MCAST

MQF Level 3

AE3-A1-21

Diploma in Aircraft Maintenance

Course Specification

Course Description

This programme is designed specifically to equip learners with the necessary theoretical understanding of aircraft maintenance and related systems and is backed by practical experience in dedicated workshops at mechanic level. The course incorporates the EASA Part-66 Category A basic course which, will allow the student to sit for the licence exams. Also, subject to authorisation by the Part-145 Organization, the licence will permit the holder to issue Certificates of Release to Service following minor scheduled works that may include line maintenance, defect rectification and component changes.

Programme Learning Outcomes

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

1. *Develop basic theoretical knowledge of the aircraft's applicable systems, structure, operations, maintenance, repair, and troubleshooting according to the approved maintenance data.*
2. *Understand how to use correctly the manuals and the approved procedures.*
3. *Make decisions in respect of fault diagnosis and rectification to the maintenance manual level.*
4. *Prepare for the examinations organised by the Transport Malta Civil Aviation Directorate with regards of Part-66 Category A licence.*

Entry Requirements

- MCAST Foundation Certificate; or
- 2 SEC/O-Level passes/SSC&P (Level 3) passes; Compulsory: Physics.

Other Entry Requirements

Applicants will be asked to attend an interview and/or sit for an Aptitude Test in Technical Understanding and Technical English. A pass in the Aptitude Test together with a positive outcome following a Colour Blindness test are a pre-requisite for entry into the course.

Current Approved Programme Structure

Unit Code	Unit Title	ECVET	Year
ETACT-303-2104	Fundamentals of Electricity and Aircraft Electronic Instrument Systems	3	1
ETACT-304-2105	Materials and Hardware	4	1
ETACT-304-2106	Maintenance Practices (Part A)	4	1
ETACT-303-2101	Aviation Legislation	3	1
ETACT-304-2107	Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part A)	4	1
ETACT-304-2111	Mathematics	4	1
ETACT-304-2112	Physics	4	1
CDKSK-304-1922	English	4	1
ETACT-304-2108	Maintenance Practices (Part B)	4	2
ETACT-305-2109	Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part B)	5	2
ETACT-304-2110	Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part C)	4	2
ETACT-305-2102	Gas Turbine Engine & Propellor	5	2
ETACT-304-2103	Human Factors	4	2
CDKSK-304-2108	Information Technology	4	2
CDKSK-304-1923	Malti	4	2
Total ECVET/ECTS		60	/

ETACT-303-2104 Fundamentals of Electricity and Aircraft Electronic Instrument Systems

Unit level (MQF): 3

Credits: 3

Unit Description

In this unit the learner will become familiar with the fundamentals of electricity and aircraft electronic instrument systems. The unit exposes the student to the basic principles of electricity including the electron theory, static electricity and the relationship between voltage, current and resistance. The learner will also become aware of both DC and AC types of electrical power and will be expected to also understand the basic principles of the generation and storage of electrical energy typically employed in the aircraft industry.

The second part of the module covers electronic instrument systems incorporated in civil and commercial aircraft. Here cockpit configurations and layouts are analysed including the principle of operation of the main types of instruments typically found on such aircraft. The handling of such equipment together with the precautions necessary to be followed to mitigate the effects of electrostatic discharge on such equipment is also investigated.

This unit addresses the requirements of EASA Part-66 Module 3 (Electrical Fundamentals) and Module 5 (Digital Techniques/Electronic Instrument Systems) at Category A level.

Learning Outcomes

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

1. *Explain the basic principles of electricity and related terminology. Describe different methods of generation and storage of electricity.*
2. *Describe typical system arrangements and cockpit layouts of electronic instrument systems.*
3. *Analyse the basic components of a computer system and the proper handling of electrostatically sensitive devices.*

ETACT-304-2105 Materials and Hardware

Unit level (MQF): 3

Credits: 4

Unit Description

In this unit learners will become familiar with the characteristics and properties of Ferrous and Non-Ferrous materials as well as Composite and Non-metallic materials used in the construction of aircraft. The learners will also be introduced to various electrical tools and components used in electrical and electronic systems .

Learners will discover different electrical materials and components used. Reference is made to manuals related to electrical works. There is also an ample part dedicated to understanding the various codes used on wires, cables and electrical components. The learners gain knowledge in interpreting such codes. The learners shall also gain knowledge on the importance of inspection of electrical systems.

The unit exposes learners to the several types of corrosion and their causes and effects on materials typically used in the aircraft industry. Learners will become familiar with the typical defects that affect the performance of materials used in aircraft construction and are expected to understand the severity of such defects and material deterioration.

