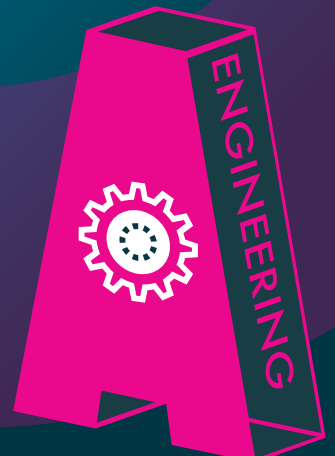


OEM ENGINEERING APPRENTICESHIP

MODULE DESCRIPTORS
AND INDICATIVE
CONTENT





THE STRUCTURE OF THE OEM ENGINEERING APPRENTICESHIP

Programme Structure and Duration

This is a three-year programme delivered over three stages:

- > Stage / Year one commences with 16 weeks off-the-job training (at Cavan and Monaghan ETB or Limerick Clare ETB) with the remainder of the year spent applying these skills in the workplace.
- > Stage / Year two and three follow the same format.

Breakdown of modules by stage/year:

16 WEEKS

CORE

- > Health & Safety
- > Engineering Drawings
- > OEM Practices
- > Electrical & Electronic Technology

UNDERPINNING

- > Team Leadership
- > Communication
- > Applied Engineering

16 WEEKS

CORE

- > Mechatronics
- > Testing & Measurement of Electronic Systems
- > OEM Operations Management

UNDERPINNING

- > Team Leadership
- > Communication
- > Applied Engineering

16 WEEKS

CORE

- > Analytics & Problem-Solving
- > Industrial Robotics & PLCs
- > Capstone Work-based Project

UNDERPINNING

- > Team Leadership
- > Communication
- > Applied Engineering

MODULE DESCRIPTORS & INDICATIVE CONTENT

OEM Engineering Apprenticeship QQI - Level 6

MODULE 1 HEALTH AND SAFETY

Module Aims

The aim of this module is to provide the learner with the skills, knowledge and competencies to carry out their duties and responsibilities in an OEM environment. The module highlights Health and Safety awareness to the learners and their co-workers in the area which they work.

Module Objectives

The apprentice will learn about the Health and Safety regulations, processes and procedures applicable to OEM operations including human factors applicable to both employer and employee responsibilities.

Minimum intended module learning outcomes

1. Evaluate safe working practices and procedures in the OEM working environment.
2. Define the categories of human factors which impact on Health and Safety and assess their impact on human performance.
3. Appraise the relationship between different roles and responsibilities in the OEM workplace.
4. Analyse Health and Safety Legislation and identify the key legal responsibilities in relation to employers and employees in an OEM environment.
5. Demonstrate an ability to contribute to, and improve on, Health and Safety procedures in an OEM environment.

Module synopsis

Module duration is 115 hours. 10 FET credits at Level 6 assigned to it.

This module contains off-the-job and on-the-job elements. The module aims to encourage the apprentice to develop the specialised knowledge and skills required for operating in the OEM environment both safely and effectively. It includes dealing with statutory and organisational Health and Safety requirements. It covers responsibilities relating to accident reporting and identification of hazards and risks.

The on-the-job element focuses on the application of learning and requires the apprentice to produce a portfolio of their learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Related Irish Legislation and how it impacts on the OEM industry.
- > Health and Safety procedures.
- > Causes of accidents.
- > Human factors as they apply to the OEM industry.
- > Fire prevention: risk assessments, methods of controlling fires.
- > Planning and executing tasks.
- > Manual Handling: operations and regulations as they apply to engineering industries.
- > Working in isolation: in confined spaces, above ground or in trenches, in close proximity to unguarded machinery, when a fire risk exists, with toxic or corrosive substances.
- > Methods of managing and avoiding errors: self-discipline; safety management system; anonymous and blame-free reporting; review of error logs; formal briefing.

MODULE 2 ENGINEERING DRAWINGS

Module Aims

The aim of the Engineering Drawings module is to develop the ability to communicate information by graphical means and acquire the ability to use drawing software packages.

Module Objectives

The apprentice will experience the use of freehand sketching of commonly used details, to extend knowledge and appreciation of the constructional and operational features of OEM machinery, develop the ability to visualise and understand spatial relationships and attain the competence to select and use appropriate graphical methods for representing design concepts.

Minimum intended module learning outcomes

1. Produce drawings of OEM parts and tools by use of freehand sketching.
2. Present drawings in orthographic and isometric projection.
3. Create detailed types of drawings using manual methods.
4. Discuss the fundamentals of Computer Aided Design using appropriate software packages.
5. Read and interpret engineering drawings and circuits to OEM standards.

