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| **Programme Title** | Robotics and Automation Apprenticeships |
| **Programme Reference Number** | FET/AMTCE/RAA |
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Programme Descriptor Template – Apprenticeship Programme(s) leading to new FET Major Award(s)

*(Version 1, 2019)*

**Guidance for Completing this document**

**Purpose of the document**: This document is designed to capture all the relevant information about a new apprenticeship programme so that it can be evaluated for the purpose of validation by QQI. It is intended to ensure that the provider has done all the planning, research and development necessary to make it likely that the programme (i) is viable, (ii) can meet the needs of the target learner group (apprentices) and (iii) can facilitate those apprentices to demonstrate that they have achieved the knowledge, skills and competence required for the award specified. It is also intended to ensure that an expert panel has all the necessary information to enable it to evaluate the programme against the criteria for validation table

It is intended that this document will be of continued use to the providers (coordinating and collaborating) well beyond the validation process i.e. it should clearly set out

* what the programme is about
* how quality assurance procedures are to be applied to this specific programme
* how it is to be staffed and managed, both on and off the job
* how it is to be communicated to apprentices, employers and others
* how it is to be delivered and assessed
* how its success or otherwise will be monitored and reviewed

**What to keep in mind:**

1. The programme, both on and off the job elements, should integrate with the coordinating provider’s QA procedures and systems.
2. The programme learning outcomes and module learning outcomes should clearly derive from the programme purpose, objectives and approved occupational profile.
3. Since the programme is intended to lead to a new QQI award, the coordinating provider needs to be able to show that the Programme Learning Outcomes are consistent with the relevant QQI award standards i.e. the knowledge, skill and competence statements in the award type descriptors for the nominated NFQ Level.
4. If it is intended to offer more than one award on the programme e.g. a special purpose, supplemental or minor as well as a major, then the parts of the programme leading to the special purpose, supplemental or minor award need to be set out as an embedded programme.

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| **Glossary of Key RAA Terms** | **Definition** |
| **RAA** | Robotics and Automation Apprenticeship |
| **RAA Apprentice National Programme Board** | The RAA Apprenticeship National Programme Board is the single national entity with responsibility for the effective management, operation, monitoring and review of the National Apprenticeship Programme |
| **4TH Industrial Revolution (4IR)** | The current industrial revolution characterised by a harnessing of the physical and technological worlds. Fuelled by a host of rapidly emerging and highly disruptive technologies, such as AI, robotics, data science, IoT, additive manufacturing and cloud computing. 4IR follows those powered by steam, electricity and computing. |
| **AEN** | Additional Educational Needs |
| **AEO** | Adult Education Officer |
| **AMTCE** | Advanced Manufacturing Training Centre of Excellence |
| **Apprenticeship** | Apprenticeshipis defined as a programme of structured education and training which formally combines and alternates learning in the workplace with learning in an education or training centre. It is a dual system, a blended combination of on-the-job employer-based training and off-the-job training.  The national apprenticeship system is governed by legislation, principally the 1967 Industrial Training Act. The legislation sets out the overall structure of the national system and the protections for as well as the responsibilities of apprentices, employers, and education and training providers.  The National Apprenticeship Alliance oversees apprenticeship. The Further Education and Training Authority, SOLAS is the lead agency responsible for apprenticeship on behalf of Government, working in close partnership with the Education and Training Boards, Higher Education Authority, Quality and Qualifications Ireland, industry and education and training providers across further and higher education. SOLAS' responsibility includes maintenance of a national register of employers approved to take on apprentices and a national register of apprentices.  The 2012 Qualifications and Quality Assurance (Education and Training) Act underpins apprenticeship, supporting validation and quality assurance arrangements for programmes nationally. |
| **Artificial Intelligence (AI)** | Computer software that performs tasks that are normally considered to require intelligence when performed by people; examples are scene and language understanding, planning and learning. |
| **AR** | Augmented Reality |
| **Assessment Schedules** | These specify the dates on which named assessments will be held in a specified training location. |
| **Assessor** | The assessor is the instructor with responsibility for conducting assessments in accordance with the quality assurance requirements set out in the RAA apprenticeship programme. |
| **ATI** | Accounting Technician’s Ireland |
| **Authorised Officer (Solas)** | A network of SOLAS Authorised Officers based in ETBs manage, support and administer a portfolio of apprentice approved companies and apprentices within their region on behalf of SOLAS. They operate under a certificate of appointment as SOLAS Authorised Officers by the Chief Executive Officer of SOLAS under section 43 of the Industrial Training Act 1967, as amended. The SOLAS Authorised Officers provide an independent brokerage through which the integrity of the overall Apprenticeship programme is maintained and are a critical link between the Coordinating and Collaborating Providers, the apprentice and the employer. |
| **Automation** | A machine that operates by itself, generally differentiated from a robot in that an automaton doesn’t necessarily include any form of intelligence, but simply carries out a predefined mechanical action. |
| **Autonomous systems** | An integrated system of machines and devices that share control programs and sensors and making decisions autonomously |
| **Awarding Body** | In Ireland, QQI is the national awarding body that has the power to certify learners |
| **Awarding Body** | In Ireland, QQI is the national awarding body that has the power to certify learners |
| **BTEI** | Back to Education and Training Initiative |
| **CAD** | Computer Aided Design |
| **CAO** | Central Applicants Office |
| **CE** | Chief Executive |
| **CESI** | Circular Economy Skills Initiative |
| **CFE** | CFE College of Further Education |
| **Cobotics** | Collaborative robots designed to enhance the impact of intelligent automation by maximising the abilities of both humans and machines. These are robots designed to work alongside and with humans. Cobots cooperate with people, working safely with them in close proximity whereas industrial robots must be isolated from workers**.** |
| **Collaborating Provider** | This is a provider who is formally involved in the provision of an apprenticeship programme and accountable in this respect to the Coordinating Provider. |
| **Competence** | Competence is the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. |
| **Conducting an Assessment** | Conducting an Assessment involves assessing learners’ performance and related knowledge in a range of areas, to ensure that the knowledge/skills/competence demonstrated meet the requirements of the National Standards for the award. In the SOLAS system, an assessment is usually conducted by the instructors/trainers of the programme. |
| **Consortium Steering Group (CSG)** | The CSG is a group, normally led by employers and including providers, involved in the development and provision of an apprenticeship programme. |
| **Coordinating Provider** | This is a relevant or linked provider who is ultimately responsible for providing (as defined by the 2012 Act) an Apprenticeship Programme. Among its responsibilities are the development and maintenance of the curriculum and assessment procedures for the programme and leading the collaborating providers involved. |
| **CPD** | Continuous Professional Development |
| **CRM** | Customer Relationship Management |
| **CSO** | Central Statistics Office |
| **DCU** | Dublin City University |
| **DEASP** | Department of Employment Affairs and Social Protection |
| **DES** | Department of Education and Skills |
| **DETE** | Department of Enterprise, Trade and Employment |
| **DFHERIS** | Department of Further and Higher Education, Research, Innovation and Science |
| **Digital twin** | A digital twin is a digital replica of something in the physical world, often using 3D modelling to create digital companions for physical objects. Digital twins are used to improve operations, test new products and train people on virtual representations of real-world machines. |
| **DOSD** | Director of Organisation Support and Development |
| **EI** | Enterprise Ireland |
| **Employers** | Employers are responsible for the employment of an apprentice and for the delivery and facilitation of the Industry-block learning elements of an apprenticeship, including supporting Industry Mentors and development of Learning Plans. The employer must: (a) Ensure the apprentice is released to attend induction presentation and ‘off the job’ blocks. (b) Provide access for the apprentice to the appropriate equipment and resources to complete the ‘on the job’ elements of the programme. (c) Assign a person qualified in the occupation to act as a mentor to the apprentice for ‘on the job’ elements. |
| **End-Effector** | The gripper or tool at the end of a robot arm designed to interact with the environment. Examples include a pinch-type gripper, a multi-finger device similar to a human hand, and a welding head. |
| **ETTA** | Engineering Technology Teachers Association |
| **ESOL** | English for Speakers of Other Languages |
| **ESRI** | Economic and Social Research Institute |
| **ETB/ETBI** | ETB Education and Training Board/Education and Training Board Ireland |
| **ETTA** | Engineering Technology Teachers’ Association |
| **External Authentication** | This is the independent review of the assessment process for a particular training programme, carried out by examining a sample of assessments in terms of:   * The assessment process, to ensure adherence to National Assessment Procedures * The technical content of the assessment and the consistency of assessment marking against the assessment specification and standards set out in the marking criteria. |
| **Face-to-Face Workshops** | These take place in a classroom setting where groups of Learners are face to face with an instructor. |
| **Fair and Consistent Assessment** | **Fair and Consistent Assessment** involves the following:   * Planning and implementation of assessment arrangements that are appropriate to the standards set out in the programme’s learning outcomes * Provision of adequate opportunities and resources for Learners to prepare for assessment * Openness and transparency * An unbiased, impartial and inclusive system that provides equity of opportunity * Consistency in terms of assessment procedures, including marking and grading. |
| **FESS** | Further Education Support Service |
| **FET** | Further Education and Training |
| **FIT** | Fastrack to IT |
| **HEA** | Higher Education Authority |
| **HEI** | Higher Education Institution - delivers awards from Level 7 upwards |
| **HND** | Higher National Diploma |
| **ICMS** | International Construction Management Standard |
| **ICT** | Information and Communication Technology |
| **IGC** | Institute of Guidance Counsellors |
| **IDA** | Industrial Development Authority |
| **Industry 4.0** | Industry 4.0 can be defined as the integration of intelligent digital technologies into manufacturing and industrial processes. It encompasses a set of technologies that include industrial IoT networks, AI, Big Data, robotics, and automation. |
| **Industry 5.0** | Industry 5.0 refers to robot and smart machines working alongside people with added resilience and sustainability goals included. Where Industry 4.0 focused on technologies such as the Internet of Things and big data, Industry 5.0 seeks to add human, environmental and social aspects back into the equation. |
| **Integrator** | A company that provides automation solutions for end-users by helping them to adopt the most suitable robots and autonomous systems in the performance of their work. |
| **Internal Verification** | This is the process by which the academic provider reviews the assessment process and provisional assessment results on a sample basis and conducts peer review, to ensure adherence to National Award Standards.  The Internal Verifier verifies that the programme’s assessment procedures have been applied across the range of assessment activities, confirms the assessment results by checking learner evidence exists, confirming marks and grades are compiled correctly, recorded and transferred correctly, and completes an internal verification report. |
| **IOT** | Internet of Things |
| **IMR** | Irish Manufacturing Research |
| **KPI** | Key Performance Indicator |
| **Learners** | Learners are persons who are acquiring, or who have acquired knowledge, skills or competence as per the learning outcomes of a particular programme. |
| **LEOs** | Local Enterprise Office |
| **LSS** | Learner Support Services |
| **LMETB** | Louth and Meath Education and Training Board (LMETB) provide a wide range of Educational Services across counties Louth and Meath. The Education and Training Boards Act 2013 provided for the establishment of 16 new education and training boards to replace the existing 33 VECs. On 1st July 2013 Co Louth VEC and Co Meath VEC merged to form Louth and Meath Training and Education Board (LMETB). |
| **Locally Devised Assessment** | These are detailed statements of the items to be addressed through a specified assessment approach when designing any block of training. |
| **LPM** | Logic Path Model |
| **MANIPULATOR:** | A jointed arm equipped with an end-effector designed to perform tasks. See also “End-effector.” |
| **MEND** | Midlands, East and North Dublin |
| **Micro-credentials** | Micro-credentials are small, accredited courses designed to meet the upskilling demands of learners, enterprise and organisations. |
| **MIMLOS** | Minimum Intended Module Learning Outcomes |
| **MIPLOS** | Minimum Intended Programme Learning Outcomes |
| **MOA** | Memorandum of Agreement – this is between the CSG and LMETB as the coordinating provider. |
| **MOU** | Memorandum of Understanding |
| **MOODLE** | Moodle is what’s commonly known as a Learning Management System (LMS) or Course Management System (CMS). This is a learning platform (VLE) designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments. Moodle itself stands for “Module Object Oriented Dynamic Learning Environment”. Moodle is a system for supporting teaching and learning and can be used in online or face-to-face learning. |
| **M & R** | Monitoring and Reporting |
| **NCCA** | National Council for Curriculum and Assessment |
| **National Examinations Board** | The role of the National RAA Examination Board is to meet and to consider the delivery and the assessment of the national apprenticeship programme. It will also ratify the results of the National RAA Apprenticeship Programme. |
| **NPB** | National Programme Board |
| **NPM** | National Programme Manager |
| **NEET** | Not in Education, Employment or Training |
| **NEFHEA** | Northeast Further & Higher Education Alliance |
| **NDP** | National Development Plan |
| **NFQ** | National Framework of Qualifications |
| **OEM** | Original Equipment Manufacturer |
| **OGP** | Office of Government Procurement |
| **Peer Review** | Peer Review involves the evaluation and critique of instructional practices and the outcomes of students' efforts by peers within the same field or discipline. This process ensures the quality, accuracy, and fairness of assessments, as well as the effectiveness of teaching methods. Peer review allows instructors to receive constructive feedback, identify areas for improvement, and maintain high standards of education and student achievement. |
| **Plagiarism** | Plagiarism is defined as copying the words of others or using someone else’s work or ideas and passing them off as one’s own. If a Learner uses the words or ideas of someone else, he or she must clearly state where they came from. |
| **Portfolio** | A portfolio is a collection of evidence that demonstrates evidence of a learning journey over time. Portfolios can relate to specific academic fields or lifelong learning. |
| **PLC** | Post Leaving Certificate College |
| **PLSS** | Programme Learner Support System |
| **Professional Learning and Development (PL&D)** | This is where the staff of an education provider is provided with appropriate professional development and training. |
| **Programmable Logical Controller (PLC)** | A solid-state control system, which has a user programmable memory for storage of instructions to implement specific functions such as: I/O control logic, timing, counting arithmetic and data manipulation. A PLC consists of a central processor, input/output interface, memory and programming device, which typically uses relay equivalent symbols. The PLC is purposely designed as an industrial control system, which may perform functions equivalent to a relay panel or a wired solid-state logic control system and may be integrated into the robot control system. |
| **QA and QAS** | Quality Assurance, Quality Assurance Systems |
| **QAGMC** | Quality Assurance Governance and Management RAA Sub-Committee |
| **QQI** | Quality and Qualifications Ireland |
| **Re-check of Assessment** | Re-check of Assessment involves checking and ensuring that all parts of an assessment have been properly recorded and that there are no errors in the recording, collating or combining of marks which determined the result. This is the first stage of an appeals process. |
| **Reasonable Accommodation** | Reasonable Accommodations are concerned with enabling individuals with disabilities to enjoy equal benefits and conditions to their non-disabled peers in accessing and participating in training and assessment. This may require a training provider to take reasonable account of Learners with disabilities’ needs and requirements in the training environment. What reasonable accommodation entails varies from Learner to Learner, depending on their individual needs and requirements. |
| **Referral** | Referral is defined as an opportunity afforded to a Learner who fails to meet the required standard in an assessment to repeat an equivalent assessment. Only referred or pass grades can be awarded in repeat assessments. |
| **Reliability** | Reliability in an assessment is the confidence one can have in the fairness of the result. Outcomes of assessments should be as consistent as possible. Those conducting assessments should produce similar results when using the same assessment for similar groups of Learners. Measures should be used to reduce the variability in grading that may be due to those conducting assessments, the assessment instruments or the assessment methods. |
| **Resit** | Resit is defined as an opportunity afforded to a Learner who abandoned an assessment due to sickness, emergency, etc., to re-sit an equivalent assessment. In such cases normal marking and grading policy applies. |
| **Results Approval Panel** | Results Approval Panel is a panel convened by the provider to formally review and approve assessment results and authorise requests for certification. |
| **Review of Assessment** | Review of Assessment is the reconsideration in detail of all or part of the existing assessment material by internal assessment personnel and reconsideration of a full set of results. This is the second stage of an appeals process, subsequent to a recheck and prior to a possible final appeal. |
| **Robot** | A re-programmable, multifunctional manipulator designed to move material, parts, tools or specified devices through variable programmed motions for the performance of a variety of tasks. Common elements which make up a robot are: controller, manipulator and end-effector. See Manipulator, Controller and End-effector. |
| **Robotic Industries Association (RIA) Standards** | A robot safety standard is a collection of guidelines for robot specifications and safe operations to which all involved in the manufacture, sales and use of robots must follow. Often, standards are created by a diverse group of industry interests to ensure the standards benefit everyone. (For further information click this [link](https://www.ieee-ras.org/images/Standards_strategy_Meeting_19_May_2019/12-Franklin--RIA-IEEE_2019-05-19_v2.pdf)) |
| **Robotic Process Automation** | Robotic Process Automation is the technology that today allows anyone to configure computer software, or a robot, to emulate and integrate the actions of a human interacting within digital systems to execute a business process. RPA robots utilise the user interface to capture data and manipulate applications just like humans do. They interpret, trigger responses, and communicate with other systems in order to perform a vast variety of tasks |
| **RPL** | Recognition of Prior Learning (RPL) is a systematic recognition process to enable individuals to enter learning programmes and attain full awards based on prior learning experiences, regardless of how that learning was acquired. |
| **SEAI** | Sustainable Energy Authority of Ireland |
| **SOLAS** | SOLAS are responsible for the provision of further education and training in Ireland. SOLAS operates under the supervision of the Irish Department of Further and Higher Education, Research, Innovation and Science. SOLAS works in collaboration with Education and Training Boards (ETBs) to deliver a wide range of training and education initiatives. SOLAS has statutory responsibility for the designation of apprenticeships as part of the statutory apprenticeship system, which is organised in Ireland by SOLAS, the Department of Education and Skills, the Higher Education Authority, employers and unions. |
| **SLMRU** | Skills and Labour Market Research Unit |
| **SMART** | Specific, Measurable, Attributable, Realistic, Timebound |
| **SME** | Small and Medium-Sized Enterprises |
| **SME** | Independent Subject Matter Expert |
| **Supervisory Control and Data Acquisition (SCADA)** | SCADA stands for Supervisory Control and Data Acquisition (SCADA) systems are used for controlling, monitoring, and analysing industrial devices and processes. The system consists of both software and hardware components and enables remote and on-site gathering of data from the industrial equipment. |
| **SPA** | Strategic Performance Agreement |
| **STEM** | Science, Technology, Engineering and Mathematics |
| **Synchronous Learning** | This refers to a type of educational or training experience where the instructor and learners engage in real-time interaction. In synchronous learning, participants are connected simultaneously, usually through online platforms, video conferencing tools, or in-person sessions. It provides an opportunity for immediate feedback, active discussions, and collaboration between the instructor and learners or among the learners themselves. |
| **Technology-Enhanced**  **Learning (TEL)** | This refers to the use of technology to support and enhance the learning process. It involves the integration of various technological tools, such as computers, the internet, software applications, and mobile devices, into educational practices and environments. |
| **TUD** | Technological University Dublin |
| **The Internet of Things (IoT):** | A network of physical objects connected over the internet. The IoT has revolutionised business and domestic life since the term was first coined in 1999 and is expected to be among the most transformative of all 4.0 technologies. |
| **Universal Design for Learning (UDL)** | This is an educational framework that aims to provide all students with equal opportunities to learn and succeed, regardless of their individual abilities, learning styles, or differences. UDL emphasises flexibility, accessibility, and inclusivity in the design of learning environments, instructional materials, and assessment methods. |
| **Validity** | Validity essentially means fitness for purpose. To be valid an assessment measures what it was intended to measure. There are different types of validity:  Face Validity: Does the assessment meet Learner expectations? Is it the kind of assessment strategy you might expect to find in a particular programme?  Content Validity: Is the assessment strategy, structure and methodology based on award standards, curriculum aims and learning outcomes?  Construct Validity: Does the assessment method measure the intended specified learning outcomes or introduce and measure some other abilities which were not required in the specified learning outcome? For example, inappropriately high level of language in the question paper or demanding keyboard skills required to complete the test but not required by the specified learning outcomes in the award standard. |
| **VECs** | Vocational Educational Committees |
| **Virtual Learning Environment (VLE)** | This is an online platform that facilitates learning and educational activities through the use of technology. VLEs are commonly used in educational institutions, such as schools, colleges, and universities, to deliver course materials, conduct online assessments, facilitate communication between students and teachers, and provide a collaborative learning environment. |
| **VP** | Virtual Production |
| **VR** | Virtual Reality |
| **VTOS** | Vocational Training and Opportunities Scheme |
| **Work Based Learning** | Work-based learning is an educational approach that integrates academic instruction with real-world work experiences. It provides students with opportunities to apply their classroom knowledge and skills in practical work settings, giving them hands-on experience and preparing them for future careers. Work-based learning programmes can take various forms, including internships, apprenticeships, co-operative education, and mentorship programmes. These programmes typically involve students working alongside professionals in a specific industry or occupation, allowing them to gain valuable industry-specific knowledge, develop technical skills, and acquire professional competencies. |
| **Workplace or Industry Mentor** | An Workplace (Industry) Mentor (WM) is an experienced person, qualified in the occupation, who will guide and support the apprentice whilst they are completing their ‘On-the-job’ learning In short they: Mentor, facilitate & guides apprentices at work; agree apprentice worked based Learning Plans; meets weekly with apprentice and reviews weekly task/Reflective Logbooks; meets with the Academic Supervisor when he/she visits; and, attends 1-day training organised by the National Apprenticeship Programme Manager. |
| **Workplace Task Log Book** | This is a workbook given to the apprentices for completion during the on-the-job phases. In addition to completing specific practical skills tasks and logging these in the Task Log Book apprentices will be encouraged to adopt a reflective approach which is a way of thinking in a critical and analytical way about your work in progress. It shows how different aspects of your work interconnect. |
| **Work Based Capstone Project (WBCP)** | This is the final project completed by the apprentices. |

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**Application for Validation of Apprenticeship Programme**

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| **Proposed Programme Title** |
| **Robotics and Automation Apprenticeship** |

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| **Occupational Profile as approved by Apprenticeship Council** | |
| [https://www.lmetb.ie/wp-content/uploads/2024/04/Alliance-RA-Occupational-Profile-Approval-1.pdf](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.lmetb.ie%2Fwp-content%2Fuploads%2F2024%2F04%2FAlliance-RA-Occupational-Profile-Approval-1.pdf&data=05%7C02%7CPQuinn.AMC%40lmetb.ie%7Ce2303b59eeca4996abf208dc6465c701%7C919083a6dcdc4391b6820d3990b0a59c%7C0%7C0%7C638495635527318975%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=nc71TfJGkyHZN1Xlhft%2FyKaI%2Bg9CiMCXT6dtu1%2BrI4U%3D&reserved=0) LMETB RAA Occupational Profile | **Date of Approval by Apprenticeship Council** |
|  | **31st January 2023** |

|  |  |
| --- | --- |
| OCCUPATIONAL PROFILE | |
| **Apprenticeship Title** | Robotics and Automation Apprenticeship (RAA) |
| 1. **NFQ Level** | 6 |
| 1. **Duration** | 2 years |
| 1. **Occupation Title** | Robotics and Automation Technician |
| **5. Typical tasks/**  **responsibilities** | Robotics and Automation continue to grow in importance as companies adopt industry 4.0/5.0 driven operations. Robotics are finding ever growing applications in manufacturing especially driven by the fusion with other technologies such as welding, inspection, metrology, 3D printing etc. Robotics are becoming integrated into automated industrial processes to drive increased flexibility, reduce costs, increase scalability of operations etc. The combination of robotics and automation systems key technology building blocks required to accommodate dynamic production demands and increasing levels of mass customisation commonly encountered by industry.  The key tasks and responsibilities for a Robotics and Automation Technician include:   * Collaborates with Engineering and Production departments on design, operation and maintenance of automation and robotics systems. Provides input/feedback on operational, design and upgrade issues and associated criteria. * Identifies and implements new technologies and manufacturing techniques to improve safety/ergonomics, reduce manufacturing costs (e.g., labour, material, inventory, scrap), and improve product/process quality. * Designs *(models),* implements and works with technology vendors and provide production support for all automation and robotics systems used in manufacturing operations. * Supports cross-functional teams in the development and implementation of automated and robotics systems in support of manufacturing operations. * Works with Production and Process Engineering Departments to provide process specifications for new technologies and upgrades. * Supports production in tracking the performance of automation systems by measuring Key Performance Indicators (KPIs). * Troubleshoots manufacturing issues in automated cells and equipment, recommends and implements improvements and solutions to support availability within manufacturing operations. * Executes support for major automation programs and continuous improvement projects. * Analyses/interprets engineering drawing, manufacturing operation sequences, tooling function, and process specifications to improve or eliminate manufacturing issues in sustaining production operations as related to automation and robotic systems. * Authors or modifies Robotics/PLC/SCADA controlling software, ensures proper operation of cells and ensures compliance to safety and RIA standards. * Works with vendors/suppliers regarding sourcing, technology information updates. |
| **6. Learning Outcomes**  On successful completion of the proposed apprenticeship, a person in the occupation of Robotics and Automation Technician will be able to: | |
| **Knowledge** | * Outline the practical application of engineering science and technology in manufacturing, referring to the principles, techniques, procedures, workshop skills and equipment in the design and production of various goods and services. * Describe the fundamental concepts of advanced manufacturing processes and techniques. * Enumerate general manufacturing mathematical principles, methods, techniques, graphical expressions, symbols formulae and calculations in a maintenance environment and the type of equipment being maintained. * Specify mechanical, electrical, electronic, fluid power and process control principles in a maintenance environment. * Outline fault diagnostic methods, techniques and equipment used when maintaining equipment and systems. * Explain the importance of complying with statutory, quality, organisational and health and safety regulation. * Describe digitisation trends in advanced manufacturing, and how they can be successfully utilised within a manufacturing environment. * Outline how teams work effectively in a manufacturing environment. * Relate the behaviours and requirements to operate effectively in a business, with customers, and the broader industrial ecosystem. * Define the various cloud terminologies, and data tools relevant in the context of advanced manufacturing. * Describe integrated environments as they apply to advanced manufacturing practices. * Explain how emerging IIoT technologies support and create innovative opportunities in advanced manufacturing. * Discuss the importance of only using current and approved processes, procedures, and documentation. * Recognise and interpret manufacturing data and documentation to undertake and complete the job tasks and activities. * Identify the different roles and functions in the organisation and how they interact to fulfil the manufacturing process. * Outline the relevance of digitalisation tools, cybersecurity and cloud technologies in Industry 4.0 / 5.0 processes and plant equipment. |
| **Skills** | * Demonstrate how to implement, monitor, and maintain advanced manufacturing processes. * Minimise machinery downtime by implementing planned preventive maintenance programmes. * Practice planned maintenance and repair activities on robotic systems and associated equipment. * Schedule the work activity using the correct processes, procedures, and equipment. * Practice condition monitoring of plant and equipment. * Employ complex fault diagnostic and repair activities on high technology engineered systems using diagnostics systems and equipment. * Monitor in accordance to prescribed operational specifications and standards, mechanical equipment and fluid & pneumatic power systems using data driven approaches. * Maintain electronic process control equipment using data driven approaches. * Apply structured techniques to problem-solving. * Resolve manufacturing problems promptly and effectively within the limits of role responsibility, using approved diagnostic methods, reporting techniques and escalation protocols as necessary. * Support the installation, testing and commissioning of manufacturing equipment. * Demonstrate how to execute support for major automation programs and continuous improvement projects. * Practice the programming, testing, integration, commissioning, operating, monitoring and maintenance of robotic systems and associated technologies. * Configure and control Robotics/PLC/SCADA systems to ensure efficient and effective operation of cells and compliance to safety and RIA standards. * Complete confirmation testing and subsequent smooth hand over of equipment and plant. * Complete any required documentation using the defined recording systems at the appropriate stages of the work activity. * Restore the work area on completion of the activity and where applicable return any resources and consumables to the appropriate location. * Interpret core digitisation information utilising input / output devices and applying data analytics techniques. * Employ prescribed safety and security protocols as they relate to the advanced manufacturing environment. * Manage vendors/suppliers regarding sourcing, equipment parts and technology information updates. |
| **Competencies** | * Demonstrate awareness of good practice within manufacturing environments. * Adopt personal responsibility and exhibit resilience in analysis and problem solving in the manufacturing environment. * Display creative and logical thinking and an organised approach to working practice. * Demonstrate use of own initiative. * Display capability to work autonomously. * Exhibit capacity to work effectively in teams. * Conform with relevant legislative and health and safety requirements. * Demonstrate a commitment to continuous professional development. * Adhere to organisational policies and codes of conduct. * Employ effective communications and interpersonal skills. * Follow quality assurance procedures and practices. * Adhere to lean principles and sustainability practices. * Cooperate with a range of internal and external stakeholders. * Retains productive, professional, and secure working environment. |
| **7. Industry/ industries served by the proposed apprenticeship** | Overall, there are 275,000 people employed in the Irish manufacturing sector, accounting for over 12% of total employment in the economy. The sector is responsible for €13.4 billion in wages and employment taxes annually, €1.7 billion of tangible investment and over €3 billion of corporation tax. In addition, it spends, over €19 billion each year on purchases of goods and services from other suppliers in the Irish economy.  The story of manufacturing in Ireland is not just one of inward investment. Irish owned manufacturing exporters grew their sales globally by over 76% between 2012 and 2022 while value-added per person employed grew by 25%. Inward FDI manufacturers grew their exports by 66% over the period. ([Ibec manufacturing report November 2023)](https://web.ibec.ie/cn/agzlc/manufacturing?_ga=2.222002264.1993310339.1710083588-26801799.1709910814)  Advanced manufacturing capacity is a key component for many manufacturing verticals such as Food Processing, Biopharma, Life Sciences, ICT, Engineering, Green Technologies etc. - whereby products are being used which have been manufactured by automated processes or a certain service is provided by those industries.  Advanced manufacturing is based on the use of integrative robotics and automation systems during the manufacturing process. The digitisation and automation of the manufacturing process enables a broad range of industry sectors to improve productivity, reduce costs, increase product quality, increase product customisation and to develop smarter products. The extensive range of services provided by the sector is critical for economic gain.  Enhanced by Industry 4.0/5.0 technologies, robotics and automation systems increasingly impact every facet of production capacity services. This enables organisations to produce goods efficiently and sustainably in response to real-time demand using analytics to maximise potential to create internal and external solutions to business problems. Developing skills and capacity will be crucial to the future success of the manufacturing sector in Ireland and its significant contribution to the regional and national economy. |
| **8. Proposed minimum entry requirements for apprentices on the programme** | **Entry Criteria:**  **Minimum entry requirements are as follows:**   * Applicants will be required to complete an initial aptitude test, * Applicants must be 17 years or older, * Applicants must have achieved a passing grade (O6H/H7) in 5 or more subjects (to include Maths and English) at Ordinary Level in the Leaving Certificate **or**   A full QQI Level 5 or higher qualification.   * For those who may not hold this certification, equivalence may be decided through a Recognition of [Prior Learning procedure](https://lmetb.sharepoint.com/:w:/r/teams/RoboticsAutomationDraftPoliciesandProcedures/_layouts/15/Doc2.aspx?action=edit&sourcedoc=%7B1e9d9086-35f9-4267-a85b-dc5eca7f4d8b%7D&wdOrigin=TEAMS-MAGLEV.teamsSdk_ns.rwc&wdExp=TEAMS-TREATMENT&wdhostclicktime=1710255703162&web=1). * Applicants must hold a minimum of a grade B2 CEFR in writing, reading, listening and speaking or recognised equivalent (Common European Framework of Reference for Languages.   **Skills and attributes are as follows:**   * Must be numerate and literate, * Have good learning skills, * Be interested in manufacturing technology and customer service, * Have the ability to absorb product knowledge, * Be motivated and analytical, * Possess effective communication skills, and excellent interpersonal skills, * Be able to work as a team member, be adaptable and flexible. |

**Section 1 Coordinating Provider Details**

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| **1.1 Coordinating Provider** | |
| **Name** | LMETB |
| **Address** | Administrative Offices, Chapel St, Townparks, Dundalk, Co. Louth,  A91 C7D8 |
| **QBS Username** | Paula Quinn [pquinn.amc@lmetb.ie](mailto:pquinn.amc@lmetb.ie) |

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| **1.2 Contact for validation** | |
| **Name:** | Kelvin Harvey, |
| **Title:** | Adult Education Officer (AEO) LMETB |
| **E-mail:** | [Kharvey@lmetb.ie](mailto:Kharvey@lmetb.ie) |
| **Phone:** | +353 (0)42 941 90 40 |
| **Mobile:** | 087 0525189 |

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| **1.3 Programme Manager (if different to 1.2 above)** | |
| **Name:** | To be confirmed on appointment |
| **Title:** |  |
| **Address:** |  |
| **E-mail:** |  |
| **Phone:** |  |
| **Mobile:** |  |