The second part of the module introduces learners to the hardware and components used on civil and commercial aircraft. These include the several types of fasteners used in the assembly of the aircraft structure and the installation of aircraft onboard systems. Learners will be exposed to the different pipes and unions as well as control cable systems and components used in aircraft systems. The learner will be introduced to the different types of bearings and transmission systems in use.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of European Union Aviation Safety Agency (EASA) Part-66 module 6 (Materials and Hardware)

Learning Outcomes

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

1. *Classify wiring standards, special tools and materials used on modern aircrafts.*
2. *Explain the properties and effects of corrosion on ferrous and non-ferrous materials.*
3. *Describe the properties and possible defects of composite, wooden and fabric materials.*
4. *Select appropriate fasteners for given aircraft applications.*
5. *Show the application of pipes, unions, control cables, bearings and transmissions.*

ETACT-304-2106 Maintenance Practices (Part A)

Unit level (MQF): 3

Credits: 4

Unit Description

This unit has been designed to provide learners with the knowledge, skills and understanding needed to carry out a range of aircraft maintenance procedures in a safe, efficient and timely manner. In this unit, learners will be introduced to the potential hazards of working in workshops and on aircraft. Safety is vital during aircraft maintenance, to protect both individuals and the integrity of the aircraft. Therefore, this unit will cover the health and safety issues relating to all aspects of aircraft maintenance.

They are also introduced to the precautions that need to be taken and how to deal with an emergency. This unit exposes the learners to workshop practices and to the several types of tools and tool handling. Learners are then taught the fundamentals of engineering drawings and the different fits and clearances used in engineering. Many different machine tools, tools and equipment are used in an aviation workshop which have to be always well kept and properly stored. Learners will learn how to safely use these tools and equipment, and they will also understand the organisation and maintenance procedures as well as calibration standards.

Learners will also understand and practice basic concepts on how to communicate effectively and how to maintain good work relationships. This will give the learners the opportunity to work effectively as part of a team, since in an aviation workshop, teamwork is highly important. The unit requires a sound understanding of the underpinning knowledge whilst addressing the requirements of EASA Part-66 sub-modules 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, and 7.7 (part of Module 7 - Maintenance Practices) at Category A level.

Learning Outcomes

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

1. *Employ safety precautions and correct practices when working on aircraft and in workshops.*
2. *Use the appropriate tools for the fabrication of components in common aircraft materials, including marking out, sizing, squaring and punching tasks.*
3. *Manufacture and assemble components and parts in accordance to engineering drawings, diagrams and standards of fits and clearances used on aircraft.*
4. *Recognise the basic practices required to carry out aircraft wiring systems.*

ETACT-303-2101 Aviation Legislation

Unit level (MQF): 3

Credits: 3

Unit Description

To ensure a high level of Safety in Aviation in each Member State, the European Union sets up an Aviation Regulation Framework that is common for and applicable to every country that is a Member within the Union. This also includes Malta. This unit presents an overview of the Regulation Framework covering up the Area of Aircraft Continuing Airworthiness, which is mainly ensured by appropriate aircraft operation and maintenance.

The unit is designed to cover up the requirements for the approval, certification and licensing of Organisations and people involved in Aircraft Operations, Maintenance and Certification. This includes the Operator of an aircraft, the Maintenance Organisation that performs the maintenance on the aircraft, the Staff Certifying the Aircraft following maintenance and before the flight, as well as the Organisation approved to carry out the Management of the Maintenance of the aircraft. The role of the EU Member State is also covered up.

The unit is also designed to completely cover up the knowledge requirements of the European Aviation Safety Agency (EASA) Part-66 Module 10 – Aviation Legislation, at Category A Level.

Learning Outcomes

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

1. *Appraise the Aviation Regulation Framework applicable to the EU Member State.*
2. *Explain the requirements for the Maintenance Organisations and Certifying Staff to obtain and retain the necessary approval or authorization.*
3. *Describe the Technical Requirements and Administrative Procedures related to Aircraft Air Operations.*
4. *Discuss Aircraft Continuing Airworthiness Requirements according to standards set up by the European Union, and any other standard set up at International and National Level.*

ETACT-304-2107 Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part A)

Unit level (MQF): 3

Credits: 4

Unit Description

Large modern passenger aircraft, by themselves, can weigh tens of thousands of kilograms. In addition, they carry large loads in the form of fuel, passengers and cargo. This unit delves into the theory on how lift augmentation is achieved upon an aircraft in order to overcome such huge loads and be able to get into flight. In addition to the weight, an aircraft also has to overcome drag. During this unit, the learner will understand the basic principles on how drag is overcome during the flight.