Module synopsis

Module duration is 130 hours. 10 FET credits at Level 6 are assigned to it.

This module contains off-the-job and on-the-job elements. The focus of the module is to develop the apprentice's ability to read and interpret engineering drawings and circuits including wiring diagrams. In addition to an understanding of projections, dimensioning of single part sub-assembly and assembly, drawings with particular focus on free hand drawing are developed. This is accomplished initially by the use of manual methods followed by the use of software packages.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content.

- > Sketching engineering components, component parts and tools.
- > Orthographic drawings.
- > Engineering drawing standards.
- > Conventional representation of standard engineering components.
- > Plans and elevations in first angle or third-angle projection of assembled machine parts and components.
- > Drawing sectional plans and elevations of assembled machine parts.
- > Producing sectional drawings.
- > Reading and preparing working drawings of machine parts and components.
- > Reading and preparing working circuits and diagrams.
- > Preparing drawings by use of recognised computer software package.

MODULE 3 OEM PRACTICES

Module Aims

The aim of this module is to provide the apprentice with the skills and knowledge to prove the competences required in the installation of mechanical, electrical and electronic equipment in a variety of OEM applications.

Module Objectives

The apprentice will be required to use the specified tools and equipment throughout product assembly and commissioning in addition to applying a range of methods and techniques employed in the workshop and assembly line. The assembly activities will include making checks and adjustments in line with their permitted procedures, and assisting others to ensure that the installed equipment functions to the required specification.

Minimum intended module learning outcomes

1. Analyse key principles and techniques relating to engineering workshop tooling and processes and describe hazards associated with installation.
2. Interpret key terminology symbols and units of measure in relation to components, tools and techniques utilised in an engineering workshop environment.
3. Select appropriate hand tools and safely employ techniques to cut, file and shape a range of components and materials utilised in an engineering workshop environment.
4. Follow relevant instructions for the assembly and commissioning of systems.
5. Deal effectively with problems within unfamiliar settings.
6. Assemble a range of equipment, all of which encompass integrated systems involving two or more interactive technologies.

Module synopsis

Module duration 230 hours. 15 FET credits at Level 6 are assigned to it.

This module contains off-the-job and on-the-job elements. The Occupational Profile for an OEM Technician identifies key skills in the assembly of parts and systems as a core area of knowledge and skills for the role. An Apprentice should be able to use the required hand and assembly skills required in the assembly of mechanical, electrical and electronic systems appropriately. In addition, the apprentice should have an awareness of how these fit within the wider context of the role in the field.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace.

The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Basic Principles of Workshop Practice.
- > Assembly, installation and commissioning techniques.
- > Use of the correct tools and equipment for the installation operations.
- > The application of installation by methods and techniques.
- > Dealing with the following conditions during the installation process:
 - > Installations with no faults.
 - > Equipment malfunction.
 - > Complete malfunction of equipment.
- > Manufacture and repair cable terminals.
- > Assembly of electrical cables including routing and securing.

MODULE 4 ELECTRICAL AND ELECTRONIC TECHNOLOGY

Module Aims

The aim of this module is to provide the apprentice with detailed knowledge of the theoretical and practical aspects of electronic and electrical technology and the capacity to combine and apply the separate elements of knowledge in a logical and comprehensive manner.

Module Objectives

The apprentice will gain the knowledge and skills required to describe the various types of circuits including the components that make up the circuits. The apprentice will be able to build complex circuits and test the inputs and outputs and apply the knowledge to complex industrial applications.

Minimum intended module learning outcomes

1. Examine the function, operation and construction of electrical and electronic components.
2. Design and construct simple electronic and electrical circuits by use of a circuit board.
3. Evaluate electronic and electrical theory and their inter-relationship with other systems.
4. Apply mathematical formulae related to the system.
5. Read and interpret system drawings and schematics and manufacturer's specification.
6. Interpret results from various sources and measurements and apply corrective action where appropriate.

Module synopsis

Module duration is 175 hours. 15 FET credits at level 6 are assigned to it.

