

**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)**

**COMPETENCY BASED CURRICULUM**

**FOR**

**AERONAUTICAL ENGINEERING (AIRFRAMES AND POWER PLANT OPTION)**

**LEVEL 6**



TVET CDACC

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NAIROBI

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# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the Engineering Sector’s growth and development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Engineering Sector Skills Advisory Committee (SSAC) have developed Occupational Standards for Aeronautical Airframe and Power Plant Technician. These standards will be the basis for development of competency-based curriculum for Aeronautical Engineering (Airframe and Power Plant Option) Level 6.

This curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee’s achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council Members, Council Secretariat, Engineering SSAC, expert workers and all those who participated in the development of this curriculum.

**CHAIRPERSON, TVET CDACC**

**ACKNOWLEDGMENT**

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organizations.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of this curriculum. My gratitude goes to Engineering Sector Skills Advisory Committee (SSAC) members for their contribution to the development of this curriculum. I thank all the individuals and organizations who participated in the validation of this process.

I am convinced that this curriculum will go a long way in ensuring that workers in Engineering Sector acquire competencies that will enable them to perform their work more efficiently.

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

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# ABBREVIATIONS AND ACRONYMS

A Control version

AC Air conditioning

AFE Airframes Engineering

AIDS Acquired Immunodeficiency Syndrome

AMM Aircraft Maintenance Manual

BC Basic Unit of learning

CBET Competency Based Education and Training

CC Common unit

CDACC Curriculum Development, Assessment and Certification Council

CEO Council Secretary

CI Compression ignition

CMM Component Maintenance Manual

CPU Control Powering Unit

CR Core Unit of learning

CU Curriculum

CV Constant velocity joint

DTI Dial test indicator

ENG Engineering

FOT Fixed orifice tube

GPS Global positioning system

HIVHuman Immuno-Deficiency Virus

IATA International Air Transport Association

ICT Information and Communication Technology

IT Information Technology

KCAA Kenya Civil Aviation Authority

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualifications Authority

KNQF Kenya National Qualification Framework

KPI King Pin inclination

LCD Liquid Crystal Display

OBD On-board diagnostics

OSH Occupational Safety and Health

PESTEL Political Environmental Social Technological Economic Legal

PPE Personal protective equipment

Q&A Questions and Answer

SSAC Sector Skills Advisory Committee

SWOT Strength Weakness Opportunity Threat

TVET Technical and Vocational Education and Training

# **KEY TO UNIT CODE**

ENG/CU/AFE/BC/01/6/A

Industry or sector

Curriculum

Occupational area

Type of competency

Competency number

Competency level

Control Version

# COURSE OVERVIEW

The Airframe Technician Level 6 qualification consists of competencies that a person must achieve to enable him/her to work in aviation industry. It entails producing airframe, carrying out aircraft interior soft furnishing, maintaining aircraft engine and aircraft hydraulic system, carrying out aircraft pneumatic system maintenance, servicing aircraft fuel system, maintaining aircraft de-icing and rain protection system, servicing aircraft power transmission system, maintaining aircraft fire protection system, aircraft oxygen systems, aircraft environmental control systems, performing aircraft exterior works and manage aviation maintenance projects.

This qualification consists of the following basic, common and core units learning as shown below:

**Basic Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Units Title** | **Duration in Hours** | **Credits Factors** |
| ENG/CU/AFE/BC/01/6/A | Communication Skills | 40 | 4.0 |
| ENG/CU/AFE/BC/02/6/A | Digital Literacy | 60 | 6.0 |
| ENG/CU/AFE/BC/03/6/A | Entrepreneurial Skills | 100 | 10.0 |
| ENG/CU/AFE/BC/04/6/A | Employability Skills | 80 | 8.0 |
| ENG/CU/AFE/BC/05/6/A | Environmental Literacy | 40 | 4.0 |
| ENG/CU/AFE/BC/06/6/A | Occupational Health and Safety | 40 | 4.0 |
| Subtotal 1 | | 360 | 36.0 |

**Common Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Units Title** | **Duration in Hours** | **Credits Factors** |
| ENG/CU/AFE/CC/01/6/A | Technical drawing | 110.0 | 11.0 |
| ENG/CU/AFE/CC/02/6/A | Engineering mathematics | 120.0 | 12.0 |
| ENG/CU/AFE/CC/03/6/A | Workshop processes and practices | 100.0 | 10.0 |
| ENG/CU/AFE/CC/04/6/A | Electrical and electronics principles | 100.0 | 10.0 |
| ENG/CU/AFE/CC/05/6/A | Aerodynamics principles | 130.0 | 13.0 |
| Subtotal 2 | | 560.0 | 56.0 |

**Core Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Units Title** | **Duration in Hours** | **Credits Factors** |
| ENG/CU/AFE/CR/01/6/A | Airframe structures | 110.0 | 11.0 |
| ENG/CU/AFE/CR/02/6/A | Aircraft interior, equipment and furnishing | 130.0 | 13.0 |
| ENG/CU/AFE/CR/03/6/A | Aircraft power plant | 90.0 | 9.0 |
| ENG/CU/AFE/CR/04/6/A | Aircraft hydraulic system | 100.0 | 10.0 |
| ENG/CU/AFE/CR/05/6/A | Aircraft pneumatic system maintenance | 110.0 | 11.0 |
| ENG/CU/AFE/CR/06/6/A | Aircraft ice and rain protection | 110.0 | 11.0 |
| ENG/CU/AFE/CR/07/6/A | Aircraft fuel system | 120.0 | 12.0 |
| ENG/CU/AFE/CR/08/6/A | Aircraft landing gear system | 110.0 | 11.0 |
| ENG/CU/AFE/CR/09/6/A | Aircraft fire protection system | 100.0 | 10.0 |
| ENG/CU/AFE/CR/10/6/A | Aircraft oxygen systems | 110.0 | 11.0 |
| ENG/CU/AFE/CR/11/6/A | Aircraft air conditioning and pressurization | 110.0 | 11.0 |
| ENG/CU/AFE/CR/12/6/A | Perform aircraft exterior works | 120.0 | 12.0 |
| ENG/CU/AFE/CR/13/6/A | Managing aviation maintenance projects | 100.0 | 10.0 |
| ENG/CU/AFE/CR/13/6/A | Industrial attachment | 480.0 | 48.0 |
| Subtotal 3 | | 1900.0 | 190.0 |
| **Grand total** | | **2820** | **282.0** |

The total duration for the course is 2820 hours

**Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Kenya Certificate of Secondary Education (K.C.S.E.) with a minimum mean grade of C- (C minus)

**Or**

1. Aeronautical Engineering Level 5

**Or**

1. Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)

**Industrial attachment**

An individual enrolled in this course will be required to undergo an industrial attachment in a firm dealing with Aeronautical engineering for a period of at least three (3) months. An individual enrolled in one of the units of learning will be required to undergo a one-month attachment in an aeronautical firm dealing with the relevant competency required. Attachment will be undertaken upon completion of the course or the unit of learning.

**Trainer qualification**

The trainer of this course must have a higher qualification than this course

**Assessment**

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier while external assessment is the responsibility of TVET/CDACC.

**Certification**

A candidate will be issued with a Certificate of competency on demonstration of competence in a unit of competency. To attain the Qualification National Certificate in Aeronautical Engineering - Airframe and Power plant Technology Level 6, the candidate must demonstrate competence in all the units of competency as given in qualification pack. These certificates will be issued by TVET CDACC in conjunction with training provider.

# BASIC UNITS OF LEARNING

## 

# COMMUNICATION SKILLS

**UNIT CODE:**  ENG/CU/AFE/BC/01/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Communication Skills

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers the competencies required to demonstrate communication skills. It involves, meeting communication needs of clients and colleagues; developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

**Summary of Learning Outcomes**

1. Meet communication needs of clients and colleagues
2. Develop communication strategies
3. Establish and maintain communication pathways
4. Promote use of communication strategies
5. Conduct interview
6. Facilitate group discussion
7. Represent the organization

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Meet communication needs of clients and colleagues | * Communication process * Modes of communication * Medium of communication * Effective communication * Barriers to communication * Flow of communication * Sources of information * Organizational policies * Organization requirements for written and electronic communication methods * Report writing * Effective questioning techniques (clarifying and probing) * Workplace etiquette * Ethical work practices in handling communication * Active listening * Feedback * Interpretation * Flexibility in communication * Types of communication strategies * Elements of communication strategy | * Interview * Written texts |
| 1. Develop communication strategies | * Dynamics of groups * Styles of group leadership * Openness and flexibility in communication * Communication skills relevant to client groups | * Interview * Written texts |
| 1. Establish and maintain communication pathways | * Types of communication pathways | * Interview * Written texts |
| 1. Promote use of communication strategies | * Application of elements of communication strategies * Effective communication techniques | * Interview * Written texts |
| 1. Conduct interview | * Types of interview * Establishing rapport * Facilitating resolution of issues * Developing action plans | * Interview * Written texts |
| 1. Facilitate group discussion | * Identification of communication needs * Dynamics of groups * Styles of group leadership * Presentation of information * Encouraging group members participation * Evaluating group communication strategies | * Interview * Written texts |
| 1. Represent the organization | * Presentation techniques * Development of a presentation * Multi-media utilization in presentation * Communication skills relevant to client groups | * Interview * Written texts |

**Suggested Methods of Instruction**

* Discussion
* Role playing
* Simulation
* Direct instruction

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone

# DIGITAL LITERACY

**UNIT CODE:**  ENG/CU/AFE/BC/02/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

**Duration of Unit:** 60 hours

**Unit Description**

This unit describes competencies required to demonstrate digital literacy. It involves in identifying computer software and hardware, applying security measures to data, hardware, software in automated environment, computer software in solving task, internet and email in communication at workplace, desktop publishing in official assignments and preparing presentation packages.

