MQF Level 6

AS6-02-21

Bachelor of Science (Honours) in Environmental Science and Sustainable Technologies

Course Specification

Course Description

The protection of natural resources, CO2 emissions, climate change and its effects, and demographic changes, are increasingly important topics in the local and international context. This degree course covers the national and global challenges of today and of the future, and includes a high level of interdisciplinary collaboration. The course of study is a merging of classical engineering with natural sciences.

Environmental engineering deals with engineering solutions for environmentally relevant challenges of our future. This course will provide students with the ability to use problem solving approaches for dealing with ecological and technical challenges, in order to creatively arrive at a situation of resource sustainability.

The course is a challenging, technically-oriented programme that offers students a broad range of fields of application. Environmental engineers can be active in the planning, construction and operation of environmentally technological facilities, in research and teaching, in environmental organisations, in administration, and in consultancy businesses of their own.

Programme Learning Outcomes

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

1. *Understand the basics of environmental engineering within a wide range of industries*
2. *Carry out water, energy and environmental audits and basic environmental impact assessments*
3. *Comprehend environmental legislation and regulations required to devise environmental policies*
4. *Implement monitoring, logging, data management and interpretation of various environmental parameters with an aim of arriving at scientific conclusions to a specific problem.*

Entry Requirements

MCAST Advanced Diploma in Environmental Sustainability
or
MCAST Advanced Diploma in Applied Science
or
2 A-Level Passes and 2 I-Level Passes
Compulsory A-Level: Physics or Mathematics (Pure or Applied) or Biology or Chemistry

Current Approved Programme Structure

Unit Code	Unit Title	ECTS	Year
ASENV-503-2002	Water Auditing	3	1
ASENV-506-1601	Principles of Ecology	6	1
ASENV-506-1603	Biodiversity and Conservation	6	1
ASENV-506-1604	Comprehensive Environmental Impact Assessment Techniques	6	1
ASCHM-506-1601	Environmental Chemistry	6	1
ASENV-506-1602	Environmental Systems	6	1
ASBIO-506-1602	Biological Survey Techniques	6	1
ASHRT-506-1601	Principles of Plant and Soil Science	6	1
ASPRJ-506-2008	Research Methods within a Research Project 1	6	1
ASWBL-503-2009	Work Based Experience 1	3	1
CDKSK-506-1704	Mathematics	6	1
ASENV-506-2003	Water Resource Management	6	2
ASENV-506-1607	Sustainable Development	6	2
ASENV-506-1614	Habitat Restoration and Repair	6	2
ASENV-506-1608	Waste Management	6	2
ASENV-506-1605	Environmental Law	6	2
ASPRJ-506-2009	Research Methods within a Research Project 2	6	2
ASWBL-503-2010	Work Based Experience 2	3	2
ASRES-509-1603	Alternative Energy and Energy Auditing	9	2
CDKSK-604-1909	Entrepreneurship	4	2
CDKSK-602-2105	Community Social Responsibility	2	2
CDKSK-503-1905	Critical Thinking 1	3	2
CDKSK-503-1906	Critical Thinking 2	3	2
ASENV-606-2004	Financial Engineering	6	3
ASENV-606-1611	Environmental Principles and Measurements	6	3
ASENG-606-1602	Fundamentals of Electrical Engineering	6	3
ASENG-606-1603	Fundamentals of Mechanical Engineering	6	3
ASENV-606-1602	Water Technology	6	3
ASENV-606-1613	Energy and the Environment	6	3
BCMGT-606-1506	Project Management	6	3
ITSFT-506-2006	Object Oriented Programming	6	3
ASDIS-612-1601	Dissertation	12	3
Total ECTS		**180**	**/**

ASENV-503-2002 Water Auditing

Unit level (MQF): 5

Credits: 3

Unit Description

This is a knowledge-based unit that will allow learners to get a firm understanding of the basic concepts, methodologies, and processes to carry out water audits for different types of situations and building premises.

By the end of the unit, learners will be able to qualify water sources/bodies according to quality and understand how water bodies become polluted. The learner will also learn about natural and non-natural processes of water treatment and water rehabilitation.

The Unit will also provide practical information on how to undertake water audits, which in turn involves skills in data compilation, using estimates when no data or insufficient data exists, assessing the economic viability of proposed solutions and audit report writing.

The Unit is relevant to learners wishing to attain a general but thorough understanding of water processes, both natural and technological.

