

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

**COMPETENCY BASED CURRICULUM**

**FOR**

**AERONAUTICAL ENGINEERING (AVIONICS OPTION)**

**LEVEL 6**



TVET CDACC

P.O BOX 15745-00100

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 Kenya’s development blue print 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 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 against this background that this Curriculum has been developed.

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 sustainable 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 toreform curriculum development, assessment and certification. This called for a shift to CBET 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 Technician (Avionics). These standards will be the basis for development of competency-based curriculum for Aeronautical Engineering (Avionics) 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.

The 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, Aeronautical 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 recognize with appreciation the role of the Engineering SSAC in ensuring that competencies required by the industry are addressed in this curriculum. I also thank all stakeholders in the engineering sector for their valuable input and all those who participated in the process of developing this curriculum.

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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# ABBREVIATION AND ACRONYMS

A Control version

AC Air conditioning

AIDS Acquired Immunodeficiency Syndrome

AMM Aircraft Maintenance Manuals

AVN Avionics

BC Basic Unit of Competency

CBET Competency Based Education and Training

CC Common unit of Competency

CDACC Curriculum Development Assessment Certification Council

CEO Council Secretary

CMM Component Maintenance Manual

CR Core Unit of Competency

CU Curriculum

ENG Engineering

FOT Fixed orifice tube

GPS Global positioning system

HIVHuman Immuno-Deficiency Virus

ICT Information and Communication Technology

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

KPI King Pin inclination

LCD Liquid Crystal Display

OBD On-board diagnostics

OSH Occupational Safety and Health

PCB Printed Circuit Boards

PESTEL Political Environmental Social Technological Economic Legal

PPE Personal protective equipment

Q&A Questions and Answer

SOP Standard Operating Procedures

SSAC Sector Skills Advisory Committee

SWOT Strength Weakness Opportunity Threat

TQM Total Quality Management

TVET Technical and Vocational Education and Training

# **KEY TO UNIT CODE**

 **ENG /CU/AVN /BC /01/ 6 /A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Control Version

# COURSE OVERVIEW

Aeronautical engineering (Avionics) level 6 qualifications consists of competencies that a person must achieve to enable him/her to work in aviation industry. It entails maintaining aircraft electrical systems, maintaining aircraft auto flight, instrumentation and control, maintaining aircraft cable/harness looms and fiber optic cables, performing assembly of avionics components and PCBS, maintaining aircraft radio systems (communication, navigation and radar), maintaining aircraft compass compensation and adjustment systems, operating aircraft electro-optical and infrared system, performing aircraft store procedures and managing avionic maintenance projects.

The units of learning comprising Aeronautical engineering (Avionics option) level 6 qualifications include 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/AVN/BC/01/6/A | Communication Skills | 40 | 4.0 |
| ENG/CU/AVN/BC/02/6/A | Digital Literacy | 60 | 6.0 |
| ENG/CU/AVN/BC/03/6/A | Entrepreneurial Skills | 100 | 10.0 |
| ENG/CU/AVN/BC/04/6/A | Employability Skills | 80 | 8.0 |
| ENG/CU/AVN/BC/05/6/A | Environmental Literacy | 40 | 4.0 |
| ENG/CU/AVN/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/AVN/CC/01/6/A | Technical Drawing | 145 | 14.5 |
| ENG/CU/AVN/CC/02/6/A | Engineering Mathematics | 135 | 13.5 |
| ENG/CU/AVN/CC/03/6/A | Workshop Processes And Practices | 135 | 13.5 |
| ENG/CU/AVN/CC/04/6/A | Electrical And Electronics Principles | 155 | 15.5 |
| ENG/CU/AVN/CC/05/6/A | Aerodynamics Principles | 145 | 14.5 |
| **Subtotal 2** | 715 | 71.5 |