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify computer hardware and software | * Concepts of ICT * Functions of ICT * History of computers * Components of a computer * Classification of computers | * Written tests * Oral presentation |
| 1. Apply security measures to data, hardware, software in automated environment | * Data security and control * Security threats and control measures * Types of computer crimes * Detection and protection against computer crimes * Laws governing protection of ICT | * Written tests * Oral presentation * Project |
| 1. Apply computer software in solving tasks | * Operating system * Word processing * Spread sheets * Data base design and manipulation * Data manipulation, storage and retrieval | * Oral questioning * Project |
| 1. Apply internet and email in communication at workplace | * Computer networks * Network configurations * Uses of internet * Electronic mail (e-mail) concept | * Oral questioning * Written report |
| 1. Apply desktop publishing in official assignments | * Concept of desktop publishing * Opening publication window * Identifying different tools and tool bars * Determining page layout * Opening, saving and closing files * Drawing various shapes using DTP * Using colour pellets to enhance a document * Inserting text frames * Importing and exporting text * Object linking and embedding * Designing of various publications * Printing of various publications | * Oral questioning * Written report * Project |
| 1. Prepare presentation packages | * Types of presentation packages * Procedure of creating slides * Formatting slides * Presentation of slides * Procedure for editing objects | * Oral questioning * Written report * Project |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Project
* Group discussions

**Recommended Resources**

* Computers
* Printers
* Storage devices
* Internet access

# ENTREPRENEURIAL SKILLS

**UNIT CODE:** ENG/CU/AFE/BC/03/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Entrepreneurial Skills

**Duration of unit:** 100 hours

**Unit Description**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

**Summary of Learning Outcomes**

* 1. Demonstrate understanding of who an entrepreneur
  2. Demonstrate knowledge of entrepreneurship and self-employment
  3. Identify entrepreneurship opportunities
  4. Create entrepreneurial awareness
  5. Apply entrepreneurial motivation
  6. Develop business innovative strategies
  7. Develop Business plan

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Demonstrate knowledge of entrepreneurship and self-employment | * Importance of self-employment * Requirements for entry into self-employment * Role of an Entrepreneur in business * Contributions of Entrepreneurs to National development * Entrepreneurship culture in Kenya * Born or made entrepreneurs | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report |
| 1. Identify entrepreneurship opportunities | * Business ideas and opportunities * Sources of business ideas * Business life cycle * Legal aspects of business * Assessment of product demand * Business environment * Factors to consider when evaluating business environment * Technology in business | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Create entrepreneurial awareness | * Forms of businesses * Sources of business finance * Factors in selecting source of business finance * Governing policies on Small Scale Enterprises (SSEs) * Problems of starting and operating SSEs | * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Apply entrepreneurial motivation | * Internal and external motivation * Motivational theories * Self-assessment * Entrepreneurial orientation * Effective communications in entrepreneurship * Principles of communication * Entrepreneurial motivation | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 1. Develop business innovative strategies | * Innovation in business * Small business Strategic Plan * Creativity in business development * Linkages with other entrepreneurs * ICT in business growth and development | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |
| 6. Develop Business Plan | * Business description * Marketing plan * Organizational/Management * plan * Production/operation plan * Financial plan * Executive summary * Presentation of Business Plan | * Case studies * Individual/group assignments * Projects * Written tests * Oral questions * Third party report * Interviews |

**Suggested Methods of Instruction**

* Direct instruction
* Project
* Case studies
* Field trips
* Discussions
* Demonstration
* Question and answer
* Problem solving
* Experiential
* Team training

**Recommended Resources**

* Case studies
* Business plan templates
* Computers
* Overhead projectors
* Internet
* Mobile phone
* Video clips
* Films
* Newspapers and Handouts
* Business Journals
* Writing materials

# EMPLOYABILITY SKILLS

**UNIT CODE:** ENG/CU/AFE/BC/04/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Employability Skills

**Duration of Unit:** 80 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**Summary of Learning Outcomes**

1. Conduct self-management
2. Demonstrate interpersonal communication
3. Demonstrate critical safe work habits
4. Lead a workplace team
5. Plan and organize work
6. Maintain professional growth and development
7. Demonstrate workplace learning
8. Demonstrate problem solving skills
9. Manage ethical performance

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct self-management | * Self-awareness * Formulating personal vision, mission and goals * Strategies for overcoming life challenges * Managing emotions * Emotional intelligence * Assertiveness versus aggressiveness * Expressing personal thoughts, feelings and beliefs * Developing and maintaining high self-esteem * Developing and maintaining positive self-image * Setting performance targets * Monitoring and evaluating performance * Articulating ideas and aspirations * Accountability and responsibility * Good work habits * Self-awareness * Values and beliefs * Self-development * Financial literacy * Healthy lifestyle practices * Adopting safety practices | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate interpersonal communication | * Meaning of interpersonal communication * Listening skills * Types of audience * Public speaking * Writing skills * Negotiation skills * Reading skills * Meaning of empathy * Understanding customers’ needs * Establishing communication networks * Assertiveness * Sharing information | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate critical safe work habits | * Stress and stress management * Time concept * Punctuality and time consciousness * Leisure * Integratingpersonal objectives into organizational objectives * Resources mobilization * Resources utilization * Setting work priorities * Developing healthy relationships * HIV and AIDS * Drug and substance abuse * Managing emerging issues | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Lead a workplace team | * Leadership qualities * Power and authority * Team building * Determination of team roles and objectives * Team parameters and relationships * Individual responsibilities in a team * Forms of communication * Complementing team activities * Gender and gender mainstreaming * Human rights * Developing healthy relationships * Maintaining relationships * Conflicts and conflict resolution * Coaching and mentoring skills | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Plan and organize work | * Functions of management * Planning * Organizing * Time management * Decision making concept * Task allocation * Developing work plans * Developing work goals/objectives and deliverables * Monitoring work activities * Evaluating work activities * Resource mobilization * Resource allocation * Resource utilization * Proactive planning * Risk evaluation * Problem solving * Collecting, analysing and organising information * Negotiation | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Maintain professional growth and development | * Avenues for professional growth * Training and career opportunities * Assessing training needs * Mobilizing training resources * Licenses and certifications for professional growth and development * Pursuing personal and organizational goals * Managing work priorities and commitments * Recognizing career advancement | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate workplace learning | * Managing own learning * Mentoring * Coaching * Contributing to the learning community at the workplace * Cultural aspects of work * Networking * Variety of learning context * Application of learning * Safe use of technology * Taking initiative/proactivity * Flexibility * Identifying opportunities * Generating new ideas * Workplace innovation * Performance improvement * Managing emerging issues * Future trends and concerns in learning | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Demonstrate problem solving skills | * Critical thinking process * Data analysis tools * Decision making * Creative thinking * Development of creative, innovative and practical solutions * Independence in identifying and solving problems * Solving problems in teams * Application of problem-solving strategies * Testing assumptions * Resolving customer concerns | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |
| 1. Manage ethical performance | * Meaning of ethics * Ethical perspectives * Principles of ethics * Ethical standards * Organization code of ethics * Common ethical dilemmas * Organization culture * Corruption, bribery and conflict of interest * Privacy and data protection * Diversity, harassment and mutual respect * Financial responsibility/accountability * Etiquette * Personal and professional integrity * Commitment to jurisdictional laws * Emerging issues in ethics | * Written tests * Oral questioning * Interviewing * Portfolio of evidence * Third party report |

**Suggested Methods of Instruction**

* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Assignments
* Q&A

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors

# ENVIRONMENTAL LITERACY

**UNIT CODE**:ENG/CU/AFE/BC/05/6/A

**Relationship to Occupational Standards**:

This unit addresses the Unit of Competency: Demonstrate Environmental Literacy

**Duration of Unit:** 40 hours

**Unit Description**

This unit describes the competencies required demonstrate environmental literacy.it involves controlling environmental hazard, controlling environmental pollution, complying with workplace sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/programs, analysing resource use and developing resource conservation plans.