Learning Outcomes

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

1. *Carry out water audits for commercial and domestic buildings.*
2. *Examine water according to its quality and how water bodies can become polluted.*
3. *Identify natural and non-natural processes of water treatment and water rehabilitation.*
4. *Evaluate the usage of water usage reduction technology and water reuse.*

ASENV-506-1601 Principles of Ecology

Unit level (MQF): 5

Credits: 6

Unit Description

This unit covers the scientific study of the distribution and abundance of plants and animals, and of the biotic and abiotic interactions between organisms and their environment that determine distribution and abundance. Understanding the principles of ecology is essential for several aspects of environmental conservation, ranging from the sustainable exploitation of individual species to the management of whole habitats. The application of ecological theory to environmental issues must be based on a detailed understanding of the pure science itself. The aim of this unit is to enable learners acquire the ecological knowledge, skills and competences that are applicable to a wide range of situations, and will form the basis for units focusing on applied ecology.

In this unit learners will develop an understanding of the essential background of evolution that forms the framework for all modern biology, with particular focus on its interrelationships with ecology. Against this evolutionary backdrop, learners will then focus on core ecological questions relating to populations: where do particular species occur (distribution), how many individuals are present (abundance), how do these parameters vary in space and time, and which mechanisms determine the observed patterns? These principles will be integrated to discuss the structure and temporal changes in communities, with reference to habitat formation and management

Learning Outcomes

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

1. *Describe the mechanisms and ecological implications of evolution*
2. *Identify the factors affecting the distribution of populations*
3. *Examine the mechanisms governing fluctuations and stability within populations*
4. *Predict temporal changes in plant and animal communities in named terrestrial and aquatic ecosystems*

ASENV-506-1603 Biodiversity and Conservation

Unit level (MQF): 5

Credits: 6

Unit Description

Biodiversity and conservation issues have gained importance in recent years following the alarming loss of biological diversity throughout the world, resulting in increased focus from scientific and governmental entities and the public at large.

This unit will examine the theme of biodiversity and the need for its protection. It is a theory based unit that will first address a basic understanding of what is biodiversity, the species, habitats and ecosystems that make it up, and understanding of the biotic and abiotic processes that result in the creation of new and adapted species. The Unit will also cover the social aspect of biodiversity, how society makes use of nature, and the benefits that are obtained from biodiversity economically and for our everyday life.

Prior to taking actions on conservation one needs to identify what are the human pressures and impacts and their extent on biodiversity, and thus to provide legislators and managers the reasoning required to arrive at the need for the protection of biodiversity. The unit will therefore cover the concepts of conservation biology when applied from legislative and practical perspectives, by considering key international treaties and local legislation, conservation measures and schemes on both an international and local level.

Learning Outcomes

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

1. *Describe what is meant by biodiversity, its components and related processes;*
2. *Recognise the value of resources that biodiversity provides;*
3. *Identify pressures and threats to biodiversity;*
4. *Identify and evaluate measures for biodiversity conservation;*
5. *Outline relevant national, regional and international legislation on biodiversity conservation*
6. *Examine conservation measures and assess in terms of efficacy and practicality.*

ASENV-506-1604 Comprehensive Environmental Impact Assessment Techniques

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to understand what it entails to carry out an Environmental Impact Assessment (EIA). They will also be able to understand the different skills involved in carrying out the different baseline studies done in order to do an EIA. They will also be able to understand the role played by the different stakeholders involved in the process. Finally they will be given the basic skills in report writing.

The Unit is relevant to learners wishing to further develop their knowledge of impact assessments and relevant documentation and procedures associated with such reports. On completion of the Unit learners will understand how an EIA is carried out and who participates in such a process. This Unit will provide the Learner with the ability to use different skills designed to analyse and interpret data obtained during the process.

Learners will carry out an assessment based on a hypothetical scenario and using available data to prepare an assessment. This will therefore require learners to be confident in analysing data, predicting impacts and suggesting mitigation measures and presenting reports.

Learning Outcomes

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

1. *Explain why and when an Environmental Impact Assessment (EIA) is required*
2. *Explain the interaction between all stakeholders*
3. *Explain the documentation involved in the process*
4. *Explain the sources and methodologies used to collate data for an EIA*
5. *Explain the role of the public in the EIA process*
6. *Explain how to prepare a baseline report*

ASCHM-506-1601 Environmental Chemistry

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to understand the chemistry processes taking place in the environment around us. Students will be able to identify the natural sources of chemicals, their extraction, use and the effects man is having thanks to their use and abuse. Various analytical methodologies to identify and monitor chemicals in our natural environment will be described. Students will also familiarize themselves with the regulatory mechanisms in order to restrain the release of chemicals in the environment.

The Unit is relevant to learners wishing to further develop their knowledge of the chemicals found in our environment either naturally or thanks to the effects of man. They will also be able to fully understand the effects these chemicals have on man and the natural environment. On completion of the Unit learners will understand how to identify and analyse different chemicals, as well as developing the understanding, knowledge and skills required to produce them. This Unit will provide the Learner with the ability to use a instruments and apparatus designed to identify the presence, analyse and interpret data and information using logical and statistical functions.