**Core Units Of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code**  | **Units Title**  | **Duration In Hours**  | **Credits Factors** |
| ENG/CU/AVN/CR/01/6/A | Aircraft Electrical Systems | 135 | 13.5 |
| ENG/CU/AVN/CR/02/6/A | Aircraft Auto Flight, Instrumentation and Control System | 155 | 15.5 |
| ENG/CU/AVN/CR/03/6/A | Aircraft Cable/Harness Looms and Fiber Optic Cables | 155 | 15.5 |
| ENG/CU/AVN/CR/04/6/A | Assembly Of Avionics Components and Printed Circuit Boards (PCBS) | 145 | 14.5 |
| ENG/CU/AVN/CR/05/6/A | Aircraft Radio Systems (Communication, Navigation and Radar) | 155 | 15.5 |
| ENG/CU/AVN/CR/06/6/A | Maintain Aircraft Compass Compensation and Adjustment Systems | 135 | 13.5 |
| ENG/CU/AVN/CR/07/6/A | Aircraft Electro-Optical and Infrared System | 155 | 15.5 |
| ENG/CU/AVN/CR/08/6/A | Aircraft Store Procedures | 145 | 14.5 |
| ENG/CU/AVN/CR/09/6/A | Managing Avionic Maintenance Projects | 145 | 14.5 |
| ENG/CU/AVN/CR/10/6/A | Industrial Attachment | 480 | 48.0 |
| **Subtotal 3** | 1805 | 180.5 |
| **Grand Total** | 2880 | 288.0 |

**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. Level 5 certificate in a related course

**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**

Trainer of this course must have a qualification higher 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 national qualification in Aeronautical Engineering ( Avionics option) 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/AVN/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/AVN/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/AVN/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/AVN/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/AVN/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/AVN/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/AVN/CC/1/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Prepare and interpret technical drawings**

**Duration of Unit:** 145 Hours

**Unit Description**

This unit covers the competencies required to prepare and interpret technical drawings by avionic technician. It involves using and maintaining drawing equipment and materials, producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings of components, assembly drawings 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 pictorial and orthographic drawings of components
5. Produce assembly drawings
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/AVN/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

## WORKSHOP PROCESSES AND PRACTICES

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

**Relationship to Occupational Standards:**

This unit addresses the unit of competency: **Perform workshop processes and practices**

**Duration of Unit**: 135 Hours

**Unit description**

This unit describes the competencies required by an 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. Thread using taps and dies
5. Produce components using a lathe and milling machine
6. Assemble metal parts and sub-assemblies
7. Perform housekeeping
8. Inspect finished work for accuracy and quality
9. 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 e.t.c
* 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 Delivery Methods**

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

**List of Recommended Resources**

**Tools and equipment suggested but not limited to:**

* 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

**Materials and supplies suggested but not limited to:**

* 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/AVN/CC/04/6/A

**Relationship to Occupational Standards**

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

**Duration of Unit:** 155 hours

**Unit Description**

This unit describes the competencies required by an 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

## AERODYNAMICS PRINCIPLES

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply aerodynamics principles**

**Duration of Unit**: 145 hours

**Unit description**

This unit describes the competencies required by a technician to apply aerodynamics principles. It involves competencies required to understand atmosphere, apply basic aerodynamics in relation to an aircraft in flight, apply principles of the theory of flight of an aircraft, and apply 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
* Non-lift 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

# CORE UNITS OF LEARNING

## AIRCRAFT ELECTRICAL SYSTEMS

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain aircraft electrical systems

**Duration of Unit:** 135 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft electrical systems. It involves observing occupational health and safety, troubleshooting/diagnosing aircraft electrical systems, rectifying aircraft electrical defects, performing electrical terminations, connections and interconnections, maintaining aircraft batteries, servicing/ repairing aircraft generators and controls, installing aircraft electrical components, modifying aircraft electrical systems and testing aircraft electrical system

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Troubleshoot/diagnose aircraft electrical systems
3. Rectify aircraft electrical defects
4. Perform Electrical Terminations, Connections and interconnections
5. Maintain aircraft batteries
6. Service/ repair aircraft generators and control units
7. Install aircraft electrical components
8. Modify aircraft electrical systems
9. Test aircraft electrical system