This module contains off-the-job and on-the-job elements. The aim of this module is to enable the apprentice to understand the underlying principles that apply across electrical and electronic technology in OEM Engineering. This particular module provides the apprentice with the opportunity to become very competent in the assembly of electrical circuits by use of circuit diagrams.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Function and operation of Resistance/Resistor and Capacitance/Capacitor.
- > Motor/Generator theory and application.
- > Transformer construction principles and operation.
- > Diode symbols, characteristics and properties; both in series and parallel. Functional testing of diodes.
- > Transistor symbols, component description and orientation. Transistor characteristics and properties.
- > Principles of operation and use of synchro system components/features.
- > Ohms Law, Kirchoff's Voltage and Current Laws.
- > Calculations using the above laws to find resistance, voltage & current.
- > Resistor colour code, values and tolerances, preferred values, wattage ratings.
- > Resistors in series and parallel. Calculation of total resistance using series, parallel and series parallel combinations.
- > Capacitor colour coding. Calculations of capacitance and voltage in series and parallel circuits. Testing of capacitors.
- > Factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.
- > Static electricity and distribution of electrostatic charges. Electrostatic laws of attraction and repulsion. Units of charge, Coulomb's Law.
- > Conduction of electricity in solids, liquids, gases and a vacuum.
- > Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells. Cells connected in series and parallel. Internal resistance and its effect on a battery.
- > Standard symbols used for electrical and electronic diagrams and drawings. Use manufacturers' catalogues and data sheets to identify replacement or equivalent parts.
- > Use of test equipment to measure circuit/system parameters - input and output voltages/signals, voltages at key test points within a system/circuit. Develop basic testing scheme for functional tests.

MODULE 5 MECHATRONICS

Module Aims

The aim of this module is to provide the learner with the skills and knowledge needed to prove the competences required to install, test and operate an engine; also, the skills and knowledge needed to prove the competence required to install, test and operate hydraulic and pneumatic and battery powered systems in a variety of OEM manufactured machines.

Module Objectives

The apprentice will be able to describe the function, operation and architecture of engines and their major component parts as well as the installation, inspection, test and repair of engine assemblies.

The apprentice will be able to interpret the design requirements of the systems, to construct a typical hydraulic or pneumatic system following circuit diagrams and perform all the required pneumatic/hydraulic activities in such a manner that is not dangerous to operator or damaging to the equipment or the environment in an industrial setting.

The apprentice will be equipped with the knowledge, skill and competencies to install and commission a battery powered system on board a battery powered vehicle.

Minimum intended module learning outcomes

1. Discuss the function and operation of power systems – hydraulic, pneumatic, internal combustion engines and battery power systems including mechanical drives.
2. Examine the construction of power systems – hydraulic, pneumatic, internal combustion engines and batteries including mechanical drives.
3. Perform inspections and maintenance tasks on the systems.
4. Evaluate the conclusions of inspections on power systems to formulate repair procedures.

Module synopsis

The module duration is 285 hours. 20 FET credits at Level 6 are assigned to it.

The marks obtained from the assessments contribute to the overall award grade.

This module contains off-the-job and on-the-job elements. This module addresses the requirements identified in the OEM occupational profile to include identifying key skills in the areas of hydraulics, pneumatics, internal engines, electrical power and mechanical systems. An understanding of the elements of mechatronics and the adherence to systems and processes are regarded as a core area of knowledge and skills required for the role, will also be assessed. Essentially, on completion of this module, an apprentice should be able to deliver the outcomes for their job role using the required systems and processes appropriately. In addition, an apprentice should have an awareness of how these fit within the wider context of the manufacturing process.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Principles of hydraulics, Properties of fluids, Applications, Safety & hazards and Components, System faults, Troubleshooting.
- > Description and operation of pneumatic components: The use of PLCs to control basic pneumatic circuits. Troubleshooting.
- > Investigation of pressure drops in systems such as leaks (including internal leaks), changes in temperature venting.
- > Principles of operation and construction of various components of a battery powered system, Troubleshooting.
- > Principles of operation of CAN BUS systems. Types of battery used in battery powered systems.
- > Description of internal and external combustion engines, Classification of IC engines, Principle and working of 2 and 4-stroke diesel engine (Compression Ignition Engine (C.I)). Vehicle emissions.

MODULE 6 TESTING & MEASUREMENT OF ELECTRONIC SYSTEMS

Module Aims

The aim of this module is to enable the apprentice to develop a practical understanding of testing and measurements of electrical and electronic OEM systems.

Module Objectives

The apprentice will gain the skill and knowledge required to evaluate the selection of test equipment used to measure differing values and to assess measured values for appropriateness of use. The apprentice should be able to use methods and techniques to interpret measurements taken and apply the correct procedures used for testing of electrical systems.

Minimum intended module learning outcomes

1. Evaluate the selection of test equipment used to measure different values.
2. Use multi-meters to measure current, voltage and resistance to the level of competence employed in the OEM circuit.
3. Use electronic instruments as signal sources and for component testing on OEM circuits.
4. Perform measurement tests on OEM electronic and electrical circuits in accordance with manufacturer's technical instructions whilst adhering to relevant legislation.
5. Communicate the results of the tests in an efficient and accurate manner.