Learners will carry out sampling and analysis of different chemicals found in the environment in order to identify the levels of pollution in that particular system.

Learning Outcomes

On completion of this unit the student will be able to

1. *Describe the chemistry of the environment*
2. *Explain the relationship of man and the atmosphere*
3. *Explain the relationship of man, the land and the aquatic environment*
4. *Identify different analytical environmental chemical techniques*

ASENV-506-1602 Environmental Systems

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to understand environment systems and how these work. Learners will be able to understand how the different components of environmental systems work together in order to have the current state of the planet. They will also be able to understand that any changes which could occur to these components have far reaching effects on all the system, hence the importance of fully understanding the mechanics behind these systems.

The Unit is relevant to learners wishing to further develop their knowledge of their surrounding environment thus helping them better understand the relationships between the living and non-living parts of that environment. On completion of the Unit learners will understand how to forecast scenarios following changes in environmental ecosystems.

Learners will carry out field work and data collection I order to predict different scenarios in the local and international context.

Learning Outcomes

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

1. *Recognise environmental systems*
2. *Identify the characteristics of the lithosphere*
3. *Recognise the characteristics of water within hydrological systems*
4. *Evaluate the relationship between global climate and environmental systems*
5. *Explain the relationship between the ecosphere and environmental systems*
6. *Describe the effect of man on ecosystems*

ASBIO-506-1602 Biological Survey Techniques

Unit level (MQF): 5

Credits: 6

Unit Description

This is a hands-on and research based unit that will allow learners to demonstrate that they have the necessary skills to be able to plan, undertake and scrutinize biological surveys in order to investigate specific environmental issues. Learners will be able understand the aims behind biological surveys, identify the key factors that influence the outcome of such surveys and plan how their data collection will be carried out by using appropriate methodologies. Students will also familiarise themselves with the key terrestrial vegetation communities in the Maltese Islands, and other important terrestrial and coastal ecosystems. In addition, learners will be exposed to established techniques used in biological surveys.

The Unit is relevant to learners wishing to further develop their knowledge of the techniques required in conducting biological surveys in terrestrial and marine/coastal ecosystem. On completion of the Unit learners will understand how to describe the main aims behind biological surveys, how these fit into European and National Biodiversity Action Plans, what resources are required, legal considerations to be taken into account and important health and safety considerations when conducting surveys. This Unit will provide the Learner with the ability to use plan and conduct a survey, collect samples from fieldwork and analyse and interpret data and information.

Learners will carry field-based work in order to obtain important firsthand experience of how biological surveys are conducted.

Learning Outcomes

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

1. *Describe the main aims of biological surveys*
2. *Identify the factors that influence biological surveys*
3. *Plan biological data collection based on ecological and operational principles*
4. *Determine the types and distribution of vegetation communities*

ASHRT-506-1601 Principles of Plant and Soil Science

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit that will allow students to understand the basic principles of plant and soil science. Through this unit candidates will be in a position to understand the various structures found in plants and relate this to the function and mode of life of plants. Learners will also be able to understand how different parts of the plant respond to a number of factors including gravity, light, and water and conditions. Via practical means candidates will also be exposed to other various processes which take place in plants and give them the opportunity to relate theoretical concepts to practice and link the soil, plant and the environment surround it.

Learners will look into a number of substrata (not limited to traditional soil), their properties and how the latter make the substrata ideal growing media. Learners will also look into various biotic and abiotic factors related to the substratum in question and look into how these factors can influence plant growth.

At the end of this unit candidates will be in a position to improve the condition of a particular substratum, choose and adapt substrata for favorable plant growth and be aware of ideal conditions required for plant processes to run smoothly and to control plant growth by taking into consideration plant structure. Candidates will also be in a position to interpret, report and discuss the results of plant-soil oriented research.

This unit is relevant for learners who wish to develop their knowledge in plant and soil sciences and coupled with other units related to scientific techniques will put the candidate in a favorable position to further his/her studies and research or conduct relevant course projects in this field.

Learning Outcomes

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

1. *Explain plant structures and their significance with respect to their function*
2. *Value through a practical approach the various physiological processes taking place in plants*
3. *Recognise the properties of various substrata*
4. *Relate the relationship between plant growth and the properties of the various substrata.*

ASPRJ-506-2008 Research Methods within a Research Project 1

Unit level (MQF): 5

Credits: 6

Unit Description

This unit will cover aspects of research methods used in research. The aim is to introduce learners to research and develop their understanding and skills in both quantitative and qualitative research methods. Learners will be introduced to the research process and apply different methodologies, data collecting tools and conceptual frameworks. The end-point of the module is the submission of a Statement of Intent (Proposal) for a research project in-line with College Regulations. This unit in meant to be followed by Research Methods 2.