**Summary of Learning Outcomes**

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs
8. Analyze resource use
9. Develop resource conservation plans

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Control environmental hazard | * Purposes and content of Environmental Management and Coordination Act 1999 * Storage methods for environmentally hazardous materials * Disposal methods of hazardous wastes * Types and uses of PPE in line with environmental regulations * Occupational Safety and Health Standards (OSHS) | * Written questions * Oral questions |
| 1. Control environmental Pollution control | * Types of pollution * Environmental pollution control measures * Types of solid wastes * Procedures for solid waste management * Different types of noise pollution * Methods for minimizing noise pollution | * Written questions * Oral questions * Role play |
| 1. Demonstrate sustainable resource use | * Types of resources * Techniques in measuring current usage of resources * Calculating current usage of resources * Methods for minimizing wastage * Waste management procedures * Principles of 3Rs (Reduce, Reuse, Recycle) * Methods for economizing or reducing resource consumption | * Written questions * Oral questions * Role play |
| 1. Evaluate current practices in relation to resource usage | * Collection of information on environmental and resource efficiency systems and procedures, * Measurement and recording of current resource usage * Analysis and recording of current purchasing strategies. * Analysis of current work processes to access information and data * Identification of areas for improvement | * Written questions * Oral questions * Role play |
| 1. Identify Environmental legislations/conventions for environmental concerns | * Environmental issues/concerns * Environmental legislations /conventions and local ordinances * Industrial standard /environmental practices * International Environmental Protocols (Montreal, Kyoto) * Features of an environmental strategy | * Written questions * Oral questions |
| 1. Implement specific environmental programs | * Community needs and expectations * Resource availability * 5s of good housekeeping * Identification of programs/Activities * Setting of individual roles /responsibilities * Resolving problems /constraints encountered * Consultation with stakeholders | * Written questions * Oral questions * Role play |
| 1. Monitor activities on Environmental protection/Programs | * Periodic monitoring and Evaluation of activities * Gathering feedback from stakeholders * Analyzing data gathered * Documentation of recommendations and submission * Setting of management support systems to sustain and enhance the program * Monitoring and reporting of environmental incidents to concerned /proper authorities | * Oral questions * Written tests * Practical test |
| 1. Analyze resource use | * Identification of resource consuming processes * Determination of quantity and nature of resource consumed * Analysis of resource flow through different parts of the process. * Classification of wastes for possible source of resources. | * Written tests * Oral questions * Practical test |
| 1. Develop resource Conservation plans | * Determination of efficiency of use/conversion of resources * Causes of low efficiency of use of resources * Plans for increasing the efficiency of resource use | * Written tests * Oral questions * Practical test |

**Suggested Methods of Instruction**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees
* Observations and comments and corrections by trainers

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Environmental Management and Coordination Act 1999
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)
* ISO standards
* Company environmental management systems (EMS)
* Montreal Protocol
* Kyoto Protocol

# OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/CU/AFE/BC/06/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Occupational Safety and Health Practices

**Duration of Unit:** 40 hours

**Unit Description**

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risk, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

**Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Control OSH hazards
3. Implement OSH programs

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify workplace hazards and risks | * Identification of hazards in the workplace and/or the indicators of their presence * Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace * Gathering of OSH issues and/or concerns | * Oral questions * Written tests * Portfolio of evidence * Third party report |
| 1. Control OSH hazards | * Prevention and control measures e.g. use of PPE * Risk assessment * Contingency measures | * Oral questions * Written tests * Portfolio of evidence * Third party report |
| 1. Implement OSH   programs | * Company OSH program, evaluation and review * Implementation of OSH programs * Training of team members and advice on OSH standards and procedures * Implementation of procedures for maintaining OSH-related records | * Oral questions * Written tests * Portfolio of evidence * Third party report |

**Suggested Methods of Instruction**

* Assigments
* Discussion
* Q&A
* Role play
* Viewing of related videos

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE) e.g.
* Mask
* Face mask/shield
* Safety boots
* Safety harness
* Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest

# COMMON UNITS OF LEARNING

## TECHNICAL DRAWING

**UNIT CODE:** ENG/CU/AFE/CC/01/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Prepare and Interpret Technical Drawings

**Duration of Unit:** 110 Hours

**Unit Description**

This unit covers the competencies required to prepare and interpret technical drawings by a Avionic technician. It involves competencies to use and maintain drawing equipment and materials, producing plain geometry drawings, solid geometry drawings, pictorial and assembly drawings, orthographic drawings of components and application of CAD software.

**Summary of Learning Outcomes**

1. Use and maintain drawing equipment and materials
2. Produce plain geometry drawings
3. Produce solid geometry drawings
4. Produce assembly drawings
5. Produce pictorial and orthographic drawings of components
6. Apply CAD software

**Learning Outcomes, Content and Suggested Assessment Methods:**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Use and maintain drawing equipment and materials | * Identification and maintain of drawing equipment and materials * Identification and maintain of drawing materials | * Observation * Oral questioning * Written tests |
| 1. Produce plain geometry drawings | * Lettering in drawing * Types of lines in drawings * Construction of geometric forms * Construction of different angles * Measurement of different angles * Standard drawing conventions | * Oral questioning * Written tests * Observation |
| 1. Produce solid geometry drawings | * Interpretation of sketches and drawings of patterns   + Cylinders   + Prisms   + Pyramids * Development of surface of interpenetrating solids and truncated solids * Interpenetrations of solids   + Cylinder to cylinder,   + Cylinder to prism,   + Prism to prism of equal and unequal diameters | * Observation * Written tests * Oral questioning |
| 1. Produce pictorial and orthographic drawings of components | * Meaning of pictorial and orthographic drawings and sectioning * Meaning of symbols and abbreviations * Drawing of isometric, oblique, axonometric, auxiliary and perspective views * Drawing of first and third angle projections * Sectioning of components * Free hand sketching of tools, equipment, components, geometric forms and diagrams | * Observation * Written test * Oral test |
| 1. Produce assembly drawings | * Explosion of orthographic views * Explosion of pictorial views * Identification and listing of parts * Production of sectional views * Hatching of drawings | * Observation * Written test * Oral test |
| 1. Apply CAD software in drawing | * Meaning and types of CAD e.g. * Auto CAD * Archi CAD * Solid works * Inventor * Circuit maker * Electronic work bench * 2D and 3D drafting technique * Annotation of models | * Practical * Observation * Written tests |

**Suggested Methods of Instruction**

* Projects
* Demonstration
* Practice by the trainee
* Field trips
* Group discussions
* Direct instructions

**Recommended Resources**

* + Drawing room
  + Computer lab
  + Drawing equipment and materials
  + Computers
  + CAD package
  + Overhead projector

## ENGINEERING MATHEMATICS

**UNIT CODE: ENG/CU/AFE/CC/02/6/A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Engineering Mathematics

Duration of Unit: 150 hours

**Unit Description**

This unit describes the competencies required by a Mechatronics technician to apply a wide range of Engineering mathematics in their work. This includes applying algebraic functions, trigonometry and hyperbolic functions, complex numbers, coordinate geometry, binomial expansion, calculus, ordinary differential equations, Laplace transforms, power series, Statistics, Fourier series, vector theory, matrix, numerical methods, probability, commercial calculations, estimations and measurements in solving problems

**Summary of Learning Outcomes**

1. Apply Algebra
2. Apply Trigonometry and hyperbolic functions
3. Apply complex numbers
4. Apply Coordinate Geometry
5. Carry out Binomial Expansion
6. Apply Calculus
7. Solve Ordinary differential equations
8. Apply Laplace transforms
9. Apply Power Series
10. Apply Statistics
11. Apply Fourier Series
12. Apply Vector theory
13. Apply Matrix
14. Apply Numerical methods
15. Apply concept of probability for work
16. Perform commercial calculations
17. Perform Estimations, Measurements and calculations of quantities