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| **1.4 Contextual information about the coordinating provider and its other programmes, especially those related to this proposed programme. State the current scope of provision and append a list of other QQI validated programmes.** |
| Louth and Meath Education and Training Board (LMETB) was established under the Education and Training Boards Act 2013. LMETB serves the two county areas of Louth and Meath and a population of 360,529 people (2022 Census of Ireland). It covers an area of 3169 km2. LMETB is one of the largest ETBs in the country, employing over 2,400 staff and providing education for over 13,000 students at primary and post-primary level, and approximately 17,000 unique FET learners.  LMETB’s provision includes:   * 4 Community National Schools * 18 post primary schools including one with PLC provision * 1 Centre for European Schooling * 2 PLC colleges * 2 Training Centres – Dundalk Regional Skills Training Centre and Drogheda College * 1 Advanced Manufacturing Training Centre of Excellence * 8 Youthreach Centres * 7 multi-use Further Education and Training campus/centres delivering education and training programmes * Youth and Community Education and Training Services in a range of community-based locations Music Generation Programme.   LMETB is joint patron of 6 Community Schools at: Ardee, Kells, Trim, Athboy, Ashbourne, and Ballymakenny College, Drogheda.  LMETB manages a budget of in excess of €230 million, serving a population of 323,317 and a staff of approximately 2,400 full-time and part-time personnel across all LMETB services.  A summary of LMETB’s Further Education and Training (FET) provision is given in LMETB’s Provider Profile document here. [Provider Profile | Louth & Meath Education and Training Board (lmetb.ie)](https://www.lmetb.ie/further-education-training/qqi-inaugural-review-of-qa-in-lmetb/provider-profile/)  LMETB administrative offices are currently based with Head Offices in Abbey Road, Navan, Co. Meath and Chapel Street, Dundalk, Co. Louth. Plans are currently underway for the development of a new Headquarters which will be based in Drogheda, Co. Louth.  **Governance and management structures**  LMETB is governed by a Board comprising twenty-one members. Membership includes five representatives from Louth County Council, seven representatives from Meath County Council, two staff representatives, two parent representatives and five community representatives. The LMETB Board is collectively responsible for promoting the success of the ETB by directing and controlling the ETB’s activities.  In order to deliver appropriate governance in LMETB, the Board must act in the interest of the ETB at all times, consistent with the requirements of legislation and government policies. The LMETB Board is required to confirm to the Minister for Education that they comply with the up-to-date requirements of the Code of Practice in their governance practices and procedures. Board members at all times must act on a fully informed basis, in good faith, with due diligence and care, and always in the best interest of the ETB, subject to the objectives set by the Government.  The LMETB Board is supported by a sub-committee structure and at centre/school level is supported by Boards of Management in LMETB schools, PLC colleges and Youthreach centres.  The standalone Post-Leaving Certificate Colleges have Boards of Management as defined by the Education Act, 1983, and these Boards are committees of the ETB Board. There is one Youthreach Board of Management which has oversight and management functions for all the LMETB Youthreach Centres in the geographic region. This board reports into the overall LMETB Board.  LMETB has also established a range of subcommittees which support the work of the board. These are   * Finance Committee and Audit and Risk Committee (both established in accordance with Section 45(1) of the Education and Training Boards Act 2013) * Land and Buildings Sub committee * Gifts scholarships and Trusts subcommittee * Adult Education Committee * Youthreach Committee * Strategy sub-committee (established in 2021 to assist in development of LMETB Strategy Statement 2022-26)   **LMETB’s Management Structure**  The work of LMETB is structured across three pillars:   * Organisational Support and Development (OSD) * Schools and * Further Education and Training. (FET)   Each pillar has a Director, who reports to the Chief Executive.  Within LMETB’s administrative offices, the OSD administrative staff provide support to schools/colleges/centres in a range of areas including:     * Human Resources * ICT * Finance * Land and Buildings and * Corporate Services.   This network of support at Head Office level supports the work of the LMETB Board in ensuring that all schools/colleges/centres are compliant in the areas of Corporate Governance.  The specific responsibilities assigned to each pillar are highlighted on the next page in Figure 1.    **Figure 1:LMETB MANAGEMENT STRUCTURE**    **Figure 2:FET MANAGEMENT STRUCTURE** Figure 2F  |  |  | | --- | --- | | **LMETB Support Services** | **DESCRIPTION** | | Adult Educational Guidance  and Information Service | This service provides assistance to people in making informed educational career and life choices. Adults start from where they left off in education and the Guidance Service provides support as they make choices and progress with their return to education and training | | Adult Learning Service | The Adult Learning Service provides literacy, numeracy and computer tuition in a supportive environment for adults who need to develop their skills in reading, writing, spelling, Mathematics and using everyday technology. It is aimed at those who left school early, are out of education a long time or have specific learning difficulties. The service welcomes adult learners of all ages and backgrounds. | | Employer Engagement | LMETB delivers services to employers through:   * The Advanced Manufacturing Training Centre of Excellence (AMTCE) * Employer Engagement FET services * Authorised Officers   LMETB provides advice to employers considering apprenticeship and upskilling and reskilling through Skills for Work, Skills to Advance and Skills to Compete initiatives.  LMETB in collaboration with MSLETB has developed an employer Customer Relations Management system (CRM) database termed “Strategic Employer Engagement Database” (SEED). It is a multichannel employer engagement tool which is currently deployed to manage to LMETB’s Skills to Advance activities. It has automated business processes, manages call backs, referrals, forms, EOI’s and records all previous, and current engagements and training provided. | | Youth Services | LMETB Youth Services support the provision, coordination, administration and assessment of youth work services in the Louth and Meath area. |   **Structures within LMETB’s FET governance:**  **FET Senior Management**  The Director of FET has overall responsibility for:   * Quality Assurance * FET Provision and * FET Support Services.   The Director is supported in this work by the Senior Management Team in FET.  Senior Management includes:   * 3 Adult Education Officers * 1 Area Training Manager * 1 Training Manager * 3 PLC Principals and * 1 Director of the AMTCE   Within the FET SMT, each of the Adult Education Officers (AEOs) and Area Training Manager has responsibility for several programmes/services within FET.  **FET Reporting Structures**  **FET Forum** The FET Forum is comprised of Coordinators from a range of FET provision/services. It is chaired by the Senior Management Team and meets 4 times annually. Its purpose is to share information between SMT and FET Coordinators and to discuss key developments within FET in LMETB. The FET Forum has representation from the following services:  **Full-time**:   * Regional Skills and Training Centre * Drogheda College * VTOS * PLC Colleges   **Part- Time**   * Community Education Service * Youth Services * Back to Education Initiative * Adult Learning Service * Skills to Advance * Advanced Manufacturing Training Centre of Excellence   **FET Support Services**   * Quality Assurance Office * Adult Educational Guidance and Information Service * Technology Enhanced Learning Office * Professional Learning and Development/ Communications Office   **Youthreach Forum**: The Youthreach Forum is made up of 8 Youthreach Coordinators. It meets four times annually.  **PLC Management Forum:** The PLC management Forum consists of the 3 PLC principals, Director of FET and 3 Adult Education Officers. It meets 4-5 times annually.  **LMETB Quality Assurance Governance Structure**  The LMETB Board is committed to a learner-centred approach to education and training and is well advanced in the development of a single integrated QA system. In 2020, LMETB’s FET QA governance structure was formally approved to oversee all aspects of the Board’s quality assurance of FET provision; QQI and non-QQI awards. In this regard, LMETB’s overarching governance group is the Quality Assurance Governance and Management Committee (QAGMC) which oversees all Quality Assurance aspects related to the design, development, approval, implementation, monitoring and review of the Further Education and Training provision offered by LMETB. This is outlined in Figure 2 on the next page.  The QA Governance/ Management Committee (QAGMC):   * Protects, maintains & develops standards * Provides oversight of planning, coordination, quality development and improvement of all aspects of FET * Approves new and amended FET courses for delivery in line with LMETB strategy.   The ongoing review, development and improvement of standards and the promotion of a culture of evaluation and quality improvement is a high priority. In this regard, LMETB recognises the importance of obtaining and acting on feedback from all learners, staff and key stakeholders that will inform quality and standards development and improvement. The Board’s FET QA governance structure reflects both the obligations noted in the Statutory Quality Assurance Guidelines, published by QQI, and the Board’s aspirations for a quality-led structure that is transparent, documented and accessible to all stakeholders. The structure’s development was informed by the ETBI supported Shared Quality Assurance Enhancement Project and workshops on the Introduction of FET QA Governance, attended by LMETB Management and QA staff.  For the purposes of the Robotics Automation Apprenticeship all QA will be managed and overseen by LMETB’s newly established QAGMC RAA Sub-Committee.    **Figure 3 LMETB FET Quality Assurance Governance Structure**  In 2018, LMETB completed re-engagement with QQI, through which its QA policies and procedures were approved. The [QQI Inaugural Review of Quality Assurance](https://www.lmetb.ie/wp-content/uploads/2022/08/LMETBQuualityReviewReport2022FINAL.pdf) in Louth and Meath Education and Training Board concluded in March 2022. LMETB is committed to the ongoing monitoring, periodic review/evaluation, development and improvement of the QA system that supports its FET provision.  The LMETB QA system is also informed by the following documents:   * Core Statutory Quality Assurance Guidelines developed by QQI for use by all Providers (2016) * Sector Specific Statutory Quality Assurance Guidelines developed by QQ for Education and Training Boards (2017) * Topic Specific Statutory Quality Assurance Guidelines for Providers of Statutory Apprenticeship Programmes (2016) * Topic Specific Statutory Quality Assurance Guidelines for providers of blended and fully online programmes (2023) * EQAVET Guidelines – The community of practice that promotes European collaboration in developing and improving the quality assurance in VET In addition, direction was taken from the quality and standard requirements of bodies such as City and Guilds/ILM and ITEC.   **LMETB’s Further Education and Training (FET) Services**  LMETB’s FET Services offer a diverse range of full-time and part-time education and training opportunities for all individuals over the age of sixteen across a variety of centres, colleges and outreach locations across Louth and Meath.  The map in Figure 4 shows the wide range of facilities and locations through which LMETB FET Services currently operate.    **Figure 4**  **Further Education and Training (FET)**  LMETB is a recognised provider with QQI under section 44(7) of the Qualifications and Quality Assurance (Education and Training) Act 2012. The FET Service in LMETB is responsible for the management and operation of 27 QQI registered FET colleges/centres.  It has an extensive scope of provision and has been successfully delivering programmes to learners from levels 1-6, and across a broad range of fields of learning, from Generic Programmes such as Literacy and Numeracy, through Business Administration and Law, Information and Communications, Health and Welfare, Early Learning and Care, Arts and Humanities as well as delivering more technical programmes such as Craft Apprenticeships in a number of areas.    Through FET, LMETB provides a wide variety of lifelong Education and Training options. FET includes Apprenticeships, Traineeships, Post Leaving Cert courses, Community Education and Training, Youthreach and Adult Education, as well as core Literacy and Numeracy services.  FET is for everyone who wants to learn new, or enhance existing, skills in further education, or to support the achievement of personal goals, including progression to higher education or employment.  LMETB offers a comprehensive range of Adult Guidance services, including one-to-one guidance sessions.  **FET Learners**  LMETB offers both full-time and part-time courses in a wide range of fields to a large and diverse population of adult and post second-level learners. Overall, it has grown the number of beneficiaries that avails of further education and training year on year. In contrast to other ETB providers LMETB grew its numbers during the Covid pandemic.  In 2023, 8,450 LMETB FET learners achieved QQI certification across major, minor, and special purpose awards. LMETB also offers a range of [craft-based apprenticeships and career traineeships](https://www.lmetb.ie/further-education-training/apprenticeships-and-traineeships/). In addition, LMETB delivers certification for a wide range of non-QQI awards, such as City and Guilds, ITEC, IPU, PSA and PHECC.  **Table 1 - Enrolment and Unique Learner Numbers 2018 to 2023**   |  |  |  | | --- | --- | --- | | **Report Year** | **Enrolments/Beneficiaries** | **Unique Learners** | | **2018** | 16,160 | 10,593 | | **2019** | 16,363 | 10,696 | | **2020** | 16,597 | 10,303 | | **2021** | 17,605 | 10,578 | | **2022** | 23,355 | 13,104 | | **2023** | 27,689 | 15,452 |   **Apprenticeships**  LMETB has a long and successful history of delivering craft-based Apprenticeship training at its Regional Skills Training Centre (RSTC) in Dundalk. Currently (March 2024) there are 2342 apprentices employed with 746 client companies supported by LMETB. Approximately 2100 of these are craft-based apprentices.  LMETB directly delivers the following craft-based apprenticeships: Carpentry & Joinery, Electrical, Plumbing and Pipefitting, Metal Fabrication, Motor Mechanics, Toolmaking, Wood Manufacturing and Finishing.  In response to requests from SOLAS it has expanded the delivery of craft-based apprenticeship programmes to other centres in the past year.  **Drogheda College**, (Donore Campus):  Drogheda College is Ireland’s first Further Education and Training (FET) centre specialising in the delivery of electrical apprenticeship programmes. It commenced delivery of Electrical Phase 2 training in September 2023 following significant investment from SOLAS.  Its opening has enabled LMETB to provide training for an additional 300+ apprentices each year, with three intakes per year. LMETB is the first ETB to establish a FET centre uniquely dedicated to the delivery of electrical apprenticeship training in Ireland.  Additional delivery capacity for the electrical apprenticeship is scheduled to begin in Q2 2024 in the Advanced Manufacturing Training Centre of Excellence (AMTCE) in Dundalk Co. Louth.  LMETB Senior Management continues to work with SOLAS staff in exploring additional opportunities for further expansion of Apprenticeship Training in the catchment area of Navan, Co Meath.  **Post-2016 Apprenticeships**  LMETB is a collaborating provider with the following bodies:   * FastTrack into Technology (FIT) for the Cybersecurity Apprenticeship. It is offered through the Regional Skills Training Centre and the Advanced Manufacturing Training Centre of Excellence (AMTCE). * Accounting Technicians Ireland (ATI) for the Accounting Technician Apprenticeship. It is offered through Dunboyne College of Further Education, Co Meath. * Limerick and Clare Education and Training Board (LCETB) for the National Apprenticeship in Hairdressing. LMETB commenced delivery of this apprenticeship in 2019 and currently offers this apprenticeship through contracted training in Dundalk, Co Louth and through Dunboyne College of Further Education, Co Meath. * MSLETB for the National Retail Sales Apprenticeship which commenced in January 2024.   **Apprenticeship Development**  LMETB is part of the national consortium on the development of the National Apprenticeship in Beauty Therapy led by Limerick and Clare Education and Training Board (LCETB).  **Other Provision: *Micro-qualifications***  Training in advanced manufacturing skills in LMETB’s Advanced Manufacturing Training Centre of Excellence (AMTCE) is currently through micro-qualification, associated with Industry 4.0, and other industry vendor certifications.  A list of AMTCE’s provision can be found [here](https://amtce.ie/wp-content/uploads/2022/05/220429_AMTCE_Catalogue-V4-2022.pdf).  Industry 4.0 represents the transition from knowledge based to data driven manufacturing operations enabled by digital transformation and connectivity. The digital transformation of manufacturing is deeply aligned with emerging technologies. Therefore, training that allows for the dynamic delivery of content that can be continuously adapted to respond to industry development and needs is required.  LMETB was validated in 2023 by QQI for **the Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing**. The suite of micro-credentials contained in the above award were developed by LMETB. They include:   * Fundamentals of Robotics * Robotics Fundamentals and Application Identification * Robotics Fundamentals with Robot Integration * Robotics Fundamentals and Robot Programming * Robotics Fundamentals, Development and Future Trends   The first iteration of this award is being rolled out in Spring 2024 in the AMTCE.  Under the SOLAS Innovation through Collaboration Fund 2024 Call for proposals, LMETB in partnership with collaborating ETBs (WWETB and LCETB) and industry stakeholders over the course of 2024-2025, plan to develop three Smart Factory micro-qualifications (MQs) to address emerging skill needs in the advanced manufacturing space by devising new and appropriate MQ FET Special Purpose awards at NFQ Level 6. These micro-qualifications supporting the "Factory of the Future" will encompass units designed to equip learners with necessary skills and knowledge to thrive in advanced manufacturing environments.  ***PLC Level 5 & 6 courses***  Through its training centres and Post Leaving Certificate colleges (PLCs) LMETB also offers courses in the related areas of Information Technology and Engineering which include:   * Engineering Technology * Software Development and Computer Systems and Networks   These are all accredited at Level 5 on the National Framework of Qualifications (NFQ).  Short vendor-certified courses in Robotics and Collaborative Robotics are offered through the Advanced Manufacturing Training Centre of Excellence (AMTCE).   |  |  | | --- | --- | | **LMETB Providers** | **IT and Engineering Programmes** | | BTEI Programme Meath  Drogheda Institute of Further Education  Dunboyne College of Further Education  RSTC  O' Fiaich College  VTOS Programme Navan | Computer Aided Design (NL11751)  Computer skills (NL07270)  Computer Systems and Networks (NL07587)  Diploma for ICT Systems and Principles for Network Engineer (7167) (CD07167)  Engineering Technology (NL07369)  Food Science (NL07873)  Laboratory Techniques (NL07131)  Motor Technology (NL07413)  Multimedia Production (NL10784)  Software Development (NL07617) |   LMETB FET courses may be offered on a part-time or full-time basis, as appropriate. While most programmes are classroom based, others, such as the Craft Apprenticeship programmes and Post-2016 Apprenticeship programmes are a combination of workplace learning and classroom based.  A list of LMETB’s 191 validated programmes leading to major, minor and special purpose awards can be found [here](https://www.lmetb.ie/wp-content/uploads/2022/01/LMETB-QQI-Validated-Programmes-166.pdf).  **Robotics and Automation Apprenticeship (RAA**)  LMETB is looking forward to having the opportunity to add the Robotics and Automation apprenticeship programme to its portfolio of programmes.  The programme fits well with the suite of programmes currently offered by LMETB and complements the organisation’s mission and vision. It will be supported by LMETBs’ core values of innovation and commitment to excellence in all aspects of its service. In this context, LMETB is looking forward to continually working with industry to deliver this programme and to making a positive contribution to the Irish economy both regionally and nationally.  **Advanced Manufacturing Training Centre of Excellence (AMTCE)**  The Advanced Manufacturing Training Centre of Excellence (AMTCE) was established by LMETB in January 2021 through funding from Enterprise Ireland and SOLAS. The Centre’s focus is on providing skills-oriented training for advancement in manufacturing technologies, processes, and operations to enable Irish companies to innovate and thrive in an increasingly challenging global marketplace. LMETB is leading the development of micro-qualifications in the area of advanced manufacturing.  **Facilities**  The AMTCE has state-of-the-art equipment in Robotics/Cobotics, Welding, Industrial Control, Precision Engineering, Industry 4.0 training lines, Additive Manufacturing including Robotic 3D Metal printing and Virtual Reality to provide the best practical learning experience, delivered by leading industry trainers using flexible delivery modes in response to identified industry needs.  The AMTCE’s vision is:   * To support the adoption by Irish manufacturers of leading-edge design, innovation, technologies, processes, and practices * To position the Irish education and training system to provide the underpinning knowledge and skills required by the workforce of the future by strengthening the role of apprenticeships, traineeships, and training for the employed through the foundation of skills development in order to advance the manufacturing sector in Ireland. * To resource the necessary skill acquisition, training programmes, supports and services to enable Irish manufacturers to attract, develop and retain a high skilled workforce into the future. * To position manufacturing as a first-choice career for new entrants and experienced skilled workers that offer high-valued careers which are technology-rich and stable. * To increase the diversity of the manufacturing workforce by the provision of specific targeted programmes.   A key focus for the AMTCE is the provision of training for current and future workforces on industry relevant state-of-art equipment and processes which will under pin the transition of companies to industry 4.0 based operations.  The AMTCE provides training across a wide range of technologies relevant to both current manufacturing operations and those required in industry 4.0 driven operations. Training is oriented towards experiential learning through practical experience with the latest equipment which is guided by leading industrial training practitioners to ensure a great learning experience.  Currently LMETB is partnering with leading industry vendors to deliver a range of technologically relevant qualifications covering a wide range of required skills to ensure learners graduate with the requisite competencies required to succeed and develop their careers in the Advanced Manufacturing domain. |

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| **1.5 Approved Scope of Provision – Overview of currently validated programmes already offered by the coordinating provider** | | | | | |
| **Highest NFQ Level** | **Lowest NFQ Level** | **Award Classes (Major, SPA, Minor)** | **Domains of learning e.g., Healthcare, Business, Engineering, Construction, IT, ELT** | | |
| 6 | 1 | Major  Special Purpose  Minor | 00 Generic programmes and qualifications: basic programmes and qualifications; literacy and numeracy; personal skills and development  01 Education  02 Arts and humanities  03 Social sciences, journalism, and information  04 Business, administration, and law  05 Natural sciences, mathematics, and statistics  06 Information and communications technologies  07 Engineering, manufacturing, and construction  08 Agriculture, forestry, fisheries and veterinary: horticulture, veterinary  09 Health and welfare: healthcare, childcare, youth services  10 Services: hair and beauty; security  Please see the list [here](https://www.lmetb.ie/wp-content/uploads/2022/01/LMETB-QQI-Validated-Programmes-166.pdf) of LMETB’s 166 validated programmes leading to major and special purpose awards | | |
| **Modes of Programme Delivery** (ü one or more as appropriate) | | | | | |
| **Face to Face only** | | **Blended** | **Apprenticeship** | **f/t** | **p/t** |
| **√** | |  | **√** | **√** | **√** |
| **Collaborative Provision** (ü one or more as appropriate) | | | | | |
| **None** | **Yes, as first provider** | **Yes, as second provider** | **Yes, national** | **Yes, transnational** | |
|  | **√** | **√** | **√** |  | |
| **Sites of Delivery** (ü one or more as appropriate) | | | | | |
| **Owned premises** | | **Long term leased premises** | **On-the-Job** | **Rented space as required** | |
| **√** | | **√** | **√** | **√** | |

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| **1.6 Approval of Quality Assurance procedures for Apprenticeship programmes** Please supply the date of approval by QQI of the coordinating provider’s QA Procedures for Apprenticeship programmes and a link to where these procedures are published | |
| 29/04/2024 | The achievement of academic excellence is a process that involves all staff members of LMETB. The active co-operation of all stakeholders is key to ensuring the objectives of delivering a quality assured, efficient, and effective apprenticeship programme. Procedures for the operation and management of the RAA Apprenticeship programme are set out in the hyperlinked Quality Assurance Procedures document, available here for review.  [Link to published procedures](https://www.lmetb.ie/wp-content/uploads/2024/05/policies.zip):  Approval of Quality Assurance procedures for the Robotics and Automation Apprenticeship will take place in concurrence with the programme validation process.  For reference, please see a list of LMETB FET overarching Quality Assurance Policies and Procedures, which are shown on the LMETB website [here](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/)  **Figure 5 LMETB FET overarching Quality Assurance Policies and Procedures** |

**Section 2 - Apprenticeship Governance and Quality Assurance**

The following are to specify how the consortium provider’s quality assurance and governance procedures for apprenticeship programmes have been applied to this particular programme.

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| **2.1 Consortium Steering Group Chair** |
| **Name:** Barry Kennedy |
| **Title:** Chief Executive Officer (CEO) |
| **Organisation:** Irish Manufacturing Research (IMR) |
| **E-mail: [barry.kennedy@imr.ie](mailto:barry.kennedy@imr.ie)** |
| **Phone:** 01 5675000 |
| **Mobile:** +353874197754 |

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| **2.2 Consortium Steering Group Member Organisations** (name and address of organisation) | |
| Adrian Kelly  Operations Manager | Advanced Manufacturing Training Centre (AMTCE)  Building B, Xerox Technology Park, Dundalk, Co Louth, A91 Y319 |
| Kelvin Harvey  Adult Education Officer (AEO) | Louth and Meath Education and Training Board  Administrative Offices,  Chapel St,  Townparks,  Dundalk, Co. Louth, A91 C7D8 |
| Paula Quinn  Training Standards Officer (TSO) | Advanced Manufacturing Training Centre (AMTCE)  Building B, Xerox Technology Park, Dundalk, Co Louth, A91 Y319 |
| Paul Doody  Authorised Officer (AO) | Advanced Manufacturing Training Centre (AMTCE)  Building B, Xerox Technology Park, Dundalk, Co Louth, A91 Y319 |
| Barry Kennedy  Chief Executive Officer (CEO) | Irish Manufacturing Research  National Science Park  Dublin Road,  Mullingar  Co. Westmeath N91 TX80 |
| Brian Cooney  General Manager | KUKA Robotics  Unit 16,  Brewery Business Park,  Ardee Rd,  Cambrickville,  Dundalk, Co. Louth, A91 ATX4 |
| Oliver Devine  Operations Support | Dromone Engineering  Ballintogher,  Dromone,  Oldcastle, Co. Meath |
| Bronagh Gilbride  Human Resources Manager | Dromone Engineering  Ballintogher,  Dromone,  Oldcastle, Co. Meath |
| Ken Seery  Director of Further Education and Training (FET) | KWETB  Aras Chill Dara,  Devoy Park, Naas,  Co. Kildare.W91 X77F |
| Vinny McGoary  Area Training Manager | Donegal ETB  Ard O’Donnell  Letterkenny  Co Donegal F92 DP98 |
| Derek Glynn  Chief Operations Officer | EMR Solutions  Dunboyne Business Park,  Unit 53 - 58,  Dunboyne,  Co. Meath, A86 KX73 |
| Martin Rooney  Automation Engineer | TE Connectivity Ireland  Ballybrit,  Business Park,  Galway. |
| Fiona Bradley  Assistant Director of Curriculum | Southern Regional College  Greenbank Campus,  Ballinacraig Way,  Newry  BT24 2QX |
| Ronan Rasdale  National Sales Manager | FANUC Robotics  K8 Maynooth Business Campus,  Straffan Rd,  Moneycooly,  Maynooth,  Co. Kildare, W23 PP97 |
| Shane Loughran  Robotics Account Manager | ABB Robotics  5th Floor The Concourse  Beacon Court  Dublin 18, D18 P6N4 |
| Malachy Ryan  Head of Sales (Europe Middle East and Africa) | Bear Robotics  70 Sir John Rogerson's Quay,  Dublin 2 |
| Joe McGill  Technical Director | Controlsoft  North Link Business Park,  23 Coes Rd, Marshes Lower,  Dundalk,  Co. Louth, A91 XN9D |
| Conor Carney  Maintenance Manager | Autolaunch  Royal Oak Rd,  Moneybeg,  Bagenalstown,  Co. Carlow |
| Ronan Smith  Manager | Abcon Industrial Products Ltd  CavMac Hose Building,  Cavan Road,  Cootehill,  Co. Cavan |
| David Webb  Automation & Mechanical Engineer | Reliance Automation  Ballymount Business Park,  Unit 5,  Ballymount Dr,  Ballymount Industrial Estate,  Dublin 12 |
| Petra Mitchell  President and CEO | Catalyst Connection  4501 Lytle St,  Pittsburgh,  PA 15207,  United States |
| Paul Murphy  National Sales Manager | SMC  2002,  Citywest Business Campus,  Naas Rd,  Brownsbarn,  Saggart,  Co. Dublin |
| Brian Nolan  Assistant General Secretary | Connect Union  6 Gardiner Row,  Rotunda,  Dublin 1,  D01 Y183 |

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| **2.3 Memorandum of Agreement for Consortium:** |
| [Click here for Memorandum of Agreement (MOA)](https://www.lmetb.ie/wp-content/uploads/2024/05/MOA-LMETB-and-CSG.pdf) |

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| **2.4 Collaborating Providers – name, address and contact person Insert full names of organisations and the roles of the contact persons** | | | |
| **Provider Name** | **Address** | **Contact Person** | **Contact email** |
| The following ETBs have expressed an interest in becoming Collaborating Providers. [ETB Expressions of Interest](https://www.lmetb.ie/wp-content/uploads/2024/05/ETB-Expressions-of-Interest.pdf) | | | |
| Limerick Clare Education and Training Board (LCETB) | [Marshal House, Dooradoyle Rd, Dooradoyle, Limerick, V94 HAC4](https://www.google.com/maps/place/data=!4m2!3m1!1s0x485b5b6530dfae97:0x516df974edc73e5b?sa=X&ved=1t:8290&ictx=111) | Paul Patton  Director of Further Education and Training  James Maher  Innovation Manager | paul.patton@lcetb.ie  [james.maher@lcetb.ie](mailto:james.maher@lcetb.ie) |
| Waterford Wexford Education and Training Board (WWETB) | Ardcavan, Ardcavan Business Park, Co. Wexford,  Y35 P9EA | Michael O’Brien  Innovation and Development Manager | [michaelobrien@wwetb.ie](mailto:michaelobrien@wwetb.ie) |
| Kildare Wicklow Education and Training Board (KWETB) | Aras Chill Dara,  Devoy Park, Naas,  Co. Kildare.  W91 X77F | Ken Seery  Director Further Education and Training (FET) | [kenseery@kwetb.ie](mailto:kenseery@kwetb.ie) |
| Donegal Education and Training Board (DETB) | Ard O’Donnell  Letterkenny Co. Donegal  F92 DP98 | Vinny McGoary  Area Training Manager | [vinnymcgroary@donegaletb.ie](mailto:vinnymcgroary@donegaletb.ie) |

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| **2.5 Roles and Responsibilities of Consortium Steering Group** (text or hyperlink) |
| Approval for establishment of the Consortium Steering Group is vested in the National Apprenticeship Alliance. The Consortium Steering Group (CSG) is part of the overall national development structure of all new apprenticeship programmes.  The role, membership, and purpose of the CSG are set out in [*QQI Topic Specific QA Guidelines for New Apprenticeships.*](https://www.qqi.ie/sites/default/files/2021-11/qg-3-topic-specific-qa-guidelines-for-statutory-apprenticeship-programmes.pdf) The establishment of a CSG is a mandatory governance requirement for validating apprenticeship programmes with QQI.  The Robotics and Automation Apprenticeship (RAA) Consortium Steering Group (CSG) comprises of key stakeholders namely, employers, those involved in the robotics and Automation industry including suppliers and the Coordinating Provider. It is chaired by the Chief Executive Officer of the Irish Manufacturing Research (IMR) Institute, an industry representative body with extensive experience in the sector.  The role of the Robotics and Automation Apprenticeship CSG is to:     * Ensure the apprenticeship programme complies with the requirements of the occupation * Develop and review the occupational profile and promote public awareness of that profile * Ensure the Robotics and Automation Apprenticeship conforms to and evolves with the requirements of the occupation. * Develop, in conjunction with relevant stakeholders, binding Memorandum of Agreement (MOA)/ Memorandum of Understanding **(**MOU) which commit all parties to the implementation process * Contribute to the decision-making process in collaboration with the Coordinating ETB and national stakeholders on the expansion of apprenticeships, and the addition of new employers and providers. * Guarantee that the Robotics and Automation Apprenticeship programme is: * enterprise-led * responsive to pertinent and emerging occupational requirements * satisfies current and future labour market requirements.   On validation of the programme, the role of the Consortium Steering Group will transition from a developmental role in the establishment of the occupational profile and the appointment of a Coordinating Provider, to a continuing role in supporting and improving the validated apprenticeship programme.  The Consortium Steering Group is the custodian of the occupation to which the apprenticeship applies.   * The CSG functions as a connection between employers and the Coordinating Provider at a strategic level. The programme is industry-led and the CSG acts to bring together the employers, the co-ordinating provider and other collaborating providers involved in the programme.   Its current function is to support the coordinating provider in developing the programme documentation for the purpose of submitting the programme to QQI for validation.  In collaboration with the statutory regulator, the CSG should guarantee that the essential component of 'on-the-job' training is upheld and administered at the suitable level with the determined learning objectives and that it is applied competently by employers and by the Coordinating Provider.  As part of its functions the CSG has   * Supported the Coordinating Provider in developing the programme documentation for submission to QQI for validation. * Identified and supported engagement activities with employers and other industry and sector bodies. This included the carrying out of surveys, arranging meetings and providing valid data and research findings to inform the objectives and focus of the programme. * Secured commitment from employers for the recruitment of apprentices and participation in the initial and subsequent intakes. * Reviewed the programme learning outcomes, content, duration, curricula and assessment. * Reviewed all draft supporting documentation for submission to QQI for validation. * Participated in a mock validation panel and reviewed the results of the mock validation process. * Identified actions as result of the mock panel validation process and supports the implementation of a Programme Improvement plan prior to submission for validation. * Presented the self-evaluation report to the QAGMC RAA Sub-Committee prior to its submission to QQI.   It will:   * Engage with QQI staff and members of the review panel during the validation panel process. * Support the Coordinating Provider and subsequently the National Programme Manager during the planning and implementation phases of the programme. * Support the marketing and dissemination of information regarding the programme, including hosting activities and events and liaison with employers and stakeholders. * Provide support in all promotional and media related activities through the provision of spokespersons to the media. * Support the Coordinating Provider in the recruitment of a National Programme Manager, a Subject Matter Expert to support the work of the Authorised Officer(s), Instructors and other staff as is appropriate. This may take the form of participating in interview boards or other related activity where industry experience and knowledge would be helpful. * Initiate evaluation process and production of associated reports. * Support the Coordinating Provider and the National Programme Manager in developing a response to actions identified in Annual Review, Evaluations and other reports. * Meet 6 times a year for the initial intake with meetings scheduled to coincide with the end of each phase   To carry out this role the CSG will interact with:     * The Coordinating Provider through the National Programme Manager * The National Programme Board * The National Examinations Board and * Collaborating Providers.       **Figure 6 Consortium Steering Group Interaction** |