In this study-unit, learners will cover different types of research design including experimental, descriptive and observational designed. Qualitative data collection designs to be introduced include archival studies, interviews and case studies. The methodological applications of these methods, including the design of appropriate research questions, will also be covered.

The syllabus also covers the challenges of various data collection techniques as well as the measurement issues of questionnaire development, reliability and validity of data, issues of sampling and of sampling size.

Following completion of this unit, learners should be familiar with all parts of the research process including funding application, ethics and publication. Tools will be provided for the learner to individually formulate a research question and to write a sound research proposal.

Learning Outcomes

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

1. *Describe the main stages of the research process.*
2. *Select the appropriate research design for a research question.*
3. *Compile a suitable ethical protocol.*
4. *Complete a research proposal for a specific research project.*

ASWBL-503-2009 Work Based Experience 1

Unit level (MQF): 5

Credits: 3

Unit Description

This is a skills-based unit that will allow learners to demonstrate thay they have the necessary skills to be able to understand the relevance of industrial work-based experience, and to be able to plan, undertake and review their placement. Learners will familiarize themselves with important aspects of planning and negotiating for a work-based experience, whilst taking into account business constraints and other limitations.

The unit is relevant to learners wishing to further develop their knowledge and understanding of the benefit of work-based experience in an industrial setting, the various industrial sectors present in Malta and Europe and the ways with which they can access these various career opportunities. On completion of the unit, learners will have grasped the three step process to preparing for work-based experience: prepare, undertake and review.

Learners will obtain insight into what steps are required in the application process, what resources they require to undertake the placement and the limitations they need to consider before commencing their placement.

Furthermore, learners will gain knowledge of various methods with which they can keep track of their progress, as well as methods of how they can review their performance for self-improvement. Learners will also be able to seek guidance from a mentor or supervisor, contribute their suggestions to business and provide recommendations on how such placements can be improved.

Learners will carry out a placement relevant to their areas of study and interest, and conduct independent research and study to obtain important inductive insight through the preparation of self-assessing report.

Throughout the unit, learners are encouraged to keep an open mindset and to be open to new ideas and concepts. It is imperative to encourage critical thinking and constructive criticism in light of their experience.

Learning Outcomes

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

1. *Understand the work industry and the preparation needed for the work environment.*
2. *Plan the industry experience.*
3. *Undertake the work place experience.*
4. *Evaluate the work place experience.*

ASENV-506-2003 Water Resource Management

Unit level (MQF): 5

Credits: 6

Unit Description

This is a knowledge-based unit that will allow learners to get a firm understanding of the basic concepts, methodologies, and processes in water resource management.

Learners will understand the importance of water and how water affects the quality of human life and the ecosystems. Learners will be exposed to information about the hydrological cycle and the natural processes of evaporation, precipitation, the generation of runoff and groundwater recharge. The Unit will also provide practical information on hands-on measurement of water flows and storage capacity, using estimates when no data or insufficient data exists.

The Unit is relevant to learners wishing to attain a general but thorough understanding of water processes, both natural and technological.

Learning Outcomes

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

1. *Recognize the importance of water as a vital resource.*
2. *Apply good governance for water resources.*
3. *Examine the concepts related to terrestrial surface water.*
4. *Identify concepts related to groundwater.*

ASENV-506-1607 Sustainable Development

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to identify and utilise the concepts used in Sustainable Development at different levels, that is on a global, regional and local level. Leaners will be in a position to identify the required information and datasets in order to identify whether a country is promoting sustainable development or not. In the latter case they would be able to identify any shortcomings.

The Unit is relevant to learners wishing to further develop their knowledge of sustainable development as a tool to help provide solutions at different levels. On completion of the Unit learners will understand how sustainable development started off as a global concept and how such a concept is applied at different levels. They will also be in a position to understand the problems associated in achieving such a form of development and the potential benefits which could be derived from it. Learners will be in a position to understand how sustainable development is being tackled at different levels, that is in a global, European, Mediterranean and local context

Learning Outcomes

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

1. *Identify the principles of sustainable development*
2. *Explain the role of environmental management in sustainable development*
3. *Explain the role of international law and agreements in sustainable development*
4. *Explain the role of International Institutions in sustainable development*
5. *Demonstrate sustainable development in the regional and local context*
6. *Identify whether we have reached the point of no return or whether we can still achieve sustainable development goals.*

ASENV-506-1614 Habitat Restoration and Repair

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit that will allow learners to demonstrate that they have the necessary skills to be able to understand how to plan, design and monitor a habitat restoration and repair project using appropriate techniques. Students will familiarise themselves with habitats influences, important principles and characteristics of habitat restoration projects, whilst taking into account influencing factors and other limitations, and how these can be applied to various ecosystems.