Module synopsis

Module duration is 240 hours. 20 FET credits at Level 6 are assigned to it.

The marks obtained from this assessment contribute to the overall award grade. As with previous modules, this module contains off-the-job and on-the-job elements. The role of the OEM Technician requires the apprentice to have sufficient knowledge and skill to carry out a series of tests and inspections on a range of OEM electrical and electronic equipment. In addition, the apprentice must develop the skills to interrogate the results of tests and communicate them appropriately while exercising autonomy and judgement in their analysis.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Correct application for the use of specialist measuring equipment such as Oscilloscopes; meters; signal generators; counters; logic analysers; spectrum analysers; low resistance ohmmeters; insulation resistance testers; voltage indicating devices; earth fault loop impedance testers; prospective fault current testers; RCD testers; earth electrode testers and phase rotation meters.
- > Coaxial; twisted pair; flat cable; single cable; clamp; fibre-optic; attenuation; phase change and frequency response; noise and noise reduction where appropriate; accounting for: response of the systems; transfer function; impulse response; frequency response and dynamic range.
- > Continuous signals; discrete signals; frequency and period; peak; average; effective value; phase shift; amplitude; peak to peak; time domain; frequency domain; Fourier series of signals.
- > Correct scale/settings of the instrument; safety checks; check equipment is functioning correctly; calibrate it in accordance with regulatory requirements.
- > Care in the use of instrumentation
- > Graphical analytical techniques to illustrate outcomes including: system/component performance, fault diagnosis, compliance to design/operational parameters
- > Items that would form part of inspection checklists for electrical systems.
- > Verify continuity of conductors (circuit protective, earthing, bonding, ring final); insulation resistance; polarity; earth electrode resistance; earth fault loop impedance; prospective fault current; correct operation of RCDs; functional testing; phase rotation (to include explanation of sequence of tests).
- > Functionality; fitness for purpose; safety in accordance with the installation specification and complete documentation (electrical installation certificates, schedules of inspections, schedules of test results).

MODULE 7 OEM OPERATIONS MANAGEMENT

Module Aims

The aim of this module is to provide the apprentice with the knowledge of how quality is assured in the manufacture and maintenance of products and how their associated processes are planned, monitored and controlled. The apprentice will be introduced to how to assess and evaluate quality management systems in OEM.

Module Objectives

The apprentice will gain knowledge that applies to both manual and computer-assisted methods and procedures for OEM planning. The apprentice will also experience inventory management with stock control and documentation systems.

The module will enhance the apprentices' understanding of the complexities of statistical analysis and control-chart interpretation and their work-place application, the fundamental concepts of statistical process control, total quality management, six sigma and the application of these concepts, philosophies, and strategies to issues arising in government and industry.

The apprentice will experience “widely-used” quality analysis tools and techniques and develop an awareness of the quality management problem-solving techniques currently in use within the OEM environment.

Minimum intended module learning outcomes

1. Discuss the importance of, and evaluate the use of, maintenance planning, scheduling and quality control in an OEM operation.
2. Appraise Total Quality Management and demonstrate an understanding of techniques and methods applied to quality control.
3. Define and apply the principles of Lean Six Sigma.
4. Evaluate the Key principles of Business Excellence models.
5. Plan and execute OEM manufacturing processes using quality assurance tools.

Module synopsis

Module duration is 280 hours. 20 FET credits at Level 6 are assigned to it.

The marks obtained from these assessments contribute to the overall award grade. This module contains both off-the-job and on-the-job elements.

This module will provide knowledge that applies to both manual and computer-assisted methods and procedures for OEM planning. It will also deal with process plans (e.g., forecasting, network analysis), capacity assessment and scheduling and maintenance strategies. The apprentice will also develop experience of inventory management with stock control and documentation systems.

Furthermore, the module will provide an introduction to the fundamental concepts of statistical process, Total Quality Management and Six Sigma and will enhance the apprentices' understanding of the complexities of statistical analysis and control-chart interpretation and their work-place application.

The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Process planning techniques, forecasting; network analysis; critical path method (CPM); project evaluation and review technique (PERT); failure mode and effects analysis (FMEA); material requirement planning (MRP); equipment and tooling; make or buy decisions; computer aided planning and estimating.
- > Capacity assessment techniques. Bill of materials; economic batch size; assessment of load and capacity; effects of re-working and scrap; methods of increasing/decreasing capacity; time.
- > Principles and types of inventory; dependent and independent demand; cost of inventory stock control systems.
- > Quality Systems: ISO 9000, Lean Six Sigma management of Six Sigma philosophy as a project; education and training of the workforce. DMAIC (Six Sigma tool).
- > Quality improvement techniques in the OEM industry. Specific techniques for design, reliability, maintenance and process improvement.
- > Conformance and Non-conformance to Quality Standards.
- > Schedule developed from the process planning and customer requirements; lead times; using scheduling techniques such as CPA, Gantt charts, software packages (CMMS, CPS, CAM, CAPP, CIM), OPT philosophy, MRP.