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| **2.6 Roles and Responsibilities of Coordinating Provider** (text or hyperlink) |
| The role of the Coordinating Provider is set out in the [QQI Quality Assurance Guidelines for Apprenticeship Programmes](https://www.qqi.ie/sites/default/files/2021-11/qg-3-topic-specific-qa-guidelines-for-statutory-apprenticeship-programmes.pdf) as follows as a relevant or linked provider who is ultimately responsible for providing (as defined by the 2012 Act) an apprenticeship programme.  The purpose of the Coordinating Provider, in this case, Louth and Meath Education and Training Board (LMETB), is to develop and maintain the curriculum and assessment procedures for the RAA programme and to lead and support approved collaborating providers.  The Coordinating Provider is a mandatory governance requirement for validating apprenticeship programmes with QQI.  Under the day-to-day leadership of LMETB, the National Programme Manager and supporting staff, operational activity will be discharged in accordance with the validation requirements as set out by QQI.    **Figure 7 Coordinating Provider**  The key responsibilities of the Coordinating Provider include:   * Working with the CSG on the development of a programme proposal for submission to QQI for validation. This involves:      * + Ensuring that there is adequate consultation with stakeholders in the development of the programme.   + Presenting informed research findings.   + Preparing supporting documentation, policies and procedures.   + Developing the curriculum and associated assessment processes.   + Managing the submission of all relevant documentation   + managing the preparation for the validation process including participation in self-evaluation processes.   ***Post validation***   * The establishment of a National Programme Board that is representative of employers and training providers (collaborating providers). * Ensuring the development, in consultation and agreement with employers and collaborating providers, of binding memoranda of understanding or memoranda of agreement which commits all parties to implementation of the agreements. * Coordinating the marketing and promotion of the apprenticeship. * Supporting the resourcing of programme development including supporting instructors in the development of programme materials for the delivery of the programme * Developing programme delivery assessment instruments for on-the job and off-the-job elements that adequately support certification of achievement of learning outcomes, * Ensuring the development of appropriate grading systems, and all necessary appeal mechanisms. * Agreeing and implementing a system with Authorised Officers (AOs) and employers for evaluation and review of employer training capacity and for addressing any gaps in that capacity * Developing supports for workplace mentors through the provision of an accredited workplace mentorship programme and ensuring that workplace mentors and instructors where appropriate are given access to relevant CPD including:      * + Teaching and learning pedagogy and methodologies in particular the AHEAD/UCD Digital Badge in Universal Design for Learning   + Appropriate vocational courses including the Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing.   + Accreditation body training (through attendance at FESS and QQI events) * Developing and resourcing administrative systems to ensure efficient and effective management of programme provision, including tracking and managing apprentices’ progress. * Coordinating with Authorised Officers and employers to ensure that recruitment of apprentices takes into account the knowledge, skill and competence required for apprentices to have a reasonable chance of completing the programme ensuring that recruitment complies with the validated programme criteria on entry requirements. * Developing and maintaining systems for access (in collaboration with employers of apprentices), transfer, progression, and expulsion of participants, including all necessary appeal processes. * Coordinating with Authorised Officers and employers to ensure the effective and efficient training of apprentices within the workplace to reach programme learning outcomes. * Monitoring the delivery of the programme, both on-the-job and off-the-job aspects to ensure that it complies with the validated programme * Coordinating the actions of other providers of education and training, who are involved in curriculum development and in programme provision. * Ensuring that the programme keeps pace with the development of the occupational profile, is enterprise-led and meets labour market needs. This will take place through the formal involvement of the Consortium Steering Group. * Developing systems to ensure employers and labour market trends influence and lead curriculum development, while providing for apprentices’ personal development and their preparation for progression. * Developing a quality system to manage curriculum and assessment updates and improvements where multiple providers are involved, so as to ensure that the national character of the curriculum is maintained and that the approved curriculum is implemented by all collaborating providers, in accordance with the unique validated programme for the apprenticeship. * Ensuring that any expansion of the consortium, through additional providers or employers, has due regard to any relevant quality assurance matters. * Managing the submission of results through the National Examinations Board and managing the certification process and requesting certification.   For further information on the role of a coordinating provider please refer to Section 4 of the Robotics Automation Apprenticeship Quality Assurance and Procedures Manual. ([RAA QAP Manual](https://www.lmetb.ie/wp-content/uploads/2024/05/RAA-QAP.pdf)) |

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| **2.7 Programme Board – Membership and Terms of Reference** (text or hyperlink) |
| The National Programme Board is the single national entity with responsibility for the eﬀective management, operation, monitoring and review of the Apprenticeship Programme.  The RAA National Programme Board is responsible for the oversight of the Robotics and Automation Apprenticeship (RAA) programme and reports to LMETB’s dedicated RAA Quality Assurance General Management Committee (QAGMC) sub-committee.  The National Programme Board (NPB) **Figure 8** consists    **Figure 8 National Programme Board**   * Chairperson Consortium Steering Group (CSG) * LMETB Adult Education Officer (AEO) with responsibility for Quality Assurance * Training Standards Officer (TSO) * Employer Representative from an organisation that is utilising robotics and automation in the manufacturing process. * Instructors representing all providers * Two RAA apprentices (to reflect providers and cohorts) * LMETB Authorised Officer (AO) * Independent Subject Matter Expert (in the absence of relevant expertise on the part of the Authorised Officer this person will be contracted by LMETB to work with the Authorised Officer (AO) and the National Programme Manager in approving employers).   The National Programme Board has   * access to information and data on the execution of the programmes * the assessment results * and the mobility of apprentices through the components of the programme.   It receives all reports from;   * the National Programme Manager * Collaborating providers * External Authenticators.   The National Programme Board will assist the Consortium Steering Group in ensuring the RAA programme is informed and led by the current and future requirements of enterprises. This is outlined in **Figure 9**  **Reporting relationship between CSG, National Programme Board,**  **& Programme Manager**    **Figure 9**  The work of the National Programme Board will be supported by the National Programme Manager. Its day-to-day oversight of the operation of the validated apprenticeship programme will include:   * Coordinating the marketing and promotion of the apprenticeship. * Devising / approving the assessment strategy and types of assessment to be used in a programme cycle to ensure that the module outcomes are being assessed, that cumulatively the MIPLOs are assessed. * Generating a bank of assessment resources. * Agreeing the assessment schedules for the programme on the advice of the Programme Manager. * Reviewing External Authenticator reports pertaining to issues of delivery and assessment. This will be done on receipt of the External Authenticator’s report and in advance of a new cycle starting. * Considering reports from Collaborating Providers, Workplace Mentors, and Instructors on the progress of apprentices and on delivery and assessment of the approved programme. * Encouraging the sharing between Workplace Mentors and providers of best practice in the delivery and assessment of apprentices. * Considering the eﬀectiveness of the teaching, learning and assessment strategies being implemented as per the validated programme. * Programme monitoring, review and improvement. This will include   + Agreeing and implementing minor modifications and additions to the programme where these do not aﬀect module outcomes. This will include suggestions from the External Authenticator, or improvements suggested by Workplace Mentors or by instructors.   + Monitoring the on-going operations of the programme nationally.   + Monitoring examination and continuous assessment results nationally to ensure an appropriate mix of learning modes and associated assessment methods.   + Seeking feedback from significant stakeholders on the delivery of the programme and on possible minor modifications. This can be achieved in conjunction with the CSG.   + Reviewing at the end of each assessment period, the results of surveys of apprentices’ feedback and that of other stakeholders of programmes.   + Contributing to the findings and work of the CSG including the occupational review process.   + Reviewing the provision of programme resources including equipment and facilities requirements as well as resourcing of skills enhancement initiatives.   + Examining the eﬀectiveness of support services such as administrative services and Virtual Learning Environments (VLEs).   + Introducing improvements in the programme arising out of the monitoring and review process which do not impact on the validated programme   + Directing a detailed self-evaluation of the operation of the Programme Board periodically (usually every five years)   + Recommending appropriate external experts to play a role in designing, monitoring, and reviewing programmes.   + Recommending appropriately qualified persons as External Authenticators. |

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| [https://www.lmetb.ie/wp-content/uploads/2024/04/Application-for-Collaborating-Provider-Approval-Form-RAA-01-Sample-partially-Completed.pdf](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.lmetb.ie%2Fwp-content%2Fuploads%2F2024%2F04%2FApplication-for-Collaborating-Provider-Approval-Form-RAA-01-Sample-partially-Completed.pdf&data=05%7C02%7CPQuinn.AMC%40lmetb.ie%7Ce2303b59eeca4996abf208dc6465c701%7C919083a6dcdc4391b6820d3990b0a59c%7C0%7C0%7C638495635527330162%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=8s1U%2F%2FYTvie0fG2YsEs1vz13LS10mQJb5yqPGn593NE%3D&reserved=0) |
| * Memorandum of Agreement for Collaborating Providers   The purpose of this agreement is to ensure the delivery of a statutory apprenticeship programme in the occupational area of Robotics and Automation. The agreement recognises the central position of employers/ enterprises in the Irish apprenticeship system. It identifies the Consortium Steering Group as the entity representing industry for the purposes of the apprenticeship programme. It also recognises the critical role of Louth and Meath Education and Training Board in the provision of the programme.  The agreement recognises Louth and Meath Education and Training Board as the sole Co-ordinating Provider of the National Robotics and Automation Apprenticeship Programme. The agreement sets out the responsibilities of both parties. It recognises that the Consortium Steering Group has a responsibility to ensure that Industry is provided with well-trained crafts persons. It recognises that Louth and Meath Education and Training Board, as an autonomous educational body, has a responsibility to QQI to provide the programme as validated and to adhere to QQI policies for the delivery and assessment of apprentices.  The purpose of this agreement is to ensure that the off‐the‐job services and those services proper to be a provider are delivered to apprentices registered on the RAA programme, and that these services are delivered in a professional manner and to the standards required by QQI, the regulator and the consortium.  The agreement also facilitates the involvement of the Collaborating Provider in the development of the programme and as part of the NPB in the management of the programme.  **Scope**  The Memorandum of Agreement(s) entered between LMETB’s and other Collaborating Providers, will cover the extent of the programme.  It will set out   * the actual programme to be delivered * the outcomes to be delivered * the staffing * physical facilities and materials required for the programme.   It also covers how the programme is managed.  Details of the relationships between the LMETB as the coordinating provider and the collaborating ETB(s) and other collaborating ETB’s contracted training provider will be clearly set out within the agreement. The operating mechanisms for the programme are to be included. A dispute resolution mechanism will also be specified.  **Delivery, Resources and Local QA for Collaborating Providers**  The agreement will also specify the programme that the apprentice is expected to follow.  This includes the details of the modules. It also will include the assessment processes as well as the staffing required to deliver the programme. This can be done by referring to the validation document or to relevant paragraphs of the validation document or to other specified documents. The programme schedule can be used as a basic contract with the apprentice as it specifies the modules and the assessment regime for the programme. Recruitment and induction processes will also be specified.  Within the agreement LMETB and other Collaborating Providers will agree on the internal QA processes within each site.  These will cover   * feedback and complaint systems * support to teaching staff * reporting mechanisms from staff to local management and onwards to the National Programme Manager   Assessment processes to ensure integrity and authenticity of assessment are also to be specified. |

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| **2.9 Memorandum of Understanding for Employers:** (append pro-forma document or insert hyperlink)  [Link to RAA Memorandum of Understanding CSG to Employer Template](https://www.lmetb.ie/wp-content/uploads/2024/04/RAA-MOU-from-CSG-to-Employer.pdf) |
| * LMETB RAA [Memorandum of Understanding](https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.lmetb.ie%2Fwp-content%2Fuploads%2F2024%2F03%2FRAA-MOU-from-CSG-to-Employer.docx&data=05%7C02%7CCKelly1%40lmetb.ie%7C93c79d25e7fa4644a0f608dc43487f75%7C919083a6dcdc4391b6820d3990b0a59c%7C0%7C0%7C638459225880332634%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=FpelN8Tjj%2F9%2Fp0isqK%2BkIEFpCoDqjmaJGd%2BbrTeuWn4%3D&reserved=0)   **Purpose and Scope**  This memorandum of understanding (MOU) between the RAA Consortium Steering Group (CSG) and RAA employer, provides an agreed framework for cooperation and communications between two organisations for the operation of the RAA Apprenticeship Programme.  It is a document that describes the broad outlines of an agreement that two or more parties have reached. It indicates that the parties have reached an understanding and are moving forward.  This document has been developed in accordance with the relevant statutory provision, national strategies, and government policies. It is not a legally binding agreement or contract and is not exhaustive in its identification of the two organisations responsibilities. It does not preclude the identification and implementation by the organisations of additional objective and actions. In the spirit of the MOU, it is anticipated that further areas of collaboration will be identified subsequent to its agreement.    The CSG and the employer will ensure that all relevant members of their organisations are familiar with the content of the MOU and that all dealings between the two organisations and with other named parties are conducted in the manner that is consistent with its objectives. |

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| **2.10 Monitoring of On-The-Job elements of the programme:** describe how and by whom monitoring is to be carried out and where the information gained will be reported. |  |
| Solas Authorised Officer | |  | | --- | | The SOLAS Authorised Oﬀicers currently carry out a range of functions on behalf of SOLAS including, but not limited to:     * Conducting assessment site visit to assess the employer’s suitability to train apprentices. * Briefing employers on their roles and responsibilities in relation to the on-the-job elements of the apprenticeship on behalf of the statutory regulator. Assessing and approving employers to register apprentices, through SOLAS Employer Approval and Code of Practice processes. * Approving and registering new apprentices and apprentices changing employers * Providing an objective information and guidance service to all apprentices registered * Monitoring of employers during the apprentice’s on-the-job phases * Maintaining apprentice and employer records. * Collaborate and communicate with the National Programme Manager in the delivery of the Programme | |

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| **2.11 Monitoring of Off-The-Job elements of the programme:** describe how and by whom monitoring is to be carried out and where the information gained will be reported |
| **Governance and Oversight**  LMETB holds responsibility for maintaining the academic quality of the programme.  **Quality Assurance checks**  LMETB quality assurance processes are a formal set of procedures that ensure fairness and consistency of standards across all assessments within a programme intake/cohort completing project assignments. The purpose of this essential monitoring is to ensure the reliability, validity, and authenticity of the assessment and related matters while apprentices are on the off-the-job element of the programme.  It is imperative to conduct regular reviews to guarantee that QA standards are being adhered to. These reviews are indispensable for confirming that programme delivery is being executed accurately and dependably. Such systematic reviews are vital for maintaining quality and reliability of the programme delivery and certification attainment.  The following sections outline the quality assurance checks that will be in operation to ensure the academic rigour of the programme.  **Operations Meetings**  The National Programme Manager will convene weekly operations meeting with Coordinating Provider (LMETB/AMTCE) staff:     * Training Centre Manager * The Lead Instructor * The Training Standards Officer (TSO) who is responsible for the QA   Delivery of the RAA within each of the Collaborating Providers will be supported by the following key staff employed by the respective ETB   * Collaborating Provider's Programme Manager/Coordinator * Training Centre Manager or equivalent * The Lead Instructor * The Training Standards Officer (TSO) or Manager with responsibility for QA   Minutes of weekly operational meetings held by Collaborating Providers should be provided to the National Programme Manager. Monthly meetings will be held by the National Programme Manager with Collaborating Providers. These meetings with the Collaborating Providers will include the Collaborating Providers’ Programme Manager. The Lead Instructor in each Collaborating Provider may attend if required.  In addition, should any issues arise with Collaborating Providers outside of these meetings, the National Programme Manager will be available to support and guide them on any operational issues.  **Collaborating Provider Programme Manager**  Each Collaborating Provider is required to nominate a staff member to act as a Programme Manager with overall responsibility for the apprenticeship programme for that Provider.  The Collaborating Provider Programme Manager will:   * Provide induction for incoming apprentices, including apprentice introduction to the training location, programme structure and on- and off-the-job content and timetable. * Ensure Instructors, Internal Verifiers and Workplace Mentors understand their role and are supported. * Ensure Instructors, Internal Verifiers and Workplace Mentors are familiar with the programme they are assessing and internally verifying and have sufficient knowledge to enable them to interpret the knowledge requirements, values, and documentation. * Ensure Instructors, Internal Verifiers and Workplace Mentors are familiar with the recording systems, documentation and procedures for assessment and internal verification quality assurance. * Liaise with apprentice employers. * Provide the National Programme Manager with reports on programme outputs and inputs as per the monitoring schedule. * Update the [RAA form](https://www.lmetb.ie/wp-content/uploads/2024/04/MOA-Template-Coordinating-Provider-LMETB-Collaborating-Provider-1.pdf) to notify the Co-ordinating Provider of any changes in personnel involved with the programme as per the Provider Approval Process and signed agreement. * Ensure any corrective actions required are locally implemented within the agreed time scales. * Attend meetings of the National Examinations Board and Programme Board as required. * Ensure any corrective actions required at the on-the-job site are communicated to the National Programme Officer when cases arise where an employer no longer has capacity to provide on-the-job training. * Contribute to Workplace Mentor training as required. * Be responsible for managing Collaborating Provider Recognition of Prior Learning (RPL) processes – promotion, selection, RPL assessment, proposing candidates to Examinations Board, etc. * Be responsible for driving demand for the programme locally and hosting events such as open evenings and employer briefings. * Be responsible for adhering to schedules and calendars as set out by the Co-ordinating Provider, such as workplace verification, e.g. pre-checks, apprentice registrations and authentication timelines.   **Coordinating Providers Training Standards Officer** **(TSO)**  The Coordinating Provider’s Training Standards Officer (TSO) will have a key support function in terms of ensuring compliance with the Quality Assurance policy and procedures framework supporting the RAA.  This will include the following roles:  **Assessments and certification**   * Briefing the Programme Instructor teams in all providers on the Quality Assurance processes and procedures. A dedicated section will be established on Moodle for the management of QA updates. In-person briefings will be held with all new providers. * Managing access and security to assessment tasks and ensuring that updates are communicated to Collaborating Providers and Lead Instructors promptly and effectively. * Ensuring through liaison with Coordinating and Collaborating Providers’ staff that all matters in relation to the assessment and certification process are conducted in a correct and proper manner in accordance with the process and procedures set out in the QAP and in accordance with the criteria outlined by QQI. * Investigating any instances of assessment malpractice. * Ensuring that the Internal Verification of assessment results is carried out in the Coordinating Provider ‘s iteration of the programme. This is to ensure that that there are no errors in marking, totalling and transcription of marks. IV reports from Collaborating Providers will be provided to the National TSO where serious issues of non-compliance have been identified. (It is the responsibility of the Coordinating Programme Manager to ensure that internal verification procedures both on and off-the-job are implemented correctly and consistently across the Collaborating Providers nationally and that Collaborating Provider Programme Managers ensure that Internal Verifiers are familiar with the recording systems, documentation procedures for assessment and internal verification of the Programme). * Ensure any recommendations and/or corrective actions of the National Programme Board or QAGMC RAA Sub-Committee are progressed. * Ensuring that External Authentication of the programme is carried out on completion of each phase to ensure that training is to a high standard and that marks are a true reflection of apprentices’ assessment.   The Coordinating Provider’s TSO will organise EA for the coordinating and all collaborating providers; this will occur at the end of each phase when module assessments are completed. In the initial delivery (and on review) of the RAA programme by any provider external authentication will be carried out on 100% of the apprentice cohort.  The Coordinating Provider’s Training Standards Officer (TSO) will submit the results and the EA reports to the National Examinations Board as part of the results approval process.  The Coordinating Provider’s Training Standards Officer (TSO) in liaison with the National Programme Manager will report to the National Programme Board and action any EA recommendations to ensure the continued quality and academic integrity of the RAA programme.      **Figure 10 Internal Verification (IV)and External Authentication (EA) process**  **Programme development and evaluation**  The Coordinating Provider’s Training Standards Officer (TSO) will:   * Provide timely advice, information, and support to the National Examinations Board on matters relating to the assessment process and processing of the programmes. * Advise the National Programme Board and National Examinations Board on any improvements/actions required to the quality assurance procedures. * Cooperate with the provision of information to the programme Evaluation Process.   **Internal Verification (IV)**  The Coordinating Provider’s Training Standards Officer (TSO) and the Collaborating Providers’ TSOs will respectively check the completion of the assessment procedure documentation and reports on all current intakes in the programme after the completion of each module through the Internal Verification process.  There is a two-stage IV process:  **Stage 1**  This involves checking compliance through the provision of instructor planning documents including ensuring use of nationally devised assessments briefs and marking schemes.  **Stage 2**  The TSO will appoint an Internal Verifier, who is a member of staff of the ETB but independent of the programme**,** to check the assessment procedure documentation and report on each intake in the programme after the completion of each module.  This internal verification activity is conducted by an individual who has was not involved in the assessment process, using RAA QA developed forms and methodology requiring a 100% sample size of the total cohort.  Internal Verification ensures completion of paperwork, and that evidence exists for same. Each Collaborating Provider is responsible for their own Internal Verification process.  Moreover, internal verification ensures that the documentation provided to External Authenticators is comprehensive and completed, thus allowing the External Authenticator to make well-informed determinations.  **External Authentication**  The external authentication of the programme's assessment processes is an essential part of ensuring that the programme is complying with its validation requirements, involving a comprehensive review of the programme's assessment, and certification attainment and related results.  This function guarantees persistent, independent supervision and scrutiny of the assessment process that has been established for the programme. Such ongoing monitoring is provided to ensure the adjudication systems are functioning properly, efficiently, and fairly in accordance with the standards and processes set out and in keeping with QQI requirements for the effective external oversight of all key assessments.  This facilitates an opportunity to ensure that all Collaborating Providers have completed all necessary assessments, monitoring, invigilation, and moderation requirements in accordance with the set QA standards.  As part of the external monitoring and review process, External Authenticators will compile a report on the programme after assessments have been completed. This gives rise to the opportunity for further evaluation of the programme at the National Programme Board meetings.  The Coordinating Provider’s TSO will engage a panel of specific subject matter expert External Authenticators at the outset of the programme. Details of the assigned EA will be communicated to each Collaborating Provider at the commencement of each intake.  **National Coordinating Programme Manager role**  LMETB National Programme Manager on the operation and management of the Programme at local level. It is the responsibility of the National Coordinating Programme Manager to:   1. Ensure the management, administrative, assessment and internal verification procedures both on and off-the-job are implemented correctly and consistently across the Collaborating Providers nationally. 2. Ensure the on-the-job Mentors and Assessors are suitably qualified and trained to conduct training and assessment for the National RAA Apprenticeship Programme. 3. Engage with the RAA local Programme Manager/Coordinator of the partners Collaborating Providers to confirm that Instructors/Internal Verifiers/Workplace Mentors are familiar with the Validated Programme documentation they are delivering and assessing. 4. Engage that the Collaborating Provider Programme Managers ensure that Instructors, Internal Verifiers and Workplace Mentors are familiar with the recording systems, documentation and procedures for assessment and internal verification of LMETB. 5. Ensure any recommendations and/or corrective actions of the National Programme Board or QAGMC RAA Sub-committee are progressed.   **Collaborating Provider Reporting**  Monthly operations meetings are held by the National Programme Manager with Collaborating Providers. These meetings will include:   * A review of the programme delivery and the performance of the apprentices. * Review of apprentice attendance, time-keeping and general behaviour as well as academic performance, including key points from summative module assessment.   As Collaborating Providers come on board it is envisaged that an apprentice portal will be developed whereby attendance, reports on issues and results can be logged as appropriate by the relevant Instructor, Authorised Officer and Workplace Mentor. This portal will be available to the local programme team and the National Programme Manager.  A key objective of the Coordinating Provider is to continuously review the RAA. The RAA will be routinely monitored through the Collaborating Provider Operations meetings to ensure:   * Programmes are progressing satisfactorily both operationally and academically. * Teaching and Learning strategies are appropriate to facilitating the achievement of the learning outcomes of the module and programme. * Assessment methods are appropriate to determining achievement of learning outcomes for the different modules and are distributed appropriately throughout the academic year. * Academic procedures are being followed. * The suitability of the existing apprenticeship programme in meeting the current and future needs of both apprentices and employers.   The National Programme Manager will visit each Collaborating Provider training centre at least once during the year and meet with all collaborating staff. They may also meet with apprentice representatives as part of the monitoring and feedback process.  Information collated through the monitoring activities may result in updates in the form of amendments and/or improvements to delivery and assessment of programme modules. The information will be compiled in a report to the National Programme Board and will be used to enhance the programme academic quality and the learner experience within the boundaries of the formal programme structure. Given the balance that this programme strikes between the applied and the practical, there will be on going opportunities to consult with practitioners in the field to ensure that the programme is relevant and fit for purpose.  **Collaborating Provider and Instructor Quality Assurance**  Prior to the commencement of the initial intake of the RAA apprenticeship programme with a Collaborating Provider, the National Programme Manager will convene a RAA Apprenticeship Programme Induction to inform relevant Collaborating Provider staff (and contracted trainers) to ensure they are fully au fait with the programme content and requirements as set out in the MOA.  The National Programme Manager will provide:   * An overview of the programme modular content and schedule * Review the instructor resources, training equipment and facilities required for the delivery of the programme.   The final component of the overview will set out the quality assurance standards and requirements. This will be delivered by the Coordinating Provider’s Training Standards Officer (TSO).  Subsequent inductions will be undertaken by the collaborating provider with support from the coordinating provider.  **Instructor Induction**  The Programme Manager in each Collaborating Provider in conjunction with the Collaborating Provider’s Training Standards Officer is responsible for the induction of all instructors to the programme. A detailed [checklist](https://www.lmetb.ie/wp-content/uploads/2024/05/Checklist.pdf) is provided, outlining the responsibilities of the instructor in terms of QA and the provision of content in Moodle, a Virtual Learning Environment (VLE). Additional briefings will be held as required to cover peer review and workplace visits. The checklist for the assessment of the employer will include establishing the presence of a minimum density of 2 robots/cobots and automated production line  compliance with the qualifications required of the Workplace Mentor Requirement which includes Level 7 Degree in a relevant field and/or 2 years post experience.    As part of the suitability assessment review the Subject Matter Expert (SME) along with the Authorised Officers (AO) and the National Programme Manager will check details on the employer’s company’s resources  confirming that the required facilities are on-site, which will enable full access to the teaching, learning, and assessment activities associated with the programmes.  QAP and related Policies and Procedures are shown on the LMETB website [here](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/revised-policies-and-procedures-2/)  **Ongoing Stakeholder Consultation Review Mechanisms**  A key objective of the Coordinating Provider and its National Programme Board is to continuously review work practices and procedures of all academic programmes.  Reviews of this Apprenticeship Programme and Quality Assurance Procedures will be routinely monitored to ensure that:   1. Programmes are progressing satisfactorily both operationally and academically; 2. Teaching and Learning Strategies are appropriate to facilitating the achievement of the learning outcomes of the module and programmes; 3. Assessment methods are appropriate to determining the achievement of learning outcomes for the different modules and are distributed appropriately throughout both the academic year and the apprenticeship phases; 4. Academic procedures are being followed; and, 5. The suitability of the existing apprenticeship programme in meeting the current and future needs of both Apprentices and employers.   Information collated through the monitoring activities may result in updates in the form of amendments and/or improvements to delivery and assessment of programme modules. In some instances, the information will be used to enhance the programme’s academic quality and the learner experience within the boundaries of the formal programme structure.  Given the balance that the programme strives for between the applied and the practical, there will be ongoing opportunities to consult with practitioner stakeholders to ensure that the programme is relevant and fit for purpose.  Examples of how the Coordinating Provider will liaise with stakeholders in order to ensure that the programme and is relevant and has currency is outline on the following page and will include:  **See Appendix III QA Reporting Summary**   |  |  | | --- | --- | | **GOVERNANCE OVERSIGHT** | **OUTPUT** | | **QAGMC - RAA** | The QA Governance/ Management Committee (QAGMC):   * Protects, maintains & develops standards * Provides oversight of planning, coordination, quality development and improvement of all aspects of FET * Approves new and amended FET courses for delivery in line with LMETB strategy.   All QA will be managed and overseen by the QAGMC RAA Sub-Committee. It will meet as required, but no less than twice a year, to review reports and reports requesting changes in procedures. | | **National Programme**  **Board** | The National Programme Board Meetings will be held at least four times per year. The frequency of the meetings may be higher for the initial iteration.  The meetings, with representatives from all key stakeholders present, will provide an ongoing opportunity for programme monitoring and review. It will consider the following:   * Report from the National Programme Manager which includes information collated through the monitoring activities and resulting recommendations. * Feedback from Apprentice Representative meetings and related survey findings. * A report from the Coordinating Provider’s Training   Standards Officer (TSO) on any improvements/actions  required to the quality assurance procedures and any EA  recommendations. This report will include contributions  from Collaborating Providers TSOs. It will review new  applications for Collaborating Provider provision. | | **Apprentice Representative**  **Meetings** | Each iteration of the RAA programme will be asked to hold at  least two Apprentice Representative Meetings per year  where apprentices will have the opportunity to voice all issues  and concerns relating to the participation of the apprentices in  the programme. This may include:   * programme content * scheduling * delivery   with the National Programme Manager or the Collaborating Provider Programme Leader who in turn will feedback to the National Programme Manager.  Reports of meetings with apprentices will be presented to the National Programme Board. | | **National Examinations**  **Board** | The National Examinations Board will act as the Results Approval Panel for the review and approval of results for all providers. It will review EA reports and recommend results for submission to QQI for certification. Its reports and findings will form part of the review of the programme and may include recommendations for the updating of the assessment instruments. | | **External Authenticator**  **Reports & Feedback** | As part of the external monitoring and review process,  External Authenticators will compile a report on the  programme after each off-the-job/assessment period which  will review results since the previous EA visit.  The frequency of the visits during the programme gives rise to the opportunity for further evaluation of the programme at the National Programme Board meetings and avoids any delay in actioning key findings by the EA. | | **Review of the**  **Occupational Profile** | The Consortium Steering Group is responsible for the review  of the Occupational Profile. This review will inform ongoing delivery of the programme and may initiate a programme  review. It will be informed by contributions from   * Employers involved in the RAA programme * Regional Skills Fora and other employer focused organisations e.g. Enterprise Ireland, IDA. Local Enterprise Offices, etc.. * National Surveys and reports (e.g. SLMRU and Future   Skills Needs reports) | | **National Programme Manager**  **Annual Report** | An Annual Report is completed by the National Programme Manager for the National Programme Board and the QAGMC - RAA. It will reflect and consolidate the feedback from all stakeholders at coordinating and collaborating provider level and will include findings from reports contributed to by:   * Apprentices * Programme instructors. * Quality Assurance (TSO and associated staff IV etc) * External Authenticators * Authorised Officers * Employers and work-based mentors * Collaborating Providers * Meetings with Regional Skills Fora and other employer focused organisations e.g. Enterprise Ireland, IDA. Local Enterprise Offices etc   This report is another opportunity to review the programme content and delivery. The Annual Report is distributed to senior management in each ETB and those involved in the delivery and management of the programme for comment. It is used to inform  discussions during the planned programme of meetings. | | **Instructor Feedback** | Instructors will have the opportunity to provide feedback in the following ways:     * at weekly operational meetings * via formal surveys after each off-the -job phrase or completion of module depending on their role. * informally to the National Programme Manager/Training Standards Officer (TSO)   Their feedback will form part of review and governance processes. | |