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * 1. Apply Algebra | * Base and Index * Law of indices * Indicial equations * Laws of logarithm * Logarithmic equations * Conversion of bases * Use of calculator * Reduction of equations * Solution of equations reduced to quadratic form * Solutions of simultaneous linear equations in three unknowns * Solutions of problems involving AP and GP | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply Trigonometry and hyperbolic functions | * Half -angle formula * Factor formula * Trigonometric functions * Parametric equations * Relative and absolute measures * Measures calculation * Meaning of hyperbolic equations * Properties of hyperbolic functions * Evaluations of hyperbolic functions Hyperbolic identities * Osborne’s Rule * Ashx+bshx=C equation * One-to-one relationship in functions * Inverse functions for one-to-one relationship * Inverse functions for trigonometric functions * Graph of inverse functions * Inverse hyperbolic functions | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply complex numbers | * Meaning of complex numbers * Stating complex numbers in numbers in terms of conjugate argument and * Modulus * Representation of complex numbers on the Argand diagram * Arithmetic operation of complex numbers * Application of De Moivre’s theorem * Application of complex numbers to engineering | * Assignments * Oral questioning * Supervised exercises * Written tests |
| * 1. Apply Coordinate Geometry | * Polar equations * Cartesian equation * Graphs of polar equations * Normal and tangents * Definition of a point * Locus of a point in relation to a circle * Loci of points for given mechanism | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Carry out Binomial Expansion | * Binomial theorem in determination of Roots of numbers * Estimation of errors of small changes using binomial theorem. * Binomial Expansion in   deriving power series | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply Calculus | * Meaning of derivatives of a function * Differentiation from first principle i.e sin x, cos x, xn and ln x * Tables of some common derivatives * Rules of differentiation i.e. product, chain, quotient, sum, implicit * Rate of change and small change * Derivative of inverse functions * Stationery points of functions of two variables * Meaning of integration * Indefinite and definite integral * Methods of integration, application of integration i.e., Integration by parts, Substitution, polynomials, inverse functions * Integrals of hyperbolic and inverse functions | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Solve Ordinary differential equations | * Types of first order differential equations * Linear Differential Equations * Homogeneous Equations * Exact Equations * Separable Equations * Integrating Factor * Formation of first order differential equation * Solution of first order differential equations * Application of first order differential equations * Formation of second order differential equations for various systems * Solution of second order differential equations * Application of second order differential equations | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply Laplace transforms | * Meaning of Laplace transforms * Deriving Laplace transforms from first principles * State properties of Laplace transform * Determination of inverse LT of simple transforms and partial fractions * Solution of differential equation by LT * Solution of simultaneous differential equation by given initial conditions | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply Power Series | * Meaning of the term power series * Taylor’s theorem * Deduction of Maclaurin’s theorem to obtain power series * Application of Taylor’s theorem and Maclaurin’s theorems in numerical work | * Written tests * Oral questioning * Assignments * Supervised exercises |
| * 1. Apply Statistics | * Classification of data * Grouped data * Ungrouped data * Data collection * Importance of sampling * Errors in sampling * Types of sampling and their limitations * Tabulation of data   + Class intervals   + Class boundaries   + Frequency tables   + Cumulative frequency * Diagrammatic and graphical presentation of data e.g.   + Histograms   + Frequency polygons   + Bar charts   + Pie charts   + Curves * Measures of central tendency (mean, mode and median) * Measures of dispersion * Variance and standard deviation | * Assignments * Oral questioning * Supervised exercises * Written tests * Simulation * Data modelling |
| * 1. Apply Fourier Series | * Determination of the Fourier series as a periodic function of the period 2π and extend to π * Determination of Fourier series of non-periodic functions over a given range * Determination of Fourier series for even and odd functions and the half-range series for a given function * Determination of Fourier series over any range | * Assignments * Oral questioning * Supervised exercises * Written tests |
| * 1. Apply Vector theory | * Definition of dot and cross product of vectors * Solution of problems involving dot and cross production of cross * Definition of operators * Definition of vector field * Solutions of problems involving vector fields * Definition of Gradient, Divergence and curl * Solutions of involving Gradient, Divergence and curl * Application of vectors * Green’s, Gauss’s and Stoke’s theorem and their application | * Assignments * Oral questioning * Supervised exercises * Written tests |
| * 1. Apply Matrix methods | * Matrix operation * Determinant of 3x3 matrix * Inverse of 3x3 matrix * Solutions of linear simultaneous equations in three unknowns * Calculations of Eigen values and Eigen vectors * Application of matrices | * Assignments * Oral questioning * Supervised exercises * Written tests |
| * 1. Apply Numerical methods | * Meaning of interpolation and extrapolation * Application of interpolation * Application of interactive methods to solve equations * Application of interactive methods to areas and volumes | * Assignments * Oral questioning * Supervised exercises * Written tests |
| 1. Apply concepts of probability in work | * Probability * Laws of probability * Expectation variance and S.D. * Types of distributions * Mean, variance and S.D of probability distributions   + Types of probability events * Dependent * Independent * Mutually exclusive   + Counting techniques * Permutation * Combination * Tree diagrams * Venn diagrams   + Application of probability distributions | * Assignments * Oral questioning * Supervised exercises * Written tests |
| 1. Perform commercial calculations | * + Product pricing   + Average sales determination   + Stock turnover   + Calculation of incomes   + Profit and loss calculations   + Salaries * Gross * Net   + Wages * Time rate * Flat rate * Overtime * Piece rate * Commission * Percentage * Bonus   + Conversion of one currency to another   + Exchange rates calculation * Devaluation * Revaluation | * Oral questioning * Written tests * Assignments * Supervised exercises |
| 1. Perform estimations, measurements and calculations of quantities | * Units of measurements and their symbols * Conversion of units of measurement * Calculation of length, width, height, perimeter, area and angles of figures * Measuring tools and equipment * Measurements and estimations of quantities e.g., Areas and volumes using Pappus theorem | * Assignments * Oral questioning * Practical tests * Observation * Supervised exercises * Written tests |

**Suggested Methods of Instruction**

* Group discussions
* Demonstration by trainer
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Rulers, pencils, erasers
* Charts with presentations of data
* Graph books
* Dice
* Computers with internet connection
* Standard mathematical tables

## AERODYNAMICS PRINCIPLES

**UNIT CODE:** ENG/CU/AFE/CC/03/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Aerodynamics Principles

**Duration of Unit:** 130 hours

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to apply aerodynamics principles. It involves uunderstanding atmosphere, applying basic aerodynamics in relation to an aircraft in flight, applying principles of the theory of flight of an aircraft, and applying static and dynamic stability of an aircraft in flight.

**Summary of Learning Outcomes**

1. Understand atmosphere
2. Apply basic aerodynamics in relation to an aircraft in flight.
3. Apply principles of the theory of flight of an aircraft
4. Apply static and dynamic stability of an aircraft in flight

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Understand atmosphere | * + Composition of the atmosphere   + Properties of the air * Temperature * Pressure * Density * Humidity * Layers of the atmosphere * Wind * Description * Causes * Types * Measurements * Effects   + Aircraft speeds * Ground speeds * Air speeds | * Written tests * Oral questioning * Practical |
| 1. Apply basic aerodynamics in relation to an aircraft in flight. | * + Newton’s laws of motion   + Gas laws   + Boyles law   + Charles law   + Combined gas law   + Bernoulli’s principle   + Static pressure   + Dynamic pressure   + Velocities of motion   + Venturi tube | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Apply principles of the theory of flight of an aircraft | * + Classification of aircraft * Lighter than air * Heavier than air   + Parts of an aircraft * Fuselage * Wings * Control surfaces * Undercarriage * Engines * Horizontal stabilizer * Vertical stabilizer * Cockpit   + Types of motion   + Forces in flight * Lift * Weight * Thrust * Drag | * Assignments * Oral questioning * Supervised exercises * Written tests |
| 1. Apply static and dynamic stability of an aircraft in flight | * Airflow patterns * Laminar * Turbulent * Boundary layer * Stages of formation * Factor affecting * Effects of airflow * Safety factors * Aerofoil * Chord * Chord line * Camber * Mean camber * Angle of attack * Angle of incidence * Aspect ratio * Fineness ratio * Principles of operation of an aerofoil * Aerofoil characteristics * Types of aerofoils * Design and nomenclature of aerofoil * Geometric features * NACA digit system NACA sectioning * Generation of lift * Bernoulli’s principle * Equation of continuity of flow * Factors * Lift curve * Centre of pressure and angle of attack * Stalling of an aerofoil * Aircraft drag * Components of drag * Nonlift drag * Boundary layer * Surface friction drag * Transition to turbulence * Form drags * Separation point * Streamlining * Interference drags * Effects of configuring * Effects of speed * Effects of attitude * Lift dependant drag * Aircraft thrust * Calculation of thrust * Aircraft weight * Effects of weight on * Take off distance * Winding loading * Stalling | * Assignments * Oral questioning * Practical * Supervised exercises * Written tests |

**Suggested Methods of Instruction**

* Group discussions
* Demonstration by trainer
* Online video clips
* Power point presentation
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Relevant reference materials
* Stationeries
* Relevant practical materials
* Computers with internet connection

## WORKSHOP PROCESSES AND PRACTICES

**UNIT CODE:** ENG/CU/AFE/CC/04/6/A

**Relationship to Occupational Standards:**

This unit addresses the unit of competency: Perform Workshop Processes and Practices

**Duration of Unit:** 100 Hours

**Unit description**

This unit describes the competencies required by a Avionic technician in order to apply a wide range of workshop technology skills in their work. It involves use of technical drawing to plan work operations, measuring and marking out dimensions on work pieces, using hand tools to cut and file parts, threading using taps and dies, producing components using a lathe and milling machine, assembling metal parts and sub-assemblies, performing housekeeping, inspecting finished work for accuracy and quality and maintaining tools and equipment

**Summary of Learning Outcome**

1. Use technical drawing to plan work operations
2. Measure and mark out dimensions on work pieces
3. Use hand tools to cut and file parts
4. Use drills to make holes
5. Thread using taps and dies
6. Produce components using a lathe and milling machine
7. Assemble metal parts and sub-assemblies
8. Perform housekeeping
9. Inspect finished work for accuracy and quality
10. Maintenance of tools and equipment

