MCAST

Malta College of Arts, Science & Technology

MQF Level 3

AS3-01-14

Diploma in Applied Science

Course Specification

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Course Description

This Diploma course provides a strong grounding in fundamental science and technology principles as well as an initial exposure to vocational science subjects found in health ,environmental, food and engineering industries. The student will be able to understand the fundamental principles and laws of science, and how these are applied within laboratory and manufacturing organisations. The student will also be able to understand the science of different materials , and gain an awareness of the physical principles behind certain technologies concerning forces speed heat and energy.

Programme Learning Outcomes

At the end of the programme the students is able to

1. *Understand the impact of human activity on the environment*
2. *Investigate forces, motion, energy , light, electricity and sound waves*
3. *Describe the factors that can affect and control human health*
4. *Identify chemical substances and organic compounds*

Entry Requirements

- MCAST Foundation Certificate ; or
- 2 SEC/O-Level/SSC&P (level3) passes from English, Mathematics, Physics, Chemistry,Biology,Design and Technology
- A full “Secondary School Certificate and Profile” (SSC&P) at Level 2 will be accepted in lieu of one (1) O-Level pass

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Current Approved Programme Structure

Unit Code	Unit Title	ECVET
ASASC-306-1401	Energy and the Universe	6
ASASC-306-1402	Application of Physical Science	6
ASBIO-306-1601	Biology and Our Health	6
ASCHM-306-1401	Chemistry and Our World	6
ASCHM-306-1402	Chemical Analysis	6
ASENV-306-1402	Monitoring the Environment	6
CDKSK-304-1403	Mathematics	4
CDKSK-304-1402	English	4
CDKSK-304-1401	Malti	4
CDKSK-304-1601	Information Technology	4
CDKSK-304-1612	Individual and Social Responsibility	4
CDKSK-304-1609	Science	4
Total ECVET		60

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Unit: ASASC-306-1401 Energy and the Universe

Unit level (MQF): 3

Credits : 6

Unit description

The aim of this unit is to the enable the students to develop the knowledge and skills related to fundamental physical concepts, so that they can investigate energy transformation, radiation and their application as well as gain the knowledge of waves, how electrical energy is transferred for various applications and how our universe has evolved. The emphasis is given to the comparison of renewable and non-renewable sources of energy and how modern technology plays its part in harnessing renewable energy sources. Economic and environmental issues are also considered. Students will learn properties of waves (electro-magnetic spectrum), and radiation (alpha, beta, gamma) covering the aspects of usefulness and safety. On aspects of electricity, students will investigate how electrical energy is produced and transferred to homes and workplace. Finally, students will get the knowledge of components of the solar system and the ways the universe is changing.

Students should be able to investigate energy transformations that will be based on their knowledge of types, sources and ways of transformations of energy. This will enable the recognition of the sources of renewable and non-renewable energy, as well as personal efficient utilization of energy. Special focus should be on electrical energy and electric circuits. Knowledge of the properties and applications of waves and radiation will be based on the basic properties of electromagnetic waves and assigned frequency spectrum for specific application. The unit includes topics that refer to the solar system and the universe that should equip the students with additional knowledge and skills related to this area.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Investigate poperties of energy sources and principles of its transformations*
2. *Apply concept and properties of waves and radiation*
3. *Know the process of electric energy transformation from different sources to electric circuits at home and in industry*
4. *Know the components of the solar system and the way the universe is changing*

Unit: ASASC-306-1402 Application of Physical Science

Unit level (MQF): 3

Credits : 6

Unit description

This unit enables students to investigate how physics is used in various day-to-day applications focusing on the concepts of motion, forces, waves and electricity. At the end of course students should be able to construct and interpret distance-time graphs for constant speed and accelerated systems, relate force and motion, and consider friction and its influence on motion. Additionally, the learners should get knowledge about sounds production, pitch and loudness. Topics related to waves such as reflections and mirrors, refraction, optics and lenses should be acquired. Moreover, the understanding of electrical circuits including the Ohm's law will be attained by this unit. All learning objectives are to be accompanied and achieved by practical laboratory work.

Students should be able to understand, describe and construct different concepts of motion and forces, as well as what influences braking. This is to be achieved through an understanding and the knowledge of the equation used to calculate acceleration, the equation relating force, mass and acceleration, and the concept of reaction time. To understand the concept of resulting force and its interpretation, students should know that forces occur in pairs, be able to determine them, explain the resultant force in case of zero and non-zero. Knowledge of the basic concepts of optics should be achieved through an understanding of how a mirror image is formed and what its characteristics are, understand how a lens refracts light, describe lenses and images, use the magnification equation. Principles of sound production should be based on the sound production and an understanding of the relationship between the pitch of a sound and the frequency of a sound wave. Construction and interpretation of electrical circuits should be based on an understanding of the current, potential difference and resistance and the knowledge of how these are calculated when the components of circuit are in a series or parallel.