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| **2.12 Management of Curriculum and Assessment updates:** describe how the consortium will manage updates and improvements to the programme. |
| Relevant research undertaken by Solas’ Skills and Labour Market Research Unit (SLMRU) and also their Data Analytics Unit, and the Monitoring Skills Needs report will be taken into account in the periodic review. Given the fast-paced nature of change in this sector with the emergence of new technologies e.g. Artificial Intelligence (AI), this may impact the time frame for revalidation.  Programme review to include a review of the curriculum and assessments will be a standard topic on all agenda meetings of the National Programme Board and at provider level for senior management meetings. Proposed changes put forward for consideration by the National Programme Board or External Authenticator after each certification period.  **Full Programme Review**  The Consortium Steering Group (CSG) will initiate a programme review through the National Programme Manager after the completion of each iteration of the programme. They will seek:   * Industry inputs on emerging skills needs and redundant skills * Learner experience * Review national strategies * Be cognisant of international practice and developments.   The review will involve:   * Current and past apprentices *(Coordinating and Collaborating providers)* * Instructors *(Coordinating and Collaborating providers)* * Authorised Officers *(Coordinating and Collaborating providers)* * Employers to include Workplace Mentors *(Coordinating and Collaborating providers)* * Companies involved in the Robotics and Automation sector that have not engaged with the apprenticeship * Staff from Coordinating and Collaborating providersinvolved in   + Quality Assurance   + Learner Support * Collaborating Providers * Regional Skills fora and other employer focused organisations e.g. Enterprise Ireland, IDA, Local Enterprise Offices etc * Solas * QQI   Feedback from all stakeholders will be considered to ensure:   * The ongoing relevance of the on-the-job and off-the-job elements * Assessment strategies * Structure of the apprenticeship, and, * Consideration of the adoption of emerging technologies in order to future proof the apprenticeship.   Data from certification periods and graduate progression statistics will also be used to inform the review.  The National Programme Manager’s review will also be informed by the following ongoing programme review activities.  **Learner Survey**  Each provider will undertake a survey of all apprentices after each off-the-job module to evaluate the design, delivery and assessment of the module. The rationale behind this is to have visibility across all modules and so the National Programme Board can review and revise when necessary.  Sample Surveys:   |  |  |  | | --- | --- | --- | | [Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUOUQ0Rk43Q0JSSEFEQVlBUDlZMlQxVlI5ViQlQCN0PWcu) | [Personal & Professional Career Development and EHS](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUNVpRUzNYSUZRQTU1UlhOTEdCUTZVTzdZUCQlQCN0PWcu) | [Maths for Advanced Manufacturing](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUN0RHSkk4R1MzQk1LV0xQNTJWVVVXOFBBTSQlQCN0PWcu) | | [Digitisation of Manufacturing Operations](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUNjZET1EyQUU2QTY1RDZIVEpMWVNZTDNWQiQlQCN0PWcu) | [Robotics Fundamentals, Operations and Automation](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUNjVMQUdCUEZYM1I2T1JNSEFPVTFYSFZKUyQlQCN0PWcu) | [Industrial Systems and Operations and Workshop Skills](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUQUY5QlY1TTFVQkE5VFYxRTlPV1hWTk1CNCQlQCN0PWcu) | | [Robotic Programming/Simulation, System Integration and Functional Safety](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUMkY4NTVBU1Y3NTczUUFOTlg2SU5OR1Q1USQlQCN0PWcu) | [Equipment Control, Automation and Actuation](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUME1JM01ONzVXVTdPTjdLTllCTU1FSlgyOSQlQCN0PWcu) | [Work Based Project](https://forms.office.com/Pages/ResponsePage.aspx?id=poOQkdzckUO2gg05kLClnJDHV7E6jk9Egg_bRTl0JtJUMFIyQklEREFHMkRTTkpMQlM3Vk40RzBFMCQlQCN0PWcu) |   Microsoft Forms via the VLE/Moodle will be used to gather feedback. Information obtained will be used for data analysis and comparison and reporting to relevant agencies.  The National Programme Board will use the data to identify improvements, review the learner experience and to ensure that the learning outcomes associated with the programme and individual modules are being addressed.  Questions asked via this survey, which can be related back to the achievement of learning outcomes will include the following areas:   * What apprentices find useful about the module * How the module could be improved * Is the module useful in the workplace * Are the workplace tasks assigned relevant to the workplace * Is the assessment relevant to the workplace * Is there any additional supports that are required on an individual or collective basis   **Site Visits**  For each intake/group the lead instructor(s) will conduct 2 site visits with apprentices and mentors with the aim of monitoring progression and obtaining and providing constructive feedback in the areas of practical skills. In addition, should there be relevant operational issues which need to be addressed, the instructors in consultation with the Authorised Officers can provide advice and support to rectify this.  Each meeting involving the apprentice and the workplace-based mentor could last an hour on average and a feedback record sheet is completed per visit which is then shared with the Programme Manager. In the initial intake the National Programme Manager will attend one of the two meetings.  Any relevant details are shared with the National Programme Board and CSG. Personal details and information will be redacted unless it is appropriate and necessary to include such information. In addition, when Authorised Officer conduct site visits, feedback where appropriate is shared with the National Programme Manager.  **Operational Meetings**  The National Programme Manager schedules operations meetings on a weekly basis and after each module discusses the feedback with the instructors to ensure learning outcomes are addressed and improvements identified. Feedback is reviewed collectively by the team on a regular basis and overviews provided to the National Programme Board and to the CSG by the National Programme Manager where appropriate.   * **Programme development and evaluation**   + The Coordinating Provider’s Training Standards Officer (TSO) will: * Provide timely advice, information, and support to the National Examinations Board on matters relating to the assessment process and processing of the programmes. * Advise the National Programme Board and National Examinations Board on any improvements/actions required to the quality assurance procedures. * Cooperate with the provision of information to the programme Evaluation Process.   **External Authentication feedback**  The external authentication of the programme's assessment and certification is an essential part of ensuring that the programme is complying with its validation, involving a comprehensive review of the programme's assessment, and certification attainment and related results.  This function guarantees persistent, independent supervision and scrutiny of the assessment process that has been established for the programme. Such ongoing monitoring is provided to ensure the adjudication systems are functioning properly, efficiently, and fairly in accordance with the standards and processes set out and in keeping with QQI requirement for the effective external oversight of all key assessments.  As part of the external monitoring and review process, External Authenticators will compile a report on the programme after assessments have been completed. This gives rise to the opportunity for further evaluation of the programme at the National Programme Board meetings.  **Presentation of findings**  The National Programme Manager will present the results of their findings to the Consortium Steering Group. The report can be adopted with or without changes and forwarded with a recommendation to the National Programme Board for adoption and implementation with relevant updates and requests forwarded to the QAGMC – RAA committee.  **Communicating changes to the curriculum and assessment procedures**  The Coordinating Provider’s Training Standards Officer (TSO) will have a key support function in terms of communicating changes to the curriculum and assessment procedures.  The TSO will:   * Brief the Programme Instructor teams in all providers on the Quality Assurance processes and procedures via the provision of relevant information to the provider at the outset of an intake. A separate channel will be created on Moodle for the management of QA updates. * Manage access and security to assessment tasks ensuring that updates are communicated to Collaborating Providers and Lead Instructors in the Coordinating Provider promptly and effectively via uploads to the Moodle QA channel. * Review Internal Verification (IV) and External Authentication (EA) reports in order to identify any changes required or recommended. |

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| **2.13 Gathering and using stakeholder feedback:**  describe how feedback on programme from apprentices, employers and industry representatives is systematically collected and used |
| **Introduction**  There is a strong commitment to consultation and taking on board the views of all stakeholders involved in the RAA including apprentices, instructors, apprentices support team, employer and other industry bodies, collaborating providers, certifying bodies and relevant national agencies, those involved in career guidance and advice at a local and national level; this process will be underscored with the methodologies as set out below.  The National Programme Manager and the National Programme Board will be involved in the distillation, synthesis, interrogation and in taking action based on the outcomes of the feedback garnered through these processes.  **Surveys and Questionnaires**  LMETB values the importance of gathering relevant feedback and analysis through stakeholder surveys/questionnaires to inform and focus the RAA Apprentice’s programme delivery. An initial baseline survey of expectations will be taken prior to the commencement of the programme. It will be revised for subsequent intakes.  This will allow the coordinating provider:   * Identify expectations and identify actions required to meet these expectations. * Measure impact through the programme. * Elicit insights to inform the development and resourcing of the programme.   Accordingly online surveys will be issued to the following key stakeholders   * Apprentices will be surveyed after each phase. * Graduates will be surveyed 6 months, 12 months, and 24 months post-graduation. * Employer's representatives will complete surveys as follows;   + Work-based mentors survey after each on-the-job phrase.   + Human Resource personnel and other staff involved in any aspect of the apprenticeship programme on completion of the programme. * Instructors will be surveyed after each off-the -job phrase or completion of module depending on their role. * Collaborating Providers will be surveyed after each phase. * Other stakeholders surveyed on the completion of the programme will include;   + Authorised Officers   + Learner Support Staff   + Skills Fora and representative bodies   + Career Guidance Counsellors   Such surveys will enable stakeholders to provide critical feedback anonymously and in timely fashion which will be enacted upon promptly to strengthen and enhance programme delivery.  **Class Representative Feedback Process**  At the commencement of the RAA Apprenticeship programme, each provider will invite each cohort of apprentices to nominate class representative(s) to communicate with them and other stakeholders in relation to the efficient and effective delivery of the programme.  Informal feedback will be obtained from class representatives over the duration of the programme by Instructors and this will be discussed at the weekly operations meetings.  Formal class representative meetings will also be scheduled annually with feedback brought back to the programme team and subsequently any recommendations brought to the National Programme Board.  Once nominated the class representative(s) will be further informed of the importance of the role and provided with a feedback template which will be submitted prior to the formal class representative meetings.  The action items arising from such meetings will be assigned to the relevant RAA apprenticeship team member (i.e. the National Programme Manager/Programme Leader and Instructors) to take on board the action items to make sure the apprentices feel heard and can see that their input is valued and acted upon.  Apprentices are also represented on   * The Consortium Steering Group (CSG) * National Programme Board * LMETB Learner network * Learner Voice activities as managed by AONTAS   and can provide feedback at those meetings. This collation of feedback will continue on an annual basis where the feedback will be utilised to shape and adapt the programme.  **One-to-one Progress Review**  The National Programme Manager or where relevant the local Programme Coordinator/Manager will meet with each apprentice and their Workplace Mentor on a bi-annual basis, taking the opportunity to review and assess the apprentices’ progress and to gain feedback on the programme structure and how it benefits both the employer and the apprentice.  Noting any issues, suggestions, and actions where appropriate, the coordinator/manager also establishes and maintains a rapport with the apprentices from the outset and throughout the two-year apprenticeship, allowing for further sharing of views and thoughts on the programme structure and the programme progression.    **Graduate Network**  On completion of the apprenticeship all apprentices will be contacted at 6 months post qualification, one year post qualification and two years to ascertain their experiences of the apprenticeship and how it relates to their current role or position. The survey will form part of the Annual Review report submitted by the National Programme Manager.  As the programme develops an RAA Alumni Network will be established to allow apprentices maintain contact with each other. In addition, it will be invited to contribute to programme review and development.  **Instructors feedback**  Instructors will have the opportunity to provide feedback in the following ways:   * At weekly operational meetings. * Via formal surveys after each off-the -job phrase or completion of module depending on their role. * Informally to the National Programme Manager/Training Standards Officer (TSO).   **Consortium Steering Group meetings**  The National Programme Manager will review the minutes of each CSG meeting for feedback, recommendations and required actions. CSG members will also be invited to complete a feedback survey each year.  **Stakeholder Focus Groups**  Employers, Apprentices and Training Providers including Instructors will each be invited to participate in separate Focus Groups as part of the National Programme Manager’s Annual Review. This will permit participants the opportunity to share their perspectives, requirements and expectations for the RAA Apprenticeship Programme to ensure the relevance and robustness of the programme in a rapidly evolving sector.  **Industry Forum**  The LMETB RAA Apprenticeship Team is dedicated to the success of the programme, which relies heavily on the involvement of multiple stakeholders.  To review and maintain high standards and quality in an ever-changing market, the National Programme Manager will hold annual RAA Programme meetings with an Advanced Manufacturing Sector Forum which is part of the Regional Skills Forum.  These meetings will garner feedback, insights, and opinions on the RAA Apprenticeship and its impact on the manufacturing sector in Ireland. Such feedback can be incredibly insightful and valuable, particularly in terms of programme outcomes, industry expectations and the potential impact of emerging technologies and new processes on the evolution of the programme content.  **Monitoring & Enhancement Review**  Every 2 years LMETB will appoint an external subject matter expert to conduct research on the programme being delivered. This research will include engagement with all stakeholders including:   * Consortium Steering Group (CSG) * Employers including work-based mentors, human resource personnel. * Apprentices and graduates * Instructors * External Authenticators * Programme management including programme teams at coordinating and collaborating providers. * Career Guidance Counsellors and other agencies and personnel involved in skills and career progression including higher education institutes. * Other agencies and organisations involved in job promotion including Enterprise Ireland, Local Enterprise Offices etc.   The aim of this review is to enhance the apprenticeship programme by improving the experience of the apprentice and strengthen industry partnerships.  **How the review reports will be used?**  Feedback is essential for the success of the programme and is utilised to maintain its high standard and to safeguard its ongoing relevance amidst constant sectoral advancements. It will form a standing item on all meetings of the National Programme Board and the Consortium Steering Group (CSG) |

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| **2.14 Expansion of programme nationally** (set out the process by which the consortium will expand availability of the programme nationally, including addition of collaborating training providers. |
| At the outset it was envisaged that the RAA programme would be a national apprenticeship. The aim of the Consortium Steering Group is to expand the provision to between 120 and 160 active apprentices by Year 4 of the programme.  Growing the numbers enrolled on the apprenticeship will involve:   * Increasing the number and regional spread of employers employing apprentices. * Expanding the number of training locations through collaborating providers. * Ensuring a steady supply of applicants for the programme.   **Expanding the number of training locations through Collaborating Providers**  The following ETBs have been involved in the development of the application for validation, contributed to various groups or meetings and/or have expressed interest in offering the programme:   * Limerick and Clare ETB * Waterford Wexford ETB * Kildare Wicklow ETB * Donegal ETB   Cork ETB have more recently expressed an interest in becoming a collaborating provider.  In addition, the National Programme Manager for the Original Equipment Manufacturing (OEM) Apprenticeship, developed by Cavan and Monaghan ETB, has participated in pre-validation reviews and provided very relevant feedback.  By year 3 the goal is for the provision to be available in at least 4 other ETB regions depending on whether the relevant ETBs have the necessary resources in place.  The process of accepting applications from other ETBs to be a Collaborating Provider will be reviewed and adapted as required as the initial roll-out of the first intake occurs. It is envisaged that it will include the following steps:     1. The two first intakes of the programme will be delivered by LMETB and monitored closely to determine which aspects of programme delivery are working as intended and what (if any) changes would improve programme delivery and apprentice experience. 2. In parallel the ETBs listed above that have expressed interest will be briefed on the QA procedures required to become a Collaborating Provider ([sample here](https://www.lmetb.ie/wp-content/uploads/2024/04/Application-for-Collaborating-Provider-Approval-Form-RAA-01-Sample-partially-Completed.pdf)). In addition to reviewing the QA procedures they will be encouraged to work towards: 3. Completing an application for consideration by the Consortium Steering Group and National Programme Board. 4. Confirming that the necessary QA procedures are in place. 5. Securing final commitment from employers in their region who have already expressed an interest in the RAA and/or recruiting new employers. 6. Ensuring that the necessary resources (staff and equipment) are in place including provisioning for and installing the necessary specialised robotics and automation and related equipment. LMETB will assist the initial collaborating ETB providers with equipment sourcing information and will visit their sites to inspect and approve the RAA labs / workshops before programme commencement is approved. 7. Marketing the provision of the RAA in their region. 8. Completing training and induction of QA staff, Instructors and Work based Mentors and all those involved in the management and delivery of the apprenticeship.   It is expected that activities relating to the review of the programme for revalidation will commence in Year 2 in time for submission for revalidation in Year 3. This will provide an opportunity to integrate the learning, improvements and changes to the programme including those related to technological advancements in the RAA sector and learnings from the delivery of the programme by at least one other ETB seeking to become a collaborating provider. Learnings from revalidation will allow for ETBs to review the updates and submit an application to become a collaborating provider.  **Growing apprenticeship numbers**  Increasing the number of apprentices participating in the programme will be achieved by working closely with employers and collaborating providers.  In addition the following activities will be undertaken by LMETB as the Coordinating Provider –   * Maintaining, subject to GDPR requirements, a database of expressions of interest from applicants following the initial national launch and intake. * Participating in Generation Apprenticeship promotion. * Attending Higher Options and World Skills Ireland events. * Exhibiting at the Apprenticeship Expos organised by Meath Chamber of Commerce and LMETB. * Attending careers fairs in schools, post leaving certificate/FET colleges, Youthreach and education centres. * Liaising with the Department of Social Protection and Intreo offices on career promotion activities. * Participating in the AMTCE Schools Pathways programme. * Briefing members of the Institute of Career Counsellors (IGC) and Engineering Technology Teachers' Association (E.T.T.A.) * Setting up of a specific RAA website and associated social media outlets. * Paid and earned promotional activities in local and national education focused media.   **Increasing the number and regional spread of employers**  The network of employers involved in the Consortium Steering Group and the resources of the Employer Engagement units in Collaborating Providers will support the expansion of the number of employers involved in the apprenticeship.  In order to expand the number of employers participating in the apprenticeship programme LMETB will promote the apprenticeship to   * Authorised Officers across all 16 Education and Training Boards, providing them with information on the type of employer that the RAA may be suitable for. * Enterprise Ireland business and specialist advisers and business advisors in Local Enterprise Offices (LEOs) * Regional Skills fora including the Advanced Manufacturing Sector Forum which is part of the Regional Skills Forum. * Industry representative groups including the Mid-Tier Engineering Network established by Enterprise Ireland.  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Proposed new apprentices over five years expected total per year (**i.e. all intakes in 5 ETBs) | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | | **ETB provider & no. of intakes** | LMETB 1 intake (OCT24) | LMETB 1 intake (OCT 25)  Limerick Clare ETB 1 intake (OCT25) | LMETB 2 Intakes (APR & OCT 26)  Limerick Clare ETB 2 intakes (APR & OCT26)  WWETB 1 intake (OCT 26)  KWETB 1 intake (OCT 26)  DETB 1 intake (OCT 26) | LMETB 2 Intakes (APR & OCT 27)  Limerick Clare ETB 2 intakes (APR & OCT 27)  WWETB 2 intakes (APR & OCT 27)  KWETB 2 intakes (APR & OCT 27)  DETB 2 intakes (APR & OCT 27) | LMETB 2 Intakes (APR & OCT 27)  Limerick Clare 2 intakes (APR & OCT 27)  WWETB 2 intakes (APR & OCT 27)  KWETB 2 intakes (APR & OCT 27)  DETB 2 intakes (APR & OCT 27) | | **Total expected minimum number of new apprentices in the year** | 12 | 24 | 84 | 120 | 120 | | **Total expected maximum number of new apprentices in the year** | 16 | 32 | 112 | 160 | 160 | |

**Section 3 Apprenticeship Programme Overview**

**3.1 Principal Programme**

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| **3.1.1 Programme title** | | **Robotics and Automation Apprenticeship** | | | | | | | | |
| **3.1.2** **Award Class**  (Major,SPA,Supplemental, Minor) | | **Major** | | | **3.1.3 NFQ Level (5 - 6)** | | | | **NFQ L 6** | |
| **3.1.4 FET Credit value** (achieved on completion of the programme) | | **150** | | | **3.1.5 ISCED[[1]](#footnote-2) code** (detail: use four digits) | | | | **0729** | |
| **3.1.6 Duration** *(years, months, weeks)* | **Years:** | **2** | **Months:** | | **24** | | **Weeks:** | | **104** | |
| **3.1.7 Brief synopsis of the programme** (refer to guidelines as to what should be entered here. In summary, use this opportunity to give an overview of the entire apprenticeship programme) | | | | | | | | | | |
| The Robotics and Automation Apprenticeship (RAA) programme aims to provide apprentices with the skills, knowledge, competencies, and practical application to secure and retain quality employment in advanced technician roles across the various advanced manufacturing sectors including engineering, food & drinks, pharma etc.  A Robotics and Automation Technician operates, designs, installs supports, and maintains the on-demand availability of both robotic and factory automation systems.  RAA apprentices will be trained and qualified to manage, monitor, and maintain automated manufacturing equipment and assembly processes, monitor and check product quality and document results in adherence to prescribed protocols and safety procedures in a discrete manufacturing environment.  Training and tasks undertaken by an RAA graduated Technician will relate to:   * Setting up, operating, and maintaining robotic cells and industrial control systems; running and real-time monitoring of equipment outputs, overseeing highly automated manufacturing cells or processes e.g., IIoT plant and machinery, tablet manufacturing or automated production and packaging process, CNC machine centres, automated welding cells etc. * Overseeing, monitoring and maintenance of automated assembly lines or assembly stations. * Relevant knowledge and familiarity with automated manufacturing processes to oversee and troubleshoot at an appropriate level in consultation senior members of staff as prescribed by operational procedures. * Maintain robotics systems and associated equipment e.g., robotic welding stations in good working order by performing regular inspection, cleaning, servicing along with preventative and predictive maintenance interventions. * Perform systems upgrades including application and firmware updates and patching. * Maintain accurate and clear documentation that proves that systems are being maintained in accordance with both internal and external quality systems or regulations. * Keep maintenance logs for the equipment or processes they oversee, which requires proficiency in technical writing, word processing and spreadsheet software. * Provide regular productivity reports, and incident reports if an accident occurs. * Follow strict internal protocols and Standard Operating Procedures (SOPs) as well as following current Good Manufacturing Practices (GMP) when working with the pharmaceutical and medical device manufacturing industry.   The proposed RAA on completion will equip Robotics and Automation Technicians with key skills and traits including:   * Key technological competencies and relevant computer skills. * Robotics and automation operations, process, and maintenance skills. * Production Process Capabilities * Ability to apply a safety mindset to all aspects of the role * Engineering and PLC competencies * CAD/CAM Competencies * Proficiency in Technical Documentation * Mathematical, Numerical & Measurement Competencies * Knowledge of IIoT Technologies Implementation, Monitoring and Maintenance * Good Communication, Interpersonal and Team skills.   The progressive learning experience of the programme takes the apprentice through a development journey from induction to completion over a 2-year period. The programme incorporates academic learning, skills training and personal development focused on behavioural and competency refinement. Graduates of this apprenticeship programme will provide industry with suitable employees who have the potential to progress into supervisory or management roles. Apprentices will be well placed to contribute to the development of the sector, and to respond to emerging sectoral developments.  **Programme Structure**  The programme structure facilitates delivery in 7 phases and it is designed so that the apprentice spends 70% of their time on-the-job and 30% off-the-job. The apprentice will receive an RAA induction delivered by LMETB prior to commencing the first phase, which is on the job with the employer. The induction period will comprise of a full day centre-based introduction to the programme, including the programme structure, issuing of ID card, logins to VLE/Moodle, and an introduction to key QA policies and procedures. There will be an introduction to the RAA team involved that will be interacting with the apprentice and an opportunity for one-to-one meetings between the apprentice and this team. The apprentice will then join the employer where they will complete an employer induction programme. At the commencement of phase 2 which is off-the-job the apprentice will take part in a comprehensive induction programme delivered by LMETB focusing on the academic aspects of the programme; this will include support for academic research and writing skills.    **Figure 11 Programme Structure**  **Phase 1** (On-the-Job) will provide the apprentice the opportunity to become familiar with the workplace. The employer with the Workplace Mentor will provide an induction into the company and begin integrating the apprentice into their workplace team and the tasks they complete. HR policies and workplace expectations will be communicated.  **Phase 2** (Off-the-Job) in the FET centre will develop the apprentices foundational understanding of Robotics and Automation, building on their initial experience with the employer. The Apprentice induction will include a centre orientation and an introduction to academic expectations, study skills, etc. The Workplace Task Logbook will be introduced and explained to the apprentice.  **Phase 3** (On-the-Job) The apprentice returns to the workplace equipped with the knowledge gained from the off the job training. The Apprentice will begin completing the Workplace Logbook with the Workplace Mentor.  **Phase 4** (Off-the-Job)will introduce the Work Based Capstone Project. Programme modules 5 & 6 will be undertaken further advancing the apprentices understanding of the RAA programme.  **Phase 5** (On-the-Job) will see the Apprentice continue completing their Workplace Logbook completing the sections relevant to programme modules 2-6. The apprentice will, in consultation with their work-based mentor commence work on their Work Based Capstone Project (WBCP) for the final module.  **Phase 6** (Off-the-Job)The Apprentice will undertake programme modules 7 & 8 concluding their academic learning. The Apprentice will review and reflect on their Work Based Capstone Project (WBCP) and will receive critical feedback from their Instructors on their Work Based Capstone Project (WBCP).  The final **Phase 7** (On-the-Job) will see the completion of the Workplace Logbook (focused on the material covered in modules 7 & 8) in the first 2 months. The Work Based Capstone Project (WBCP) will be finalised and presented.  See [section 6](#Section6) for further detail and diagrams / schematics related to the programme structure. | | | | | | | | | | |
| **3.1.8 Target Learner group** (this should be as well described as possible. The programme learning outcomes should reflect not only the programme content but the needs and expectations of this particular target apprentice group) | | | | | | | | | | |
| **Target Learner Group**  This apprenticeship will target those who wish to develop a career in advanced manufacturing. It is aimed at delivering, committed, adaptable and ambitious individuals into the advanced manufacturing sector year on year. These will include:     1. School leavers who have completed their Leaving Certificate or equivalent. This group will be aged 17 years and upwards who may have undertaken Engineering, Computer Science and related subjects at senior cycle and who are interested in the technology related areas of advanced manufacturing but not interested in undertaking a 3- or 4-year degree programme. 2. Those with existing FET qualifications e.g. QQI Level 5 or equivalent qualifications. This learner may have completed a Pre-Apprenticeship or Pre-University NFQ Level 5 course in Engineering, Robotics, Computer Science of related area. They are seeking to continue their studies to a higher level, having enjoyed the continuous assessment approach to training with a strong industry placement they completed as part of their initial FET qualification. 3. Those currently working in the sector who wish to upskill.   LMETB encourages applications from all genders, aiming to reach a minimum of a 65/35 male-to-female ratio on the programme.  LMETB through the outreach AMTCE facility in Navan has successfully run an iteration of its Level 6 Advance Manufacuring programme with an all-female cohort.  Female participation in the LMETB Advanced Manufacturing pathways programme is extremely high and anecdotally is having an impact in the selection of stem related subjects by female students for the Leaving Certificate. It is anticipated this may travel through in relation to career choice in the sector.  **Needs and expectations of target apprentice groups**  **School Leavers**  Overall, school leavers will seek a comprehensive learning experience that combines theoretical knowledge with practical skills, mentorship, and professional growth opportunities in robotics.  By opting for an apprenticeship over a college-based degree they are indicating that they want the opportunity to develop their skills through work-based learning supported by in-centre training.  A Leaving Certificate student opting for the apprentice will expect:     * The apprenticeship programme to provide them with opportunities to work directly with robots, understand their mechanics, and learn relevant technical skills including an understanding of sensors. * To enhance their problem-solving abilities, especially in the context of robotics challenges. This includes troubleshooting, debugging, and finding innovative solutions to complex problems that arise during robot design and operation. * Support from mentors and fellow employees who can provide additional learning opportunities, provide feedback on assessments undertaken in the workplace and provide advice on career progression. * To engage in networking opportunities with industry professionals who may be engaged in the delivery of the programme or who contribute to the programme. * A recognized qualification on completion of the programme that validates their skills and increases their employability in the robotics and automation sectors.   **Those with other FET qualifications**  This target group will have similar expectations to those of the Leaving Certificate leaver including the opportunity:   * To work directly with robots, understand their mechanics, and learn relevant technical skills including an understanding of sensors. * To enhance their problem-solving abilities, especially in the context of robotics challenges. This includes troubleshooting, debugging, and finding innovative solutions to complex problems that arise during robot design and operation. * To work alongside industry professionals and gain support from mentors and fellow employees who can provide additional learning opportunities, provide feedback on assessments undertaken in the workplace and provide advice on career progression. * To engage in networking opportunities with industry professionals who may be engaged in the delivery of the programme or who contribute to the programme.   This target group will:   * Expect a higher level of qualification i.e. Level 6 and this will be one of their key expectations given that they already hold a Level 5 or equivalent NFQ award. * Be seeking a recognized qualification that validates their skills and increases their employability, building on previous certification with a focus on robotics and automation skills and competencies. * Seek a comprehensive learning experience that combines theoretical knowledge with practical skills, mentorship, and professional growth opportunities in robotics. * By opting for an apprenticeship over using their Level 5 qualification to access a college-based degree they are indicating that they want the opportunity to develop their skills through work-based learning supported by in-centre training. * Based on their previous experience of a FET award, which will have influenced their decision to opt for an apprenticeship, be placing a higher value on the continuous assessment and work-based learning provisions in the programme. They will bring with them experience of continuous and work-based assessment.   **Those in employment in the sector**  Overall, existing employees who enroll in apprenticeships in robotics are looking for opportunities to advance their careers, stay competitive in their industries, and contribute meaningfully to the growing field of robotics through enhanced skills and knowledge.  Existing employees may seek to enhance their existing skill set by gaining specialized knowledge and expertise in robotics. Like the FET Level graduate, they may have experience in related fields such as engineering, manufacturing, or programming and want to pivot towards robotics.  Employees may enroll in a robotics apprenticeship with the expectation of advancing their careers within their current organization or seeking better opportunities elsewhere. They see robotics skills as valuable assets that can open doors to higher-paying positions or leadership roles.  In industries where robotics and automation are becoming increasingly prevalent, employees may enroll in apprenticeships to stay relevant and competitive in the job market. They recognise the importance of staying up to date with technological advancements to remain employable.  Some employees may view apprenticeships in robotics as a chance to diversify their skill set and become more versatile professionals. They may want to transition into roles that involve robotics integration or interdisciplinary projects that require knowledge of both robotics and their current field.  Experienced employees often seek opportunities to enhance their problem-solving skills within the context of robotics. They may encounter complex challenges in their current roles that could benefit from robotics solutions, and they see the apprenticeship as a way to develop the necessary expertise.  If they are nominated or encouraged by their existing employer, their expectations may align to the company's strategic plans. Existing employees may expect the apprenticeship to provide networking opportunities with experts in robotics, both within and outside their organization. They value the chance to collaborate with peers from diverse backgrounds and industries, which can lead to innovative solutions and professional growth.  Existing employees may see the apprenticeship as an opportunity to undertake training on the employers’ time as it provides approved training that gives them the flexibility to balance their professional and personal responsibilities while pursuing further education in robotics.  Employees may expect recognition from their employers for investing time and effort in upskilling through apprenticeships. This recognition can take the form of promotions, salary increases, or other incentives that acknowledge their commitment to professional development.  In summary the programme was developed to ensure a consistent number of apprentices are hired, retained and developed and also to ensure the industry partners engaging in the development of the programme and approved employers hiring apprentices are seen as employers of choice with regard to outstanding training, development and progression opportunities within the Robotics and Automation sector. The RAA will become a key contributor to the strategic development of the advanced manufacturing sector industry in Ireland over the coming years and in the process provide an opportunity for successful graduates to further their careers within the advanced manufacturing sector. | | | | | | | | | | |
| **3.1.9**  **Proposed Start Date for programme** i.e. when first apprentices will be recruited. | | | | **October 2024** | | | | | | |
| **Maximum number of intakes[[2]](#footnote-3) per annum** | | | | | | | 16 | | | |
| **3.1.11**  **Proposed new apprentices over five years – enter expected total per year (i.e. all intakes in all centres)** | | | | **Year**  **1** | | **Yea**  **2** | **Year**  **3** | **Year**  **4** | | **Year**  **5** |
| **Total expected minimum number of**  **new apprentices in the year** | | | | **12** | | **24** | **84** | **120** | | **120** |
| **Total expected maximum number of**  **new apprentices in the year** | | | | **16** | | **32** | **112** | **160** | | **160** |

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| **3.1.12**  **Total costs and income over the 5 years** (reference appendix containing budget for programme showing projected income and expenditure) See Appendix II(RAA 2 Year Programme Costs) |
| **Capital Equipment and Start-up Costs** Appendix II (RAA Equipment Costs)   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Year | Programme Cost Per Class  (€) | No. Classes | Promotion & Advertising  (€) | Other Costs  (€) | Total  (€) | | 1 | 62,312 | 1 | 20,000 | 35,640 | 118,952 | | 2 | 186,936 | 3 | 20,000 | 15,000\*\* | 221,936 | | 3 | 249,248 | 4 | 20,000 |  | 269,248 | | 4 | 373,872 | 6 | 20,000 | 15,000\*\* | 408,872 | | 5 | 641,436 | 8 | 20,000 |  | 518,496 | | Total Delivery Cost | | | | | **1,537,504** |   \*\*\*Income: LMETB/AMTCE programme delivery costs are fully funded by SOLAS. There are no student fees for those undertaking the RAA apprenticeship programme. |

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| **3.1.13**  **Proposed countries where the programme will be provided**  (i.e. where apprentices will be based –default is Ireland) | | Ireland | |
| **3.1.14 Will the programme accept apprentices from abroad and / or foreign exchange apprentices (yes/no)?** If yes, provide details | | No | |
| **3.1.15**  **Name of collaborating providers’ centre(s) where the off-the-job programme is to be provided.** | **QBS centre code(s)** if applicable  (e.g. 38123F), | **Expected minimum number of apprentices per intake** | **Expected maximum number of apprentices per intake** |
| * Expressions of interest have been received from the following ETBs * Limerick and Clare Education and Training Board (LCETB). * Donegal Education and Training Board (DETB) * Waterford Wexford Education and Training Board (WWETB) * Kildare Wicklow Education and Training Board (KWETB) * Cork Education and Training Board (CETB) |  | 16 | 32 |
|  |  |  |  |
| **3.1.16** **Criteria for selecting additional off-the-job locations for programme delivery** | | | |
| LMETB is keen to ensure that the roll out of the RAA Apprenticeship programme fulfils a national spread and remit to address the talent needs of the manufacturing sector across the country. There has been considerable interest in the Robotics micro-qualifications developed by LMETB from specific ETBs, who have also expressed a similar level of interest in becoming collaborating providers in the RAA programme.  Employer demand within a region is a key determinant for the commencement of a RAA programme. Research undertaken in 2021 suggested that when fully operational at least 3 ETBs could be Collaborating Providers.  In this context LMETB Collaborating Provider MOA specifies a number of conditions ETBs have to adhere to be engaged as a Collaborating Provider. These checklists of conditions include criteria relating to off-the-job delivery locations and requirements:   1. Employer demand in the ETB area/hinterland sufficient to justify the commencement of a RAA Apprenticeship programme? 2. The Collaborating Partner must have access to experienced and committed Instructors that meet the criteria validated in the programme. 3. The training environment and equipment need to be to the standards required. 4. The proposed collaborating provider ETB’s QA systems must fulfil the quality assurance requirements of the programme. 5. The programme’s delivery personnel must have experience in administering and delivering similar apprenticeship programmes.   The process requires that the collaborating provider ensures that only suitably qualified staff are used across all roles including assessment, internal verification, and appeals processes. Mentor training for workplace mentors must also be delivered in this context.  The criteria and procedures for the approval of a provider to offer the programme are set out in the Collaborating Provider Approvals Procedure in the [QAP](https://www.lmetb.ie/wp-content/uploads/2024/05/RAA-QAP.pdf).  Following an appraisal process by LMETB, Collaborating Providers will be required to sign and adhere to the respective Memorandum of Agreement (MOA) with LMETB concerning the delivery of off-the-job programme components through ETB quality assurance structures.  The MOA clearly outlines the conditions of the collaboration and relationship, addressing elements such as   * Key staff contacts * The exchange of pertinent delivery and quality assurance data, including assessment data in compliance with GDPR and Data Protection requirements * Physical and personnel resources, such as instructor competency and experience, equipment and facilities specifications * Wider arrangements regarding the ETB invigilation and monitoring the provision on an ongoing basis.   LMETB as Coordinating Provider, must be satisfied and verify that all Collaborating Providers have the capacity to offer the new apprenticeship programme. A provider wishing to offer the apprenticeship programme will need to demonstrate they have the capacity to do so. Providers seeking to become Collaborating Providers of a programme are required to conduct a detailed self-evaluation against the required criteria and when satisfied that they have the capacity and capability, they may apply to be a Collaborating Provider. A written statement confirming that this has been carried out, accompanied by the self-evaluation, will be required by the LMETB. | | | |

**Off-the-Job Elements of the Programme**

In this section you are asked to supply information about the way the programme will operate in the collaborating providers’ centres i.e. where the off the job elements of the programme will be delivered.