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Observe occupational health and safety
 | * Personal safety
* Work environment
* Lighting
* Weather
* Radiations
* Chemicals
* Biological hazards
* Psychosocial hazards
* Physiological hazards
* Noise and vibrations
* Personal protective equipment
* Equipment
* Fire safety
* Housekeeping workspace
* Workplace is planning.
 | * Practical
* Observation
* Oral
 |
| 1. Troubleshoot/diagnose aircraft electrical systems
 | * Methods of troubleshooting
* Use of FIM – Faults Isolation Manual
* Maintenance manuals
* Relevant tools for troubleshooting electrical system
* Safety precautions on troubleshooting electrical system
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Rectify aircraft electrical defects
 | * Use of relevant aircraft manuals
* CMM – Component maintenance manual
* AMM – Aircraft maintenance manual
* SWPM – Standard wiring practices manual (ATA 20)
* WDM – Wiring diagram manual

  | * Practical
* Oral
* Observation
* Written
 |
| 1. Perform electrical terminations, connections and interconnections
 | * Aircraft wires
* Terminations
* Connective devices
* Connectors
* Connectors contacts
* Front release connectors
* Rear release connectors
* Connector strain relief
* Coax connectors
* Splices
* Crimping tools
* Clamps
* Electrical bonding and grounding
* Wiring terminals
* Cutting and stripping wire and cable
* Crimping insulation
* Dimple codes
* Gauges
* Limitations on soldered terminals for aircraft for aircraft use
* Solderless terminals and splices
* Copper terminals
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Maintain aircraft batteries
 | * Types of aircraft batteries
* Construction of aircraft batteries
* Methods of charging and discharging batteries
* Capacity tests
* Deep cycling
* Safety precautions
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Service/ repair aircraft generators and controls and protective devices
 | * Types of generators
* AC
* DC
* AC and DC generation
* TRU – Transformer Rectifier Unit
* Static invertors
* Generator control and protective devices
* Bus ties
* Relays
* Circuit breakers
* Fuses
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Install aircraft electrical components
 | * Electrical components
* Switches
* Fuses
* Circuit breakers
* Relays and solenoids
* Inflight Entertainment system (IFE)
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Modify aircraft electrical system
 | * Service Bulletin (SB)
* Airworthiness Directives (AD)
* Relevant aircraft manuals
* Relevant publications and Circulars
* Service information letters
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Test aircraft electrical system
 | * Electrical testing equipment
* Automatic Test Equipment (ATE)
* Types of aircraft testing
* Functional test
* Operational test
* LRU (Line Replaceable Units) test
* System test
* BITE (Build in test equipment) test
 | * 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 Avionics service and repair sector.
* Industrial visits.

**Recommended Resources**

* Helmet
* Ear plugs/ muffs
* Overalls
* Safety boots/ shoes
* Reflectors
* Gloves
* Heat guns
* Crimping tools
* Digital Modular Code (DMC) kit
* Cables
* Connectors
* Splices
* Terminals
* Sleeves
* Tie rap gun
* Fiber optic connectors
* Batteries
* Generators
* Respirator filters
* Safety glasses Computer modules
* Avometer (Multimeter)
* Meggar
* Bonding tester
* Aircraft Manufacturers service manuals for all the modules
* Appropriate aircraft electrical engineering text books

## AIRCRAFT AUTOFLIGHT, INSTRUMENTATION AND CONTROL SYSTEM

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Auto Flight, Instrumentation and Control System

**Duration of Unit:** 155 hours

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft auto flight, instrumentation and control system. It involves troubleshooting/diagnosing aircraft auto flight, instrumentation and control system, rectifying aircraft instruments defects, installing aircraft instruments and control components, installing aircraft flight guidance and control systems (Auto flight), performing aircraft software uploading and downloading, servicing and repairing aircraft instrument components, installing inertial navigation system/inertial reference system and testing aircraft instruments and control systems

**Summary of Learning Outcomes**

1. Troubleshoot/diagnose aircraft auto flight, instrumentation and control system
2. Rectify aircraft instruments defects
3. Install aircraft instruments and control components
4. Install aircraft flight guidance and control systems (Auto flight)
5. Perform aircraft software uploading and downloading
6. Service and repair aircraft instrument components
7. Install inertial navigation system/inertial reference system
8. Test aircraft instruments and control systems