The Unit is relevant to learners wishing to further develop their knowledge and understanding of habitat restoration and repair, allowing them to grasp the notion of both natural and human-induced restoration. On completion of the Unit, learners will have grasped the importance of habitat restoration and repair, identify important principles in this process, be able to plan and design projects, and finally examine management techniques post-restoration. Learners will also be exposed to best practice techniques in restoration ecology, together with guidelines to achieving effective restoration. This will be complemented by a review of specific restoration techniques for terrestrial and aquatic habitats.

Learners will be able to propose a habitat restoration project for a location of their choosing, ideally set in the Maltese Islands or a similar ecosystem, by using knowledge gained from this unit and conducting personal research into issues that are currently prevalent in Mediterranean Basin. Students will conduct independent research and study to obtain important inductive insight through the preparation of a presentation and self-assessing reports.

Learning Outcomes

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

1. *Describe the strategic importance of habitat restoration and repair*
2. *Illustrate underlying principles in habitat restoration*
3. *Describe planning strategies for habitat restoration*
4. *Examine management strategies of restored habitats*

ASENV-506-1608 Waste Management

Unit level (MQF): 5

Credits: 6

Unit Description

As European society has grown wealthier it has created more and more waste. Each year in the European Union alone approx. 3 billion tonnes of waste are generated.

Waste can be managed with benefit to the economy and to the environment, or mismanaged with potentially serious consequences to the community that produces it and beyond. It is therefore no surprise that, with approx. 30 binding many legislative instruments, the waste sector is one of the most controlled sectors in the European Union. Moreover the process of legislating waste sector is a dynamic one, with old legislation being reviewed and new legislation being adopted on a regular basis. This is challenging for the waste sector itself and to businesses that generate waste. It is imperative, for the sake of competitivity, that businesses keep up to date, and that tomorrow's workforce be fully informed of the obligations and opportunities that are related to the waste sector.

This is a knowledge-based Unit and is designed to provide adequate knowledge to the students when these find themselves in a business environment. The Unit provides the students with knowledge on the legislation that controls waste as well as how businesses can avoid waste and turn unavoidable waste into a resource. The Unit is also aimed at students who intend to further develop their knowledge on the subject

Learning Outcomes

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

1. *Identify the factors related to the generation of waste*
2. *Recognise the nature of waste and its classification*
3. *Recognise the effects of waste on human health and the environment*
4. *Outline the legislative instruments related to the management of waste*
5. *Review the Waste Hierarchy and selected techniques for the sustainable and safe management of waste in a business environment*

ASENV-506-1605 Environmental Law

Unit level (MQF): 5

Credits: 6

Unit Description

This is a knowledge based unit and will allow learners to demonstrate they have the necessary skills to be able to understand the basic principles of Law in general, and most importantly the basic principles of Environmental Law. Learners will thus be in a better position to understand the principles that regulate the substantive subjects of Environmental Conservation, its regulations, implementation and enforcement.

The Unit is relevant to the proposed course syllabus on Environmental Conservation, since it will enable the leaner to further develop their knowledge of the underlying laws regulating the subjects. On completion of the Unit learners will understand how environmental conservation is regulated, implemented and enforced.

Learning Outcomes

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

1. *Explain the sources of Maltese law, the structure of the Maltese Courts and tribunal system*
2. *Explain the process of creating law in the form of EU Regulations, Directives and Decisions*
3. *Explain the process of the implementation of Community Law, and the principle of Direct Effect;*
4. *Explain the process of creating law in the form of Parliamentary Legislation and Subsidiary Legislation*

ASPRJ-506-2009 Research Methods within a Research Project 2

Unit level (MQF): 5

Credits: 6

Unit Description

This unit will cover further aspects of research methods used in research. The aim is to help the learners collect data, analyze it, and draw meaningful conclusions from it. The end-point of the module is the submission and presentation of a Level 5 research project in-line with College Regulations. The learners will be encouraged to complete a project as a pilot to a larger research endeavor such as a thesis. This unit in meant to be preceded by Research Methods 1.

The quantitative part of the unit will address research questions in terms of statistical concepts. Methods such as descriptive statistics, estimation and confidence intervals and inferential statistical tests such as chi-square, t-tests and ANOVAs for both parametric and non-parametric data will be covered. Skills in using statistical software such as SPSS will also be developed.

In this study-unit, learners will learn to organize and format a research report in line with College Regulations. This might include the preparation and presentation of a research poster. Techniques for presenting research during a viva or other similar scenarios will also be taught. Skills in compiling and writing a Literature Review will be covered. Preparation and proper formatting of Tables and Figures will also be taught.

Following completion of this unit, learners will have experienced the research process, and will be able to express their experiences and findings in a suitable format.