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| 3.1.17 Attendance options available to apprentices: (Note that if the programme is to be delivered both part time and full time, two separate timetables need to be supplied) | |
| **Option** | **Apprentice attendance – days and hours per week** (description) |
| FULL-TIME  Block Release | Attendance is mandatory on the programme for both on and off the job phases. During the off the job phase, the apprentice is required to attend classes. Should they not attend for any reason, they are required to contact the National Programme Manager by email and cc their workplace mentor to confirm the reason for their non-attendance.  Employers and apprentices (and all associated staff in the Coordinating Provider) will be provided with the schedule of the different phases of the apprenticeship on commencement of each intake. The schedule will indicate the periods when the apprentice is   * On-the-Job * Off-the-Job and the location for this training * Module and Assessment scheduling and deadline dates * Periods during which holidays may be taken in consultation with the employer   **Programme Structure see** [**sample timetable**](https://lmetb.sharepoint.com/:x:/r/teams/RoboticsAutomationDraftPoliciesandProcedures/_layouts/15/Doc.aspx?sourcedoc=%7B6015B217-27FF-4EC6-9C4B-7163382806F8%7D&file=indicative%20timtable.xlsx&wdLOR=c5BBC8934-FBFE-4E80-8E85-567BF25EA4E7&fromShare=true&action=default&mobileredirect=true)  The RAA Apprentices is a full-time 24-month programme and will comprise 7 Phases over a programme duration of 104 weeks (incorporating 4 weeks annual leave per annum).  Phases 2, 4 and 6 encompass the off-the-job elements of the programme The off-the-job days are in a classroom/lab/workshop setting.  Please see [Section 6](#Section6) for a full overview and detailed structure, including diagrams and schematics, for the whole programme.  On commencement of the programme Apprentices will undergo an Off the job centre-based induction followed by an in-company orientation with their employer where they are informed of company culture, work practices and reporting / accountability structures. |
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| **3.1.18 Delivery modes:** Indicate the primary modes of delivery (how and where the off the job learning will take place). | |
| **Mode** | **Proportion** (% of Total Directed Learning) |
| All delivery will take place face-to-face in the Advanced Manufacturing Centre of Excellence (AMTCE) in classrooms and Robotics Labs and workshops.  Apprentices will have access to additional resources for self-directed learning, assessment and project work. Moodle will be the Virtual Learning Environment (VLE) used for the efficient support of the RAA Apprenticeship Programme and to reinforce the associated quality assurance requirement. The VLE will facilitate and support the delivery of both on-the-job and off-the-job modules and aspects of the programme by offering an online repository of materials.  Workplace mentors will support formal delivery with on-the-job demonstrations and support. | |
| Classroom / Face to Face | 100% |

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| **3.1.19 List the teaching and learning methodologies:** (e.g. one-to-one, instructional, group discussions/group interactions, practical sessions /workshops /laboratories /studio, simulated work environment/ work experience, tutorials / one on one supported learning, field trips, on the job training. Clarify each with a brief description of what it means in the context of this programme and a staff to apprentice ratio) | | |
| **Methodology / Learning Activity** | **Description** | **Staff to Apprentice Ratio e.g. 1:12** |
| Face- face learning in a classroom/training environment | Traditional instructor-led classes including practical classes and workshops with skills demonstrations. | 1:16 |
| Robotic Instruction | Instructor led with demonstrations of different types of robotics. | 1:16 |
| AR/VR Instruction | Instructor facilitated - learner AR/VR headsets and virtual lesson environment.  Using simulation software allows apprentices to experiment with robotics and automation concepts in a virtual environment, offering a safe space for learning without the risk of damaging equipment. | 1:16 |
| Demonstration / Practical | Instructor / Workshop Supervisor facilitated practical sessions.  This will provide apprentices with real-world experience through   * hands-on projects * lab sessions and workshops   It is crucial for understanding the practical aspects of robotics and automation. | 1:16 |
| Simulation –digital twins | A digital twin is a digital replica of something in the physical world, often using 3D modelling to create digital companions for physical objects. Digital twins are used to improve operations, test new products and train people on virtual representations of real-world machines. In order to provide an immersive and engaging learning environment digital twins will be utilised. | 1:16 |
| Problem-Based Learning (PBL) | Presenting apprentices with real-world problems related to robotics and automation and guiding them through the process of identifying solutions fosters critical thinking, creativity, and innovation. | 1:16 |
| Case Study presentations by Instructor and Apprentices | Analysis of real-life case studies of robotics and automation implementations will help apprentices understand the challenges, solutions, and best practices in the field.  This would allow for simulated role plays of customer problems and issues. | 1:16 |
| Group Projects | Instructor assigned task and groups.  Collaborative group projects encourage teamwork, problem-solving, and communication skills development among apprentices while working on practical assignments related to robotics and automation.  This peer-to-peer learning will support the development of personal and professional skills as well as technical skills. | 1:16 |
| Completion of formative assessments | The completion of a range of formative assessments will aid learning. These can include:   * + Quizzes   + Discussions   + practical exercises | 1:16 |
| Masterclasses & Guest Lecturers & Site Visits | Industry experts will share their knowledge and experience in contemporary areas relevant to apprenticeship.  Inviting guest speakers from industry or arranging visits to robotics and automation companies exposes apprentices to real-world applications, industry trends, and networking opportunities. | 1:16 |
| Feedback Review Sessions | Instructor one to one interaction with learner | 1:1 |
| By incorporating a combination of these teaching and learning methodologies apprentices are offered the opportunity to develop the necessary knowledge, skills, and competencies required to meet the learning outcomes. Office 365 Education, VLE platform (Moodle) will be used to provide feedback to learners on assessment results and share learning materials. | | |

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| **3.1.20 Staff Role Profiles[[3]](#footnote-4): Qualifications and Experience[[4]](#footnote-5)** provide information on profiles of staff involved in programme management, delivery and support – on and off the job. Information should include professional and educational qualifications, licences-to practise, experience and the staff/learner ratio | | |
| Note further detail is provided is section 9.6. and Appendix IV | | |
| **Role e.g. Instructor, Mentor etc** | **Qualifications & experience required:** | **# of Staff on the programme with this profile (WTEs[[5]](#footnote-6))** |
| Manager Advanced Manufacturing Training Centre of Excellence (AMTCE) –  APO Level | **Qualifications & experience**  NFQ Level 8 or above award in Manufacturing / Robotics/Engineering or related field with minimum 5 years' experience in relevant sector.  He/she will be responsible for strategic management of all training programmes including apprenticeships.  **Responsibilities**  Contribute to strategic development of new apprenticeships in LMETB. | .25 |
| Training Centre Manager  (Apprenticeships) | **Qualifications & experience**   * A qualification at minimum Level 7 on the National Framework of Qualifications or its equivalent, or significant relevant work experience. * Minimum 5 years post qualification work experience and/or experience of working with target client groupings which parallel those of LMETB.   **Responsibilities** will include:   * Overall operational management of new apprenticeship programmes * Ensures all educational and quality assurance standards are maintained in relation to academic administration, learning resources and supports, IT systems and governance * Monitors the effectiveness of all programme information and communications and oversees the development of all programme information | .4 |
| QA Officer/Training Standards Officer (TSO) | **Qualifications & experience** NFQ Level 6 or above award with relevant experience.  A minimum of 2 years’ Quality Assurance experience in relation to education and training would be desirable ncluding familiarity with QQI policies and procedures  **Responsibilities**  Manages the Quality Assurance aspect of  the programme:   * Managing assessment control * Manages Internal Verification and External Authentication * Maintains academic integrity through staff briefing * Engages with QQI | .30 |
| Authorised Officer | **Qualifications & experience**  NFQ Level 7 or above award in relevant area, preferably with experience in the Robotics/Automation industry.  **Responsibilities**  The SOLAS Authorised Oﬀicers currently carry out a range of functions on behalf of SOLAS including, but not limited to:     * Conducting assessment site visit to assess the employer’s suitability to train apprentices. * Briefing employers on their roles and responsibilities in relation to the on-the-job elements of the apprenticeship on behalf of the statutory regulator. Assessing and approving employers to register apprentices, through SOLAS Employer Approval and Code of Practice processes. * Approving and registering new apprentices and apprentices changing employers * Providing an objective information and guidance service to all apprentices registered * Monitoring of employers during the apprentice’s on-the-job phases * Maintaining apprentice and employer records. * Collaborate and communicate with the National Programme Manager in the delivery of the Programme | .5 |
| National Programme Manager – Grade 7 | **Qualifications & experience**  NFQ Level 7 or above award in Manufacturing / Robotics or related field.  The following would be desirable   * line management responsibility * financial management * management of staff development * project evaluation * and continuous improvement cycles, with the ability to take lead responsibility for the management of the programme on a national basis.   **Responsibilities**   * Manages the operational planning and scheduling, ensures all relevant input is made to develop supporting policies and procedures * Manages the day-to-day activities of the programme including apprentice registration, induction and administrative support, monitoring activities, the programme action list and the programme calendar * Acts as the management point of contact for all apprentices, college and workplace mentors, and collaborating provider programme managers * Manages the development of all programme information and communications across the team including policies, procedures, marketing collateral, etc. * Sets, monitors and reports on all programme performance * Delivery of employer briefings to new employers * Supports employers in the approval process * Chairs the Programme Board * stakeholder engagement (CSG, SOLAS, QQI, Mentors, Apprentices) | 1 |
| Lead Instructor | **Qualifications & experience**  NFQ Level 7 or above award in Manufacturing / Robotics or related field.  Have a minimum of 4 years of work experience in industry.  A minimum of 1 year teaching or training in a digital environment is desirable.  **Responsibilities**  Lead by example in terms of module delivery, corrections, completion of administration   * Take the lead in monitoring curriculum & AIS updates in collaboration with the team * Support fellow instructors in terms of QA systems, corrections, feedback * mechanisms, IV/EA, one drive folder, AIS, MOODLE) * Support the National Programme Manager with administration when required * Supports the apprentices, workplace   mentors and collaborating provider staff through all stages of the programme, particularly through the early programme stages when most support is required  *This role could be held by one of the Instructors listed below in the initial stage.* | 1 |
| Robotics Instructor | **Qualifications & experience**  NFQ Level 7 or above award in Manufacturing / Robotics or related field.  Have a minimum of 2 years of work experience in industry.  A minimum of 1 year teaching or training in a digital environment is desirable.  **Responsibilities**   * Module delivery, corrections, completion of administration * Monitoring curriculum & AIS updates in collaboration with the team * Completion of documents for QA systems, including reporting, corrections, feedback mechanisms, IV/EA, and Moodle * Support the Lead Programme Instructor and National Programme Manager with administration when required * Supports the apprentices and workplace mentors (See Appendix III) | 1 |
| PLCs / Electronics/ Automation Instructor | **Qualifications & experience**  NFQ Level 6 or above award in Industrial Electronics/ Industrial Electrical or related field.  Have a minimum of 3 years of work experience in industry would be desirable.  A minimum of 1 year teaching or training in a digital environment is desirable.  **Responsibilities**   * Module delivery, corrections, completion of administration. * Monitoring curriculum & AIS updates in collaboration with the team. * Completion of documents for QA systems, including reporting, corrections, feedback mechanisms, IV/EA, and Moodle. * Support the Lead Programme Instructor and National Programme Manager with administration when required. * Supports the apprentices and workplace mentors.   (See Appendix III) | 1 |
| AMTCE Workshop Skills Manager | **Qualifications & experience**  NFQ Level 6 or above award with minimum 5 years' experience in relevant sector.  **Responsibilities**   * Setting up and maintaining equipment. * Supporting Instructors in the delivery of practical skills classes. | 0.50 |
| Personal and Professional Development Instructor | **Qualifications & experience**  NFQ Level 6 or above award in Communication, Human Resources, Career Guidance or equivalent  A minimum of 1 year teaching or training in a digital environment is desirable.  **Responsibilities**   * Module delivery, corrections, completion of administration. * Monitoring curriculum & AIS updates in collaboration with the team. * Completion of documents for QA systems, including reporting, corrections, feedback mechanisms, IV/EA, and Moodle. * Support the Lead Programme Instructor and National Programme Manager with administration when required. * Supports the apprentices and workplace mentors. | 0.10 |
| Support Staff | **Qualifications & experience**  Appropriately qualified/experienced in the area in which they are providing support at a NFQ Level 7 with a minimum of 3 years' experience in a teaching or training environment is desirable.   * Guidance and Information Officers * IT Support * Learner Support Officer * TEL Officer * Communications * PD Officer   These staff will be drawn from the existing services provided by LMETB.  **Responsibilities**   * Providing relevant support services. | 0.25 depending on the role and requirements of the apprentices |
| Grade III Administration Support | **Qualifications & experience**  Grade III Administration Support  **Responsibilities**   * Supporting the day-to-day administration needs of the RAA on behalf of LMETB * Maintenance of a database of employers and mentors from all providers * Providing the secretariat for the Consortium Steering Group and the National Programme Board * Secretarial support to meetings of the National Examinations Board * Assisting with the Organising /co-ordinating mentor training for workplace mentors * Working with centre IT Systems – PLSS, Sun, Apprenticeship Client Services * Any other duties that may be assigned by management as required | .5 |
| Technology Enhance Learning (TEL) Officer | **Qualifications & experience**  Appropriately qualified/experienced in the area in which they are providing support at a NFQ Level 8 with a minimum of 3 years' experience in a teaching or training environment is desirable.  **Responsibilities**  They will   * provide pedagogic and technical advice, support and training on the use of educational technology in the teaching and learning context of the RAA apprenticeship. * work both on an individual basis and collaboratively with teaching staff, and apprentices to promote, support, enhance and transform learning through the use of digital technologies. * actively support internal and inter-institutional technology enhanced learning innovations and projects associated with the apprenticeship. * provide confidential academic support service, which assists apprentices in managing the demands of the apprenticeship. | Depending on the requirements of the Instructors and Apprentices. |
| The Learning Support Officer | **Qualifications & experience**  Appropriately qualified/experienced in the area in which they are providing support at a NFQ Level 8 with a minimum of 3 years experience in a teaching or training environment is desirable.  **Responsibilities**   * Learning support is provided to all apprentices. * The Support Officer will ensure that support is provided in particular to apprentices with disabilities, learning difficulties and neurological differences. * Apprentices will be encouraged to contact the officer if they have been diagnosed with specific learning difficulties/conditions in order to avail of supports. * The Officer will run weekly drop-in clinic (in person or online) to support learners with assignments and other coursework, offer various workshops on topics such as academic writing, referencing and exam revision skills and manage the provision of reasonable accommodations for examinations. | 0.3 |
| Training Centre  Assistant Manager  (Apprenticeships) | **Qualifications & experience**  NFQ Level 6 or above award.  **Responsibilities**   * Contribute to management of new apprenticeships in LMETB. * Providing support to the National Programme Manager. * Experience in developing new apprenticeship programmes and with the quality assurance procedures associated with these programme would be desirable. * Minimum of 3 years’ experience in Teaching, Learning and Assessment. | .5 |
| **3.1.21 Special requirements, including physical resources** (identify any particular resources / facilities required to deliver this specific programme in a collaborating provider’s centre.) | | |
| The RAA apprenticeship programme requires access to Robotics and Automated Systems equipment and resources as well as computer software, tools & simulation labs**.**  A recommended list of consumable materials is given, though it is not exhaustive and other items may be acquired.  All providers of the RAA Apprenticeship Programme will verify that the required equipment is available and provide details of the location(s) of site delivery prior to programme commencement. Collaborating Providers must confirm that these physical resources are in place prior to the commencement of an intake.  Provision of suitable equipment and resources will be monitored as part of the ongoing monitoring procedures and is in accordance with the established Partner Conditions for both Approved Employers and Collaborating Providers (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/)). Access to suitable equipment during the on-the-job phases will be assessed during the approval processes for an employer. [Checklist](https://www.lmetb.ie/wp-content/uploads/2024/05/Checklist.pdf) | | |
| **Training Facilities: Classroom** | | |

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| **Item** | **Description** | **Quantity** |
| **1** | A classroom that can accommodate the enrolled number of trainees with internet connectivity and containing all specified training requirements. | 1 |
| **2** | Access to Restrooms | 1 |
| **3** | Access to Canteen Facilities | 1 |
| **Training Facilities: Consumable Materials** | | |
| **4** | Workstation with 2 x double 13-amp socket | 1 per learner (16) |
| **5** | Apprentice desk | 1 per learner (16) |
| **6** | Adjustable chair | 1 per learner (16) |
| **7** | Instructors desk | 1 |
| **8** | Overhead projector/electronic screen | 1 |
| **9** | White Board | 1 |
| **Training Facilities: Information Technology Resources** | | |
| **10** | Appropriate specification desktop or laptop computer. Internet/network connectivity, minimum 8 GB RAM (16 recommended), minimum screen size 15 inches plus relevant GPU | 1 per learner (16) |
| **11** | Minimum Microsoft Windows 10 Operating system | 1 per learner (16) |
| **12** | Microsoft Office or Similar | 1 per learner (16) |
| **13** | Internet connectivity for training room | 1 per learner (16) |
| **14** | Access to Online Learning Resources/Platform | 1 per learner (16) |
| **15** | Access to integrated development environment | 1 per learner (16) |
| **16** | 16 Electro-pneumatics Training Panels | 1 per learner (16) |
| **17** | 16 Industrial Ethernet Control and Sensing Training Panels (IFM- IO-Link/Ethernet/IP) | 1 per learner (16) |
| **18** | 16 Industrial Automation with PLC Training Panels (Mitsubishi) | 1 per learner (16) |
| **19** | 8 SMC MEC-200 Mechanical Training Systems | 1 between 2 apprentices (8) |
| **20** | 16 3-Phase Motor Control Training Panels | 1 per learner (16) |
| **21** | 16 GW INSTEK Dual Channel Oscilloscopes | 1 per learner (16) |
| **22** | 16 GW INSTEK Function Generators | 1 per learner (16) |
| **23** | 16 GW INSTEK DC Power Supplies | 1 per learner (16) |
| **24** | 4 KUKA Robotics Educate Cell | 1 between 4 apprentices (4) |
|  | *\*Instructor to have access to similar tools, training kits as well as instructor resources* |  |

**On-the-Job Elements of the Programme**

In this section you are asked to supply information about the way the programme will operate on the job i.e. in the apprentice’s place of employment.

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| **3.1.22 List the teaching and learning methodologies employed when the apprentice is in the workplace** | |
| **Methodology / Learning Activity** | **Description** |
| Workplace/ Industry Aligned Learning  Through completion of the Special Purpose Award 6N3325 in Training and Development, mentors will have the necessary skills to ensure they offer the best possible opportunities for learning to the apprentices. | Workplace mentors will play an important role in guiding and facilitating the learning process. They will adopt the following approaches:   * Apprentice Induction with a focus on safety training. * Mentors will provide hands-on training to apprentices directly within the workplace, allowing them to learn by doing and gaining practical experience with robotics and automation equipment and processes. * Job Shadowing where apprentices shadow their mentors as they perform tasks related to robotics and automation, observing their techniques, problem-solving approaches, and best practices firsthand. * 1:1 Coaching by mentors to address individual learning needs, clarify concepts, and provide guidance on specific projects or tasks. This will involve the assignment of tasks by the mentors to the apprentice * Workplace tasks will include guidance on: * Task Planning * Planning specific assigned projects /tasks * Completion of tasks under direction * Monitoring by Workplace Mentor of tasks * Feedback on tasks * Data Interpretation / Analytics / Preventative Maintenance Practice and Reporting * Completion of documentation associated with tasks e.g. Workplace * Job rotation will allow the apprentices rotate through different departments or roles within the organization to gain exposure to various aspects of robotics and automation, broadening their skill set and understanding of the industry. * Review of Workplace Task Log Book which requires completion of specific tasks or projects by apprentices, allowing them to apply their knowledge and skills in real-world scenarios while receiving guidance and feedback from their mentor. * Reflective Practice interview process which will encourage apprentices to reflect on their experiences, identify challenges encountered, and analyse their performance to facilitate continuous learning and improvement. The documenting of the learning will also contribute to the learning process. * Skills demonstrations (Mentor-Led) * Mentor meetings * Networking with colleagues and industry specialists |
| Industry Aligned Learning  to include the completion of Workplace Task Log Book and other relevant documentation    Mentors are required to attend mandatory training to ensure they are comfortable in their support role of the apprentice. | The RAA Apprenticeship has been designed to integrate classroom learning with real-world work experiences. It provides the apprentice with the opportunity to acquire and apply knowledge and skills in a workplace setting, allowing them to gain practical experience and develop career-related competencies.  Key learning takes place by Skill Development. The programme has been designed in close collaboration with employers. As the workplace is recognised as the main site for learning, workplace tasks have been designed to specifically align learning in the classroom to learning at work. The apprentice applies theoretical knowledge in their workplace, enhancing their practical skills and competencies.  Apprentices will be provided with a Workplace Task Log Book which is required to be completed in a number of modules. Where relevant the apprentice can upload photos or video evidence of tasks they complete. In modules 2-6 some assessments will be completed via practical work-based assessments where the workplace tasks act as live case studies.  This action-learning and active learning orientated style of assessment requires the apprentice to utilise the learning acquired on the programme and implement it in their own organisation.  This will result in:   * Completion of the Workplace Task Log Book under the supervision of the workplace mentor. * Reflections of the apprentice will be captured as a component of their workplace tasks. * Review of Workplace Task Log Book in association with the Lead Instructor. |
| Personal and Professional Skills and Career Development | The applied learning in the workplace provides significant opportunities to complete varied assessed tasks in the workplace of both a technical nature as outlined above and to demonstrate the application of transversal skills in the workplace.  The personal development of apprentices is essential if they want to succeed in the workplace. The development of their personal skills is as important as knowledge of their business discipline. They develop attributes, traits and competencies, which will enhance their performance both on and off the job.  This will be achieved through;   * Group work * In company activities * Problem solving in the workplace with technical tasks * Time management and professional conduct appropriate to the workplace achieved through attendance under the mentor's guidance. * The encouragement by the mentor of the apprentice will lead to the development of the following traits in the apprentice. * Confidence * Resilience * Presentation skills * Communication skills * Customer Empathy and Focus skills achieved through the completion of workplace tasks and the study of case studies * Self-reflection - reflections of the apprentice on tasks will be captured in the Workplace Task Log Book. |
| Career Progression Planning | The apprentice will be supported in professional career development by:   * Employer and Workplace Mentor * Colleagues in the workplace. * LMETB Adult Guidance and Information Team * Information sessions from Higher Education Institutes. * Attendance at Career Skills events e.g. Generation Apprenticeship, World Skills – Ireland.   This will be achieved through:   * Completion of a module on Professional and Career Development. * Presentations by Higher Education Institutes. * Attendance at World Skills – Ireland and Higher Options. * Networking with colleagues and industry specialists. * Presentations and Induction sessions with employer Human Resource Departments * Job shadowing. * Self-reflection captured via Workplace Task Log Book. * Guest Speakers * Attendance at Industry events and Trade Shows |

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| **3.1.23 Employer Staff Profiles[[6]](#footnote-7): Qualifications and Experience[[7]](#footnote-8)** | **Role in relation to the Apprentice** | **# of Staff with this profile (WTEs[[8]](#footnote-9))** |
| **Workplace Mentor**   * NFQ Level 6 or above award in Manufacturing / Robotics or related field with relevant work experience or * Have a minimum of 2 years’ experience working in the Robotics and Automation.   The Workplace Mentor will be an experienced member of the employer’s management or senior staff who has achieved a relevant major award at Level 6 and/or has a minimum of 2 years’ relevant experience.   * Have at least 1 year's supervisory work experience in industry.   Mentors will also be offered the opportunity to complete the following awards -   * **Special Purpose NFQ Level 6 Award in Mentorship (**6S21999) which comprises   + The Fundamentals of Mentoring (5 credits)   + Applied Mentoring (5 credits) * **Special Purpose NFQ Level 6 Award in Training and Development** which comprises of the following modules   + Training Needs Identification and Design   + Training Delivery and Evaluation   **Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing**  The suite of micro-credentials contained in the above award were developed by LMETB and are available via Skills to Advance funding to employers through the AMTCE. They include:     * Fundamentals of Robotics * Robotics Fundamentals and Application Identification * Robotics Fundamentals with Robot Integration * Robotics Fundamentals and Robot Programming * Robotics Fundamentals, Development and Future Trends   Mentors who wish to undertake this award must complete Module 1 Fundamentals of Robotics first before completing any of the other modules. They then may take any or all of the remaining modules. | The workplace is recognised as an important site for learning and workplace tasks identified for each module help align learning in the classroom with learning in the workplace. Workplace mentors who will have undergone bespoke training for this programme so they can provide support to the apprentice throughout the 2 years. Ongoing contact between workplace mentors and programme staff including the Lead Instructor and the Programme Manager will provide for effective integration between on-the‐job and off‐the‐job learning experiences.  Each apprentice is allocated a workplace mentor from their employer (Supervisor/ Manager) registered as the workplace mentor. They monitor, support and guide the apprentice throughout the duration of the programme.  The workplace mentor is responsible for the;   * Creation of a supportive learning environment consistent with employer obligations. * Providing oversight to ensure relevant on the job training and effective workforce integration   The National Programme Manager schedules mandatory Workplace Mentor Training for all active employers.  This is a 3 hour synchronous training session delivered by the National Programme Manager. The Lead Instructor and other members of the Apprentice Support Team on the programme.  The primary feature of workplace mentoring is to ensure that apprentices maintain the required progress through all off-the-job modules. In addition, to ensure ongoing communications, instructors schedule a tripartite meeting twice a year with the Workplace Mentor and Apprentice to discuss continued progress. Details of these meetings are  stored electronically, are available to the programme team and feed into the annual progress report of each apprentice. | Minimum of one Workplace Mentor per approved participating employer.  1 mentor to 2 apprentices |
| Human Resources Manager  NFQ Level 6 or above award in Human Resource management or related field with relevant work experience | * Management of the recruitment of apprentices * Creation of a supportive learning environment consistent with employer obligations. * Providing oversight to ensure relevant on the job training and effective workforce integration. | Minimum of one person with responsibility for HR with each employer. |

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| **3.1.24 Role Description for On-the-Job mentor:** (text or hyperlink) |
| The employer will facilitate the apprentice learning experience in the workplace (on-the-job) by facilitating opportunities for shadowing, coaching, observing, and guiding.  Consequently, employers are required to directly employ a suitably qualified person who can or has been approved by SOLAS to act as the Workplace Mentor.  Workplace Mentors will be experienced practitioners who meet one of the following minimum criteria:   * A level 6 qualification in a mechanical/electrical/mechatronic or related discipline and a minimum of 2 years industry experience in the sector or * Have completed a craft apprenticeship in mechanical, electronic, or electrical or related discipline and a minimum of 2 years industry experience in the sector or * Have a minimum of 5 years’ experience working in the Robotics and Automation.   They will occupy a role in the workplace that corresponds to a senior practitioner level. They will be appointed by the employer and approved by the SOLAS Authorised Officer and supported by the National Programme Manager as required.  Nominated Workplace Mentors must attend a mandatory Mentoring Training Induction Programme which will be delivered by the Coordinating Provider to ensure that they understand their responsibility in relation to training and assessing an apprentice on-the-job, to industry and awarding body standards.  LMETB has a role to ensure workplace mentors are trained and supported. In addition to mandatory training induction programme they will be offered the following accredited training if they do not already hold these qualifications;   * Special Purpose NFQ Level 6 Award in Mentorship Practice which comprises of   + The Fundamentals of Mentoring (5 credits)   + Applied Mentoring (5 credits) * Special Purpose NFQ Level 6 Award in Training and Development which comprises of the following modules * Training Needs Identification and Design * Training Delivery and Evaluation   To develop their industry knowledge they will be facilitated to undertake any module listed as part of the Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing.  The suite of micro-credentials contained in the above award were developed by LMETB and are available via Skills to Advance funding to employers through the AMTCE. They include:     * Fundamentals of Robotics * Robotics Fundamentals and Application Identification * Robotics Fundamentals with Robot Integration * Robotics Fundamentals and Robot Programming * Robotics Fundamentals, Development and Future Trends   Mentors wishing to complete the Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing must complete Module 1 Fundamentals of Robotics first and then may take any or all of the remaining modules.  The above Special Purpose Awards will be offered to all employers signing up to participate in the RAA programme. Programmes will be scheduled to facilitate the completion by nominated employees wishing to act as Mentors. It is envisaged that the mentors will, if they sign up to the programmes, complete the awards over the duration of their employer’s participation in the apprenticeship. There is no onus on the employer or the mentor to complete all the awards prior to taking on an apprentice.  The Workplace Mentor is an advocate, facilitator, and support resource to apprentices in the workplace. Their mandate is the apprentice's emotional well-being and advancement toward accomplishing the apprenticeship learning objectives as they pertain to the on-the-job elements of the programme  The Workplace Mentor is appointed by and directly accountable to the employer but works closely with the programme team in LMETB or the relevant ETB.  Employers must sign a Memorandum of Understanding accepting their responsibilities in placing an apprentice on the RAA apprenticeship programme. As part of this they will ensure that an appropriate workplace mentor is appointed to each apprentice.  The Employer is expected to train the apprentice in the required on-the-job aspects of apprenticeship and to provide them with the opportunities to practice new skills under supervised conditions while taking cognisance of their skill level at the time the task is being undertaken.  The Workplace Mentors have responsibility for training opportunities in the workplace, contributing to ongoing assessment tasks and the capstone work-based assessment.  As reflected in the SOLAS Code of Practice signed up to by the apprentice, the Employer, and the ETB, the Workplace Mentor is assigned by and directly answerable to the employer but are also accountable to LMETB as Coordinating Provider with regards to the Apprentice’s well-being and development while on-the-job.  The Workplace Mentor is not a member of any quality assurance or governance entities but on occasion may be requested to take part in Programme Board, Examinations Board and/or Syllabus/Curriculum Review Group events and surveys.  As companies can be small in size, some work place mentors may also be the employer of the apprentice.  The Workplace Mentor will:   * Provide support for the general wellbeing and pastoral care of the apprentice in the workplace. * Familiarise themselves with the programme. * At the commencement of their apprenticeship programme, ensure apprentices receive appropriate induction training in the workplace. * Assist the apprentice in understanding and becoming conversant with work practices. * Ensure that the apprentice is provided with sufficient opportunities to practice their knowledge and competencies and demonstrate skills achievement of their workplace module learning modules. * Build and maintain an open and honest relationship and create work friendly environment * Be enthusiastic and motivating ‐ share experiences of interesting and challenging jobs to generate enthusiasm * Encourage the apprentice’s personal development and learning by providing formative feedback to reinforce what the apprentice does well, and help in areas where he/she needs to develop further * Assist the apprentice to take increasing initiative for his/her own learning and development and to take increasing responsibility for managing the mentoring relationship; * Be cognisant of the modules the apprentice is undertaking whilst learning ‘Off‐the‐Job’ and reinforcing this within the workplace * Discuss with the apprentice what assessments he/she needs to complete and how they intend to progress with these assessments and the completion of the Workplace Task Logbook. * Ensure that the apprentice receive timely instruction, guidance, and feedback to assist them attain their occupational learning goals. * Be the initial contact for any issues or concerns an apprentice may encounter. * Maintain strong communications with the Coordinating Provider, or Collaborating Providers where applicable, to ensure that the apprentice obtains complete, prompt, and precise data concerning the workplace modules in a timely manner. * Liaise with off-the-job instructors/assessors regarding the wellbeing, guidance, instruction, and effective progression of apprentices. * Encourage the apprentice to collate evidence for his/her Workbook through task allocation * Facilitate the apprentice’s learning in the workplace by shadowing, coaching, observing and guiding. * Promote independence and autonomy in learning and in the completion of the Workbook. * Promote a culture of ongoing development with a focus on developing knowledge, skills, competencies and attitudes to positively influence performance * Challenge the apprentice to demonstrate what he/she has learnt and correct any misunderstandings and reinforce the knowledge gained whilst fostering a supportive environment * Facilitate peer learning with other experienced members of staff. * Develop a sense of professionalism in the apprentice including attributes such as dependability, maturity, politeness, respect, loyalty and the ability to communicate effectively. * Participate in a mandatory Workplace Mentor Training programme prior to the apprentice commencing employment. This includes Special Purpose NFQ Level 6 Award in Mentorship Practice and briefings specific to the RAA programme and its activities. * May participate in and/or contribute to the National Programme Board and National Examinations Board. * Liaise with the Instructors and Programme Manager of the programme * Furnish the Employer and Coordinating Provider, or Collaborating Providers where applicable, with regular monitoring resorts outlining of the apprentice's progression, behaviour, and general wellbeing. * Notify the RAA Apprenticeship National Programme Manager (or the RAA Programme Leader in Collaborating Providers, as appropriate) promptly on any matter that could impede the apprentice's successful accomplishment of the programme as outlined * Assume responsibility for their own Continuous Professional Development (CPD) to sustain a high level of proficiency in their important role as Mentor to apprentices. |