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Troubleshoot/diagnose aircraft auto flight, instrumentation and control system
 | * Methods of troubleshooting
* Use of FIM – Faults Isolation Manual
* Maintenance manuals
* Relevant tools for troubleshooting auto flight, instrumentation and control system
* Safety precautions on troubleshooting auto flight, instrumentation and control system
 | * Practical
* Observation
* Written
* Oral
 |
| 1. Rectify aircraft instruments defects
 | * Use of relevant aircraft manuals
* CMM – Component maintenance manual
* AMM – Aircraft maintenance manual
* SWPM – Standard wiring practices manual (ATA 20)
* WDM – Wiring diagram manual
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Install and maintain aircraft instruments
 | * Aircraft instruments
* Pressure measurements
* Temperature measurements
* Rotational speed measurements
* Quantity measurements
* Flow measurements
* Pitot-static systems
* Vacuum systems
* Gyroscopic instruments
* Instrument system installation
* Panel layout
* Instrument range markings
* Equipment and instrument mounting
* Position indicators
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Maintain aircraft flight guidance systems (Auto flight)
 | * + Principles of flight
	+ Fixed-wing aircraft
	+ Helicopters
	+ Servomechanisms and automatic control fundamentals
	+ Sensing of attitude changes
	+ Command signal detection
	+ Command signal processing
	+ Outer loop control
	+ Conversion of command signals to powered control
	+ Automatic control of helicopters
	+ Flight director systems
	+ Automatic landing and auto throttle systems
	+ Fly-by-wire control systems
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Perform aircraft software uploading and downloading
 | * Software installation and downloading procedures
* Pre-requisites for software loading
 | * 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. Service and repair aircraft instrument components
 | * Instrument maintenance
* Cleaning
* Calibration
* Static leaks
* Pitot covers installation
 | * 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 inertial navigation system/inertial reference system
 | * Inertia reference system
* Laser gyros
* Accelerometer
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Test aircraft instruments and control systems
 | * Auto flight testing equipment
* Automatic Test Equipment (ATE)
* Types of aircraft testing
* Functional test
* Operational test
* LRU (Line Replaceable Units) test
* System test
* BITE (Build in test equipment) test
 | * Practical
* Observations
 |

**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 Avionics service and repair sector;
* Industrial visits.

**Recommended Resources**

* A fully equipped Avionic workshop
* Fully functional sensor modules
* Electronic modules
* Control modules
* Tools as per the CMM and AMM
* Driver modules
* Gauges
* Pneumatic components
* Screw drivers
* Test bench
* Testing and measuring instruments modules
* Power supply modules
* Soldering guns and irons
* Holding vices
* Internet access to manufacturers’ technical information;
* Calibration setting tools;
* Personal protective equipment (PPE) and suitable coverings to machines
* Consumables for electrical installation
* Manuals
* Cables and conductors
* Pipes and conduits
* Electrical accessories
* Oils and lubricants
* Electronic components
* Oil seals and gaskets;
* Drive belts**.**
* Manufacturers service manuals for all the modules
* Appropriate Avionic engineering text books available on numerous eBook websites

## AIRCRAFT CABLE/HARNESS LOOMS AND FIBER OPTIC CABLES

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Maintain aircraft cable/harness looms and fibre optic cables**

**Duration of Unit:** 155 hours

**Unit description**

This unit covers the competencies required to maintain aircraft cable looms and fibre optic cables. It involves observing occupational health and safety, troubleshooting aircraft cable looms, rectifying aircraft cable looms, modifying aircraft cable looms, installing aircraft cable looms and testing aircraft cable looms.