**Learning Outcomes, Content and suggested assessment methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Use technical drawing to plan work operations | * Producing technical drawings * Reading and extraction of information (dimensions, tolerances, BS/ANSI Drawing Standards, geometric ISO symbols & abbreviations) * Development of working procedure/ operational plan | * Practical * Observation * Written |
| 1. Measure and mark out dimensions on work pieces | * Selection of measuring tools and marking tools * Steel rule * Vernier calipers * Micrometer screw gauge * Punch * scribers * Inspection and calibration of measuring tools * Marking out of dimensions on the work-piece | * Practical * Observation * Written |
| 1. Use hand tools to cut and file parts | * Selection of the appropriate hand tools * Claw Hammer * Chisel * Hacksaw * File * Screw drivers * Hand drill * Vise etc. * Cutting of the work-piece * Filing of the cut work-piece * Production of all the parts | * Practical * Observation * Written |
| 1. Use drills to make holes | * Marking of hole * Centre punching of hole centers * Selection and mounting of drill bits * Mounting and clamping of the work-piece * Drilling of holes * Inspection of drilled holes | * Practical * Observation * Written |
| 1. Thread using taps and dies | * Selection of taps and dies * Clamping of work-piece * Setting up taps and dies on the work-piece * Cutting of threads | * Practical * Observation * Written |
| 1. Produce components using a lathe and milling machine | * Selection of the right tool * Cutting tool * Boring tool * Knurling tool * Drilling tool * Boring tool * Threading tool * Parting tool * Tool post grinding * Facing of work-piece on the lathe machine * Turning of work-piece * Threading of work-piece * Boring of work-piece * Knurling * Parting of work-piece * Drilling of work-piece * Gear cutting on milling machine * Plane/slab milling * Face milling * Side milling * Angular milling * Gang milling * Form milling * Sprocket cutting | * Practical * Observation * Written |
| 1. Assemble metal parts and sub-assemblies | * Joinery and assembly method selection * Welding * Use of adhesives * Riveting * Use of screws, bolts and nuts * Soldering * Brazing etc * Joining, fitting and assembling * Quality control (Dimensions, Tolerances, surface finishing, Alignment) | * Practical * Observation * Written |
| 1. Performing finishing processes | * Finishing * Polishing * Filing * Grinding * de-burring * painting of components | * Observation * Practical * Observation * Written |
| 1. Performing housekeeping | * Cleaning of work environment (waste sorting and disposal) * Cleaning and storing of tools and equipment * Servicing and maintenance of machine (lubrication, inspection, alignment and adjustment) | * Observation * Practical * Observation * Written |
| 1. Inspect finished work for accuracy and quality | * Selection of inspections methods and tools * Inspection of finished product * Adjustment of product to required specification | * Observation * Practical * Observation * Written |
| 1. Maintenance of tools and equipment | * Inspection of machines and tools * Lubrication of machines and tools * Grinding of tools before storage * Identification of faulty machines and broken tools | * Written * Oral |

**Suggested Methods of Instruction**

* Demonstration by trainer
* Discussions
* Practical work by trainee(s)
* Exercises
* Industrials visits
* Internet.
* Simulation

**List of Recommended Resources**

* Welding
* Drilling machines
* Vices
* Burnishing machine
* Cutting tools
* Combination square
* Centre punch
* Centre lathe
* scribers
* calipers
* Dies and taps
* Surface plate
* V-blocks
* Dial gauge
* Die stock
* Engineer’s square
* File card
* Assorted Files
* Clamps
* Assorted hand tools
* Hammers
* Measuring tools
* Drill bits
* Assorted inspection tools and equipment
* Inspection and measuring tools, GO and NOT GO gauges
* Jigs and fixture
* Pliers
* Rotary disc abrasive grinder
* Reamers
* Saw
* Screwdrivers
* Spiral lowering
* Tap wrench
* Vacuum cleaners
* V-block
* Workbenches
* Vacuum cleaners
* Mops/ Brooms and buckets
* Firefighting equipment
* First Aid kit
* Personal safety gear:
* Goggles
* Safety shoes
* Overall
* Cap
* Ear Muffs
* Gloves
* Drawing papers
* Raw materials
* Mild steel plate
* Sheet metal
* Brass sheets
* Zinc sheets
* Aluminum sheets
* Bright Drawn Mild Steel
* Carbon steel
* Brass rods
* Aluminum rods
* Abrasive materials
* Grinding paste
* Cotton wastes
* Cleaning detergents

## ELECTRICAL AND ELECTRONICS PRINCIPLES

**UNIT CODE:** ENG/CU/AFE/CC/05/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Electrical and Electronics Principles

**Duration of Unit:** 100 hours

**Unit Description**

This unit describes the competencies required by a Avionic technician in order to apply a wide range of electrical and electronics principles skills in their work. It involves use of the concept of basic electrical quantities, use of the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, carrying out power rectification in electrical systems, use earthing in electrical installations and applying lightning protection measures

**Summary of Learning Outcomes**

1. Use the concept of basic Electrical quantities
2. Use the concepts of D.C and A.C circuits in electrical installation
3. Use of basic electrical machine
4. Carry out power rectification in electrical systems
5. Use of earthing in Electrical installations
6. Apply lightning protection measures

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Use the concept of basic Electrical quantities | * The meaning of SI unit * SI unit of various types of Electrical parameters * Calculations involving various Electrical parameters e.g. Power, Current, Voltage, Resistance * Instruments used in measuring various types of Electrical parameters | * Written tests * Oral questioning * Assignments |
| 1. Use the concepts of D.C and A.C circuits in electrical installation | * Ohm’s law * Definition of terms * Parallel and series circuits * AC and DC network theorems | * Written tests * Oral questioning * Assignments |
| 1. Use of basic electrical machine | * Types of Electrical machines * AC and DC single and three phase motors, generators and Transformers * Application of AC and DC machines | * Oral questioning * Written tests |
| 1. Carry out power rectification in electrical systems | * Power rectification methods * Half wave rectifiers * Full wave rectifiers * Full wave Wheatstone bridge * Definition of terms * Power smooth * Power training techniques * Power regulation methods * Power protection methods and devices * Switches * Fuses * Circuit breakers | * Written tests * Oral questioning * Assignments |
| 1. Use of earthing in Electrical installations | * Meaning of Earthing * Terms in Earthing * Earthing points in Electrical installation * Methods of earthing * Factors to consider in selecting an earthing method * Testing an earthing system | * Assignments * Written tests * Practical test |
| 1. Apply lightning protection measures | * Meaning of lightening * Lightening strokes and their types * Lightening protection components * Testing a lightening system * Application of lightening system * Maintenance of lightening system | * Assignments * Oral questioning * Written tests |

**Suggested Methods of Instruction**

* Group discussions
* Demonstration by trainer
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Relevant reference materials
* Stationeries
* Electrical workshop
* Relevant practical materials
* Dice
* Computers with internet connection

# CORE UNITS OF LEARNING

## AIRFRAME STRUCTURES

**UNIT CODE:** ENG/CU/AFE/CR/01/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Produce Airframe

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to produce airframes. It involves marking out aircraft components, cutting and shaping aircraft components, bending and forming aircraft components, carrying out joining process, producing aircraft assemblies, installing aircraft controls, testing aircraft and its components and maintaining airframe and structures.

**Summary of Learning Outcomes**

1. Mark out aircraft components
2. Cut and shape aircraft components
3. Bend and form aircraft components
4. Carry out joining process
5. Produce aircraft assemblies
6. Install aircraft controls
7. Test aircraft and its components
8. Maintain airframe and structures

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Mark out aircraft components | * ATA chapter * Aircraft inspection/ damage assessment * Safety precautions * Aircraft marking tools and equipment * Aircraft materials * Measurement of surface damage * Marking out procedures * Aircraft assessment report | * Practical * Observation * Written * Oral |
| 1. Cut and shape aircraft components | * Safety precautions * Cutting methods * Shaping methods * Cutting tools and equipment * Damage removal * Types of aircraft structures * Types of aircraft structure damage | * Observation * Written * Oral * Practical |
| 1. Bend and shape aircraft components | * Structural manuals * Safety precautions * Measurements and allowances * Bending machines * Shaping machines * Tools and equipment for bending and shaping * Material handling | * Practical * Oral * Observation * Written |
| 1. Carry out joining process | * Joining methods * Welding * Mechanical fastening * Adhesive jointing * Stitching * Operation manuals | * Practical * Oral * Observation * Written |
| 1. Repair aircraft assemblies | * Material specification of the assembly * Material gauge * Heat treatment methods * Safety precautions * Report writing * Tools and equipment for aircraft repair | * Practical * Oral * Observation * Written |
| 1. Install aircraft controls | * Electronic equipment installations * Method of operation * Installation manual. * Monitoring and control systems * Control devices are testing | * Practical * Oral * Observation * Written |
| 1. Test aircraft and its components | * Operational/ functional test * Aircraft testing equipment * Testing methods * Certification | * Practical * Oral * Observation * Written |
| 1. Maintain airframe and structures/ aircraft storage | * Routine servicing check on an air frame and structures * Inspection of aircraft components using * Precision measuring equipment * Non-Destructive Inspection (NDI) techniques * Aircraft structural repair. | * Practical * Oral * Observation * Written |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the mechatronics service and repair sector;
* Industrial visits.