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| **3.1.25 Special requirements, including physical resources** required to be available in the workplace |
| As part of the approval process for an employer, the Authorised Officer and the Subject Matter Expert, if required, together with the National Programme Manager on behalf of the CSG will undertake a process to ensure that the particular employer has the required physical resources to undertake the relevant array of workplace learning activities. ([see checklist](https://www.lmetb.ie/wp-content/uploads/2024/05/Checklist.pdf))  In the event that an employer does not have access to specific equipment arrangements will be made with the Advance Manufacturing Training Centre of Excellence for access to relevant equipment to meet the learning outcomes.  In relation to Module 9, the Work Based Capstone Project, the apprentice needs to have access to the relevant processes, equipment and software at their employer location(s) that is required to enable the agreed Project Brief to be fulfilled. A 1:1 meeting with the Lead Instructor, or the relevant subject matter expert Instructor will be held prior to the apprentice finalising their Capstone project. On confirmation of the details a meeting will take place between the apprentice and workplace mentor. At that stage the apprentice will present a list of resources they need access to to complete the Capstone Project. Should the employer not be able to access all the necessary resources, provision will be made for the apprentice to access the resources in the Advanced Manufacturing Training Centre of Excellence. The employer will be encouraged to facilitate the apprentice’s attendance through work release. The facilities of the AMTCE will also be made available to apprentices at agreed times outside normal working hours if necessary.  Employers participating in the apprenticeship will be encouraged through the Community of Practice network of employers to facilitate apprenticeship visits from other employers.  LMETB is conscious of the fact that certain applicants may require extra assistance to access the programme and make the required adjustment in the teaching methodology or workplace environment, due to physical or unseen disabilities. In such instance LMETB will engage and seek the professional guidance and support of the LMETB Learner Support & Development Unit and any relevant support agencies including   * National Adult Literacy Agency (NALA) * AONTAS - Irish National Adult Learning Organisation * AHEAD, an independent non-profit organisation working to create inclusive environments in education and employment for people with disabilities   to ensure that such apprentices are adequately supported and assisted to successfully complete the programme.  This may also include liaison with the Health Services Executive (HSE) and/or the local County Council if reasonable accommodation provision is required. |

**Section 4 Programme Aims, Objectives, Standards and Minimum Intended Programme Learning Outcomes (MIPLOs)**

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| **4.1 Programme Aim / Purpose** |
| The Robotics and Automation Apprenticeship programme aims to provide a dedicated and practical programme for apprentices wishing to secure and retain employment in a robotics and automation technician role.  The overall objective of the programme is to provide apprentices with the underpinning academic knowledge combining learning ‘‘off-the-job’’ and significant ‘‘on-the-job’’ practical experience to enhance their employment and educational opportunities. Upon successful completion of the programme, they will receive an NFQ Level 6 Advanced Certificate in Robotics and Automation.  The academic and work-based training throughout the programme ensures that all apprentices will graduate from the programme with an enriched experience of the classroom blocks of study that can be directly applied to the workplace. This applied feature of the programme provides a unique experience and ensures its durability as the learning and assessment undertaken is always current and responsive to individual and industry trends in real time.  The programme culminates with a Work Based Capstone Project drawn from workplace learning. It consolidates the apprentice’s learnings over the life of the programme.  Targeting school leavers, FET graduates and existing employees, as well as other demographics who wish to upskill or develop a career in the robotics and automation sector this programme offers a unique opportunity to learn in a practical, supportive environment while simultaneously working towards a recognised QQI qualification.  The programme provides an opportunity for successful graduates to further their careers within advanced manufacturing, robotics and automation industries. The programme was developed to ensure a consistent number of apprentices are hired, retained and developed and to ensure the industry partners engaging in the development of the programme and approved employers hiring apprentices are seen as employers of choice regarding outstanding training, development and progression opportunities in the manufacturing sector.  The programme aims to produce committed, adaptable and ambitious individuals. It will be a key contributor to the strategic development and growth of robotics and automation across a range of manufacturing industries.  The progressive learning experience of the programme takes the apprentice through a development journey from induction to completion of a 2-year programme incorporating academic learning, practical skills training and personal development focused on behavioural and competency refinement. Graduates of this apprenticeship programme will provide industry with suitable employees who have the potential to progress into supervisory or management roles or advance to higher qualifications. Apprentices will be well placed to contribute to the sector's development and to respond to emerging sectoral developments and the implementation of advanced manufacturing processes. |
| **4.2 Programme Objectives** |
| 1. To provide apprentices with a broad knowledge of robotics and automation in the advanced manufacturing sector. |
| 1. To provide apprentices with related specialised knowledge, a safety mindset, practical skills, and competence for autonomous professional practice as a robotics and automation technician. |
| 1. To enable apprentices to fully participate in the related professional community of practice. |
| 1. To provide apprentices with the skills to evaluate information and evidence and to generate creative solutions to problems arising in their professional activity. |
| 1. To develop the ability for apprentices to exercise autonomy, judgement and responsibility in applying their knowledge and skills in compliance with safety requirements. |
| 1. To enable apprentices to communicate effectively and to achieve a professional standard of communications across various forms of technical and non-technical communications. |
| 1. To provide apprentices with the ability to act effectively in team roles, exercise supervision, lead activities and contribute to development of the workplace and the performance of others. |

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| **4.3 Minimum Intended Programme Learning Outcomes (MIPLOs)**  List the learning outcomes for the programme i.e. what an apprentice should be capable of on completion of the programme.  The mapping of the MIPLOs to the award standards will be done in 4.4 below |
| On completion of this programme, the learner (apprentice) will be able to … |
| 1. Identify and appraise the key elements and principles of advanced manufacturing and Industry 4.0/5.0. and the fundamentals and benefits of robotic systems. |
| 1. Evaluate problems and develop solutions autonomously in the design, programming, system integration and use of robotic systems while adhering to health and safety regulations and guidelines. |
| 1. Adhere to a safety mindset in their own professional activity and be able to apply the relevant safety concepts, regulations and standards that apply to automation and robotic systems within the context of the community of practice. |
| 1. Demonstrate an ability to apply tools and techniques to the digitisation of the design, maintenance and optimisation of manufacturing processes with due regard to ethical considerations. |
| 1. Apply knowledge, initiative, good decision making autonomously, and the practical skills required to operate, maintain, calibrate, troubleshoot, and upgrade industrial systems and engineering workshop processes. |
| 1. Describe various types of control systems used in manufacturing and robotics; and how to configure, programme, maintain and troubleshoot them. |
| 1. Use a range of mathematical techniques to solve problems and describe how this approach can be applied to improve manufacturing processes. |
| 1. Work effectively as an individual, in teams and lead others in the field of advanced manufacturing, robotics and automation, taking responsibility for their own work while continually engaging in ongoing learning and professional development. |
| 1. Communicate complex information effectively in both technical and non-technical contexts. |
| 1. Manage and evaluate their own learning and help others to identify their needs in the context of the potential impact of the technologies and how they are used. |

| **4.4a Mapping of Programme Purpose to that of Professional Award Type Descriptor at nominated NFQ Level (Level N)** As an example, Level 6 standards are inserted as Level N, with level 5 entered as Level N-1 | | |
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| **Purpose Statement of QQI Award Type Descriptor (Level 5)** | **Purpose Statement of QQI Award Type Descriptor (Level 6)** | **Purpose Statement of this Programme** (Ref 4.1 above) |
| The knowledge, skill and competence acquired are proper to autonomous professional practice at this level as a member of a well-defined professional community of practice, typically in a structured setting or in an organisation, as well as relevant to personal development, participation in society, the community of practice, employment and study including access to additional formal education and training | The knowledge, skill and competence acquired are proper to autonomous professional practice at this level as a member of a well-defined professional community of practice, typically in a structured setting or in an organisation, as well as relevant to personal development, participation in society, the community of practice, employment and study including access to additional formal education and training | The knowledge, skill and competence acquired in this programme are proper to autonomous professional practice as a Robotics and Automation Technician. The programme facilitates participation in the robotics and automation technician community of practice, employment in the advanced manufacturing sector, and engagement in ongoing lifelong learning and professional development while contributing to society and the community of practice. |

**Note:** [**Please click here to open the Alignment of MIPLOs to Modules and Professional Award Standards document**](https://www.lmetb.ie/wp-content/uploads/2024/05/Alignment-of-MIPLOs-to-Modules-and-Professional-Award-Standards.pdf)**.**

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| **4.4b Mapping of Programme Learning Outcomes (MIPLOs) to Award Standards at nominated NFQ Level N . As an example, Level 6 standards are inserted as Level N, with level 5 entered as Level N-1** | | | | | | |
| To show that the programme learning outcomes are consistent with the standards for the nominated award Level (Level N) it is necessary to compare them and to show that the MIPLOs are different from the standards for the level below. Note that one programme learning outcome may be relevant to a range of the award learning outcomes. The mapping does not have to be one to one.  You should also show where in the programme e.g. what module(s), the MIPLOs will be taught and where (by which assessment technique) their achievement will be evidenced. | | | | | | |
| **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 5** | **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 6** | | **MIPLO statement(s)** (for each, include number and text from 4.1 above) | | **Key teaching and learning opportunities provided to facilitate achievement of the MIPLO** | **Where achievement of MIPLO is evidenced (assessed) across the programme** |
| **Knowledge:** Broad current general knowledge and an integrated body of specialised knowledge required to support a craft or occupational discipline and knowledge of its connections with related activities; Specialised knowledge here involves some theoretical concepts and abstract thinking with significant depth in some areas.  Practical understanding of facts, concepts, rules, regulations, methods, materials, tools, devices, techniques; their development and limitations; and how they are applied in current occupational activity  Knowledge of the context for professional activity (familiarity with the community of practice and with safety, employment, technological and regulatory perspectives) and awareness of disciplines likely to be encountered as a member of the community of practice | **Knowledge:** Broad current general knowledge and an integrated body of specialised knowledge required to support a craft or an occupational discipline and knowledge of the connections with related disciplines; Specialised knowledge here involves significant underpinning theory and an awareness of the boundaries of that knowledge  Practical understanding of facts, concepts, rules, regulations, abstract models, methods, materials, tools, devices, technologies; their development and limitations; and how they are applied in current occupational activity  Knowledge of the context for professional activity (familiarity with the community of practice and with safety, employment, technological and regulatory perspectives and with relevant economic, social and environmental issues) and awareness of other disciplines likely to be encountered as a member of the community of practice | | 1. Identify and appraise the key elements and principles of advanced manufacturing and industry 4.0/5.0. and the fundamentals and benefits of robotic systems. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application:**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8.  **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO7  **Module 4: Digitisation of Manufacturing Operations**  LO1, LO2, LO3, LO5, LO6, LO7, LO8.  **Module 5: Robotics Fundamentals, Operations and Automation**  LO1, LO2, LO3, LO4, LO5, LO6, LO7.  **Module 6: Industrial Systems and Operations and Workshop Skills**  LO1.  **Module 8: Equipment Control, Automation and Actuation**  LO1.  **Module 9: Work Based Capstone Project**  LO1, LO3. |  |
| 3. Adhere to a safety mindset safety mindset in their own professional activity and be able apply the relevant safety concepts, regulations and standards that apply to automation and robotic systems within the context of the community of practice. | | **Module 1. Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Applications**  L08.    **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO7, LO8  **MIMLO Module 5: Robotics Fundamentals, Operations and Automation**  LO8  **MIMLO Module 6: Industrial Systems and Operations and Workshop Skills**  LO1, LO7, LO8    **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  L07, LO8  **MIMLO Module 9: Work Based Project**  LO1 |
| 4. Demonstrate an ability to apply tools and techniques to the digitisation of the design, maintenance and optimisation of manufacturing processes with due regard to ethical considerations. | | **Module 4: Digitisation of Manufacturing Operations**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  .  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO2, L04, LO5  **Module 8: Equipment Control, Automation and Actuation**  LO4, LO6 |
| 6. Describe various types of control systems used in manufacturing and robotics; and how to configure, programme, maintain and troubleshoot them. | | **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO1, LO2, LO4.  **Module 8: Equipment Control, Automation and Actuation**  LO1, LO2, LO3, LO4, LO5, LO6, LO7. |
| 7. Use a range of mathematical techniques to solve problems and describe how this approach can be applied to improve manufacturing processes. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  LO4  **Module 3: Maths for Advanced Manufacturing**  LO1, LO2, LO3, LO4 |
| 8. Work effectively as an individual, in teams and lead others in the field of advanced manufacturing, robotics and automation, taking responsibility for their own work while continually engaging in ongoing learning and professional development. | | **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO1, LO3, LO4, LO5, LO6, LO6, LO7, LO8  **Module 4: Digitisation of Manufacturing Operations**  LO2, LO6, LO7, LO8  **Module 6: Industrial Systems and Operations and Workshop Skills**  LO3, LO4, LO5, LO6  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO3, LO6  **Module 8: Equipment Control, Automation and Actuation**  LO7  **Module 9: Work Based Project**  LO1, LO2, LO3 |
| **4.4b Mapping of Programme Learning Outcomes (MIPLOs) to Award Standards at nominated NFQ Level N . As an example, Level 6 standards are inserted as Level N, with level 5 entered as Level N-1** | | | | | | |
| To show that the programme learning outcomes are consistent with the standards for the nominated award Level (Level N) it is necessary to compare them and to show that the MIPLOs are different from the standards for the level below. Note that one programme learning outcome may be relevant to a range of the award learning outcomes. The mapping does not have to be one to one.  You should also show where in the programme e.g. what module(s), the MIPLOs will be taught and where (by which assessment technique) their achievement will be evidenced. | | | | | | |
| **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 5** | **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 6** | | **MIPLO statement(s)** (for each, include number and text from 4.1 above) | | **Key teaching and learning opportunities provided to facilitate achievement of the MIPLO** | **Where achievement of MIPLO is evidenced (assessed) across the programme** |
| **Know How and Skill** Select from a broad range of specialised skills and tools and apply them to problems arising in professional activity; problems here are usually predictable but are subject to change  Evaluate and use information to draw conclusions and determine solutions to predictable problems arising in professional activity that take due account of social, field specific and ethical insights  Communicate oral and written information effectively in familiar contexts; engage in the transfer of knowledge and skills within the professional community of practice; convey information and decisions, to specialists and non-specialists, including clients | **Know How and Skill:** Select from a comprehensive range of specialised skills and tools and apply them to the generation of creative solutions to problems arising in professional activity  Plan and develop investigative strategies and evaluate information to determine creative, evidence-informed solutions to predictable and unpredictable problems and respond to unpredictable change arising in professional activity that take due account of social, field specific and ethical insights  Communicate complex oral and written information effectively in familiar and unfamiliar contexts; facilitate the transfer of knowledge and skills within the professional community of practice; justify decisions, to specialists and non-specialists, including clients | | 2. Evaluate problems and develop solutions autonomously in the design, programming, system integration and use of robotic systems while adhering to health and safety regulations and guidelines. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  LO6  **Module 3: Maths for Advanced Manufacturing**  LO1, LO2, LO3, LO4  **Module 4: Digitisation of Manufacturing Operations**  LO3, LO4, LO5  **Module 5: Robotics Fundamentals, Operations and Automation**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  **Module 6: Industrial Systems and Operations and Workshop Skills**  LO2  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  **Module 8: Equipment Control, Automation and Actuation**  LO2, LO5, LO6, LO7  **Module 9: Work Based Project**  LO1, LO2 | Assessed by assignments and a learner record during and after module delivery.  Assessed by assignments and an examination during and after module delivery.  Assessed by assignments, skills demonstration, examination and a Workplace Task Log Book with a learner record during and after module delivery.  Assessed by an examination.  Assessed by evaluating the Project Final Report against the Work Based Capstone Project Brief. |
| 4. Demonstrate an ability to apply tools and techniques to the digitisation of the design, maintenance and optimisation of manufacturing processes with due regard to ethical considerations | | **Module 4: Digitisation of Manufacturing Operations**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  .  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO2, L04, LO5  **Module 8: Equipment Control, Automation and Actuation**  LO4, LO6 |
| 7. Use a range of mathematical techniques to solve problems and describe how this approach can be applied to improve manufacturing processes. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  LO4  **Module 3: Maths for Advanced Manufacturing**  LO1, LO2, LO3, LO4 |
| 9. Communicate complex information effectively in both technical and non-technical contexts. | | **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO1, LO2, LO3, LO4, LO5  **Module 5: Robotics Fundamentals, Operations and Automation**  LO3  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO7, LO8  **Module 8: Equipment Control, Automation and Actuation**  LO7  **Module 9: Work Based Project**  LO1, LO9 |
| **4.4b Mapping of Programme Learning Outcomes (MIPLOs) to Award Standards at nominated NFQ Level N . As an example, Level 6 standards are inserted as Level N, with level 5 entered as Level N-1** | | | | | | |
| To show that the programme learning outcomes are consistent with the standards for the nominated award Level (Level N) it is necessary to compare them and to show that the MIPLOs are different from the standards for the level below. Note that one programme learning outcome may be relevant to a range of the award learning outcomes. The mapping does not have to be one to one.  You should also show where in the programme e.g. what module(s), the MIPLOs will be taught and where (by which assessment technique) their achievement will be evidenced. | | | | | | |
| **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 5** | **QQI award statements of knowledge skill and competence to be achieved by an apprentice successfully completing this programme.**  **Level 6** | | **MIPLO statement(s)** (for each, include number and text from 4.1 above) | | **Key teaching and learning opportunities provided to facilitate achievement of the MIPLO** | **Where achievement of MIPLO is evidenced (assessed) across the programme** |
| **Competence:** Exercise autonomy and judgement in applying knowledge and skills in varied and specific contexts including professional practice and learning  Exercise initiative and independence in professional activity, taking responsibility for the nature and quality of outputs and for decisions in work and learning contexts  Act effectively in team roles within multiple, complex and heterogeneous groups Assist in the supervision of routine work or learning activities Take responsibility for leading on some occupational activities Contribute to the review and development of the performance of others  Maintain professional knowledge and skill taking responsibility for own learning within a managed environment; Provide learning support, and guidance to others in the professional contexts Seek guidance as appropriate when working independently  Assume full responsibility for consistency of self- understanding and behaviour at personal, occupational, societal, and environmental levels | **Competence:** Exercise autonomy and judgement in applying knowledge and skills in a variety of contexts including professional practice and learning  Exercise initiative and independence in professional activity, taking responsibility for the nature and quality of outputs and for decisions in work and learning contexts  Act effectively in team roles within multiple, complex and heterogeneous groups Exercise supervision in contexts of work or learning activities Lead a variety of occupational activities Contribute to the review and development of the performance of others; Take some responsibility for the evaluation and improvement of work or learning activities  Evaluate and maintain professional knowledge and skill taking responsibility for own learning within a structured learning environment; Provide learning support and guidance to apprentices in the professional context; assist others in identifying learning needs; Seek guidance as appropriate when working independently  Express an internalised, personal world view, reflecting engagement with others at the personal, occupational, societal, and environmental levels | | 2. Evaluate problems and develop solutions autonomously in the design, programming, system integration and use of robotic systems while adhering to health and safety regulations and guidelines. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  LO6  **Module 3: Maths for Advanced Manufacturing**  LO1, LO2, LO3, LO4  **Module 4: Digitisation of Manufacturing Operations**  LO3, LO4, LO5  **Module 5: Robotics Fundamentals, Operations and Automation**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  **Module 6: Industrial Systems and Operations and Workshop Skills**  LO2  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8  **Module 8: Equipment Control, Automation and Actuation**  LO2, LO3, LO5, LO6, LO7  **Module 9: Work Based Project**  LO1, LO2 | Assessed by assignments, skills demonstration, examination and a Workplace Task Log Book with a learner record during and after module delivery.  Assessed by an examination.  Assessed by evaluating the Project Final Report against the Work Based Capstone Project Brief. |
| 3. Adhere to a safety mindset safety mindset in their own professional activity and be able apply the relevant safety concepts, regulations and standards that apply to automation and robotic systems within the context of the community of practice. | | **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO7, LO8  **MIMLO Module 5: Robotics Fundamentals, Operations and Automation**  LO8  **MIMLO Module 6: Industrial Systems and Operations and Workshop Skills**  LO1, LO7, LO8    **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  L07, LO8  **Module 9: Work Based Project**  LO1, LO5, LO6, LO7, LO8 |
| 4. Demonstrate an ability to apply tools and techniques to the digitisation of the design, maintenance and optimisation of manufacturing processes with due regard to ethical considerations | | **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO2, L04, LO5  **Module 8: Equipment Control, Automation and Actuation**  LO4, LO6 |  |
| 5. Apply knowledge, initiative, good decision making autonomously and the practical hands-on skills required to operate, maintain, calibrate, troubleshoot, and upgrade industrial systems and engineering workshop processes. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  **LO2**  **MIMLO Module 6: Industrial Systems and Operations and Workshop Skills**  LO1, LO,2, LO3, LO4, LO5, LO6, LO7, LO8  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO3, LO4 |
| 8. Work effectively as an individual, in teams and lead others in the field of advanced manufacturing, robotics and automation, taking responsibility for their own work while continually engaging in ongoing learning and professional development. | | **Module 4: Digitisation of Manufacturing Operations**  LO2, LO6, LO7, LO8  **Module 6: Industrial Systems and Operations and Workshop Skills**  LO3, LO4, LO5, LO6  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO3, LO6  **Module 8: Equipment Control, Automation and Actuation**  LO7  **Module 9: Work Based Project**  LO1, LO2, LO3 |  |
| 9. Communicate complex information effectively in both technical and non-technical contexts. | | **Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO1, LO2, LO3, LO4, LO5  **Module 5: Robotics Fundamentals, Operations and Automation**  LO3  **Module 7: Robotic Programming/Simulation, System Integration and Functional Safety**  LO7, LO8  **Module 8: Equipment Control, Automation and Actuation**  LO7  **Module 9: Work Based Project**  LO1, LO9 |
| 10. Manage and evaluate their own learning and help others to identify their needs in the context of the potential impact of the technologies and how they are used. | | **Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application**  LO5, LO7  **MIMLO Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS)**  LO1, LO3, LO4, LO5, LO6  **MIMLO Module 4: Digitisation of Manufacturing Operations**  LO1, LO2, LO5, LO6, LO7, LO8 |
| **Articulation and Progression**: Access arrangements must include mechanisms for recognising prior learning. Progression arrangements must be established | | **Articulation and Progression**: Access arrangements must include mechanisms for recognising prior learning. Progression arrangements must be established. | | See Section 8, Access, transfer and progression procedures, criteria and arrangements for the programme. | | |
| **Assessment:** The minimum expected knowledge, skill and competence associated with the award must be expressed and validly and reliably assessed. This will involve integrative assessment to ensure transversal learning outcomes have been achieved | | **Assessment:** The minimum expected knowledge, skill and competence associated with the award must be expressed and validly and reliably assessed. This will involve integrative assessment to ensure transversal learning outcomes have been achieved. | | The final module in the programme, module 9, is the Work Based Capstone Project which is a synoptic project - it is the accumulation of the apprentices’ knowledge, skills and behaviours which have been developed across the apprenticeship learning journey. As such the assessment of the Work Based Capstone Project integrates assessment which covers all the learning the apprentice has accomplished throughout the programme. Synoptic assessment is valuable because it shows that learners have achieved a holistic understanding of their sector and that they can make effective connections between different aspects of the subject content and across the breadth of the assessment objectives in an integrated way.  See section 7 for additional information. | | |