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Troubleshoot aircraft cable/harness looms
3. Rectify aircraft cable/harness looms
4. Modify aircraft cable looms
5. Install aircraft cable looms
6. Test aircraft cable looms

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Observe occupational health and safety
 | * Personal safety
* Work environment
* Lighting
* Weather
* Radiations
* Chemicals
* Biological hazards
* Psychosocial hazards
* Physiological hazards
* Noise and vibrations
* Personal protective equipment
* Equipment
* Fire safety
* Housekeeping workspace
* Workplace planning.
 | * Practical
* Observation
* Written
* Oral
 |
| 1. Troubleshoot aircraft cable/harness looms
 | * Relevant aircraft maintenance documentation.
* Preparation of aircraft cable/harness looms system.
* Testing aircraft cable looms system
* Testing insulation resistance
* Using specialist tools in troubleshooting process.
* Locating aircraft cable/harness looms system faults and the causes of the faults
* Determining rectification requirements
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Rectify aircraft cable/harness looms
 | * + Interpreting aircraft cable/harness loom
	+ Reports
	+ Part number
	+ Serial number
	+ Inspecting aircraft cables/harnesses looms
	+ Tagging cable/harness looms
	+ Repairing cable/harness looms
	+ Generating technical rectification report
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Modify aircraft cable looms
 | * Rendering cable/harness loom safe
* Assessing cable/harness looms for serviceability
* Modifying of cable/harness looms
* Documenting aircraft cable/harness loom modification
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Install aircraft cable looms
 | * Checking aircraft cable/harness loom to be installed
* Performing installation of cable loom
* Reinstating cable loom system
* KCAA regulations on cable looms
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Test aircraft cable looms
 | * Aircraft cable loom testing equipment
* Automatic Test Equipment (ATE)
* Types of aircraft testing
* Functional test
* Operational test
* LRU (Line Replaceable Units) test
* System test
* BITE (Build in test equipment) test
 | * 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 motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Gloves
* Helmets
* Reflectors
* Safety shoes/boots
* Tool box
* Testers
* Multimeter
* KCAA regulations
* Aircraft maintenance manual (AMM)
* Aircraft wiring manual
* Meggar
* Avometer
* Heat gun
* Crimping tool
* Manufacturers service manuals for electro-mechanical system being serviced;
* Appropriate electro-mechanical engineering text books
* Health and Safety manuals

## ASSEMBLY OF AVIONICS COMPONENTS AND PRINTED CIRCUIT BOARDS (PCBS)

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Perform assembly of avionics components and printed circuit boards (PCBS)**

**Duration of Unit:** 145 hours

**Unit description**

This unit describes the competencies required by a technician to perform assembly of avionic components and PCBs. It involves inspecting, troubleshooting, dissembling and assembling multi-layer printed circuit cards and associated components.

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Inspect multi-layer printed circuit cards and associated components
3. Test multi-layer printed circuit cards and associated components
4. Troubleshoot multi-layer printed circuit cards and associated components
5. Disassemble multi-layer printed circuit cards and associated components
6. Assemble multi-layer printed circuit cards and associated components

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Observe occupational health and safety
 | * + Personal protective equipment
	+ Storage of tools and equipment
	+ Usage of workshop tools and equipment
	+ Workspace housekeeping
	+ Workplace planning
	+ First aid
 | * Practical
* Observation
* Written
* Oral
 |
| 1. Inspect multi-layer printed circuit cards and associated components
 | * Interpreting relevant maintenance documentation
* Preparation of work area and circuit card assemblies
* Substrate
* Circuit tracks
* Edge connectors
* Components
* Static discharge
* Inspection of circuit card assemblies
* Establishing modification status
* Identifications of defects
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Test multi-layer printed circuit cards and associated components
 | * Preparing circuit card assemblies
* Testing circuit card assemblies
* Aligning circuit card assemblies, hardware and electronic components
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Troubleshoot multi-layer printed circuit cards and associated components
 | * Application of maintenance documentation
* Maintenance manual fault diagnosis guides, logical processes and test equipment
* Location of component faults
* Causes of the faults
* Rectification requirements for components.
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Disassemble multi-layer printed circuit cards and associated components
 | * Removing conformal/protective coatings
* Observing appropriate OHS precautions during maintenance procedure
* Disassembling circuit card assembly
* Tagging and dispatching parts for processing
* Packaging and storing parts for retention and re-fitment
* Disposal of parts
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Assemble multi-layer printed circuit cards and associated components
 | * Parts removal and replacement
* Rework techniques CMM
* Assembling of Printed circuit card and associated components
* Circuit substrate material, circuit tracks, edge connectors and through-hole eyelets
 | * 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 Avionics service and repair sector;
* Industrial visits.