Learning Outcomes

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

1. *Use qualitative and/or quantitative methodologies.*
2. *Apply research methods, including a correct sampling method, taking into consideration issues such as reliability, validity, and bias.*
3. *Use the appropriate Software for processing and analysing results.*
4. *Compile a research report based on own research endeavours.*

ASWBL-503-2010 Work Based Experience 2

Unit level (MQF): 5

Credits: 3

Unit Description

This is a skills-based unit which builds on the unit covered in the first year. As learners would have already experienced their first work-based experience, learners are encouraged to go a step further by deeply analysing their activities and finding ways of improving for a better learning experience.

This unit will encourage learners to think critically, adopt or improve strategies and demonstrate that they have the necessary skills to be able to understand the value and relevance of gaining industrial experience. This unit will encourage learners to plan, undertake and further familiarize themselves with industry, whilst taking into account the limitations of the placement. Learners are encouraged to evaluate the experience to the best extent and suggest improvements.

The unit is relevant to learners wishing to further develop their knowledge and understanding of the benefit of work-based experience in an industrial setting, the various industrial sectors present in Malta and Europe and the ways with which they can access these various career opportunities. On completion of the unit, learners will have grasped the three step process to preparing for work-based experience: prepare, undertake and review.

Furthermore, learners will gain knowledge of various methods with which they can keep track of their progress, as well as methods of how they can review their performance for self-improvement. Learners are also encouraged to put themselves in a leadership role to understand the industry from a different perspective.

Learners will also be able to seek guidance from a mentor or supervisor, contribute their suggestions to the industry they are working in and provide recommendations on how such placements can be improved.

Learners will carry out a placement relevant to their areas of study and interest, and conduct independent research and study to obtain important inductive insight through the preparation of self-assessing report.

Learning Outcomes

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

1. *Evaluate the importance of improving own approach at the workplace.*
2. *Identify own tasks and responsibilities of the work-based experience.*
3. *Carry out the workplace experience.*
4. *Evaluate the work based experience and own quality of work.*

ASRES-509-1603 Alternative Energy and Energy Auditing

Unit level (MQF): 5

Credits: 9

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to understand renewable and alternative source of energy. Learners will be able to understand how the different systems work. They will learn about solar radiation and how the climate of earth changes due to its movement around the Sun. Learners will know the energy demand and resources, fossil fuels and the effect of greenhouse gases to cause global warming. They will learn about Biomass availability, production of biogas and generation of electricity using biomass. Learners will know different forms of renewable energy and understand the generation of electricity from wind energy and solar energy. They will know how to store energy and how to transmit it from one place to another place.

Learners will know the techniques of energy survey of buildings and learn the energy method of energy audit. They will know about sustainability, energy conservation and design of energy efficient buildings in various climates.

The Unit is relevant to learners wishing to further develop their knowledge of their surrounding environment thus helping them better understand the relationships between the living and non-living parts of that environment. On completion of the Unit learners will understand how to forecast scenarios following changes in environmental ecosystems.

Learners will carry out field work and data collection in order to predict different scenarios in the local and international context.

This course also provides a base for higher education.

Learning Outcomes

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

1. *Define the natural environment and environmental conservation.*
2. *Define the sources of energy and impact on environment due to its excessive use.*
3. *Define the biomass for the production of electrical energy.*
4. *Define wind energy for production of electrical energy.*
5. *Define solar thermal and solar photovoltaics for the production of electrical energy.*
6. *Define hydro-electrics, fuel energy; sea waves and other forms of alternative energy.*
7. *Use procedure of energy auditing.*
8. *Define energy management and energy efficient building design methods*

ASENV-606-2004 Financial Engineering

Unit level (MQF): 6

Credits: 6

Unit Description

Land-based businesses are those which are involved in farming particularly the areas of agriculture and horticulture with a particular emphasis on primary food production. It is becoming of paramount importance for owners and managers of these organisations to familiarise themselves with the business aspect of their organisation with a view to enable them to plan for the future in a more informed manner and to constantly evaluate business performance to take the necessary action as and when required.

This unit provides learners with the opportunity to understand the concepts of managing a land-based business including its financial performance and stability. In doing so learners will be able to identify the sources of finance available to their business and the resources that need to be employed. Subsequently learners will be able to assimilate the range of physical and financial information required to measure business performance, evaluate the outcomes and plan for the future.

This will involve understanding how to manage and analyse enterprise-based information be it of a financial or resource nature, the identification of performance indicators and the computation of specific performance indicators. This will lead learners to become confident in evaluating business performance in order to take the business forward into its next operating cycle.

Learning Outcomes

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

1. *Distinguish those sources of finance which may be used to start-up and operate land-based businesses;*
2. *Apply management principles to land-based business and its required resources;*
3. *Categorise and analyse the physical and financial information generated from the business;*
4. *Evaluate business performance on the basis of its physical and financial information.*

ASENV-606-1611 Environmental Principles and Measurements

Unit level (MQF): 6

Credits: 6

Unit Description

"Only when we get sufficiently rich can we afford the relative luxury of caring about the environment."