MODULE 8 ANALYTICS & PROBLEM SOLVING

Module Aims

The aim of this module is to provide the apprentice with the skills and knowledge needed to deliver the competences required to carry out efficient and effective fault diagnosis on mechanical, electronic and electrical equipment, in accordance with recognised procedures.

Module Objectives

The apprentice will develop a good understanding of their work, and will provide an informed approach to applying fault diagnosis procedures on mechanical equipment. The apprentice will gain an understanding of the various fault diagnosis methods and techniques used, and their application.

The apprentice will enhance their knowledge of applying and interpreting information obtained from diagnostic aids and equipment, in sufficient depth to provide a sound basis for carrying out the activities and for identifying faults or conditions that are outside the required specification.

The apprentice will be required to diagnose faults on a range of mechanical electronic and electrical equipment, both at assembly and sub- assembly level. The apprentice will engage a variety of fault diagnosis methods and techniques and utilise a number of diagnostic aids and equipment.

Minimum intended module learning outcomes

1. Examine the purpose of Fault Tree Analysis (FTA) and apply the rules of FTA.
2. Explain the purpose, benefits and objectives of Failure Mode Effect Analysis (FMEA) and develop and complete a FMEA.
3. Carry out fault diagnosis on a variety of equipment which may include electrical equipment and circuits, mechanical equipment and electronic equipment.
4. Analyse results of the FTA and FMEA diagnosis, compile reports and present findings.
5. Manage follow-up and verification activities on the diagnosis which may include proposing rectification solutions.

Module synopsis

Module duration is 275 hours. 20 FET credits at Level 6 are assigned to it.

The marks obtained from these assessments contribute to the overall award grade.

As before, this module contains off-the-job and on- the-job elements. It is concerned with pneumatic, hydraulic, mechanical and electrical actuation systems. The topics covered will enable the apprentice to interpret diagrams, explain the operation of circuits and systems and identify and test electrical and mechanical components. The learner will also be able to perform diagnostic checks on prepared (simple) systems and make deductions from the results of these checks which lead to a correct fault diagnosis.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > A FMEA (Failure Mode and Effect Analysis) as a guide to the development of a complete set of actions that will reduce risk associated with the system, subsystem, and component or manufacturing/assembly process to an acceptable level.
- > Develop FTA using simple mechanical faults to more complex electrical/electronic systems. Investigate potential faults; modes and causes, quantify their contribution to system unreliability.
- > Methods used in identifying and isolating faults.
- > Select, use and apply diagnostic techniques, tools and aids to locate faults.
- > Investigate potential faults; modes and causes, quantify their contribution to system unreliability.
- > Fault isolation, root cause, detection + isolation = diagnosis, determining size of fault, determining the time of onset of the fault.

MODULE 9 INDUSTRIAL ROBOTICS AND PLCs

Module Aims

To develop skill and knowledge to allow the apprentice to understand the uses of PLCs and Robotics in the OEM sector while working individually and/or as part of a team.

Module Objectives

The apprentice will experience the uses of PLCs and Robotics from simple to complex applications in both simulated and industrial context and also the programming of PLCs to allow robots perform functions and communicate with their environment.

Minimum intended module learning outcomes

1. Examine the characteristics of and create operational programmes to drive PLCs in industrial related tasks.
2. Explain the operational requirements for input and output devices.
3. Evaluate types of communication links used in programmable logic control systems and controllers.
4. Discuss the technology requirements for integrating robots into manufacturing operations.
5. Evaluate the safety requirements to be applied in the use of robotics.
6. Analyse the developing trends for using robotics in the OEM sector.

Module synopsis

Module duration is 275 hours. 20 FET credits at Level 6 are assigned to it. Marks obtained from these assessments contribute to the overall award grade.

This module contains off-the-job and on-the-job elements. The core elements of this module are concerned with the basic principles of mains power, power electronic components, electronics employed in process control and automation systems and also basic customer care. The topics covered will enable the learner to interpret circuit diagrams, explain the operation of circuits, and perform tests on circuits. The learner will also be able to carry out simple PLC programming and articulate key methods required for satisfactory customer care.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

Understanding and knowledge of the following functions of PLCs.