Upon delivering the basics of flight theory, the learner will understand the effects of flying at different speeds on flight augmentation, as well as on the aircraft aerodynamics. The provisions taken to achieve subsonic and supersonic speeds are also examined.

The module also presents the learner with the concepts of the aircraft airframe structure, with particular emphasis on the aeroplane. The learner will also appreciate the importance of structural strength. An overview of the main airworthiness requirements to be met during the design and manufacturing of an aircraft in order to achieve proper structural strength to to ensure a safe flight is delivered. Other elements related to safety presented in this unit are: structural classification; strain and fatigue elements and the provisions taken to prevent corrosion and safe operation of the structure in case of a lightning strike.

The main sections related and attached to the fuselage of an aeroplane will be studied such as: wings; flight control surfaces; engines; landing gears; doors and windows. Construction provisions to ensure structural integrity in case of abnormal flight conditions is also discussed.

Learning Outcomes

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

1. *Explain the basic means by which lift and drag are generated during the flight of an aircraft.*
2. *Examine the effects of aerodynamics over aeroplanes flying at different air-speeds.*
3. *Describe the general concepts of the structure forming the airframe of an aircraft.*
4. *Outline the function of the main sections that constitute the airframe structure of an aeroplane.*

ETACT-304-2111 Mathematics

Unit level (MQF): 3

Credits: 4

Unit Description

This unit has been designed to fulfil the requirements for EASA Part-66 CAT A Module 1 which consists of basic level of mathematics. Furthermore, it acts as an essential basis for the successful completion of other units within the programme of study.

Initially, the learner will become familiar with basic rules governing numbers and then proceed to apply the learnt principles in decimal numbers, fractions, indices, conversions, percentages and averages, and ratios and proportions.

This will lead the learner to be able to understand and apply simple algebraic techniques to manipulate expressions and mentally solve algebraic equations commonly found in the aviation context.

Eventually, the learner will be introduced to graphical techniques. This will enable the learner to understand the application of the Cartesian coordinate system, plot linear and quadratic equations, determine the equation of a straight line from a graph, and graphically, solve simultaneously two equations.

Finally, the learner will be presented material related to mensuration. The knowledge transmitted to the learner will enable him/her to be able to construct and determine the area and volume of simple and compound geometrical figures.

Learning Outcomes

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

1. *Apply the correct arithmetic process following the understanding of the correct use of numbers.*
2. *Apply basic algebraic techniques to manipulate expressions.*
3. *Use simple graphical techniques to solve problems.*
4. *Apply geometrical properties of shapes and solids to find areas and volumes.*

ETACT-304-2112 Physics

Unit level (MQF): 3

Credits: 4

Unit Description

This module has been designed to fulfil requirements for EASA Part-66 Module 2 CAT A which covers matter, mechanics and thermodynamics.

A clear understanding of matter will set the foundation by enhancing the learner's knowledge with regards to the nature of different materials along with physical and chemical properties. The learner will be competent to distinguish between the different states of matter.

The learner will also be introduced to mechanics. In relation to aviation, mechanics is constructed of the following divisions: statics, kinetics, dynamics and fluid dynamics. Through statics, the learner will analyse loads acting on physical system which are in static equilibrium and hence do not experience acceleration. When dealing with kinetics, the learner will study the relationship between motion (both linear and rotational) and its causes, namely forces and torques. Dynamics deals with the effect that forces have on motion while fluid dynamics focuses on the flow of fluids, liquids and gases, including aerodynamics and hydrodynamics.

Through thermodynamics, the learner will be made familiar with different temperature scales and understand the definition of heat

Learning Outcomes

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

1. *Distinguish between materials according to their physical and chemical properties.*
2. *Explain statics in mechanics according to an aviation set up.*
3. *Apply the theory of linear and rotational kinetics to aviation systems.*
4. *Apply the dynamics and fluid dynamics principles on an aviation set up.*
5. *Discuss thermodynamic principles in an aviation context.*

ETACT-304-2108 Maintenance Practices (Part B)

Unit level (MQF): 3

Credits: 4

Unit Description

In this unit, learners will further familiarise themselves with the requirements and fundamentals of working in the aviation maintenance sector. The learners will practice further health and safety requirements, personal protective equipment usage and the need to apply safe working practices. With the practical skills and knowledge acquired in this unit, learners will be able to work safely on basic tasks, whilst taking the necessary precautions during the working process.

In this unit, learners will also become familiar with different tools used in an aviation workshop. Learners will practice aircraft riveting and riveting techniques. They will also be introduced to an array of fasteners and fastening techniques commonly used in aircraft assemblies.