**Recommended Resources**

* Workshop (electrical / mechanical / hydraulic)
* Cutting machines
* Bending machines
* Vices
* Hand tool
* Powers tools
* Fasteners
* Welding machines
* Testing
* Mechanical tool box
* NDT tools
* Aircraft model
* Sheet metal
* Fiberglass materials
* Fabrics
* Manufacturers service manuals for all the modules
* Appropriate airframes and power plant engineering text books

## AIRCRAFT INTERIOR, EQUIPMENT AND FURNISHING

**UNIT CODE:** ENG/CU/AFE/CR/02/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Interior, Equipment And Furnishing

**Duration of Unit:** 130 hours

**Unit description**

This unit covers the competencies required to carry out aircraft interior soft furnishing. It involves installing aircraft lockers and storage units, cutting and shaping furnishings, installing interior panels and soft furnishings, installing aircraft seating and furniture, aircraft lavatory and galley, aircraft emergency equipment and aircraft stretcher

**Summary of Learning Outcomes**

1. Install aircraft lockers and storage units
2. Cut and shape furnishings
3. Install interior panels and soft furnishings
4. Install aircraft seating and furniture
5. Install aircraft lavatory and galley
6. Install aircraft emergency equipment
7. Install aircraft stretcher

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Install aircraft lockers and storage units | * + ATA chapter 25   + Type of material used for lockers and storage units   + Types of aircraft lockers   + Installation and removal of lockers and storage units as per CMM/ AMM | * Practical * Observation * Written * Oral |
| 1. Cut and shape furnishings | * Type of material * Material selection * Fire proof tests * Cutting and sharping of materials | * Observation * Written * Oral * Practical |
| 1. Install interior panels and soft furnishings | * Removal and installation of interior panel | * Practical * Oral * Observation * Written |
| 1. Install aircraft seating and furniture | * Types of aircraft seats * Removal and installation of seats * Maintenance of tables and seats | * Practical * Oral * Observation * Written |
| 1. Install aircraft lavatory and galley | * Removal and installation of lavatory and galleys * Servicing of aircraft lavatories. | * Practical exercises with observation checklists conducted by trainer. * Oral questioning with checklist conducted by trainer to assess. Underpinning knowledge. * Short answer written tests to assess underpinning knowledge. |
| 1. Install aircraft emergency equipment | * Types of aircraft emergency equipment * Location of aircraft emergency equipment * Removal and installation of emergency equipment * Emergency equipment inspection * Emergency equipment certification | * Practical exercises with observation checklists conducted by trainer. * Oral questioning with checklist conducted by trainer to assess underpinning knowledge. * Short answer written tests to assess underpinning knowledge. |
| 1. Install aircraft stretcher | * Types of stretchers * Removal and installation of stretchers | * Practical * Oral * Observation * Written |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the mechatronics service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tools, equipment, Materials and supplies
* Tool box
* Stretcher
* Aircraft seats
* Aircraft fabrics
* Hinges
* Locks
* Life vest
* Life raft
* Aircraft slide
* Aircraft lavatory
* Fasteners
* Storage units
* Lockers
* Cleaning materials
* Manufacturers service manuals for all the modules
* AMM/CMM
* Appropriate mechatronic engineering text books available on numerous eBook websites

## AIRCRAFT POWERPLANT

**UNIT CODE:** ENG/CU/AFE/CR/03/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Power Plant

**Duration of Unit:** 90 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft power plant. It involves competencies to troubleshoot aircraft engine condition, overhaul aircraft engine, service and reassemble aircraft engine components, service and install engine accessories and auxiliary components and test aircraft engine.

**Summary of Learning Outcomes**

1. Troubleshoot aircraft engine condition
2. Remove and install aircraft engine
3. Service aircraft engine components
4. Service and install engine accessories and auxiliary components
5. Test aircraft engine
6. Preserve/depreserve aircraft engine

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Troubleshoot aircraft engine condition | * Functions of an engine * Types of aircraft engines * Working principles of the aircraft engine * Aircraft engine systems (ATAs) * Aircraft maintenance manuals * Aircraft engine inspection | * Practical * Observation * Written * Oral |
| 1. Remove and install aircraft engine | * Aircraft maintenance manuals (AMM) | * Observation * Written * Oral * Practical |
| 1. Service aircraft engine components | * Engine oils * Engine greasing * Aircraft engine cleaning * Aircraft engine general condition. | * Practical * Oral * Observation * Written |
| 1. Service and install engine accessories and auxiliary components | * Engine build-up * Oil pump * Hydraulic pump * Generators * Taco-generators * Fuel pump * Tools and equipment used for servicing engine * Repairing and servicing of faulty engine * Testing of repaired/ serviced engine * Documenting of serviced/ repaired engines | * Practical * Oral * Observation * Written |
| 1. Test aircraft engine | * Aircraft engine functional testing * Monitoring, evaluation and assessment of the engine * Performance parameters of aircraft engine. * Restoring aircraft to normalcy * System commissioning | * Practical * Oral * Observation * • Written |
| 1. Preserve/depreserve/ aircraft engine | * Component Maintenance manuals | * Practical * Oral * Observation * Written |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the mechatronics service and repair sector;
* Industrial visits.

**Recommended Resources**

**Tools, Equipment, materials and supplies**

* Engine models
* Tool box
* Servicing rig
* Cleaning solutions
* Grease
* Engine oil
* Manufacturers service manuals for all the modules
* Appropriate control and instrumentation engineering text books

## AIRCRAFT HYDRAULIC SYSTEM

**UNIT CODE:** ENG/CU/AFE/CR/04/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Hydraulic System

**Duration of Unit:** 100 hours

**Unit description**

This unit covers the competencies required to maintain aircraft hydraulic system. It involves troubleshooting aircraft hydraulic system, removing aircraft hydraulic components, servicing/ repairing aircraft hydraulic components, fitting/replacing aircraft hydraulic components, installing aircraft hydraulic system and testing aircraft hydraulic system.

**Summary of Learning Outcomes**

1. Troubleshoot aircraft hydraulic system
2. Remove aircraft hydraulic components
3. Service/ repair aircraft hydraulic components and system
4. Fit/replace aircraft hydraulic components
5. Install aircraft hydraulic system
6. Test aircraft hydraulic system

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Troubleshoot aircraft hydraulic system | * Introduction of hydraulic systems * Functions * Adherence to cautions/ warning * Types of hydraulic fluids and their properties * Components of hydraulic systems * Hydraulic system inspection * Component functional and operational tests | * Practical * Observation * Written * Oral |
| 1. Remove aircraft hydraulic components | * Safety precautions (MSDS) * Tools and equipment for hydraulic * Reference to appropriate manuals | * Observation * Written * Oral * Practical |
| 1. Service/ repair aircraft hydraulic components and system | * Component cleaning as per appropriate manuals * Component inspection * Replacement procedures as per the relevant procedures * Certification procedures | * Practical * Oral * Observation * Written |
| 1. Fit/replace aircraft hydraulic system/ components | * Work safety precautions * Service manual * Tools and equipment * Replacement/installation procedure * Functional/ operational test | * Observation * Written * Oral * Practical |
| 1. Test aircraft hydraulic system | * Safety precautions * Adherence cautions and warnings * Functional testing of peripheral devices and limit markings * Specifications of hydraulic oil * Calibration of testing equipment * Call for duplicate/ independent inspection * Returning aircraft to service * Certification procedures | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tool box/ (ITEM)
* Hydraulic rig
* Hydraulic pipes (rigid/ flexibles)
* Hydraulic fluids
* Computers
* Reference materials
* Seals
* Filters
* Hydraulic pump
* Models
* Reservoir
* Pump
* Actuator
* Valves
* Instruments
* Sensors
* Compressors
* Regulators
* Manufacturers programming manuals;
* Appropriate programming text books

## AIRCRAFT PNEUMATIC SYSTEM

**UNIT CODE:** ENG/CU/AFE/CR/05/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Carry Out Aircraft Pneumatic System Maintenance

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to carry aircraft pneumatic system maintenance. It involves assessing aircraft pneumatic system, removing aircraft pneumatic components, servicing/ repairing/replacing aircraft pneumatic components, installing aircraft pneumatic system and testing aircraft pneumatic system.

**Summary of Learning Outcomes**

1. Assess aircraft pneumatic system
2. Remove aircraft pneumatic components/systems
3. Service/ repair/replace aircraft pneumatic components
4. Install aircraft pneumatic system/components
5. Test aircraft pneumatic system

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Assess aircraft pneumatic system | * + Introduction of pneumatic systems * Functions * Adherence to cautions/ warning   + Components of pneumatic systems   + Pneumatic system inspection   + Component functional and operational tests   + Troubleshooting Techniques | * Practical * Observation * Written * Oral |
| 1. Remove aircraft pneumatic components/systems | * + Safety precautions   + Relevant Aircraft Maintenance manuals   + Tools and equipment   + Removal pneumatic components   + Pneumatic component cleaning   + Component inspection | * Practical * Observation |
| 1. Service/ repair/replace aircraft pneumatic components | * Safety precautions * Component maintenance manuals * Pneumatic servicing tools and equipment * Components servicing procedures * System testing * Pneumatic system certification | * Observation * Written * Oral * Practical |
| 1. Install aircraft pneumatic system/components | * Aircraft maintenance manuals * Adherence to cautions and warnings * Installation procedures | * Practical * Oral * Observation * Written |
| 1. Test aircraft pneumatic system | * Functional/operational tests * Certification procedures. | * Practical * Oral * Observation * Written |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the mechatronics service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tools box (ITEM)
* Pneumatic rig
* Pneumatic pipes (rigid)
* Computers
* Reference materials
* Seals
* Filters
* Models
* Reservoir
* Actuator
* Brakes
* Valves
* Instruments
* Sensors
* Compressors
* Manufacturers service manuals for all the modules
* Appropriate aircraft maintenance text books