- > PLC programming methods, Ladder and logic diagrams; flow charts: statement lists; Boolean algebra; function diagrams; graphical programming languages.
- > Methods of using text in PLCs; Contact labels; rung labels; programming lists; cross- referencing.
- > Master to slave; peer to peer; ISO; IEE; MAP.
- > Logic functions AND; OR; EXCLUSIVE OR; NAND; NOR.
- > Performance assessment frameworks needed to assess need for robotics.
- > The use of program flow charts to define the program steps and sequential logic; implement the program; evaluate program performance.
- > Understanding of robot path, position overshoot.
- > Characteristics of robot arms; sensors and sensor interfaces for communication with other machines and to aid locating, handling and positioning.
- > Developments in types of robots used in OEM products and in the manufacture of the products – interaction between robots and skilled operators (cobots).
- > Advanced PLC automated assembly systems.

MODULE 10 TEAM LEADERSHIP

Module Aims

This programme module aims to equip the apprentice with the knowledge, skill, competence and confidence to work as an effective leader and member of a team, independently and/or in a future supervisory capacity.

Module Objectives

The module will enable the apprentice to acquire knowledge of, and gain experience in, a variety of theoretical perspectives of leadership, management, teamwork and communication skills.

The module will assist the apprentice with learning how to manage, negotiate, plan, monitor and evaluate the team based projects /activities that they lead out on.

Minimum intended module learning outcomes

1. Research the elements and stages of team development, to include different kinds of teams, the characteristics of an effective team and the need for different roles for individuals taking into account cultural differences.
2. Evaluate the concepts of leadership and management, different leadership and management styles and the principal theories that underpin these, and contribute to the debate over leadership versus management.
3. Contribute to organisational planning and teamwork planning, to include setting specific, measurable, attainable, relevant and time-bound 2 (SMART) objectives, ongoing monitoring of progress, and evaluation.
4. Appraise a range of current motivation theories and practical strategies to enhance motivation in teams.
5. Demonstrate team leadership, to include team building, supporting team members at different stages of team development, interpersonal communications, reporting structures.

Module synopsis

Module duration is 225 hours. 20 FET credits at Level 6 are assigned to it.

Marks obtained from these assessments contribute to the overall award grade. This module contains off-the-job and on-the-job elements.

Team leadership is integrated into the everyday role of the OEM Technician and will be a key skill in sustaining lifelong learning. The module will enable the apprentice to research the elements and stages of team development, (to include different kinds of teams, and multi-team environments), the characteristics of an effective team and the need for different roles for individuals within a team. An additional aim of this module is to equip the apprentice with the knowledge, skill, competence and confidence to work as an effective team member and leader in a future supervisory or management capacity.

The on-the-job element requires the apprentice to produce a portfolio of their learning in the workplace. The apprentices will have the opportunity to reflect on their work and study experiences over the module within the underpinning module Communications.

Major topics included in the indicative content

- > Review the different types of teams and their associated characteristics.
- > Identify the varied roles played by team members.
- > Explore the stages of team formation and the feelings and behaviours associated with each stage.
- > Compare and contrast strategies associated with team building.
- > Differentiate between the different types of leadership styles.
- > Evaluate a range of relevant theories on leadership.
- > Explore the meaning of management and the main activities or functions of management.
- > Identify the importance of management to the effective performance of work organisations.
- > Differentiate between the characteristics of a leader and the characteristics of a manager.
- > Explore the characteristics of effective project management.
- > Explore a range of theories on managerial styles and the effect these styles have on managing people.
- > Demonstrate an awareness of meeting management skills to include inter-team and intra- team reporting structures.

MODULE 11 COMMUNICATIONS

Module Aims

The aim of this module is to enable the apprentice to develop an understanding of communications and the critical role it plays in the OEM community.

Module Objectives

The module will provide the apprentice with all the modalities of communication including reading, writing, verbal, visual and oral. The apprentice will be provided with the fundamentals of digital and mobile communication methods including their application and implications. The apprentice will be given the opportunity to practice their communication skills in a variety of settings.

Minimum intended module learning outcomes

1. Critique current issues in communications and information technology and evaluate the elements of legislation that impact on same e.g. GDPR.
2. Assess the impact of non-verbal communication and construct non-verbal and visual message as aides to communication within the OEM environment.
3. Utilise listening skills in a variety of roles and contexts including formal and informal working groups.
4. Employ a range of reading techniques on a variety of written material.
5. Practise writing skills to produce formal written communications relevant to specific workplace situations.
6. Demonstrate oral and interactive skills in personal and professional contexts.
7. Engage research skills to investigate relevant topics, to include use of effective study skills, research methodologies and enquiry techniques.