Learners will understand basic concepts in relation to communication and maintaining work relationships. Therefore, learners will be able to work effectively as part of a team since in an aviation workshop this is very important due to some tasks needing the collaboration of a team to be accomplished.

The learners are also introduced to the different aircraft systems and how these are inspected and maintained. The aircraft systems covered are pipes and hoses, transmissions and control cables together with the associated bearings and springs. Towards the end of the unit, the learners will learn how to properly handle an aircraft especially during maintenance and the techniques used in the disassembly, inspection, repair and assembly of aircraft systems and structures and the associated maintenance procedures. Learners are also introduced to the potential abnormal events an aircraft can experience and what checks are carried out in such an eventuality.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of EASA Part-66 sub-modules 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 7.17, 7.18, 7.19, and 7.20 (part of Module 7 - Maintenance Practices) at Category A level.

Learning Outcomes

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

1. *Prepare aircraft sheet metal for riveting and rivet prepared parts accurately according to documentation provided.*
2. *Outline the importance of pipes and hoses, springs and bearings in aircraft applications.*
3. *Outline the importance of transmission and control cable systems in aircraft applications.*
4. *Carry out procedures for handling, maintenance and storage of aircraft that also include preparation of aircraft parts and inspection after abnormal events.*

ETACT-305-2109 Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part B)

Unit level (MQF): 3

Credits: 5

Unit Description

To be able to fly an aircraft, both mechanical and electrical systems are required so that the necessary control is achieved, as well as so that the different systems within the aircraft can operate correctly and safely. This unit focuses mainly on the mechanical aspects of the different aircraft systems.

A system that is very important and essential on large aircraft, in order to achieve the control of operations of systems like flight controls and landing gear, is the hydraulic system. The first part of this unit focuses on systems essential for the control of a large aircrafts. This part of unit covers the principles of hydraulic transmission to such aircraft systems and their associated components.Particularly principles associated with hydraulic power actuation and the application in modern hydraulic systems. Including typical provisions taken during emergency and abnormal conditions.

The unit presents the purpose, construction and operation of typical aircraft landing gear systems, including system arrangement for extension and retraction of the landing gear, nose wheel steering, as well as braking. Also includes system operation during abnormal events. The second main system usually related directly to the hydraulic system, is the flight control system of an aircraft. Large aircraft flight controls are subject to heavy loads that makes it impossible to move a flight control manually during flight. Hence, most large aircraft employ hydraulic power to achieve such control. The unit covers also typical flight control systems as found on different aircraft types.

Apart from these three main systems for aircraft control, this unit covers other aircraft systems that are vital for large passenger aircrafts; like the system related to air, as well as pressurisation. The air systems covered include pneumatic supply, air-conditioning and aircraft pressurization. With the latter 2 beingessential on passenger aircraft flying at high altitudes, due to not enough oxygen present in the atmosphere and the extremely low ambient temperatures.

Another essential aircraft system is the fuel system. The unit covers typical fuel systemsfound on aircrafts and explains typical system layouts and operation principles; including methods of fuel supply, transferring, venting and draining. Also covers

important safety requirement that must be followed during aircraft refueling and defueling and other safety requirements that must be observed prior fuel tank entering. The final part of the unit deals with the passenger cabin and cargo compartments, and related systems like oxygen and water/waste. Typical system layouts, as well as safety requirements are presented. Including typical cabin layouts and installations, cargo handling and retention equipment, oxygen supply systems (crew/passenger), and water and waste systems. It also demonstrates typical servicing practices performed regularly during aircraft operation on oxygen and water/waste systems.

Learning Outcomes

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

1. *Describe the modern aircrafts' hydraulic system, flight control systems, landing gear systems and associated components.*
2. *Explain the function and operation of a typical aircraft fuel system.*
3. *Recognise the function and purpose of an aircraft air-conditioning and pressurisation system.*
4. *Outline the construction, purpose and operation of aircraft cabin equipment, oxygen and water/waste systems and associated components.*

ETACT-304-2110 Basic Aerodynamics and Turbine Aeroplane Aerodynamics, Structure and Systems (Part C)

Unit level (MQF): 3

Credits: 4

Unit Description

As technology improves, the blend between mechanical and electrical systems is becoming more evident. This effect is happening in the simplest machines to the more complex system. This phenomena is highly noted in the aviation sector where old mechanical systems are eventually supported by electrical and avionics systems. This blend of mechanical and electrical/electronics is intended to ensure a safer method of transport in aviation.