Bjørn Lomborg, 2001

Is this statement truly justified?

The environment has been on the political agenda since the late 1960s. Given that decades have since passed and much has happened in that time, is it possible to argue that the planet is better off? The global ecological footprint of humanity is a measure of the amount of nature it takes to sustain a given population over the course of a year. This global footprint first exceeded the Earth's biological capacity in the late 1970s, since then it has risen steadily.

The maintenance of an environment suited to efficient performance by human beings and the preservation of comfort and enjoyment of living are the goals for the future. However, it is also important to keep in mind that in some parts of the world simple survival and the prevention of disease and poisoning are still serious concerns. Thus, these levels of life and progress can be the basis for action programs in environmental health.

Whilst sceptics would argue that things are bad and getting steadily worse, it would be wrong, however, to draw the conclusion that nothing has changed over the last forty years without knowing the whole picture because in practice, the picture is much more complicated.

This unit aims to take a holistic approach by building upon other units and aims to combine different dimensions related to Environmental Engineering, by taking into consideration the social, economic and the moral aspects that are attributed to the Environmental Sciences. The learners will be able to exploit the knowledge that they have gained and critically analyse the theoretical concepts that they perhaps have grown accustomed to. The learners will be expected to make use of the theoretical

skills in practical settings, and through their own findings suggest recommendations and improvement.

Learning Outcomes

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

1. *Identify the principles of Comprehensive Planning for environmental, health and engineering controls.*
2. *Demonstrate the application of Environment Indicators for sustainable measurements.*
3. *Evaluate policy instruments in relation to Environmental and Social Principles.*
4. *Interpret Moral and Political Reasoning in environmental practices.*
5. *Analyse international legislation and agreements which govern Sustainable Environment.*

ASENG-606-1602 Fundamentals of Electrical Engineering

Unit level (MQF): 6

Credits: 6

Unit Description

This a practice-based unit that will allow learners to demonstrate that they have developed the necessary understanding of an introductory knowledge of Electrical Engineering. They will have developed skills to understand the principles of operation of electric systems and be able to understand the basics of analogue and digital systems together with single and three phase systems. The module will give the learners the basic knowledge so that they can interact and work with electrical engineers in field of work.

The Unit is relevant to learners wishing to further develop their knowledge on electrical, electronic and electromechanical engineering. The Unit content is targeted to groups composed of non-electrical engineering learners. Unit content begins by defining the various branches of electrical engineering, including digital, analogue, electromechanical systems by showing the interactions between them. Outcomes 1, 2, and 3 will expose the learner to a series of definitions to acquaint the learner with electric circuits; next to the fundamental laws that govern the behaviour of electric DC/AC circuits, and a basic introduction to circuit analysis, for the various electrical engineering disciplines. Following these preliminary topics, the emphasis moves on practical activities for applying such concepts to various engineering applications and their use. Learning outcome 4 will then present the learners with the generic model of data processing; how analogue or digital signals from various transducers are processed by writing simple visual programs for programmable logic controller so to produce desired outputs driving varieties of actuators. This will allow the learners to monitor different environmental parameters in their future projects.

Learning Outcomes

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

1. *Apply basic calculations on units of electricity and simple DC/AC circuits.*
2. *Understand the operation of basic digital electronic circuits.*
3. *Understand simple AC circuits including single and three phase systems.*
4. *Apply different transducers in PLC/SCADA applications.*

ASENG-606-1603 Fundamentals of Mechanical Engineering

Unit level (MQF): 6

Credits: 6

Unit Description

This theoretic unit will allow learners to demonstrate that they have acquired the necessary introductory knowledge of mechanical engineering. Thus learners are able to understand the principles of thermodynamics, materials, mechanics of materials, computer-aided design, power generation, fluid mechanics and power generation.

In the first part of the unit learners will be introduced to the concept of material science. This lays the foundation of the basic science behind materials. In addition learners will also be provided with knowledge of thermodynamics and heat transfer and static and dynamic fluid systems. This will lay the foundation for future study of fluid mechanics.

Finally learners will be given a basic introduction to Computer-Aided-Design and simulation to visualise the theory studied throughout this unit.

Learning Outcomes

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

1. *Understand the fundamentals of material science in relation to mechanical engineering.*
2. *Identify the basic concepts of thermodynamics and heat transfer in mechanical engineering*
3. *Outline the basic principles of fluid mechanics*
4. *Apply Computer-Aided-Design and Simulation using dedicated software*

BCMGT-606-1506 Project Management

Unit level (MQF): 6

Credits: 6

Unit Description

Project management refers to the definition and planning, and then the subsequent management, control, and conclusion of a project. It is important to recognize that all projects need some level of project management. The larger and more complex the project, the more there is a need for a formal, standard, structured process. Smaller projects still need a structured process, but it does not need to be as elaborate or as complex. Obviously there is a cost to the effort associated with project management, but there are many benefits that are obtained as well. These benefits far outweigh the costs.

