environmental scenarios.*

# ASURS-706-2301: Urban Planning

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

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## Unit Description

This unit provides a holistic approach to the analysis and design of urban planning within a region / locality. Participants will explore ways in which economics, demographics, policies and social necessities interact in complex spatial settings. Significant focus will be dedicated to sustainable land use within the region. The unit will consider basic infrastructure requirements in the urban environment including energy infrastructure, water infrastructure, transportation systems and for the development of green/recreational areas amongst others.

## Learning Outcomes

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

1. *Understand the basic principles of urban planning.*
2. *Understand the basic principles of sustainable land use.*
3. *Apply the concepts of urban planning considering economics, policies and social necessities*
4. *Understand the requirements for basic infrastructure within a region considering water, energy, transportation and green areas.*
5. *Consider the infrastructural impacts/requirements of high-rise buildings.*
6. *Consider the urban planning in small states/islands.*

# ASURS-706-2302: Resource Management

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

Resources are generally very limited, and the unit resource management is aimed at understanding the potential of the resources available in order to make the best use of them. The unit introduces a number of relevant concepts to participants as well as using the concept of Life Cycle Assessment (LCA). The latter will assist participants to make better judgment with respect to environmental issues and assist in decision-making.

## Learning Outcomes

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

1. *Understand the concepts of zero waste, sustainable development, green economy and carbon neutrality.*
2. *Understand sustainable materials and green manufacturing processes.*
3. *Understand the concept of design for the environment.*
4. *Be familiar with the waste management hierarchy and relevant policies.*
5. *Understand waste management and recovery of resources.*
6. *Practice the concept of Life Cycle Assessment (LCA).*

# ASURS-706-2303: Solid Waste Management Techniques

Unit level (MQF/EQF): 7
Credits: 6
Delivery Mode: Blended
Total Learning Hours: 150

## Unit Description

The unit solid waste management technologies aims to give participants an overview on various waste management processes. These processing include the management of both hazardous and non-hazardous waste streams. At the end of the unit, participants will be able to understand and differentiate between different treatments and suggest the best solution for the particular waste stream. The unit will be balanced between theoretical and practical aspect with the consideration of relevant case studies.

## Learning Outcomes

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

1. *Learn about different recycling processes for metals, plastics, glass and paper and cardboard.*
2. *Learn about hazardous waste management for WEEE, oil, paints, and medicinal waste.*
3. *Understand material sorting processes.*
4. *Understand the concept of thermal treatment.*
5. *Understand the concept of biological treatment.*
6. *Understand the concept of engineered landfilling.*