The intention of this unit is to expose the learner to different aircraft systems that are highly linked with electricity and avionics. The learner is offered the possibility to learn about the production and distribution of electrical power, aircraft flight instrument systems, communication systems that includes voice over radio and radio navigation systems and aircraft modular systems.

The learner is also exposed to other avionic systems like on board maintenance systems, cabin electrical and electronic systems that includes in-flight entertainment and communication systems, and aircraft data information systems.Besides the avionics and electrical systems, the unit offers an overview of the aircraft's, light system, fire protection system and ice and rain protection system.

Learning Outcomes

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

1. *Describe Aircraft Electrical Power, lighting, fire protection and ice and rain systems.*
2. *Discuss the purpose, function, operation and position of Aircraft Indicating and Instrument Systems.*
3. *Explain the function, operation and layout of various communication methods including voice and radio navigation systems*
4. *Describe the basic requirements for on board maintenance systems, integrated modular avionics systems, cabin systems and information systems.*

ETACT-305-2102 Gas Turbine Engine & Propellor

Unit level (MQF): 3

Credits: 5

Unit Description

Engine power has to be converted into thrust.On some aircraft the propeller is used to create such thrust. This part of unit aims to give learners a detailed understanding of aircraft propellers. Propellers, being aerofoil shaped, produce lift to pull the aircraft forward through aerodynamic action. Through this part of unit the learner will obtain a detailed understanding of the above, as well as propeller blade construction theory and operation.

This part of unit also covers the progression from fixed pitch propellers to controllable pitch to constant speed propellers.Knowledge about the procedures required to protect, maintain, store and preserve propellers in compliance with laid down standards will also be acquired.

This part of the unit covers the syllabus required by a person to sit for the European Aviation Safety Agency (EASA) Part 66 examination in Category A Module 17A Propellers. The other part of the unit explains the most essential fundamentals that are necessary to understand the principles of gas turbine engines. Students will become familiar with the terms most commonly used. It also gives an understanding of how thrust is produced.

The gas turbine engine is an internal combustion engine which burns a lean mixture of fuel with compressed air. The pressurized combustion gases expand through the turbine resulting in thrust. This part of unit introduces the engine construction, operation and maintenance. The students are encouraged to become familiar with lubrication, cooling, starting, ignition, ice and fire protection systems. Phenomena such as choke, stall and surge are presented in addition to instruments used to monitor engine performance. Turbine engine hydraulis, fuel and oil systems, as well as the generation of electrical power are also covered.

The knowledge required by a person to sit for the European Aviation Safety Agency (EASA) CAT A Part 66 Exam Module 15 – Gas Turbine Engines is covered.

Learning Outcomes

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

1. *Describe the theoretical fundamentals of propeller construction and pitch control.*
2. *Discuss the methods of ice protection, maintenance, storage and protection of propeller blades.*
3. *Explain the theoretical fundamentals of the gas turbine engine.*
4. *Describe the gas turbine engine construction.*
5. *Analyse the different systems used in a gas turbine engine including controls and instrumentation.*
6. *Describe the performance of gas turbine engines and their maintenance.*

ETACT-304-2103 Human Factors

Unit level (MQF): 3

Credits: 4

Unit Description

The study of Human Factors is about understanding human behaviour and performance. When applied to Aviation Maintenance, Human Factors knowledge is used to optimize the fit between people and the systems in which they work in order to improve safety and performance.

An understanding of the importance of human factors to aircraft maintenance engineering is essential to anyone considering a career as an aircraft maintenance unlicensed or licensed mechanic or technician. Human factors impinge on everything a person involved in aviation maintenance does in the course of his/her job in one way or another, from communicating effectively with colleagues to ensuring they have adequate lighting to carry out their tasks. Knowledge of this subject has a significant impact on the safety standards expected in aircraft maintenance.

This unit covers essential aspects of human factors as related to aviation maintenance such as, human performance and limitations as applied to aviation maintenance, as well as elements of social psychology and factors affecting performance of a person involved in aviation maintenance. The physical environment found in aircraft maintenance, and the tasks involved during aviation maintenance are also tackled. The importance of communication and its contribution to avoid human error are also covered.

The unit requires a sound understanding of the underpinning knowledge and addresses the requirements of EASA Part-66 module 9 (Human Factors) at Category A level.

Learning Outcomes

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

1. *Describe the effect of physiological and psychological factors that could affect and limit human performance.*
2. *Discuss he type of aviation maintenance tasks and the proper physical environment for aircraft maintenance.*
3. *Explain the importance of good communication between persons during aviation maintenance work.*
4. *Identify human errors and hazards in the workplace.*