Learning Outcomes

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

1. *Understand concepts of Project and Programme Management.*
2. *Understand the processes of Project Management.*
3. *Use tools and methods for Project Management and Programme Management implementation.*
4. *Explain the management of a project-oriented organization.*

ASENV-606-1613 Energy and the Environment

Unit level (MQF): 6

Credits: 6

Unit Description

In this unit learners will be exposed to two different types of sustainable energy; that is sustainable energy in the built environment and also sustainable transportation.

In this very skills based unit learners will be able to demonstrate that they have acquired the necessary skills to be able to implement measures to optimise use of sustainable energy in the built environment using basic calculation principles and state of the art software tools.

Learners will also learn the techniques and methods to perform a proper energy audit and establish in a professional manner whether an energy retrofitting project is commercially viable.

To support all the above learners will be expected to carry out field work and data collection in order to predict the environment sustainability in different scenarios in the local and international context.

Learners will also be given an introduction to sustainable transportation which will include the main concepts of sustainable transportation and the different technologies used nowadays.

This course also provides a very good basis for Level 7 education related to sustainable energy and sustainable built environment.

Learning Outcomes

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

1. *Understand the advantages, current drivers and challenges to move to sustainable and low CO2 emission energy systems.*
2. *Identify the main concepts of a sustainable building and the required design or energy retrofit for a building to be comfortable, sustainable and energy efficient.*
3. *Perform an energy audit and use building energy simulation programs to recommend solutions to improve the energy performance and carbon footprint of a building/industry.*
4. *Choose between the various possible sustainable energy technologies for a given project in terms of costs, energy savings and reduction in emissions.*
5. *Determine the concepts of sustainable transportation and the different energy efficient technologies and fuels related to transport*

ASENV-606-1602 Water Technology

Unit level (MQF): 6

Credits: 6

Unit Description

Water technology is the techniques, processes and machinery used to produce and treatment water. Since water is ubiquitous in our lifestyles and environment, so are the technologies involved in this sector.

This unit aims to give an introduction to the processes, designs and principles that are in place within the water sector. Therefore, the learners will be first introduced to resource assessment i.e. water quantity and quality; portraying the importance of best fit of water quality for specific uses. It is important that the learner is shown that such best fit is usually accompanied by regulations and policies that protect the end users which are either human or the aquatic environment.

After being introduce to such concepts the learner will be exposed to the technologies and designs for potable water production and waste water treatment in the urban and agricultural sectors. Besides, the techniques and principles of water production, distribution and networks are important. The planning of infrastructure will be aided using models and IT support which are used by the water utilities industry. Infrastructure and design will also be extended to flood mitigation. It is of equal importance to make sure that the technologies used are energy efficient to continue promoting sustainability.

On a minor, yet still important to obtain a holistic approach the learner will be exposed to technologies used and developed from natural systems such as floodplains, wetlands and aquifers.

To conclude the learners will be shown how to integrate the technologies together to produce a sustainable system through planning and modelling. Since their decisions will affect the livelihood of humans and environment it is important for the learners to be introduced to risk governance.

Learning Outcomes

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

1. *Summarise water resource assessment and management*
2. *Manage water in the urban and agricultural context*
3. *Manage water in the natural ecosystems*
4. *Integrate water resources and technologies*

ITSFT-506-2006 Object Oriented Programming

Unit level (MQF): 6

Credits: 6

Unit Description

This unit aims to build up learners from basic concepts in OOP to more advanced object-oriented concepts. Basic OOP concepts include objects and classes, access modifiers, properties, constructors and use of methods (parameters and returning data). Following this, more advanced concepts will be introduced such as encapsulation, polymorphism and abstraction. Focus will be given in particular to possible relationships between different objects. Such relationships include inheritance, association, aggregation and composition. Such concepts will be applied to more advanced scenarios, ensuring that there is an in depth understanding of the different concepts.

Finally, the unit covers persistence. In this part of the unit, learners will integrate with and store data in a database using the object-relational language LINQ. Learners will appreciate the differences between a data-centric approach and an object-centric approach when designing the model layer of an application.

During the learning process for this unit, learners will be given the necessary tools to acquire skills for proper management of building an Object-Oriented solution. Such management will be including preparation and design, time management, presentation, handling queries and as error handling.

Learning Outcomes

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

1. *Build object-oriented solutions using both fundamental and advanced object-oriented concepts to be able to address business requirements.*
2. *Implement different relationships between objects found in a scenario and show proper understanding of such existing relationships.*
3. *Implement persistence in created applications to allow created applications to store and read data from multi-user database management systems.*
4. *Show management skills in the process of building and deploying an Object-Oriented solution.*