Module synopsis

Module duration is 270 hours. 20 FET credits at Level 6 are assigned to it.

Marks obtained from these assessments contribute to the overall award grade. Clear communication is essential in the execution of the duties of the OEM Technician. The OEM environment is complex in the sense that numerous communication techniques are used. This module will provide the apprentice with an understanding and an appreciation of all the modalities of communication including reading, writing, verbal, visual and oral. In addition, the apprentice will be provided with the fundamentals of digital and mobile communication methods including their application and implications. The apprentice will be given the opportunity to practise the communication skills in a variety of settings by using a variety of tools including case studies, presentations and elevator pitches.

The on-the-job element requires the apprentice to produce a portfolio of the learning in the workplace. The apprentice should reflect on the learning and progress they have achieved throughout each of the modules they have completed, using Gibbs reflective cycle. This reflective piece should be insightful and not only account for learning gained throughout the module but also demonstrate plans for future learning following on from the completion of the module in the “action plan” section.

As the module is delivered across all stages of the programme, the apprentice can exercise and be assessed on the Communications MIMLOs while being assessed on the various MIMLOs of some of the other modules. Continuous reinforcement is seen as key to the development of strong communication skills.

Major topics included in the indicative content

- > Understand the key terms of the communications process e.g. communications loop.
- > Create an awareness of interactive skills in allowing for maximum participation in different communication contexts.
- > Explore developments in digital and mobile communications and their application and implications in the OEM workplace.
- > Explore the channels of communications that exist internally in an organisation and the role they play in leadership and effective management.
- > Develop an understanding of the different mediums of communications that exist.
- > Develop effective study skills and research methodology e.g. Primary/Secondary, Qualitative/Quantitative.

MODULE 12 OEM APPLIED ENGINEERING

Module Aims

This module enables the learner to develop their skills in, and understanding of, mathematics and science to provide the underpinning knowledge for other modules across all stages of the programme.

Module Objectives

The apprentice will be equipped with the mathematical and mechanics underpinning knowledge required to support the learning on modules 2, 3, 4, 5, 6, 8, 9 and 13. The apprentice will be equipped with the statistical techniques required to underpin modules 7, 8 and 13.

Minimum intended module learning outcomes

1. Perform calculations involving indices, scientific notation, fractions, percentages and ratios, trigonometry, algebra and graphs.
2. Define the principles of linear mechanics, stress strain, machine drives and forces.
3. Solve problems involving linear mechanics, stress strain, machine drives and forces.
4. Discuss the principles of thermodynamics, optics, wave motion and sound.
5. Practice simple statistical techniques to support quality assurance and maintenance planning operations.

Module synopsis

Module duration is 200 hours. 20 FET credits at Level 6 are assigned to it.

The marks obtained from the assessments from all stages contribute to the overall award grade. This module enables the apprentice to develop the skills in and understanding of mathematics and science so as to provide the underpinning knowledge required for other modules across all stages of the programme. The apprentice will be equipped with the mathematical and science underpinning knowledge to support the learning on technical modules 2, 3, 4, 5, 6, 8, 9 and 13. The apprentice will be equipped with the statistical techniques to underpin modules 7, 8 and 13.

Major topics included in the indicative content

- > Arithmetical terms and signs, method of multiplication and division, fractions and decimals, factors and multiples, weights, measures and conversion factors, ratio and proportion, averages and percentages, areas and volumes, squares, cubes, square and cube roots.
- > Evaluating simple algebraic expressions, addition, subtraction, multiplication and division, use of brackets, simple algebraic fractions.
- > Linear equations and their solutions; Indices and powers, negative and fractional indices. Binary and other applicable numbering systems; simultaneous equations and second degree equations with one unknown.
- > Simple geometrical constructions; representation; nature and uses of graphs of equations/functions.
- > Simple trigonometry; trigonometrical relationships, use of tables and rectangular and polar coordinates.
- > Nature of matter; the chemical elements, structure of atoms, molecules.
- > Chemical compounds States; solid, liquid and gaseous; Changes between states. Nature and properties of solid, fluid and gas; Pressure and buoyancy in liquids (barometers).
- > Forces, moments and couples, representation as vectors; Centre of gravity.
- > Elements of theory of stress, strain and elasticity; tension, compression, shear and torsion.
- > Kinetics, Linear and Rotational movement. Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.
- > Linear movements: uniform motion in a straight line, motion under constant acceleration (motion under gravity)
- > Rotational movement uniform circular motion (centrifugal / centripetal forces); Periodic motion: perpendicular movement.
- > Simple theory of vibration, harmonics and resonance; Velocity ratio, mechanical advantage and efficiency.
- > Thermodynamics. Temperature: thermometers and temperature scales; Celsius, Fahrenheit and Kelvin; Heat definition.
- > Gases; ideal gasses laws; specific heat at constant volume and constant pressure, work done by expanding gas. Isothermal, adiabatic expansion and compression, engine cycles, constant volume and constant pressure, refrigerators and heat pumps.
- > Latent heats of fusion and evaporation, thermal energy, heat of combustion.
- > Optics (Light) / Nature of light; speed of light. Laws of reflection and refraction; reflection at plane surfaces, reflection by spherical mirrors, refraction, lenses; Fibre optics.
- > Wave Motion and Sound. Wave motion; mechanical waves, sinusoidal wave motion, interference phenomena, standing waves; Sound: speed of sound, production of sound, intensity, pitch and quality, Doppler Effect.
- > Statistical Techniques. Complex function analysis: Solve complex equations involving complex variables; find roots of complex numbers.
- > Mean; variance; standard deviation; proportion, explain common statistical techniques for summarising data.