**Section 5 Programme Development**

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| **5.1 Programme concept**  Set out the broad underpinning concept behind the proposal to offer this programme taking into account the apprentice profile and MIPLOs. If helpful, the various aspects can be explained in more detail using the headings below. |
| **Rationale for Programme**  The manufacturing sector in Ireland employs 275,000 people and plays a pivotal role in global supply chains from engineering to computers and medical technologies. Worldwide manufacturing industry is undergoing a significant shift towards digital transformation, driven by advances in technology and changing consumer expectations. From automation and artificial intelligence to the Internet of Things (IoT) and cloud computing, these digital technologies are revolutionizing the way manufacturers operate, improving efficiency, reducing costs, and enhancing product quality. The rapid pace of technological advances in areas such as artificial intelligence, machine learning and robotics present challenges and opportunities. Robotics and automation are rapidly evolving technologies. In just a few decades, robots and automation have become commonplace in factory settings across the world, and they continue to gain traction due to productivity and profitability reasons.  Today’s industrial revolution, (Industry 5.0) is characterised by the integration of digital connectivity and advanced technologies which is driven by the interconnectedness of advanced technology, automation, robotics and real time data via the Industrial Internet of Things (IIoT). At consumer level, it has manifested itself in such things as smart home devices and voice-enabled technologies and now for example is migrating towards robotic home assistants. At societal level, robotics are fuelling the growth of small cities, revamping public services etc.  Robotics and Automated systems continue to grow in importance within manufacturing and industrial production systems as companies leverage their ability to employ advance manufacturing and increase production. Robots have an impressive range of applications e.g. packaging, welding, painting, machining, inspecting parts, to name a few and find application in almost every industry such as pharmaceutical, chemical, automotive, healthcare, food, agricultural etc. Big companies are leveraging digital technologies throughout their extensive operations. These tools are also democratising manufacturing by allowing the entry of smaller players into sectors previously unchallengeable, while supporting sustainability and facilitating bespoke, flexible manufacturing production.  Ireland is a manufacturing powerhouse. Thanks to a combination of strong foreign investment and a thriving domestic manufacturing industry there are world-class manufacturing clusters in fields such as medical and pharmaceutical products, organic chemicals, food and drink, agricultural machinery and precision engineering. According to Central Statistics Office data:   * Manufacturing accounts for over 36% of our GVA (gross value added) – significantly higher than other leading European economies (bigger than any other EU country – average 15%) * 37% of Irelands GDP depends on its Manufacturing Sector, the highest in Europe. * Ireland is the No 2 exporter of medical devices in Europe * Ireland is 3rd highest global exporter of Pharmaceuticals (Pharmaceutical products are the 6th most traded products in the world) * 3rd in the world for Medical Device exports, and * Number 1 in the world for Contact Lens manufacturing.   ***Robot Density***  However, Ireland is significantly behind in the introduction of Robotics and Automation globally, where South Korea leads the world at 1012 Robots/10,000 employees, Germany is at 415, UK is at 111 and Ireland is at 55.  When it comes to manufacturing, the introduction of robotics and automation boosts productivity. The use of robots helps manufacturers to remain agile, cost efficient and globally competitive. Statistics consistently show that among the most productive manufacturing nations, automation rates are above average. However, Ireland has one of the lowest concentrations of robots in the EU and among advanced economies.  There are only 1,478 robot installations across the entire country, compared with 245,098 in Germany. When we consider robot density, Ireland has only 54 industrial robots per 10,000 employees in manufacturing; Germany has 397. Even the UK, which is seen as a laggard in robotics and automation uptake, has 111 – more than twice the robot density of Ireland.  A graph of blue and black numbers  Description automatically generated with medium confidence  **Figure 12 Robot Density in the Manufacturing Industry 2022**  These statistics are especially concerning when one considers that Ireland is facing a manufacturing skills shortage and is so dependent on Manufacturing for stable economic success. An ageing workforce, the post-Covid ‘Great Resignation’ phenomenon and outdated perceptions of manufacturing, all contributed to the current situation, where survey after survey consistently report firms have difficulty filling roles.  Automation will play a key role in bridging this skills gap – robots represent the perfect replacement for hard-to-find manual workers in dull, dirty and dangerous tasks. Robots enable manufacturers to make better use of the human employees they do have, upskilling them to boost recruitment and retention rates while increasing overall productivity.  There is a widespread recognition that the labour pool is not sufficient for the current or future needs of the country which means investing in upskilling and reskilling for the future needs of the country, and creating a pipeline of relevant skills, is deemed a top priority; intelligent introduction of technology into the workplace is the key to unlocking latent potential productivity and allowing workers the freedom to add value; recognition of the fact that it is not just the larger enterprises producing high tech products, but all of our manufacturing sector including SMEs will be affected by decisions made on skills development, technology application and progressive education for these sectors required which need to be inclusive to all.  Manufacturing in Ireland is just starting to become highly automated with the move towards Industry 4.0/5.0 ‘the smart factory’. Modern automated production lines involve data exchange, cyber-physical systems, the Internet of Things and cloud computing. This has given rise to automated industrial systems and smart production processes that boost efficiency across supply chains. While industrial cyber-physical systems in advanced technologies process, direct, manage and maintain machine operations, gather data, and can autonomously exchange information to trigger actions and make decentralised decisions, it’s impossible to dismiss the importance of the human factor in the manufacturing process as emphasised by Industry 5.0.  These need to work in concert with employees to create what is often called a “smart shop floor.” The key challenge emerging in the context of ‘advanced’ or ‘smart’ manufacturing is the optimal cooperative interactivity of humans, robotics, machines, and ICT systems. Thus, production technologies, production processes and organisation, as well as human resources development, are regarded as equally important. The challenge now is keeping pace with demand by producing trained, competent and confident technicians. There is demand right across the country for technicians who understand robotics, controls and automation.  It is this advancement that requires a programme such as the Robotics and Automation Apprenticeship to develop and ensure that technicians leave the programme with skills and competences that allow them to work safely and competently with highly automated and robotic manufacturing systems. With that, it is essential that the skills are transferrable across a range of sectors such as biomedical, automotive, food processing and electronic manufacturing sectors.  Robotics and Automation is a multidisciplinary area that combines aspects of electronic and mechanical engineering, and computer science. It includes embedded programming, control systems, automated decision making, and power electronics. Due to the level of technicality involved in this specialised and interdisciplinary field, there is a shortage of qualified personnel in the industry.  The task of both nurturing new talent and upskilling the existing workforce is a complex one, requiring a multi-faceted approach that spans training centres, technical colleges, universities, research institutes and industry. However, as consortium Member Ronan Rasdale, Robotics, FANUC Ireland and Northern Ireland, commented:  *“Our current apprenticeships often struggle to address the needs of companies who are automating. They need a workforce that is ready to operate the technology that’s being implemented, with skills from basic robot operation through to controls, automation and software engineering”......“As Ireland’s manufacturing sector ramps up its investment in automation to remain competitive, there will be an even greater need for engineers who can programme, install and maintain robots and automation systems”.* [1]  **Policy alignment**  The proposed national Robotics and Automation Apprenticeship Programme is fully aligned to key and relevant National and Regional Government strategies, policies and actions regarding workforce development, and industrial policy as articulated in the following publications:   1. Future Jobs Ireland 2019: Preparing Now for Tomorrow’s Economy. 2. Technology Skills 2022: Ireland’s Third ICT Skills Action Plan 3. The Expert Group on Future Skills Needs Report-Digital Transformation: Assessing the impact of Digitalisation on Ireland’s Workforce. 4. SOLAS Further Education and Training Strategy 2020 – 2024 5. Ireland’s Industry 4.0 Strategy 2020 – 2025 6. Manufacturing in Ireland 2023 (IBEC) 7. OECD Skills Strategy Ireland (2023)   **Skills shortage**  The recent National Skills Survey from SOLAS highlighted that automation is an area experiencing a significant shortage in available skills [2]. Engineers with automation skills is one area that experienced strong growth in the issuing of new employment permits, indicating a significant constraint in available skills within the current workforce. The report also highlights that SOLAS’ recruitment agency survey (Oct ’22) indicated that automation professionals among the most difficult to fill. Automation skills are also among the most frequently mentioned in online job adverts.  The Department of Enterprise Trade and Employment (DETE) list automation engineers as a Critical Skills Occupation highlighting again the skills shortage in the area [3]. A recent article in Silicon Republic which examined the OECD Ireland Skills Strategy report outlines the risk of Ireland falling behind, due to a lack of automation skills within the workforce and that developing these skills is urgently needed [4]. A recent article in Irish Tech News highlighted the need by Irish businesses for automation skills and their concerns regarding the lack of available workers with automation skills [5].  The Irish advanced manufacturing sector is undergoing a digital transformation driven the adoption of Industry 4.0 including Automation systems. This trend is also being reflected in demand for the Automation training provision, which is seeing increases year on year. Courses such as Programmable Logic Controllers (PLCs) and Digital Sensors are seeing high demand.  LMETB was recently validated by QQI for a [Level 6 Specific Purpose Certificate in Utilising Robotics in Advanced Manufacturing](https://qsearch.qqi.ie/WebPart/ValidationReportDetails?programmeCode=PG25388) and is offering the first iteration of this award in 2024.  A Level 6 apprenticeship programme in Robotics and Automation will meet the needs of the Advanced Manufacturing sector and beyond. As the AMTCE ramps its provision of automation related training courses and programmes for the Advanced Manufacturing sector and other aligned sectors such as construction, provision of this type is of critical importance.  There is growing demand for technology skills orientated training in areas such as Automation and Control Systems and Robotics with various end effector technologies such as welding, CNC Robotics etc due to the adoption of Industry 4.0 technologies.  The Future Jobs Ireland report (2019) focused on how to prepare people and companies for rapid technological change and the move to a low-carbon economy. This key report highlights that technology continues to herald new ways of doing business and new economic opportunities. The report states that technology presents challenges, but also presents new possibilities, in addition certain job roles will disappear or be redefined, and emerging job roles will require new and different skills this will include areas such as Automation and Control Systems, etc. The report focused on five pillars and sets out core ambitions for each of these pillars. Pillar 3 focuses on Enhancing Skills and Developing and Attracting Talent with following key actions:   * Engrain Lifelong Learning and offer career enhancing opportunities to workers. * Provide training in emerging technologies.   The RAA apprenticeship programme is a direct response to these identified action items, following on from AMTCEs engagements with employers and their employees.  The Government’s Industry 4.0 Strategy 2020-2025 report outlined its strategy for Ireland to be an innovation-driven manufacturing hub at the frontier of the fourth industrial revolution and its adoption. Key in this strategy is ensuring that the education and training systems responds to changing skills needs. The AMTCE needs to further enhance its training delivery capacity to ensure that the Centre continues to dynamically response to the rapidly evolving training and upskilling needs of industry.  The Expert Group on Skills Needs Report-Digital Transformation: Assessing the impact of Digitalisation on Ireland’s Workforce states:   * The adoption of digitisation/ automation is happening gradually in Ireland and this slow but steady progress is expected to continue. * As a key location for the development of digital technologies, Ireland is already benefitting greatly from the global roll-out of digital transformation. * Most respondents expect the biggest jobs impact in their sector will be between 2023 and 2030. * The main risk will be people in low-skilled occupations. * Retraining and reskilling will be required to minimise the negative impact of digitisation/ automation on employment and there will be a role for many stakeholders to play in this. * There was acknowledgement that Government initiatives are already underway in several areas including a greater emphasis on teaching soft skills in the education system, the promotion of life-long learning for all employees and retraining and reskilling programmes. * Sectors most at risk are those normally associated with repetitive, manual tasks that can be replaced by automation.   **The AMTCE**  As a relatively new training centre, the AMTCE is in rapid expansion phase in terms of its training provision. The Centre delivered its first training course in August 2021 and by year end delivered a total of 31 training courses for 237 learners. The AMTCE delivered training to a total of 1,151 learners in 2022. In 2023 that number will be in the region of 1,958 across its various provisions. During 2022 and 2023 the AMTCE has seen growth in the demand for Automation and related technologies training, particularly from companies.  There is a clear ambition within LMETB to put in the place a strong and operationally effective capacity within the AMTCE to provide the full range of Industry technologies training services including industrial automation systems and the full range of Robotics training services, required by employers and their employees. Effective and performance orientated management of Automation and Controls training delivery is key to the learner experience, programme quality, employer sentiment and stakeholder management.  **The Robotics and Automation (RAA) apprenticeship**  In short, LMETB have developed a Robotics and Automation apprenticeship to increase the national ability to meet both the training and talent development needs of industry at the technician level. The emerging and apparent skills storage across the advanced manufacturing sectors is considered as having a significantly negative impact on the capacity for growth despite there being a buoyant and expanding global marketplace. The RAA consortium proposed to develop a national Robotics and Automation Apprenticeship Programme (RAA) accredited at the appropriate NFQ Level as a means of addressing some of the emerging skill needs.  An apprenticeship at level 6 will be critical to engage employers across the entire country and to provide the capacity to be proactive in the delivery of Robotics and Automation related training programmes in response to identified employer trainings needs. The RAA will enhance the talent pipeline for the manufacturing, robotics, automation, and systems integration sectors as part resolution to the growing and concerning skills shortages across these sectors.  A specialised Robotics and Automation apprenticeship will enhance both operational delivery and strategic planning of provision within the AMTCE and enable the delivery of the right training at the right time for employers and their employees. Additionally, it is also important to provide the ability to engage with key stakeholders such Enterprise Ireland, IDA, Regional Skills Forums, Chamber of Commerce, Industry groups etc to provide a joined up and coordinated response to the evolving needs of industry in the region and nationally. |
| **Programme Development process**:  **Research and Guiding Documentation**  The overall principles of programme validation are governed by the Qualifications and Quality Assurance (Education and Training) Act 2012.  Supporting documentation and research considered in the creation of this new programme include:   |  | | --- | | 1. Assessment and Standards (Quality and Qualifications Ireland, 2013a) | | 1. Core Statutory Quality Assurance (QA) Guidelines (Quality and Qualifications Ireland, 2016a) | | 1. [DRIVING RECOVERY AND SUSTAINABLE GROWTH 2021-2024 (IDA 2021)](https://www.idaireland.com/getmedia/69a2499c-ac2b-45b7-a342-e57bfb42a2de/IDA_STRATEGY_Draft_15.pdf?ext=.pdf) | | 1. Global Robotics Race: Korea, Singapore and Germany in the Lead - International Federation of Robotics (ifr.org) | | 1. [Industry 4.0 Strategy 2020-2025](https://enterprise.gov.ie/en/publications/publication-files/irelands-industry-4-strategy-2020-2025.pdf) | | 1. Ireland - Manufacturing, Value Added (% Of GDP) - 2024 Data 2025 Forecast 1995-2022 Historical (tradingeconomics.com) | | 1. Ireland’s pharma phenomenon: The road to the top and the bumps ahead – Euractiv | | 1. [Manufacturing in Ireland Unlocking Ireland’s Manufacturing Potential for the next Manufacturing Evolution IBEC (2024)](https://www.ibec.ie/manufacturinginireland#:~:text=Ibec's%20latest%20report%20'Manufacturing%20in,with%20Ibec's%20recommendations%20for%20continued) | | 1. [Ministers Harris and Collins welcome publication of 2023 National Skills Bulletin (www.gov.ie)](https://www.gov.ie/en/press-release/3554d-ministers-harris-and-collins-welcome-publication-of-2023-national-skills-bulletin/) | | 1. National Framework of Qualifications (Quality and Qualifications Ireland, 2021) | | 1. [North-East Regional Enterprise Plan to 2024](https://enterprise.gov.ie/en/publications/publication-files/north-east-regional-enterprise-plan-to-2024.pdf) 2. NSAI Advanced Manufacturing [Sectoral\_Study\_of\_Standards\_in\_Manufacturing.pdf (nsai.ie)](https://www.nsai.ie/images/uploads/standards/Sectoral_Study_of_Standards_in_Manufacturing.pdf) | | 1. [OECD Skills Strategy Ireland 2023](https://www.oecd.org/publications/oecd-skills-strategy-ireland-d7b8b40b-en.htm) | | 1. OECD Skills Strategy Ireland <https://www.oecd-ilibrary.org/education/oecd-skills-strategy-ireland_d7b8b40b-en> | | 1. Policies and Criteria for the Validation of Programmes of Education and Training (Quality and Qualifications Ireland, 2017a) | | 1. Policy and Criteria for Access, Transfer and Progression in Relation to Apprentices for Providers of Further and Higher Education and Training (Quality and Qualifications Ireland, 2015) | | 1. Policy for Determining Award Standards (Quality and Qualifications Ireland, 2014) | | 1. Quality Assuring Assessment Guidelines for Providers, Revised 2013 (Quality and Qualifications Ireland, 2013b (Revised 2018) 2. [QQI Assessment and Standards Revised 2022](https://www.qqi.ie/Publications/Publications/Apprenticeship%20Programmes%20QAG%20Topic-Specific.pdf) | | 1. Why automation matters for Ireland's manufacturing success - Business Plus | | 1. <https://enterprise.gov.ie/en/what-we-do/workplace-and-skills/employment-permits/employment-permit-eligibility/highly-skilled-eligible-occupations-list/> | | 1. <https://imr.ie/2019/06/10/project-industrial-internet-things-iiot/> | | 1. <https://imr.ie/2023/02/23/unlock-your-manufacturing-potential-through-technology-adoption/> | | 1. <https://irishtechnews.ie/automation-key-to-retaining-irelands-productivity/> | | 1. <https://irishtechnews.ie/expleo-research-reveals-94-percent-of-businesses-in-ireland-suffer-from-it-skills-shortages-despite-tech-layoffs/> | | 1. <https://web.ibec.ie/cn/agzlc/manufacturing_ga=2.222002264.1993310339.171008358826801799.1709910814> | | 1. https://www.cso.ie/en/releasesandpublications/ep/p-isse/informationsocietystatistics-enterprises2022/useofrobots/ | | 1. <https://www.ey.com/en_ie/advanced-manufacturing/how-digital-twins-give-automotive-companies-a-real-world-advantage> | | 1. <https://www.irishtimes.com/special-reports/2022/06/17/automation-for-the-people/> | | 1. <https://www.madein.ie/content/features/why-automation-is-key-to-retaining-ireland-s-place-as-a-productivity-league-leader> | | 1. <https://www.madein.ie/content/features/why-automation-is-key-to-retaining-ireland-s-place-as-a-productivity-league-leader/> | | 1. [https://www.madein.ie/content/news/the-changing-face-of-irish-manufacturing-fanuc-supports-the-skills-shift/](https://www.madein.ie/content/news/the-changing-face-of-irish-manufacturing-fanuc-supports-the-skills-shift) | | 1. https://www.madein.ie/content/news/the-changing-face-of-irish-manufacturing-fanuc-supports-the-skills-shift/ | | 1. [https://www.solas.ie/f/70398/x/940b9df162/national-skills-bulletin-2023.pdf](https://www.solas.ie/f/70398/x/940b9df162/national-skills-bulletin-2023.p) 2. https://enterprise.gov.ie/en/what-we-do/workplace-and-skills/employment-permits/employment-permit-eligibility/highly-skilled-eligible-occupations-list/ 3. <https://irishtechnews.ie/expleo-research-reveals-94-percent-of-businesses-in-ireland-suffer-from-it-skills-shortages-despite-tech-layoffs/> 4. [https://www.madein.ie/content/news/the-changing-face-of-irish-manufacturing-fanuc-supports-the-skills-shift/](https://www.madein.ie/content/news/the-changing-face-of-irish-manufacturing-fanuc-supports-the-skills-shift/ ) 5. [https://www.siliconrepublic.com/careers/oecd-skills-report-ireland-2023](https://www.siliconrepublic.com/careers/oecd-skills-report-ireland-2023  ) 6. [https://www.solas.ie/f/70398/x/940b9df162/national-skills-bulletin-2023.pdf](https://www.solas.ie/f/70398/x/940b9df162/national-skills-bulletin-2023.pdf  ) 7. <https://irish-manufacturing.com/embracing-robotics-and-automation-bridging-the-skills-gap-in-irish-manufacturing/> |   **Stakeholder Consultation**  LMETB has extensive experience in education, training initiatives and programme development. Programme development is a multi-faceted process involving a range of stakeholders, namely, the National Apprenticeship Office (NAO)/ NAA, SOLAS, QQI, the ETBs, employers, and apprentices. Stakeholders have distinct roles in approval, funding, validation, delivery, QA, certification, content provision, assessment, work placement, and programme completion. The RAA programme development process involved extensive engagement with manufacturing enterprises across industry both regionally and nationally.  The genesis of the apprenticeship resides in work undertaken by the Regional Skills Forum – Northeast into advanced manufacturing with a skills audit (2019), involving a strong cluster of international businesses services as well as indigenous manufacturing and technology companies.  The key findings of the survey were as follows:   * 80% of companies have staff that need access to digital skills in order to reach their full potential in their current role. * 80% of the companies currently have technical vacancies in design, automation, maintenance and process roles. * Over 70% experienced difficulty in filling vacancies.   Particular manufacturing skills identified as needed were:   * Robotics * Automation and Control * Electrical Principles * Additive Manufacturing * Metallurgy * Pneumatics   There was clear interest and support from companies for the development of new programmes to meet the skills needs of the manufacturing sector. There was a high level of commitment and interest expressed by companies in having an input into curriculum development.  An Initial Robotics and Automation Apprenticeship Consortium Group comprising of Employers, Unions, Education and Training Providers, and other Stakeholders was established to address the critical skills gaps within the manufacturing sector. The ambition was to build an enhanced talent pipeline of highly skilled, current, and future employees who will have access to a variety of high-quality careers pathways, which are demonstrating high and increasing demand.  Accordingly, it is envisaged that the RAA programme would:   * Early Programme Objectives were to provide the advanced manufacturing sectors with ready access to Robotics and Automation skills which are increasing in demand as a consequence of the digitisation of manufacturing processes in order to boost productivity, competitiveness and to facilitate the adoption of new technologies and production processes in meeting global challenges. * Play a key role in redressing the skills gap in the high value manufacturing sectors. * Support manufacturers to adopt a more agile and forward approach to product demands and embrace new technologies. * Address the impact of advanced manufacturing techniques and methods that require current and future workers to develop skills that are primarily technology based in: digitalisation; robotics and automation, maintenance, analytical thinking; machine ergonomics; understanding manufacturing methodologies including 3D Design for manufacture; design for assembly and robotics etc.   All members of the Initial Consortium Group have contributed significantly to the RAA development process, however, in order to develop and refine the curriculum, a sub-committee comprising members of the CSG/AMTCE/LMETB staff was established (the Curriculum Development Group)**.**  They worked along with the consultants who were employed to develop the programme including the programme objectives, the MIPLOS and MIMLOS as well as the programme content and structure. This process was iterative in nature over a two-year period whereby the book of modules and programmes shape was consulted on, feedback was sought and incorporated into the final design adopted.  LMETB completed two separate additional skills needs analysis surveys into the Advanced Manufacturing and related sectors, prior to lodging an application to the National Apprenticeship Office/SOLAS to develop an apprenticeship in the area. The two pieces of research provided a regional and national perspective on emerging skills demand within the sector and involved strong employer engagement and input, thereby informing the content of the RAA Apprenticeship programme.  In 2020, LMETB commissioned Socrates Ltd to carry out a skill need assessment to determine the specific advanced manufacturing skills requirements of companies which further informed the RAA programme development process. The research involved a blend of direct meetings and an online survey. For the purpose of the audit each skill was broken into 3 performance levels:   * Basic (Entry) - Operating knowledge, some minor maintenance skills and monitoring. * Intermediate- Configure and manipulate machinery, equipment and components, and carry out planned maintenance tasks, with some ability to troubleshoot. * Advanced- Very good equipment and process knowledge, capacity to troubleshoot complex issues, involved in system design.   The audit revealed a very strong support for robotics, automation and digitisation skills in advanced manufacturing. All companies indicated they would be seeking to upskill current employees and a desire to recruit candidates with such skills sets in the coming years.  LMETB commissioned a further Employer Survey in May 2021 which saw completed returns received from 35 employers and at a consortium meeting held to review the responses, it agreed to proceed with the submission to SOLAS/National Apprenticeship Council. Further consultation and stakeholder surveys were completed in 2023 by the AMTCE engagement unit which continue to underscore a strong training demand from the sector.  Over 2023 meetings of the Consortium were held to validate the content of the curriculum being developed and to test assumptions about the delivery structure being considered.  Re-engagement took place with employers in April 2024 It has resulted in the following commitments to enrol apprentices;   |  |  |  |  | | --- | --- | --- | --- | | **Company name** | **2024**  **No of places** | **2025**  **No of Places** | **2026**  **No of Places** | | **KUKA** | **1** | **1** | **1** | | **Bellurgan** | **2** | **2** | **2** | | **AIS Automation** | **1** | **1** | **1** | | **Dromone** | **2** | **2** | **2** | | **Innishowen** | **2** | **2** | **2** | | **Medtonic** | **6** | **6** | **6** | | **TE** | **2** | **2** | **2** | | **ICE medical** | **2** | **2** | **2** | | **Merit** | **2** | **2** | **2** | | **Magna** | **1** | **1** | **1** | | **BDD** | **1** | **1** | **1** | | **Abcon** | **2** | **2** | **2** | | **Total** | **24** | **24** | **24** |   **Figure 13 Employer Engagement** |
| **Who was consulted**:  **Employers:**  The RAA programme development process involved extensive engagement with manufacturing enterprises across industry sectors both regionally and nationally. In addition the Regional Skills Forum – Northeast undertook an Advanced Manufacturing Skills Audit involving a strong cluster of international businesses services including:  eBay, Coca-Cola, National Pen, International Fund Services, Liberty Mutual, Manufacturing Cargotec, Becton Dickinson, Kyte Powertech, Wellman/Indorama, Abbot as well as indigenous manufacturing and technology companies such as: Hilton Foods, Glanbia, Irish Cement, Boyne Valley, ABB Ltd, Anord Control Systems Ltd, Intact Software, Glen Dimplex, Rye Valley Foods, Monaghan Mushrooms, Silver Hill Foods, McArees Engineering, Combilift, Carton Bros, Liffey Meats, Kingspan, Abbot Laboratories, Mannock, Epicom Food Ltd GDHV Ireland, BMC Manufacturing, AQF Ltd, Abec Technologies.  **National and Regional Development Agencies:**  In addition, the following organisations were consulted and expressed support for the development of the RAA programme application: Local Enterprise Offices (Meath and Louth), Meath County Council, Louth County Council, Enterprise Ireland, IDA Ireland, ERNACT, Regional Skills North-East, Focussed Engineering Network, Northeast American Ireland Chamber of Commerce, Ibec.  **Delivery Partners**  Instructors who have delivered material in related manufacturing programmes were consulted by LMETB to give their professional views and insights on the RAA programme development process, and content and its complementarity with existing modular components supporting manufacturing skills development and to address an aspect of unnecessary duplication.  **National Apprenticeship Office / Alliance**  The Apprenticeship Office / Alliance was consulted at the outset and approved the Occupational Profile that LMETB and the Initial Consortium Group proposed for the RAA programmes.  **SOLAS / DFHERIS**  Solas, the statutory regulatory authority for apprenticeships and funding partner to ETBs have been informed and consulted throughout the development process and have publicly expressed their support for the development of the RAA programme, as has An Taoiseach Simon Harris TD during his time as Minister for Further and Higher Education. The Department of Further and Higher Education has also been informed and consulted throughout the development process.  **QQI**  LMETB had ongoing contact with QQI during the apprenticeship development process. Most recently LMETB received a site visit to LMETB AMTCE by QQI Quality Assurance and Awards Team members who carried out a review of equipment and facilities and delivered a briefing on validation requirements.  **Career Guidance Professionals**  Members of the Institute of Guidance Counsellors (IGC) which includes secondary school Career Guidance Counsellors have been introduced to the potential for an apprenticeship in this sector through involvement in the AMTCE Further Education and Training Advance Manufacturing schools project.   |  | | --- | | **Advanced Manufacturing Pathways Schools Project**  The Further Education and Training (FET) Advanced Manufacturing Pathways Schools Project introduces students and teachers to STEM, and new technologies used in manufacturing. It also aims to facilitate teachers and students learning a new skill that will allow them to relate what is taught in school with the workplace. The benefit for the students will be to get to experience a real-life application of engineering and interact with engineers from several backgrounds which will give them an overview of the different career paths available in STEM. On the other hand, teachers will upskill and will potentially become facilitators of this new technology within their schools. The project consists of 4 stages: Teacher training, Schools Project including · Visits to schools· Demo trip· Presentation of results  The project harnesses cutting-edge technologies such as Virtual Reality (VR), Augmented Reality (AR), and Robotics in state-of-the-art FET centres to enhance learning experiences. Its objectives encompass providing students and educators with hands-on exposure to advanced manufacturing and digital technologies, illuminating career pathways in these sectors, and promoting digital skills for the workplace. Additionally, the project aims to broaden students' understanding of various technology applications in manufacturing, cultivate their communication, creativity, and digital skills, and facilitate engagement with industry professionals to shape career aspirations. It also underscores the importance of forging connections with post-primary education, training, and employment opportunities, while promoting awareness of emerging technologies like 3D printing and cybersecurity.  The AMTCE initiated the program rollout in 2021 as a pilot project involving four LMETB schools. Since then, over 400 students from LMETB have participated, and the programme has expanded to encompass 11 LMETB schools and six schools under Kerry ETB. |   Career Guidance Counsellors in each of the 19 second-level schools under the remit of LMETB with a combined enrolment in excess of 12,000 have been briefed on the content of the RAA and have expressed strong interest and support for the development of the RAA. A snapshot sample survey of Senior Cycle Post Primary students was conducted by the RAA Programme Development Team in April 2024. 36 learners indicated an interest in pursuing an apprenticeship in Robotics and Automation as a career pathway.  The Engineering Technology Teachers Association (ETTA) have indicated their support for the apprenticeship and offered to engage in promotional activities.  A member of the senior FET management team is also engaged with the National Council for Curriculum and Assessment (NCCA) in a review of the senor cycle Engineering curriculum.  FET Colleges and centres in LMETB, with a combined enrolment of 27,698 (2023), have also expressed interest in the apprenticeship. Learners on related courses in engineering, manufacturing, life sciences and computer programming have in the past progressed to apprenticeship programmes and many have expressed interest in the RAA. |
| **Involvement of Employers and Practitioners:**  There has been extensive engagement with industry which informed the programme design and content, ensuring that the programme is aligned to industry skills requirements. Engagement took the form of focus groups, individual meetings and survey questionnaires, and included major employers in the region and regional skills networks**.**  **RAA Consortium Steering Group**   |  |  | | --- | --- | | **Barry Kennedy (Consortium Chair)** | IMR | | **George Ryan** | FIT | | **Bronagh Gilbride** | Dromone Engineering | | **Denis Rowan** | AMTCE Business Consultant | | **Fiona Bradley** | Assistant Registrar SRC | | **Conor O'Connor** | Reliance Automation | | **Paul Doody** | AMTCE AO | | **Martin Rooney** | TE | | **Michael McGrath** | AMTCE Technical Director | | **Frank Woods** | LMETB AO | | **Gerry Graham** | FANUC | | **Joe McGrath** | Consultant | | **Kelvin Harvey** | LMETB AEO | | **Conor McCarney** | Autolaunch/Magna | | **Conor Kelly** | FANUC | | **Paula Quinn** | AMTCE TSO | | **Shane Loughran** | ABB Robotics | | **Peter Davitt** | FIT | | **Joe McGill** | Control Soft |   **Figure 14 RAA Consortium Steering Group**  A group of logos on a white background  Description automatically generated  **Figure 15 Employers on RAA CSG Committee**    b) 30+ Advanced manufacturing enterprises were directly consulted. These include:    **Figure 16 Employers on RAA CSG Committee**   1. Louth and Meath Education and Training Board (LMETB) Board of Directors 2. Advanced Manufacturing Training Centre of Excellence (AMTCE) Board 3. Irish Manufacturing Research (IMR) 4. Fast Track into Innovation (FIT) 5. Apprenticeship Instructors across Electrical, Manufacturing, Mechanical and OEM apprenticeships 6. Workplace Supervisors in employers listed above   The parties above have all been engaged and consulted with respect to the RAA development. |
| **Evidence of apprentice demand for the programme**:  In the light of the advanced manufacturing skills audit previously undertaken and in response to the urgent demand expressed by manufacturing enterprises / employers, LMETB developed several advanced manufacturing training programmes at NFQ Level 4 and Level 5 & 6 in pneumatic, electronics and PLCs to meet some of the pent-up demand.  Participant demand for these programmes has grown exponentially due to the high progression rates into quality employment. These programmes experience strong demand and currently enjoy a 92% placement rate into industry.  We are confident that the RAA programme, which is complementary and additional to existing provision, offering an ‘earn and learn’ opportunity, where apprentices employed from the outset will enjoy similar if not stronger levels of demand and take-up. This view is further bolstered by the fact that the employers who participated in the programme research and skills analysis stated their intent to avail of the RAA programme at the first possible opportunity.  In addition, engineering courses within higher education attract high participation rates with a 5% upward trend in interest in engineering and related courses in CAO statistics in 2023. The Central Applications Office (CAO) reports a 7% increase in applications for manufacturing and processing courses. (Irish Times 9th March 2024)  As these programmes appear to be overly male dominated, our goal from the outset in introducing the first RAA Apprenticeship programme of its kind in Ireland, will be to encourage high levels of female participation and broad diversity within the profile of participants.  Employers have already indicated a strong commitment to offering apprenticeship places with 24 places available in Year 1.  **Figure 17: Letters from companies willing to employ RAA Apprentices**   |  |  |  |  | | --- | --- | --- | --- | | **Company name** | **2024**  **No of places** | **2025**  **No of Places** | **2026**  **No of Places** | | **KUKA** | **1** | **1** | **1** | | **Bellurgan** | **2** | **2** | **2** | | **AIS Automation** | **1** | **1** | **1** | | **Dromone** | **2** | **2** | **2** | | **Innishowen** | **2** | **2** | **2** | | **Medtonic** | **6** | **6** | **6** | | **TE** | **2** | **2** | **2** | | **ICE medical** | **2** | **2** | **2** | | **Merit** | **2** | **2** | **2** | | **Magna** | **1** | **1** | **1** | | **BDD** | **1** | **1** | **1** | | **Abcon** | **2** | **2** | **2** | | **Total** | **24** | **24** | **24** | |
| **Link to funding / regulatory / employment requirements, licence to practice** if any:  Not applicable to this programme |
| **Employment / progression opportunities for apprentices who complete the programme**:  The RAA Programme is specifically designed to address current and future skills gap and to get apprentices future skills ready. It focuses on the acute skills needed, in the domain of Robotics, Cobotics, IIoT, Industrial Sensors, Digitisation and the urgent need to support operations and technicians in factories. Using advanced manufacturing state-of-the art equipment, innovative delivery modes and facilities, apprentices will learn from expert industrial practitioners and trainers.  The Robotics and Automation Apprenticeship Programme will provide apprentices with extensive knowledge, skills and experience in the fundamental principles and practice of installation, testing, fault finding and maintenance/repair of complex automated production facilities within high value manufacturing environments and other specialist areas. We anticipate that the RAA programme will achieve a 90% completion rate of which a minimum of 80% will be retained by their current employer / sponsor company.  The RAA programme will provide qualified apprentices numerous progression pathways to Levels 7 and 8 Engineering Programmes including:   * Electrical and Engineering * Bachelor of Engineering * Energy Systems Engineering * Aerospace Engineering * Agricultural Engineering * Industrial Engineering * Mechatronics Engineering * Bachelor of Engineering (Honours) in Robotics and Automation   **BSc Robotics and Intelligent Devices – Maynooth University**  <https://www.maynoothuniversity.ie/study-maynooth/undergraduate-studies/courses/bsc-robotics-and-intelligent-devices>  [Maynooth University have committed](https://www.lmetb.ie/wp-content/uploads/2024/05/2024-APR-Letter-to-LMETB-re-Robotics.pdf) to developing a progression route for those who complete the apprenticeship.  **B Eng (Common Entry)– Dublin City University (DCU)**  <https://www.dcu.ie/courses/undergraduate/school-electronic-engineering/common-entry-engineering>  DCU have indicated an interest in exploring options for progression once the apprenticeship is validated.  LMETB has a strong working relationship with both universities on the development of progression routes and once validation is secured will engage with the universities on more detailed links.  Other specific Higher Education Degrees that progression routes could be developed include:  <https://www.gmit.ie/higher-certificate-in-engineering-in-automation-and-robotics>  <https://www.gmit.ie/bachelor-of-engineering-in-automation-and-robotics>  <https://www.itsligo.ie/courses/benghons-in-robotics-and-automation/>  <https://www.mtu.ie/courses/creacsy7a/>  <https://www.tudublin.ie/study/undergraduate/courses/automation-engineering-tu701/>  <https://tus.ie/courses/us753/>  <https://www.itcarlow.ie/courses/type/undergraduate-cao-courses/electronic-engineering-communications-courses/cw588-robotics-automated-systems.htm>  <https://tus.ie/courses/us776/>  <https://www.cit.ie/course?id=18962>  **Southern Regional College (SRC)**, Newry, Co. Armagh, Nothern Ireland formally joined the RAA consortium. Southern Regional College has an extensive curricular offering in the subject specialisms of Construction and Engineering from Level 3 right up to their successful Degree Apprenticeships in both Construction and Engineering.  Over the course of 2003 members from RAA consortium engaged with SRC in an extensive dialogue to investigate the feasibility of providing a potential progression pathway from the L6 RAA programme onto a Degree programme delivered by SRC. Following consultation with their Awarding Organisation Open University, they commenced an initial mapping between the RAA and their Foundation Degree which comprises three of the following pathways:   * Mechatronics * Product Design and Manufacture * Electrical and Electronics   Following a full mapping in collaboration with OU and QQI, SRC now have identified a clear progression pathway utilising accreditation of prior learning. The L6 RAA programme is equivalent to 150 UK Credit Value, therefore all Apprentices should they wish to progress will be required to complete a further 90 UK Credits to achieve the L7 ROI equivalency which will be the Foundation Degree in Engineering (Mechatronics) in NI.  See Appendix I for further information. |

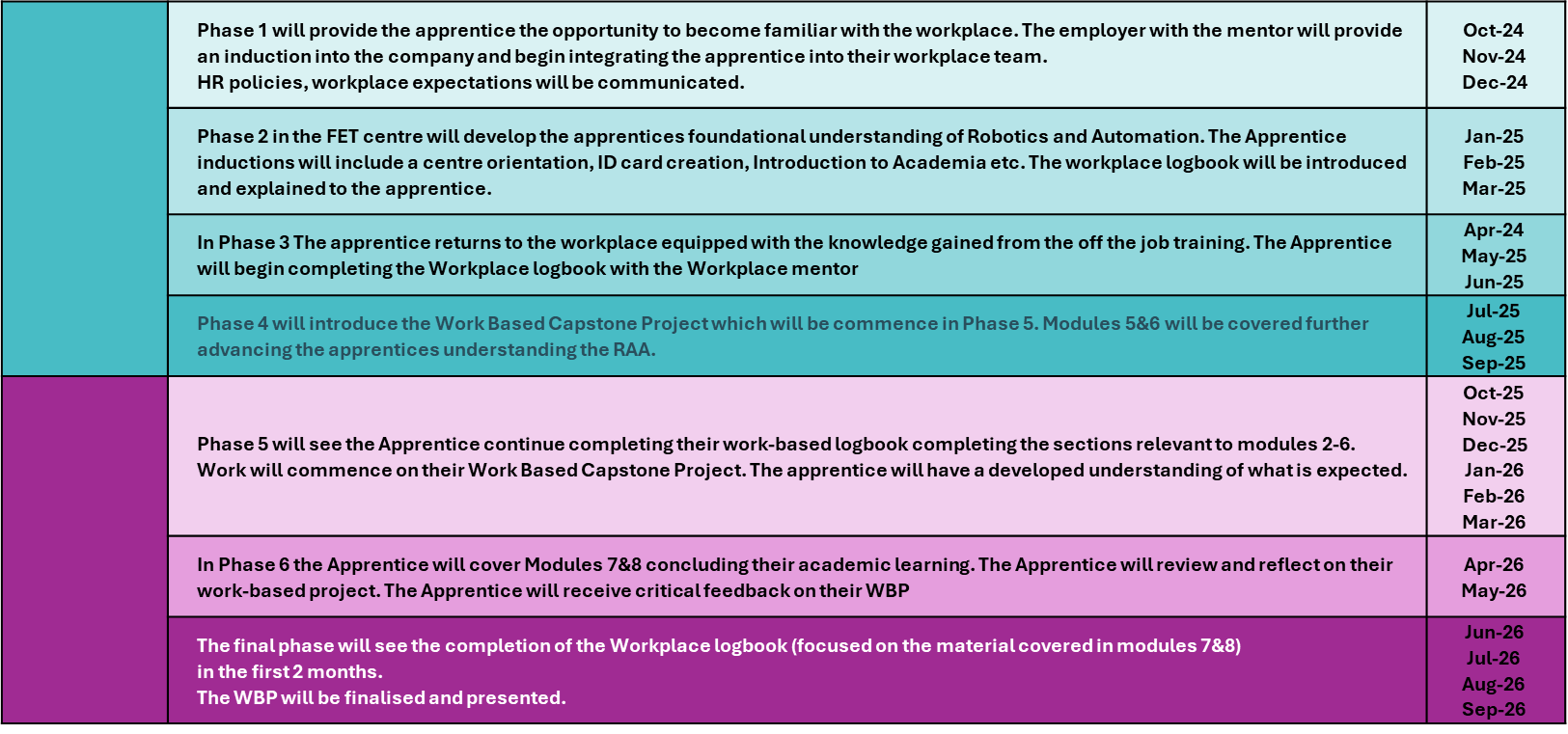
|  |  |  |  |
| --- | --- | --- | --- |
| **Table 2: Detailed comparison/mapping with selected national and international apprenticeship** | | | |
| **Award** | **Higher Certificate in Engineering in Manufacturing Engineering**  **(Apprenticeship)** | **Original Equipment Manufacturing (OEM)**  **Apprenticeship** | **Robotics Automation Apprenticeship (RAA)** |
| **Course Information and weblinks to all modules** | [Higher Certificate in Engineering](https://www.gmit.ie/higher-certificate-in-engineering-in-manufacturing-engineering-apprenticeship) [in Manufacturing Engineering](https://www.gmit.ie/higher-certificate-in-engineering-in-manufacturing-engineering-apprenticeship) [(Apprenticeship) | ATU - Atlantic](https://www.gmit.ie/higher-certificate-in-engineering-in-manufacturing-engineering-apprenticeship) [Technological University (gmit.ie)](https://www.gmit.ie/higher-certificate-in-engineering-in-manufacturing-engineering-apprenticeship) [Apprentice - IBEC](https://www.ibec.ie/connect-and-learn/industries/construction-property-and-engineering/manufacturing-engineering-apprenticeships/apprentice) | Home | OEM Apprenticeship Layout 1 (oemapprenticeship.ie) | TBA |
| **Entry Requirements** | Entry requirements – IBEC | [OEM ENGINEERING - OEM](https://oemapprenticeship.ie/wp-content/uploads/2023/09/OEM-Flyer.pdf)  [Engineering Technician [Leaflet]](https://oemapprenticeship.ie/wp-content/uploads/2023/09/OEM-Flyer.pdf) [(oemapprenticeship.ie)](https://oemapprenticeship.ie/wp-content/uploads/2023/09/OEM-Flyer.pdf) | See Occupational Profile of this Programme Descriptor |
| **Program Focus** | Focuses on manufacturing engineering skills including engineering, mathematics, science, electrical sciences, computer-aided design, quality management, and professional skills. | Focuses on skills relevant to Original Equipment Manufacturing (OEM) sector such as health and safety, engineering drawings, electrical and electronic technology, mechatronics, industrial robotics, PLCs, and team leadership. | Focuses on introducing advanced manufacturing and Industry 4.0/5.0 technologies, robotics fundamentals and operations,  robotic programming/simulation, digitization of manufacturing operations, industrial systems and operations, equipment control, automation, mathematics for advanced manufacturing, and personal & professional career development. |