## AIRCRAFT FUEL SYSTEM

**UNIT CODE:** ENG/CU/AFE/CR/06/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Service Aircraft Fuel System

**Duration of Unit:** 120 hours

**Unit description**

This unit covers the competencies required to service aircraft fuel system. It involves competencies required to troubleshoot aircraft fuel system, service fuel system pumps, service/repair fuel tanks, and service/ repair fuel system components

**Summary of Learning Outcomes**

1. Determine fuel system/components maintenance requirements
2. Troubleshoot aircraft fuel system/components
3. Dismantle and inspect fuel system/component parts
4. Repair and/or modify fuel system/components or parts
5. Assemble, test and adjust fuel system components

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Determine fuel system/components maintenance requirements | * Introduction of aircraft fuel system * Functions * Adherence to cautions/ warning * Types of aircraft fuels and their properties * Types of aircraft fuel tanks * Components of aircraft fuel system * Fuel system inspection in accordance with relevant manuals (ATA 28) * Component functional and operational tests * Troubleshooting Techniques | * Observation * Written * Oral * Practical |
| 1. Troubleshoot aircraft fuel system/components | * Troubleshooting manuals and procedures * Fault rectification requirements | * Observation * Written * Oral * Practical |
| 1. Dismantle and inspect fuel system/component parts | * + Safety precautions   + Fuel system component   + Material safety data sheets (MSDS)   + Fuel system inspection   + Dismantling/ assembling procedures in accordance with relevant manuals   + Functional / operational test   + Certification. | * Practical * Oral * Observation * Written |
| 1. Repair fuel system/components or parts | * + Service manual   + Tools and equipment for repairing fuel system   + Fuel system component repair/ service in accordance with CMM procedures   + Components tagging, sealing and packaging   + Certification | * Observation * Written * Oral * Practical |
| 1. Assemble, test and adjust fuel system components | * Safe precautions * Fuel system component assembling in accordance with relevant AMM * Fuel system testing * Leaks * Flow * Certification | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation sector;
* Industrial visits.

**Recommended Resources**

* Tools box (ITEM)
* Fuel pipes (rigid/ flexible)
* Computers
* Reference materials
* Seals
* Filters
* Models
* Fuel tanks
* Valves
* Instruments
* Sensors
* Fuel pumps
* Manufacturer manuals;
* Appropriate project management text books

## AIRCRAFT ICE AND RAIN PROTECTION

**UNIT CODE:** ENG/CU/AFE/CR/07/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Ice and Rain Protection System

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft de-icing and rain protection system. It involves competencies required to troubleshoot aircraft de-icing and rain protection system, service/ repair ice detector system, maintain wing and horizontal and vertical stabilizer anti-icing system, service/repair propeller de-ice system, perform aircraft ground de-icing and maintain aircraft rain protection system

**Summary of Learning Outcomes**

1. Determine aircraft de-icing/anti-icing and rain protection system maintenance requirements
2. Troubleshoot aircraft de-icing/anti-icing and rain protection system
3. Service/ repair ice detector/rain protection system
4. Maintain aircraft anti-icing/anti-icing system
5. Perform aircraft ground de-icing/anti-icing
6. Maintain aircraft rain protection system

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Determine aircraft anti-icing/de-icing and rain protection system maintenance requirements | * Functions of ice and rain protection * Anti- icing * De-icing * Rain protection * Ice theory * Critical areas to be protected from ice formation * Methods of ice and rain protection * Types of ice detectors * Material safety data sheets (MSDS) | * Observation * Written * Oral * Practical |
| 1. Troubleshoot aircraft de-icing/anti-icing and rain protection system | * Troubleshooting manuals and procedures * Fault rectification requirements | * Observation * Written * Oral * Practical |
| 1. Service/ repair ice detector/rain protection system | * + Safety precautions   + Component maintenance manuals   + Ice and rain protection tools and equipment - AMM   + Components servicing procedures   + System testing   + System certification | * Practical * Oral * Observation * Written |
| 1. Perform aircraft ground anti-icing | * + Anti-icing equipment   + Anti-icing fluids   + Relevant ground anti-icing manuals | * Practical * Oral * Observation * Written |
| 1. Maintain aircraft rain protection system | * + Types of rain protection system * Hydrophobic film * Wipers   + Safety precautions and warning   + Certification procedures. | * Practical * Oral * Observation * Written |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tool box (ITEM)
* Avometer
* De-icing fluids
* Compressors
* Valves
* Sensors
* Reference materials
* Instruments
* Relevant maintenance manuals;
* Appropriate aviation text books

## AIRCRAFT LANDING GEAR SYSTEM

**UNIT CODE:** ENG/CU/AFE/CR/08/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Landing Gear System

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft landing gear system. It involves determining aircraft landing gear system maintenance requirements, troubleshooting and overhauling aircraft landing gear and emergency extension, servicing/repairing aircraft steering system and wheels, maintaining aircraft brakes and servicing aircraft tires.

**Summary of Learning Outcomes**

1. Determine aircraft landing gear system maintenance requirements
2. Troubleshoot aircraft landing gear system
3. Retract and extent aircraft landing gear
4. Service/repair aircraft steering system
5. Service/repair aircraft wheels
6. Maintain aircraft brakes
7. Service aircraft tires

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Determine aircraft landing gear system maintenance requirements | * Safety precautions * Functions of landing gears * Types of landing gears * Interfacing systems * Shock absorption * Types * Aircraft braking system * Types * Aircraft wheels * Types * Aircraft tyres * Sections * Aircraft steering * Nose/tail wheel * Indications | * Observation * Written * Oral * Practical |
| 1. Troubleshoot aircraft landing gear system | * Troubleshooting manuals and procedures * Fault rectification requirements | * Observation * Written * Oral * Practical |
| 1. Retract and extend aircraft landing gear | * Retraction and extension (normal) * Emergency extension | * Practical * Oral * Observation * Written |
| 1. Service/repair aircraft steering system | * + Safety precautions   + Aircraft maintenance manuals   + Steering tools and equipment - AMM   + System servicing procedures   + System testing   + System certification | * Observation * Written * Oral * Practical |
| 1. Service/repair aircraft wheels | * + Safety precautions   + Component maintenance manuals   + Aircraft wheels tools and equipment - AMM   + Components servicing procedures   + Component testing   + Component certification | * Observation * Written * Oral * Practical |
| 1. Maintain aircraft brakes | * + Safety precautions   + Component maintenance manuals   + Aircraft brakes unit tools and equipment - CMM   + Components servicing procedures   + Component testing   + Component certification | * Observation * Written * Oral * Practical |
| 1. Service aircraft tires | * + Safety precautions   + Component maintenance manuals   + Aircraft tyres tools and equipment - CMM   + Components servicing procedures   + Component testing   + Component certification | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tools box (ITEM)
* Reference materials
* Seals
* Models
* Valves
* Instruments
* Sensors
* Wheel hubs
* Tyres
* Shock strut
* Brake unit/pads
* Actuators
* Manufacturer manuals;
* Appropriate project management text books

## AIRCRAFT FIRE PROTECTION SYSTEM

**UNIT CODE:** ENG/CU/AFE/CR/09/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Fire Protection System

**Duration of Unit:** 100 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft fire protection system. It involves installing fire/heat/smoke detection system, fire fighting system, servicing/ repairing fire fighting equipment and testing aircraft fire detection and protection system.

**Summary of Learning Outcomes**

1. Install fire/heat/smoke detection system
2. Install fire extinguishing system
3. Service/ repair fire-extinguishing equipment
4. Test aircraft fire detection and protection system

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Fire/ heat and smoke detection system | * Functions of Fire protection system * Classes of fires * Types of fire detection announcement and extinguishing systems * Distinction between fixed and portable fire extinguishing systems * Types of Extinguishing agents * Types of smoke detectors * Critical areas to be protected from fire * Material safety data sheets (MSDS) | * Observation * Written * Oral * Practical |
| 1. Removal/installation of fire protection system | * Safety precautions and warnings * Material safety data sheets (MSDS) * Fire protection system inspection * Dismantling/ assembling procedures in accordance with relevant manuals * Functional / operational test * Certification. | * Observation * Written * Oral * Practical |
| 1. Maintenance/service/ repair of fire-protection system equipment | * Safety precautions * Component maintenance manuals * Fire protection tools and equipment – AMM/CMM * Components servicing procedures * System testing * System certification | * Practical * Oral * Observation * Written |
| 1. Test aircraft fire detection and protection system | * Fire protection system integrity test * System certification | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tool box (ITEM)
* Avometer
* Fire extinguishing agents
* Fire extinguishing bottles
* HST rig
* Sensors/detectors
* Reference materials
* Instruments
* Warning light bulbs (special bulbs)
* Manufacturer manuals;
* Appropriate project management text books

## AIRCRAFT OXYGEN SYSTEMS

**UNIT CODE:** ENG/CU/AFE/CR/10/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Oxygen Systems

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft oxygen system. It involves competencies required to determine aircraft oxygen requirements, troubleshoot oxygen system components, dismantle and inspect oxygen system components, repair and/or modify oxygen system components, assemble, test and adjust oxygen system components