MODULE 13 FINAL PROJECT

Module Aims

The aim of this module is to enable the apprentice to apply underlying concepts and principles of their area of study to address an identified workplace problem or issue, evaluate different approaches to the problem or issue identified, initiate and use strategies to address an identified workplace issue while demonstrating effective and appropriate communication skills.

Module Objectives

The objectives of the module is to provide the apprentice with the skill and knowledge to research workplace problems, set project objectives, and identify information required for inclusion in work place projects. The module will require the apprentice to produce project proposals to the required scope and also produce project objectives. The apprentice will be able to source information, concepts and principles relevant to workplace problems. The apprentice will develop, work, plan, and report on the outcomes of projects.

Minimum intended module learning outcomes

- > Devise and develop a project proposal and plan in the context of the OEM Technician's role
- > Conduct primary and secondary research and apply to the work-related project
- > Investigate the research question and collate the data acquired
- > Work independently and to pre-described deadlines.
- > Analyse and formulate meaningful conclusions
- > Present the total report including conclusions and recommendations

Module synopsis

This is a work-based capstone module. Module duration is 305 hours with 30 FET credits assigned to it.

The marks obtained from the assessments of Stage 3 contribute to the overall award at Level 6 grade.

This work-based module aims to make apprentices active in their own Continuing Professional Development (CPD). The module recognises that CPD itself is a continuous process, encouraging learners to keep planning for the development and progression of their careers. The Occupational Profile for an OEM apprentice is clear in the need to "future proof" themselves for this rapidly evolving sector.

The aim of this module is to enable the apprentice to apply underlying concepts and principles of their area of study to address an identified workplace problem or issue, evaluate different approaches to the problem or issue, initiate

and use strategies to address this issue and finally demonstrate effective and appropriate communication skills in convincing others of the approach to and validity of the proposed solution. The module will provide the apprentice with the skill and knowledge to research workplace problems, set project objectives and identify information required for inclusion in their work place project.

The apprentice will be required to produce project proposals and objectives to include scope and source information as well as concepts and principles relevant to workplace problems. Furthermore, the apprentice will review the priorities and practices relevant to the project, select key sources of data and information to support the project, select project methods to address objectives and evaluate the strengths of methods in relation to project objectives. The apprentice will justify selected method(s) used to address project objectives and develop a work plan and report on the outcomes of projects.

This module contains some off-the-job but primarily on-the-job elements.

Project Specification

A project in the Advanced Certificate in OEM Engineering technology is a specific study of a particular topic extended over a given time frame. The project will show the apprentice's ability to gather and organise material, to evaluate and analyse this material, to conduct research and to argue conclusions. The project can consist of a practical or written project. Where a practical project is undertaken it must be supported by a written report.

Apart from providing the opportunity for receiving feedback on performance, the project has several purposes:

- > To provide a focused medium in which to develop the learning acquired from this programme and to apply it to a specific topic.
- > To develop analytical, critical, and evaluative faculties through requiring the apprentice to link the theories and knowledge that they have acquired in their studies with the requirements of their project.
- > To develop their practical skills in writing and presenting a project in accordance with the format of published work.
- > To allow the apprentice to work within agreed time frames.

In undertaking this project, the apprentice should be able to demonstrate the following skills:

1. Decision-making: for example, topic choice and methodology
2. Problem-solving: Seeking out information, overcoming barriers to information gathering
3. Information presentation: Producing a professional report document
4. Independent work: Designing and implementing a product and/or report *relating* to research objective

NOTES



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