**Recommended Resources**

* Capacitors
* Resistors
* Wires
* Transistors
* MOSFET
* Diodes
* Semiconductors
* Inductors
* Transformers
* Switches
* Connectors
* Multi-pin ICS
* Terminal posts and heat-sink materials
* Component Maintenance Manual(CMM)
* Aircraft Maintenance Manual (AMM)

## AIRCRAFT RADIO SYSTEMS (COMMUNICATION, NAVIGATION AND RADAR)

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Radio Systems (Communication, Navigation and Radar)

**Duration of Unit:** 145 hours

**Unit description**

This unit covers the competencies required to maintain aircraft radio system. It involves observing occupational health and safety, troubleshooting/diagnosing aircraft radio systems, rectifying aircraft radio defects, installing aircraft communication systems, installing aircraft navigation systems, installing aircraft radar system, reducing radio interference, servicing and repairing aircraft radio components and testing aircraft radio systems.

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Troubleshoot/diagnose aircraft radio systems
3. Rectify aircraft radio defects
4. Install aircraft communication systems
5. Install aircraft navigation systems
6. Install aircraft radar system
7. Reduce radio interference
8. Service and repair aircraft radio components
9. Test aircraft radio systems

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Observe occupational health and safety
 | * Safety precautions
* Electro-static devices (ESD)
* ESD carrier bags
* Wrist-strap
* Material handling
* Workstations
* High frequency (HF) radio
* Refuelling
* Personnel
 | * Practical
* Observation
* Written
* Oral
 |
| 1. Troubleshoot/diagnose aircraft radio systems
 | * No transmission
* No reception
* Methods of troubleshooting
* Bench
* In-situ
* Tools and equipment for troubleshooting aircraft radio system
* Maintenance messages
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Rectify aircraft radio defects
 | * Use of relevant aircraft manuals
* CMM – Component maintenance manual
* AMM – Aircraft maintenance manual
* SWPM – Standard wiring practices manual (ATA 20)
	+ WDM – Wiring diagram manual
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Install aircraft communication systems
 | * Radio mountings
* Check for integrity of radio mounting
* Checking aircraft communication system to be installed
* Control unit
* Transceiver
* Antenna
* Performing installation of communication system
* Reinstating communication system
* Boding music
* KCAA regulations on radio communication systems
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Install aircraft navigation systems
 | * Navigation mountings
* Checking aircraft navigation system to be installed
* Performing installation of navigation system
* Reinstating navigation system
* KCAA regulations on navigation systems
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Install aircraft radar system
 | * Radar mountings check for integrity
* Wave guides integrity
* Checking aircraft radar system to be installed
* Performing installation of radar system
* Restore radar system
* KCAA regulations on radar systems
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Reduce radio interference
 | * Radio interference
* Sources
* Types of interference
* Precipitation static
* Electrostatic induction
* Capacitive pick ups
* Inductive pick ups
* Cross-talks
* Reduction of radio interferences
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Service and repair aircraft radio components
 | * Troubleshooting radio components
* Replacement of fault components
* Repair tools and equipment
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Test aircraft radio systems
 | * Aircraft radio system testing equipment
* Automatic Test Equipment (ATE)
* Types of aircraft testing
* Functional test
* Operational test
* LRU (Line Replaceable Units) test
* System test
* BITE (Build in test equipment) test
 | * 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 motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Test bench
* Headphone
* Antenna
* Control unit
* Frequency synthesizer
* Oscilloscope
* Tool box
* Power supply
* Cables
* Fiber optic cables
* Wrist strap
* Electrostatic mat
* Dummy load
* Bonding tester
* Multimeter
* DME (Distance measuring equipment)
* VOR (Omni-Directional Range)
* Glideslope
* Localiser
* Marker beacon
* GPS – Global Positioning System
* SATCOM – Satellite Communication Manufacturers programming manuals;
*  CMM
*  AMM
* Appropriate programming text books

## MAINTAIN AIRCRAFT COMPASS COMPENSATION AND ADJUSTMENT SYSTEMS

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Aircraft Compass Compensation And Adjustment Systems

**Duration of Unit:** 135hours

**Unit description**

This unit covers the competencies required to maintain aircraft compass compensation and adjustment systems. It involves observing occupational health and safety, troubleshooting aircraft direct and remote reading compass, rectifying aircraft compass compensation and adjustment systems, install direct reading compass and remote reading compass and testing aircraft compass compensation and adjustment systems.