**Summary of Learning Outcomes**

1. Determine aircraft oxygen system serviceability
2. Troubleshoot oxygen system components
3. Dismantle and inspect oxygen system components
4. Repair and/or modify oxygen system components
5. Assemble, test and adjust oxygen system components

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Determine aircraft oxygen system serviceability | * Safety precautions and warning * Liquid Oxygen and Chemical generated systems * System components * Storage and system supply * Cylinder colour coding | * Observation * Written * Oral * Practical |
| 1. Troubleshoot oxygen system components | * Flow check * Indication | * Observation * Written * Oral * Practical |
| 1. Dismantle and inspect oxygen system components | * Dismantling of system component * Inspection of component * Tagging and packaging of parts requiring specialist repair * Compiling parts lists | * Practical * Oral * Observation * Written |
| 1. Repair and/or modify oxygen system components | * System component repair and replacement * Modification of components | * Observation * Written * Oral * Practical |
| 1. Assemble, test and adjust oxygen system components | * Assembling of oxygen components * Calibrating and adjusting of oxygen system components * Tagging, sealing and packaging of components * Maintenance documentation | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Tools (ITEM) Special
* Oxygen bottles
* Protective Personnel Equipment
* Valves
* Passenger service units (masks)
* Oxygen generators
* Pipes/hoses
* Manufacturer manuals;
* Appropriate project management text books

## AIRCRAFT AIR CONDITIONING AND PRESSURISATION

**UNIT CODE:** ENG/CU/AFE/CR/11/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Air Conditioning and Pressurisation

**Duration of Unit:** 110 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft air conditioning and pressurisation. It involves competencies required to determine aircraft environmental control system requirements, troubleshoot environmental control system components, dismantle and inspect environmental control system components, repair and/or modify environmental control system components, assemble, test and adjust environmental control system components

**Summary of Learning Outcomes**

1. Determine aircraft environmental control system serviceability
2. Troubleshoot environmental control system components
3. Dismantle and inspect environmental control system components
4. Repair and/or modify environmental control system components
5. Assemble, test and adjust environmental control system components

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Determine aircraft environmental control system serviceability | * Workplace safety procedures * Report generation * Inspection of air-conditioning components * Establishing of serving and repairing status * Certification procedures of aircraft air conditioning and pressurization | * Observation * Written * Oral * Practical |
| 1. Troubleshoot environmental control system components | * Obtaining and utilization of troubleshooting report. * Logical processes are used for troubleshooting * Special troubleshooting processes * Location of system faults * Fault rectification requirements | * Observation * Written * Oral * Practical |
| 1. Dismantle and inspect environmental control system components | * Relevant aircraft manuals and ATA chapters * Dismantling system component parts * Inspection of air conditioning and pressurization of components * Packaging and tagging of system components * Compiling and processing parts list | * Practical * Oral * Observation * Written |
| 1. Repair and/or modify environmental control system components | * System component repair and servicing in accordance with relevant AMM * Component modification procedures. | * Observation * Written * Oral * Practical |
| 1. Assemble, test and adjust environmental control system components | * Assembly of component parts * System components adjustment/ calibration * Components are tagging, sealing and packaging. * Maintenance documentation | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* + Standard maintenance toolbox
  + Compressor
  + Condensing unit
  + Evaporator
  + Pipes
  + Sensors
  + Pressurization Gauges
  + Cabin Air Pressure Safety Valve Operation
  + Cabin Pressure Controller
  + Combustion air heater system
  + Manufacturer manuals;
  + Appropriate aeronautical engineering text books

## AIRCRAFT EXTERIOR WORKS

**UNIT CODE:** ENG/CU/AFE/CR/12/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Perform Aircraft Exterior Works

**Duration of Unit:** 120 hours

**Unit description**

This unit describes the competencies required by a technician to perform aircraft body works. It involves performing aircraft towing, aircraft body inspection, cleaning aircraft body, painting aircraft surfaces, carrying out aircraft transfer, decals and livery and striping and removing aircraft finishes.

**Summary of Learning Outcomes**

1. Perform aircraft towing
2. Perform aircraft exterior inspection
3. Clean aircraft body
4. Paint aircraft surfaces
5. Carry out aircraft transfer, decals and livery
6. Strip and remove aircraft finishes

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Perform aircraft towing | * Work safety * Operational inspection of tow tractor and tow bar * Cleaning of the towing tractor * Monitoring of radio communication and towing request instruction. * Towing operations | * Observation * Written * Oral * Practical |
| 1. Perform aircraft exterior inspection | * Inspection tools and equipment * Publications and manuals * Reviewing aircraft logbooks * Reviewing checklists * Visual inspection of aircraft * Specialist aircraft inspection * Documentation of aircraft. | * Observation * Written * Oral * Practical |
| 1. Clean aircraft body | * Properties of aircraft cleaning water * Cleaning tools and detergents * Preparation of aircraft for cleaning * Aircraft cleaning procedures * Banner is removed from covered parts according to safety procedures | * Practical * Oral * Observation * Written |
| 1. Paint aircraft surfaces | * Painting procedures * Relevant aircraft manuals and publications. * Aircraft component for painting * Surface preparation for paint application * Masking and barrier materials * Aircraft surface conditioning * Rectification of painting faults * Painting procedures * Documentation of painting works * Waste disposal * Tools and equipment storage and cleaning * Housekeeping | * Observation * Written * Oral * Practical |
| 1. Carry out aircraft transfer, decals and livery | * Aircraft transfers * Carrying out aircraft decals * Carrying out aircraft liveries * Restoring aircraft normalcy. | * Observation * Written * Oral * Practical |
| 1. Strip and remove aircraft finishes | * Relevant aircraft manuals and ATA chapters * Methods of removing stripping and finishes of aircraft * Strip and aircraft finishes removing procedures * Cleaning of aircraft surface | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop;
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Epoxy primers
* Lacquer primers
* Acrylic top coats
* Polyurethane top coats
* Chemicals
* Masking and barrier materials
* Low pressure gun or touch-up gun
* General purpose suction feed spray guns
* Airless spray units
* Electrostatic spray equipment
* Sanding/polishing equipment and materials
* PPE
* Kenyan environmental legislation, regulations and codes for the storage and disposal of hazardous and toxic materials
* MSDS
* Maintenance organisation manual
* Procedures manual
* Work instructions
* Relevant civil aviation regulations and instructions
* Standing instructions
* Manufacturer manuals;
* Appropriate aeronautical engineering text books

## AVIATION MAINTENANCE PROJECTS

**UNIT CODE:** ENG/CU/AFE/CR/13/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage Aviation Maintenance Projects

**Duration of Unit:** 100 hours

**Unit description**

This unit describes the competencies required by a technician to manage aviation maintenance projects. It involves planning for aviation maintenance project, implementing avionic maintenance activities, providing aviation maintenance guidance, monitoring and certifying aviation maintenance quality, managing human resource activities, performing workplace avionic training tasks and generating aviation technical report and publications.

**Summary of Learning Outcomes**

1. Plan for aviation maintenance project
2. Implement avionic maintenance activities
3. Provide aviation maintenance guidance
4. Monitor and certify aviation maintenance quality
5. Manage human resource activities
6. Perform workplace aviation training tasks
7. Generate aviation technical report and publications

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **LEARNING OUTCOME** | **CONTENT** | **Suggested Assessment Methods** |
| 1. Plan for aviation maintenance project | * Identification and analysis of maintenance tasks * Team organization * Job priority * Job resources * Maintenance facilities | * Observation * Written * Oral * Practical |
| 1. Implement avionic maintenance activities | * Job allocation * Team communication * Job authorization | * Observation * Written * Oral * Practical |
| 1. Provide aviation maintenance guidance | * Team management * Conflict management | * Practical * Oral * Observation * Written |
| 1. Monitor and certify aviation maintenance quality | * Check maintenance activities * Job inspections | * Observation * Written * Oral * Practical |
| 1. Manage human resource activities | * Identifying and addressing human factors affecting job performance * Minimising the possibility of maintenance errors * Maintaining sound teamwork by supporting the identification of contributing factors * Supporting sound employment relations | * Observation * Written * Oral * Practical |
| 1. Perform workplace aviation training tasks | * Delivering on-the-job training * Job documentation * Providing expert witness verification * Providing opportunities for individuals to develop | * Observation * Written * Oral * Practical |
| 1. Generate aviation technical report and publications | * Designing aviation technical report * Data capturing techniques * Problem identifications * Problem resolution strategies * Publication procedures * Copyright legislation * Publication amendment * The publication management database is updated, and the completed publication is delivered or distributed | * Observation * Written * Oral * Practical |

**Suggested Methods of Instruction**

* Presentations and practical demonstrations by trainer;
* Guided learner activities and research to develop underpinning knowledge;
* Supervised activities and projects in a workshop.
* Visiting lecturer/trainer from the aviation service and repair sector;
* Industrial visits.

**Recommended Resources**

* Human resource
* Machines
* Tools and equipment
* Capital
* Human resource
* Machines
* Tools and equipment
* Capital
* Manufacturer manuals;
* Appropriate project management text books