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Learning Outcomes

On completion of this unit learners should be able to:

1. *Use different concepts of motion and forces*
2. *Identify what influences braking*
3. *Understand the concept of resulting force and its interpretation*
4. *Understand the concepts of refraction and reflection and how lenses and mirrors function*
5. *Know the principles of sound production*
6. *Design and characterized electrical circuits.*

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Unit: ASBIO-306-1601 Biology and Our Health

Unit level (MQF): 3

Credits : 6

Unit description

This unit enables the students to develop the knowledge and skills related to the fundamental concepts in biology. Students will investigate the living organisms, how humans affect the environment and the factors that affect human health. The students' technical skills will be developed along with their knowledge and understanding of biological techniques as they carry out practical investigations. In this unit students will gain knowledge of the wide variety of living organisms on the Earth and their classification, interactions between organisms and with the environment, basic structure of animal and plant cells and their functions, the role of DNA and the inheritance, the effect of biological factors on human health and how body responds to internal and external environmental changes.

The ability to investigate the functions of living organism will be achieved through the knowledge of a classification system and understanding of the relationships between living organisms as well as knowledge realted to properties of genetic materials and processes of their modification and transferring. The knowledge of the factors which affect and control the human health should be based on understanding the causes and the prevention of diseases, social factors in community and STD (sexually transmitted diseases), as well as inherited factors and genetics.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Investigate structures and functions of living organisms and their interactions*
2. *Analyze the impact of human activity on the environment*
3. *Identify the factors which influence human health*
4. *Recognize human body reaction to environmental changes.*

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Unit: ASCHM-306-1401 Chemistry and Our World

Unit level (MQF): 3

Credits : 6

Unit description

This unit enables the students to acquire the knowledge of fundamental chemistry concepts and the chemical effects of human and natural activities on environment. It covers the basics of chemistry: chemical classification - elements, compounds and mixtures. The unit includes investigation of procedures for safe use of chemicals within work setting. Additionally, students learn about chemical reactions in industrial use for the production of items for sale. Also, the procedures applied to maximise production of these items are considered. It also covers natural processes and chemical reactions which have changed the Earth. This unit is laboratory orientated. After getting to know laboratory apparatus, students will perform laboratory experiments in a safe manner. Students will deliver their reports using appropriate terminology and symbols.

Knowledge of physical properties of different types of chemical substances should enable the students to describe different classes of chemicals. This knowledge is a sound basis for their proper and safe applications. The ability to investigate the properties of the elements relating to their chemical structure should be illustrated with examples of the most common industrial processes. The physical and chemical processes that affect the Earth, as well as the factors that can influence the underlying chemical reactions will be interpreted to the students.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Analyze physical properties of different types of chemical substances*
2. *Investigate the properties of the elements related to their chemical structure*
3. *Recognize the factors that influence the rate of chemical reactions*
4. *Know the factors that are affecting the Earth and their environment.*

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Unit: ASCHM-306-1402 Chemical Analysis

Unit level (MQF): 3

Credits : 6

Unit description

This unit enables students to develop the skills needed to detect and analyse a variety of chemical compounds. These skills are essential for work in the food, pharmaceutical, biochemical industry, pathology, environmental and forensic laboratories. The main areas of the unit cover chemical reactions and instrumental analysis. Students should be able to prepare simple solutions and measure pH using indicator papers and pH meters. Learners are skilled to recognise cations based on flame tests and the reaction with sodium hydroxide. Moreover, the unit enables learners to identify gases (hydrogen, oxygen, carbon dioxide), and recognise anions - carbonates, halides and sulphates. Instrumental analysis will cover chromatographic techniques, for which the principles will be explained on a visually accessible thin layer chromatography. All learning objectives are to be accompanied and achieved by practical laboratory work.

Students should be able to classify pH-based substances based on their knowledge of the pH definition and the ways of determining/measuring a pH. Recognition of lithium, sodium, potassium, calcium and barium should be achieved through the knowledge of specific reactions to cations (flame test). The understanding of sodium hydroxide reactions will be used for the identification of aluminium, calcium, magnesium, copper and iron. Students should learn how to follow procedures to underpin their knowledge of gas testing.The identification of carbonates, halides and sulphates should be based on the knowledge of specific tests. Understanding the principles of chromatography is to be achieved through the knowledge of principles and experimental work.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Classify substances based on pH*
2. *Determine the presence of lithium, sodium, potassium, calcium and barium based on flame tests for cations*
3. *Estimate the presence of aluminium, calcium, magnesium, copper and iron by their reaction with sodium hydroxide*
4. *Carry out tests for hydrogen, oxygen, and carbon dioxide*
5. *Identify the presence of carbonates, halides, sulphates by conducting specific tests*
6. *Understand the principles of chromatography.*

Unit: ASENV-306-1402 Monitoring the Environment

Unit level (MQF): 3

Credits : 6

Unit description

The aim of this unit is to enable students to investigate key environmental concepts, to develop the skills needed to monitor ecosystems and to know how various agencies work to protect the environment. Students will study how the components of the ecosystem function by interrelating with each other to maintain balance. They will then consider how this balance may be affected by human activities which result in various forms of environmental pollution and the generation of excessive waste. By knowing how ecosystems function and the effect of human influence, students should have a better understanding of the outcome of their practical investigation. Students will acquire the knowledge of the techniques for the monitoring of ecosystems and measuring influences of carbon dioxide, benzene, acidity etc. Additionally, this unit developes the vocational practical skills of the learners in order to work safely and competently in any relevant environmental setting or laboratory. They will also be familiar with regulative related to the environmental issues, i.e. environment legislation to provide protection of the environment.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Analyze the structure and the operation of an ecosystem*
2. *Investigate influence of the human activities on ecosystems*
3. *Employ techniques involved in the monitoring of ecosystems*
4. *Apply regulatives related to environmental protection.*

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