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Troubleshoot aircraft direct and remote reading compass
3. Rectify aircraft compass compensation and adjustment systems
4. Install direct reading compass
5. Install remote reading compass
6. Test aircraft compass compensation and adjustment systems

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Observe occupational health and safety
 | * Types and usage of PPE
* Industrial safety signs
* Safety standards
* Safety operations
* First aid
* Fire fighting
* House keeping
 | * Practical
* Observation
* Written
* Oral
 |
| 1. Troubleshoot aircraft direct and remote reading compass
 | * Troubleshooting
* Direct reading compass
* Remote reading compass
* Base survey techniques
 | * Practical
* Observation
 |
| 1. Rectify aircraft compass compensation and adjustment systems
 | * Compass swing
* Compass swinging areas
* Aircraft magnetism
* Terrestrial magnetism – variation
* Methods and procedures of swinging compasses
* Flux valve operation
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Install direct reading compass
 | * Remove and install flux valve
* Compensation and adjustment procedures
* Compass types
* Calculations and effects on a compass
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Install remote reading compass
 | * Removing and installing compass integral lights
* Inspection of compass before installation
* Locating and identifying components of a remote compass
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Test aircraft compass compensation and adjustment systems
 | * Pivot test
* Damping test
* Locating and identifying the point at which index error is adjusted
* Storage of master compass
 | * 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 Avionics service and repair sector;
* Industrial visits.

**Recommended Resources•**

* Storage master compass
* Compass
* Compass tester
* Non-magnetic screw drivers
* Non-magnetic environment
* Non-magnetic clothing and jewellery
* Safety boot/shoes
* Multimeter
* Nonmagnetic tools
* Compass card
* Luber line
* Compass rose
* Heading bug
* Manufacturers service manuals for all the modules
* CMM
* AMM
* Appropriate industrial automation and robotics engineering text books

## AIRCRAFT ELECTRO-OPTICAL AND INFRARED SYSTEM

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Operate aircraft electro-optical and infrared system**

**Duration of Unit:** 155 hours

**Unit description**

This unit covers the competencies required to operate aircraft electro-optical and infrared system. It involves observing occupational health and safety, troubleshooting aircraft electro-optical and infrared system, rectifying aircraft electro-optical and infrared components, installing electro-optical and infrared components, repairing aircraft infrared sources, testing aircraft electro-optical and infrared systems and operating aircraft electro-optical and infrared system

**Summary of Learning Outcomes**

1. Observe occupational health and safety
2. Troubleshoot aircraft electro-optical and infrared system
3. Rectify aircraft electro-optical and infrared components
4. Install electro-optical and infrared components
5. Repair aircraft infrared sources
6. Test aircraft electro-optical and infrared systems
7. Operate aircraft electro-optical and infrared system

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested assessment methods** |
| 1. Observe occupational health and safety
 | * + Types and usage of PPE
	+ Industrial safety signs
	+ Safety standards
	+ Safety operations
	+ First aid
	+ Fire fighting
	+ House keeping
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Troubleshoot aircraft electro-optical and infrared system
 | * Relevant aircraft electro-optical and infrared maintenance documentation.
* Preparation of aircraft electro-optical and infrared systems.
* Testing aircraft electro-optical and infrared system
* Using specialist tools in troubleshooting process.
* Locating aircraft electro-optical and infrared system faults and the causes of the faults
* Determining rectification requirements
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Rectify aircraft electro-optical and infrared components
 | * Rendering aircraft system
* Electro-optical and infrared system component
* Maintenance documentation
* Tagging and packaging components
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Install electro-optical and infrared components
 | * Electro-optical and infrared system components
* Physical installation of components
* System maintenance
* Maintenance documentation
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Repair aircraft infrared sources
 | * Use of relevant aircraft manuals
* CMM – Component maintenance manual
* AMM – Aircraft maintenance manual
* SWPM – Standard wiring practices manual (ATA 20)
* WDM – Wiring diagram manual
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Test aircraft electro-optical and infrared systems
 | * Components adjustment and calibration
* Tagging, sealing and packaging finished components
* Testing Electro-optical and infrared system
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Operate aircraft electro-optical and infrared system
 | * Relevant maintenance manual
* Aircraft electro-optical and infrared parts.
* Safety precautions
* Operation of electro-optical and infrared system
* Basic maintenance in accordance with relevant manuals
 | * 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 motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Fiber optic cables
* Light source (transmitter)
* Receivers
* Aviation tool box
* Display unit
* Sensor unit
* Processor unit
* Control panel unit
* IR camera
* Power supply
* Recorders
* Manufacturer manuals;
* Appropriate project management text books

## AIRCRAFT STORE PROCEDURES

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

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Perform Aircraft Store Procedures

**Duration of Unit:** 145 hours

**Unit description**

This unit covers the competencies required to perform aircraft store procedures. It involves requesting aircraft parts from the store, inspecting received aircraft parts, monitoring and ensure smooth flow of parts and maintaining organization’s technical library.

**Summary of Learning Outcomes**

1. Requisite aircraft parts from the store
2. Inspect received aircraft parts
3. Monitor and ensure smooth flow of parts
4. Maintain organization’s technical library

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

|  |  |  |
| --- | --- | --- |
| **Learning outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Requisite aircraft parts from the store
 | * Work instructions
* Organizational policy.
* Requisition forms
* Aircraft parts and materials (spares)
* Utilization of aircraft materials
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Inspect received aircraft parts
 | * Aircraft business documents
* Aircraft store procedures
* Inspection of store materials.
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Monitor and ensure smooth flow of parts
 | * Aircraft parts database
* Store terms and conditions
* Generating requisition forms
* Checking and distributing materials
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Maintain organization’s technical library
 | * Maintenance reports and documentation
* KCAA regulations
 | * 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 motor vehicle service and repair sector;
* Industrial visits.

**Recommended Resources**

* Spare parts
* Manuals
* Softwares
* Consumables
* Computers
* Aviation store
* Manufacturer manuals;
* Appropriate project management text books

## MANAGING AVIONIC MAINTENANCE PROJECTS

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

**Relationship to Occupational Standards**

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

**Duration of Unit:** 145 hours

**Unit description**

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

**Summary of Learning Outcomes**

1. Plan for avionic maintenance project
2. Implement avionic maintenance activities
3. Provide avionic maintenance guidance
4. Monitor and certify avionic maintenance quality
5. Manage human resource activities
6. Perform workplace avionic 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 avionic maintenance project
 | * Identification of maintenance tasks
* Maintenance data
* Team organization
* Resources identification
* Tools and support equipment
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Implement avionic maintenance activities
 | * Job allocation
* Communication
* Job authorization
* Job procedures
* Job legal requirements
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Provide avionic maintenance guidance
 | * Providing guidance to team members
* Determining cause of complex faults or faults
 | * Practical
* Oral
* Observation
* Written
 |
| 1. Monitor and certify avionic maintenance quality
 | * Checking maintenance activities
* Performing check inspections
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Manage human resource activities
 | * Human factors affecting job performance
* Minimise maintenance errors
* Maintain sound teamwork
* Supporting sound employment relations
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Perform workplace avionic training tasks
 | * Delivering on-the-job training
* Supervisory documents
* Providing expert witness verification
* Developing individual competencies
 | * Observation
* Written
* Oral
* Practical
 |
| 1. Generate aviation technical report and publications
 | * Generating aviation technical report
* Identifying potential problems
* Problem resolution strategies
* Copyright legislation
* Publication of reports
* Database management
 | * 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 motor vehicle 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