**Table 2**

# Section 6 [Proposed Programme Structure and Curriculum](#Section6)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Principal Programme** | **Award Class** | | **Award Level** | **Award Credits** | **Award Title** | | | | | | |
| **Robotics and Automation Apprenticeship** | **M** | | **6** | **145** | **Advanced Certificate in Robotics and Automation** | | | | | | |
| **Programme Module Number and Title**  (add / delete rows as required. Use numbering to indicate sequence if relevant) | **M/O** | **On / Off the Job** | **Mode/s of delivery** | | **Module credit** | **Weeks** | **Total Apprentice Effort Module (hours)** | | **Assessment Techniques and Weightings** | | **Indicate when in the programme when assessment is due** |
| **Directed** | **Self- Directed** | **Technique** | **Weighting** |
| Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application | **M** | On / Off the Job | Classroom/lab/workshop | | **15** | 14 to 20 | **100** | **50** | Assignment  Examinations  Project  Work Based Task Logbook | 16%  40%  24%  20% | mid-module  end of module On return to workplace |
| Module 2: Personal & Professional Career Development and Environmental Health & Safety (EHS) | M | On / Off the Job | Classroom/lab/workshop | | **15** | 17 to 21 | 100 | 50 | Assignment  Work Based Task Logbook | 40%  60% | mid-module  end of module On return to workplace e |
| Module 3: Maths for Advanced Manufacturing | M | Off the Job | Classroom | | **10** | 21 to 23 | 75 | 25 | Case Study Scenarios  Skills Demonstration / Exam | 75%  25% | Mid and end of module |
| Module 4: Digitisation of Manufacturing Operations | M | On / Off the Job | Classroom/lab/workshop | | **15** | 24 to 26 | 100 | 50 | Presentation  Assignment  Skills Demonstration  Work Based Task Logbook | 32%  28%  20%  20% | End of module mid-module.  On return to workplace |
| Module 5: Robotics Fundamentals, Operations and Automation | M | On / Off the Job | Classroom/lab/workshop | | **15** | 43 to 48 | 100 | 50 | Assignment  Work Based Task Logbook | 20%  80% | End of module mid-module.  On return to workplace |
| Module 6: Industrial Systems and Operations and Workshop Skills | M | On / Off the Job | Classroom/lab/workshop | | **15** | 45 to 49 | 100 | 50 | Examination  Skills Demo  Practical Project | 20%  40%  40% | End of module mid-module. |
| Module 7: Robotic Programming/Simulation, System Integration and Functional Safety | M | On / Off the Job | Classroom/lab/workshop | | **15** | 80 to 83 | 100 | 50 | Assignment  Exam  Practical Assessment  Work Based Task Logbook | 40%  17%  23%  20% | End of module mid-module.  On return to workplace |
| Module 8: Equipment Control, Automation and Actuation | M | On / Off the Job | Classroom/lab/workshop | | **15** | 83 to 87 | 100 | 50 | Exam  Skills Demonstration  Work Based Task Logbook | 20%  40%  40% | End of module mid-module.  On return to workplace |
| Module 9: Work Based Capstone Project | M | On / Off the Job |  | | 30 | 50 to 104 | 50 | 250 | Project Brief | 100% | At the end of the programme |

**Table 3 RAA Phases**

**Phases**

**YEAR 2**

**YEAR 1**

|  |
| --- |
| **6.1 Rationale for the proposed programme structure set out above** |
| *The programme was fashioned to achieve four goals on completion of the apprentice’s learning journey:*   * *Acquire a* ***Development Framework*** *– learn the required underpinning knowledge and skills (M1 and M6)* * *Attain* ***Focused Competencies*** *– gain the core robotics & automation knowledge and skills (M4.5.7 & 8)* * *Realise* ***Transversal Skills*** *– essential for a rounded educational experience (M2&3)* * *Develop* ***Practitioner Competency*** *– the application of learning through a Work Based Capstone Project*   *This is illustrated in the figure below in which the module categories are colour coded and shown accordingly:*    **Figure 18 RAA Modules** |

|  |  |  |
| --- | --- | --- |
| **6.2 Typical learning effort hours required for the programme** (Refer to Guidelines) | | |
| **Off-the-Job** | | |
| **Total Apprentice Effort (Hours)** | **Directed Learning (Hours Range – include face to face and on-line as appropriate)** | **Self-Directed Learning (Hours Range - include face to face and on-line as appropriate)** |
| 965\* | 755 | 210 |
| **On-the-Job** | | |
| **Total Apprentice Effort (Hours)** | **Directed Learning (Hours Range – include face to face and on-line as appropriate)** | **Self-Directed Learning (Hours Range - include face to face and on-line as appropriate)** |
| 485\* | 245 | 240 |

\*Total learner effort is 1,450 hours and this is aligned to a total of 145 FET credits.

|  |
| --- |
| **6.3 Programme teaching and learning strategy for this specific programme**  Set out your overall approach / strategy to support teaching and learning, taking into account the apprentice profile and MIPLOs. If helpful, the various aspects can be explained in more detail using the headings below. |
| **Introduction**  LMETB is committed to excellence in teaching and learning and the creation of a learning environment whereby apprentices are encouraged to actively engage and take responsibility for their own learning. LMETB understands that a quality teaching and learning environment, provision of education supports, and reliable governance are instrumental for quality education.  It is the policy of LMETB to manage the development of a teaching and learning strategy to deliver relevant, high-quality programmes to apprentices, and to enhance apprentice learning and progress, both on and oﬀ-the-job.  **QQI Validation requirements**  All new national apprentice programmes are required as part of QQI validation process to have an associated set of Minimum Intended Programme Learning Outcomes (MIPLOs) and Minimum Intended Module Learning Outcomes (MIMLOs). These are used as the basis for deciding approaches to teaching and learning, and to assessment. This new RAA apprenticeship programmes oﬀered by LMETB is structured to facilitate the learning process and has considered external reference points on knowledge, skill and competence standards as expressed in the QQI Professional Awards Standards.  Teaching and learning strategies employed by LMETB are intended to facilitate apprentices taking ownership of, and responsibility for their own learning in partnership with their employers and education provider. A range of learner and topic-focused teaching strategies are engaged with a view to providing the optimum learning environment. Instructor led classes including skills-based training and development, directed learning, practical work, the use of IT, automation and robotic equipment to support learning, guest lectures and skills demonstrations are examples of approaches and methodologies designed to actively engage the apprentice.  The programme’s curriculum aims to:   * provide an academically robust and vocationally relevant programme that reflects the current and projected needs of the advanced manufacturing sector. The rationale for the curriculum structure is firmly rooted in (ongoing) consultation with industry (the CSG) and feedback from employers; * is learner-focused and aims to provide the opportunity for both breadth and depth of learning and challenges in line with current industry requirements and anticipated future needs; and, * is designed to foster the development of core practical skills, on a foundation of sound knowledge and competence that will enable apprentices to grow in confidence and become skilled technicians in the advanced manufacturing space.   Key Principles:   * Adopting an apprentice centred approach to promote the application of learning into the workplace whereby the learner/apprentice will be enabled to contribute both practically and productively. * Acknowledging that the programme requires learning that takes places both on and off job, and that the dual approach allows the apprentice to acquire learning from observing, practicing, experiencing and reflecting. * In respect of the key teaching and learning strategies outlined a spiral approach to embedding these methods within the course will be adopted providing variety and innovation in the learning suitable to the module being delivered. * Providing classroom-based instructor led training delivered by experienced Instructors who meet the profile. * Ensuring that the apprentice gets exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems, during scheduled class module time and within their workplace setting. This will include access to software-based design and robotic programming software systems. * Utilizing subject matter and industry experts in the format of regular guest lectures and site visits throughout the duration of the programme. * Reinforcement of learning in the workplace with the support of a Work Based Employer Work-based Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) Moodle which will support and reinforce the instructor delivered classes and scaffold both a community of practice and independent, proactive learning. * Embedding both formative and summative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. reflection, quizzes, multiple choice questions etc. in the VLE.   **Learning Methodologies**  A variety of learning methodologies will be used on the RAA Apprenticeship Programmes to communicate and develop understanding of the curriculum. These include but are not limited to:   * Classroom based delivery. * Guest lectures * Formative assessment * Problem solving * Inquiry-based learning * Employability skills development * Tutoring * Mentoring * Seminars * Workshops * Group work * Case Study Analysis * Research supervision and project work * Simulation activities (e.g., Digital Twin simulations) * Videos and feedback -Field trips (including in company visits) * Self-directed learning * Work based Logbook * Summative Assessment   As Coordinating Provider, in collaboration with the National Programme Board, LMETB will develop and apply an appropriate range of teaching methods, supported by eﬀective assessment mechanisms, which match the learning outcomes and enable apprentices to take responsibility for their own learning. Active apprenticeship participation is encouraged to ensure an apprentice-centred approach. Guest trainers/speakers will be included and will expose apprentices to contemporary knowledge and expertise. Self-directed learning is actively encouraged. Apprentices will be directed to a [range of resources](https://www.lmetb.ie/wp-content/uploads/2024/05/RAA-Module-Reading-Lists.xlsx) including books, academic, industry journals, articles, videos and Internet sources to provide them with the ability to follow autonomous learning paths and to encourage an ethos of life-long learning.  LMETB have a planned investment strategy on the development of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. Considerable work has already commenced for the development of resources for the delivery of the Special Purpose Award in Advanced Manufacturing Level 6     |  | | --- | | **Teaching and learning tools**  Specific Teaching and Learning Tools will include but are not limited to:   * Traditional instructor led classes * Practical Skills demonstrations * Learner practice of skills demonstrated, * Guest speakers * Formative assessments –, discussions, case studies, practical exercises * Teach back sessions & peer-to -peer learning * Presentations, * Subject-specific handouts, * TEL Tools will be used extensively as part of class-based instruction. |   Learning objectives will be fostered through appropriate teaching and learning methodologies and assessment procedures. These include the ability to evaluate critically, to identify problems as well as solutions, to work independently and in multidisciplinary teams. Readings, desk research and the use of the Internet as a research tool will be important components of the apprentices’ learning experience.  The employer, workplace mentor and apprentice will receive the 2-year academic calendar schedule in advance of registration which will assist in planning in the workplace. The workplace mentor will provide opportunities to enable the apprentice to achieve the module’s minimum intended learning outcomes by facilitating the apprentice’s learning in the workplace by leading by example and promoting the health, safety and wellbeing of employees.  The profile of the apprentice will lend itself to studying the modules in an integrated fashion and thus reinforce the learning and will ensure that all apprentices are provided with learning opportunities that will develop their full potential and allow them to fulfil their roles within an advanced manufacturing environment.  Role of the Instructor for the work-based project supervision   |  | | --- | | Apprentices will be allocated an instructor who will act as their work-based Project Supervisor. Apprentices are encouraged to be pro-active and seek the support of their project supervisor. As part of their role supervisors will:   * Facilitate discussions around ideas for the Work Based Capstone Project with apprentices and encourage consultation with the employer. * Suggest relevant reading materials and resources. * Provide support with structuring, write-up and particular unit requirements. * Agree objectives and targets and guide apprentices in project planning. * Schedule 1-to-1 supervisions for the project over the course of the project. * Provide remote support via telephone/ email/video calls (where appropriate) |   The structure adopted for the programme involves a number of phases for the apprentice and incorporates many of the principles associated with Kolb’s (1984) Experiential Learning Cycle. In this theory Kolb argued that learning is most effective when following the cycle presented in the figure below  David Kolb's Experiential Learning Cycle  **Figure 19 Teaching and Learning Strategy**  The Teaching and Learning strategy of the apprenticeship revolve around Kolb’s Experiential Learning Theory in general According to Kolb, effective learning takes place when an individual completes a cycle of the four stages: concrete experience, reflective observation, abstract conceptualisation and active experimentation. This process is believed to be best represented by a cyclical model where apprentices progress through four different phases. This learning cycle highlights the importance of experience in education whereby the creation of knowledge is a process “created through the transformation of experience". As the name suggests this “experiential learning theory” supports the importance and relevance of experiential activities such as those experienced in a work-based learning scenario. The apprentice can start at any phase; however, s/he must follow each stage sequentially, ensuring that effective links are made between each stage.  The Kolb Learning Style Inventory (LSI) and Kolb's Experiential Learning Theory (ELT) are often utilised in educational settings, including apprenticeships, to understand how individuals learn and to tailor teaching strategies accordingly. Kolb's theory suggests that individuals may have preferences for certain stages of the learning cycle. These preferences form the basis of the Learning Style Inventory (LSI), which categorizes learners into one of four styles:   |  |  |  | | --- | --- | --- | | **Preferences for certain stages of the learning cycle** | | **In an apprenticeship setting, understanding these learning preferences can aid mentors/educators tailor their teaching strategies to better meet the needs of each apprentice. For example:** | | 1 | **Diverging (Concrete Experience/Reflective Observation)**: People with this style are good at viewing situations from different perspectives. They excel in brainstorming sessions and are imaginative. | Diverging learners might benefit from group discussions or creative projects. | | 2 | **Assimilating (Abstract Conceptualization/Reflective Observation)**: These learners are more interested in logical theories and ideas. They prefer reading, lectures, and exploring analytical models. | Assimilating learners may prefer lectures, reading assignments, or case studies | | 3 | **Converging (Abstract Conceptualization/Active Experimentation)**: Learners with this style are practical and prefer to apply ideas to real-world situations. They enjoy problem-solving and decision-making activities. | Converging learners might thrive with hands-on projects, simulations, or real-world applications. | | 4 | **Accommodating (Concrete Experience/Active Experimentation)**: Individuals with this style prefer hands-on experiences and are more likely to take risks. They learn best through trial and error. | Accommodating learners could benefit from practical experiences, experimentation, and immediate feedback. |   By incorporating various teaching methods that align with the preferences of different learners, the Robotics and Automation Apprenticeship can be effective in promoting skill development and knowledge acquisition.  **Programme teaching and learning strategies for the RAA programme**  **Induction**  A key support for apprentices is a comprehensive induction programme delivered by the National Programme Manager with the support of the Programme Delivery Team. Included in this induction, is training for apprentices on how to access Moodle and the use of the Microsoft Office Suite will be delivered and an awareness created in order that apprentices will know how to access resources/supports.  **Personal Development**  LMETB recognises that the personal development of apprentices is essential if they are to succeed in the industry. They must not only acquire knowledge but should also develop attributes, traits and competencies which will enhance their performance. In the teaching of all modules, instructors will be conscious of the need to develop these personal attributes and to reinforce and build upon learning which takes place in a more focused way through the communications and personal development components of the programme.  **Learning scaffolding**  Classes will be available for individuals and small groups, as appropriate, to meet with instructors to progress development needs, especially where one-to-one support is required.  LMETB acknowledges that Apprentices have diverse learning styles and may be referred for academic support for a variety of reasons – for example English language supports, academic writing support or numeracy support. The objective of this service is to diagnose individual apprentice diﬀiculties as they relate to all aspects of academic work and provide feedback and guidance to Apprentices in meeting academic performance variances.  Collaborating Providers will ensure these supports are available to the apprentice in their own ETB.  **UDL**  LMETB are cognisant that every learner is different, and this must be built into the curriculum using methods of teaching, learning and assessment based on the Universal Design for Learning framework. LMETB is committed to the application of the ['UDL for FET Practitioners: Guidance](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) [for Implementing Universal Design for Learning in Irish Further Education and Training'](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) guidance. UDL fits perfectly into everything LMETB does to support all learners by using a variety of teaching methods to reduce barriers to learning. This means that inclusive teaching and learning approaches are built-in at design stage so that all learners' needs are addressed where possible. By applying the principles of UDL in FET programmes, accessibility, variability and the flexibility that addresses learners' strengths and needs are built-in, thereby improving outcomes for all learners.  LMETB actively encourages inclusive and alternative assessment formats, in the context of this programme this includes collections of work and skills demonstrations.  **Technology Enhanced Learning**  LMETB is committed to using technology where it adds value to the learning environment and engages in active evaluation of new technologies on an ongoing basis. The usage of the Moodle VLE will provide instructors and apprentices with a virtual learning environment to complement, enrich and support the more traditional learning environment**.**  LMETB has significantly invested in TEL to enhance the teaching and learning experience across its provision From the RAA apprenticeship perspective, TEL leverages digital tools, software, and platforms to create engaging and interactive learning experiences for students. Examples include:   * Online Learning Platforms: MOODLE is used as the preferred learning management system. This platform provides a virtual environment where apprentices can access programme materials, submit assessments and receive their online feedback from instructors. Apprentices are given training on this platform during induction and 1-1 training should they need it to ensure they can engage in the classroom environment. * Multimedia Content: MyAcademy may be used to host multimedia content such as videos and other multimedia content; * Collaborative Tools: The programme team promotes collaborative learning by providing tools for online collaboration, such as discussion forums, group projects, and real-time collaboration platforms (e.g. padlet). These tools enable the apprentices to work together, share ideas, and learn from their peers. * Digital twins: Digital twins are used to improve manufacturing operations, test new products and train people on virtual representations of real-world machines. The objective may be to demonstrate robotic assets simulation models for on ground monitoring, predictive maintenance, model driven operations, effective operation/planning of the robotic asset (rover, arm, driller, etc) or The objective of this activity is to demonstrate a digital twin for a selected manufacturing process such as composite or additive manufacturing technologies.   The teaching, learning and assessment strategies for this programme have been informed by QQI guidelines, policies, and procedures. These strategies endeavour to develop an understanding of core theory and practice with a specific orientation to the role of a Robotics and Automation Technician. The main objective of this programme’s teaching and learning strategy is that it is learner-centric and that the relevant modules are delivered coherently. This ensures that all graduates of the programme will be competent employees that value continuous professional development and life-long learning and possess the knowledge, skills and confidence to pursue further study if they wished to do so.  The success of any curriculum is through the delivery of high-quality teaching and learning and the diversity of teaching methodologies is a key feature of this curriculum. Instructors will implement various approaches to teaching, learning and assessment all of which are varied, and learner focused.  As previously acknowledged LMETB are cognisant that every apprentice is different, and this must be built into the curriculum using methods of teaching, learning and assessment based on the Universal Design for Learning framework. Due to the diverse profile of the Apprentices, instructors will establish a supportive relationship with the apprentice by focusing building on his/her strengths.  Classes are delivered with a ratio of 1:16 (minimum class sizes 14) thus learning will be enhanced by more class participation, more time available for formative assessment and feedback and thus apprentices will become more confident and comfortable with their peers. There are many teaching and learning strategies that instructors use to support inclusion and they will need to have knowledge of and the skill to choose ones that best meet the differing learning needs of this diverse cohort of apprentices. It is envisaged that by 2025 all instructors on the programme will have completed the AHEAD Digital Badge in UDL.  Teaching is designed to create a relevant and meaningful context for apprentices to make practical connections to the knowledge and skills they are acquiring. Teaching styles and contexts are flexible and aim to motivate and engage the Level 6 learner. Assessments are recognised as learning opportunities in themselves and are designed to match the required level of study, validate achievement of the MIMLOs and MIPLOs, and prepare apprentices for progression in their career. The following Teaching & Learning Strategies will be evident in the programme:  **•** **Facilitative learning**  This approach emphasises the role of a facilitator in guiding and supporting the learning process. The facilitator acts as a guide or mentor rather than a traditional instructor, focusing on creating an environment that encourages active participation, collaboration, and critical thinking.  Instructors (as facilitators) on the Robotics and Automation apprenticeship programme acknowledge that learners have different backgrounds, experiences, and learning styles. They create a learner-centred environment where apprentices can take ownership of their learning and engage in meaningful interactions with both the facilitator and their peers. Their role is to provide support, ask thought-provoking questions, and encourage reflection, rather than simply delivering information.  Key principles of facilitative learning on the programme include:  • Active participation: Apprentices are actively engaged in the learning process, participating in discussions, problem-solving activities, and hands-on practical experiences.  • Collaboration: Apprentices work together, sharing ideas, perspectives, and knowledge. It fosters social interaction, cooperation, and the exchange of diverse viewpoints.  • Critical thinking: Apprentices are encouraged to think critically, analyse information, and develop their own conclusions. This type of learning promotes questioning, exploration, and the ability to evaluate different sources of information.  • Reflection: Apprentices are encouraged to reflect on their learning experiences, identify strengths and areas for improvement, and make connections between new knowledge and prior understanding.  • Supportive environment: The facilitator creates a safe and supportive learning environment where learners feel comfortable expressing their thoughts, asking questions, and taking risks.  Facilitative learning can be applied in various educational settings, such as face-to-face sessions in a classroom, workshops, and training sessions. It is particularly effective in promoting active engagement, critical thinking skills, and deeper understanding of the subject matter. Throughout the programme, the apprentice will be provided with opportunities to learn from others. In the workplace, the apprentice is allocated a workplace mentor and should also be introduced to experienced colleagues willing to share their knowledge and skills. The opportunity to attend meetings, conferences or other workplace events will also facilitate learning. The assessments and workplace tasks require the apprentice to engage with others in the organisation in sharing and seeking knowledge, and skills. The classroom will provide a further opportunity for the apprentice to learn from their instructors and their peers. Introducing guest lectures and subject matter experts enhances the learning experience by providing advanced knowledge of a particular subject area. Specific examples relating to the RAA apprenticeship include:   * + Traditional instructor led classes.   + Practical classes/workshops using role-plays   + Formative assessments –discussions, case studies, practical exercises, peer to peer learning   + Guest speakers   + Completion of their on-the-job Workplace Task Logbook   + Shadowing their mentors and other experienced colleagues   + Engagement with customers   + Skills demonstrations   **•** **Cooperative learning**  This approach is seen where apprentices will work together in small groups to achieve a common goal or complete a learning task. It involves active participation, collaboration, and mutual support amongst the group members. In a cooperative learning setting, the apprentices are encouraged to interact with one another, share knowledge and resources, and take collective responsibility for their learning.  The concept behind cooperative learning is that apprentices can benefit from working together and supporting each other. It promotes social interaction, communication skills, critical thinking, and problem-solving abilities. By engaging in cooperative learning activities, apprentices can develop a deeper understanding of the subject matter and enhance their overall learning experience.  Cooperative learning can take various forms, including group activities, discussions, problem- solving activities, and jigsaw activities/team teaching (where each group member becomes an expert in a specific topic and teaches it back others). The instructor on the programme plays a crucial role in structuring and facilitating these activities, providing guidance and support to ensure that each group member is actively engaged and that learning objectives are met. Cooperative learning will involve the following key elements:  • Positive interdependence: Apprentices are dependent on one another to complete the task or achieve the goal. Each individual's success is tied to the success of the group as a whole.  • Individual accountability: Each apprentice is responsible for contributing to the group's efforts and ensuring their own learning. This helps to promote group work and for the apprentice not to rely solely on others to do the work.  • Face-to-face interaction: Apprentices actively engage in discussions, share ideas, ask questions, and provide feedback to one another. This interaction fosters a supportive and collaborative learning environment.  • Cooperative skills: Students learn and practice skills such as active listening, communication, teamwork, and conflict resolution, which are essential for effective collaboration.  • Group processing: Groups reflect on their performance, identify strengths and areas for improvement, and adjust as needed. This helps to enhance the learning process and improve group dynamics over time.  Specific examples relating to the RAA apprenticeship may include:  • Jigsaw: Also referred to as a teach-back, with a jigsaw activity, apprentices are divided into small groups, and each group is assigned a specific topic or piece of information. They become experts on their assigned topic and then regroup with apprentices who were assigned different topics. In the new groups, they share their knowledge and teach each other, so that everyone in the group gains a comprehensive understanding of the entire topic.  • Think-Pair-Share: This activity involves three stages. First, apprentices individually think about a question, problem, or topic given to them by the instructor. Then, they pair up with a partner and discuss their thoughts. Finally, pairs share their ideas with the whole class. This strategy encourages active participation and gives apprentices the opportunity to learn from their peers.  • Group Work: Apprentices are organised into small groups and given a problem or project to investigate. Each group member has a specific role or responsibility within the group, and they collaborate to gather information, analyse data, and develop solutions. This approach encourages critical thinking, research skills, and teamwork.  • Roundtable: In a roundtable activity, apprentices sit in a circle and take turns discussing a topic or question. Each apprentice contributes their thoughts or ideas, and the discussion continues until everyone has had a chance to share. This promotes equal participation and active listening skills.  • Learning Stations: Learning stations involve setting up different activity/learning stations in the classroom. Apprentices work in small groups and rotate through the stations, engaging in various tasks or activities related to the lesson. This allows for collaborative learning, hands-on-experiences, and differentiated instruction.  • Problem-solving groups: Apprentices are divided into small groups and given a problem or challenge to solve together. They work collaboratively, brainstorm ideas, analyse different perspectives, and come up with solutions. This activity promotes critical thinking, communication, and teamwork skills.  Feedback from instructors on the programme has indicated that cooperative learning works best in a face-to-face environment, leads to improved academic achievement, increased motivation, enhanced interpersonal skills, and a positive classroom environment. It promotes a sense of belonging, cooperation, and mutual respect amongst the apprentices, fostering a more inclusive and collaborative learning community.  **•** **Peer to Peer Learning**  This recognises the importance of social interaction and the value of learning from one's peers. It promotes active engagement, collaboration, and the development of essential skills needed for success in industry and has proven to be critical in the delivery of teaching and learning on the RAA apprenticeship programme. It involves the exchange of knowledge, skills, and experiences among apprentices who are at similar levels of understanding or expertise academically however would have different levels of experience in the workplace.  In a peer-to-peer learning environment, apprentices take an active role in their education by interacting and collaborating with their peers. This approach recognises that apprentices have valuable insights, perspectives, and knowledge that can benefit their fellow learners. The age group of apprentices is potentially from 17 upwards thus the sharing of experiences and knowledge can be very rich in terms of learning. Instructors on the programme encourage peer to peer learning by  • Collaboration: Encouraging apprentices to work together on projects, assignments, or problem- solving tasks. By collaborating, learning can engage in discussions, share ideas, and learn from one another's experiences.  • Active engagement: Apprentices are actively involved in the learning process, which can enhance their motivation and interest in the subject matter. They become more responsible for their own learning and take ownership of their own educational journey.  • Diverse perspectives: Peer-to-peer learning brings together apprentices with different backgrounds, experiences, and perspectives. This diversity fosters a rich learning environment where apprentices can gain new insights and broaden their understanding of a topic.  • Improved communication skills: Engaging in peer-to-peer discussions and group work assists apprentices develop effective communication and interpersonal skills. They learn to articulate their thoughts, listen actively to others, and collaborate effectively.  • Enhanced critical thinking: Peer-to-peer learning often involves problem-solving activities and discussions that require the apprentice to think critically and analyse information. Through these interactions, apprentices can develop their analytical and reasoning abilities.  • Increased confidence: Working with peers can help boost apprentice’s confidence in their abilities. As they share their knowledge and receive feedback from their peers, they become more self-assured and develop a deeper understanding of their strengths and areas for improvement.   * Social and emotional growth: Peer-to-peer learning provides opportunities for apprentices to build social connections, develop empathy, and learn from one another's experiences. It creates a supportive and inclusive learning community where individuals can feel valued and respected.   Peer-to-peer learning can take various forms on the RAA apprenticeship such as   * + Group discussions   + Collaborative projects   + Study groups   + Peer tutoring   + Online discussion forums   + Collaborative document sharing   + Online study group   + Discussion boards   + Cap-stone Project (apprentices can attend the final presentation of their colleagues' project) |
| **Language, Literacy and Numeracy supports:**  The required level of prior educational attainment to access the programme ensures that applicants who are enrolled as apprentices on the programme will have a fair and reasonable chance of participating fully in all programme elements. LMETB benchmarked this requirement with equivalence to a B2 on the CEFR framework.  LMETB views the integration of literacy and numeracy/maths into the organisations' apprenticeship offering as a key priority and is cognisant of the impact it can have on learner retention and progression. Given the duration of this programme, additional learning supports may be required. It might be the case that some of the apprentices commence this programme after having been away from education and/or the workplace for a period and therefore study skills will need to be updated. This programme requires independent learning by apprentices, and some may need help to follow this new style of learning and thus by offering literacy and maths supports, the learner can enhance both their professional and personal development**.**  Specifics supports include:   * Online literacy diagnostic test prior to induction with a 1-1 literacy check in during registration to review any literacy needs. * An “*Introduction to Academic Skills*” Workshop including academic writing during induction delivered by an LMETB Adult Education tutor(s). * Literacy (if required), writing and study skill classes will be delivered throughout the off the job phases. * One to one support classes will be delivered if required. * [ETBI Literacy, Numeracy and Scholarly Resources for FET](https://library.etbi.ie/resources/open) provide a suite of literacy and numeracy information for apprentices in the FET sector. These include the sectoral - [Academic Writing for](https://www.innopharmaeducation.com/our-courses/certificate-programmes/certificate-food-science-technology) [Learners in the FET Sector](https://www.innopharmaeducation.com/our-courses/certificate-programmes/certificate-food-science-technology) & [Referencing Handbook for Learners in the FET Sector](https://www.innopharmaeducation.com/our-courses/certificate-programmes/certificate-food-science-technology) * Access to an LMETB Guidance Counsellor when required. * [LMETB Adult Educational Guidance Service](https://www.lmetb.ie/further-education-training/guidance-information-and-recruitment/) * Access to a fully functioning computer with appropriate software applications * Programme specific equipment and facilities * [Academic support](https://www.lmetb.ie/further-education-training/fet-learner-support/lmetb-fet-learner-virtual-hub/#learningspace) * Reasonable Accommodations * Advocacy support * [Access to additional literacy and numeracy support](https://www.lmetb.ie/further-education-training/part-time-and-evening-courses/als/) * [Access to FET Learner Support Office](https://www.lmetb.ie/further-education-training/fet-learner-support/) * [FET Learner Virtual Support Hub](https://www.lmetb.ie/further-education-training/fet-learner-support/lmetb-fet-learner-virtual-hub/) * Professional Counselling funding by LMETB and provided through MyMind.org * Assistive Technology (AT) and training in AT * [RAA Supports visualisation chart](https://lmetb-my.sharepoint.com/:u:/g/personal/mburns1_lmetb_ie/Ea-_ncOD63JDn7Tfi7cNTwoB_3sKPPRqn6FSPIeq8TY_3A?e=NIdwxx) * [FET Learner Virtual Support Hub](https://www.lmetb.ie/further-education-training/fet-learner-support/lmetb-fet-learner-virtual-hub/)   LMETB are cognisant that every learner is different, and this must be built into the curriculum using methods of teaching, learning and assessment based on the Universal Design for Learning framework. LMETB is committed to the application of the ['UDL for FET Practitioners: Guidance](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) [for Implementing Universal Design for Learning in Irish Further Education and Training'](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) guidance. UDL fits perfectly into everything LMETB does to support all learners by using a variety of teaching methods to reduce barriers to learning. This means that inclusive teaching and learning approaches are built-in at design stage so that all learners' needs are addressed where possible. By applying the principles of UDL in FET programmes, accessibility, variability and the flexibility that addresses learners' strengths and needs are built-in, thereby improving outcomes for all learners.  LMETB actively encourages inclusive and alternative assessment formats, in the context of this programme this includes collections of work and skills demonstrations. |
| **Monitoring of apprentices learning:**  Collaborative Providers are required to submit a Monitoring Report to the National Programme Manager on a Monthly basis. The Report will provide a thorough analysis of the programme delivery and the performance of the apprentices. It is a comprehensive overview of the programme delivery and progression also recording detailed regarding apprentice attendance, time-keeping and general behaviour as well as performance. The monthly report also updates the results of the formative and summative module assessments for all participating apprentices. It is intended to develop an apprentice portal where attendance, reports on issues and results can be logged as appropriate by the Instructor and Workplace Mentor to avoid any security issue associated the emailing of reports in a spreadsheet etc. |
| **Use of formative assessment and feedback:**  Formative feedback plays a vital role in the learning process by providing apprentices with valuable insights and guidance to improve their understanding and performance. Unlike summative assessment that measures final outcomes, the programme delivery team will use formative feedback to focus on progression and development which will include constructive comments, suggestions, and assessments provided by instructors, peers, or self-reflection. This feedback encourages apprentices to reflect on their strengths and areas for improvement, helps them set goals, and guides them towards effective learning strategies. By highlighting specific areas of improvement and offering actionable advice, formative feedback enables the apprentices to take ownership of their learning, fosters a growth mind-set, and ultimately enhances their academic achievement.  Instructors will adopt and implement formative assessment strategies into their teaching practices for the delivery of this programme. The ethos of formative assessment is to ensure instructors are aware of where their learners are at in their learning, where they need to go and how best to get them there. At team planning and assessment design meetings, instructors will engage in discourse around the implementation of effective formative feedback into their practice, and how best this can be achieved for the benefit of learners, consider the timing of giving effective feedback and the method used. There will be an emphasis on instructors sharing their formative assessment techniques and methodologies in a collaborative approach. Modules will have built-in formative assessment and can take the form of skills demonstrations, group discussions, teach back sessions and individual feedback. These practices help to develop learners' self-reflective and cognitive skills. For this programme and in order to increase the apprentices personal and academic confidence to ensure knowledge has been transferred, regular formative feedback will be provided by the instructor. It is intended to be constructive in nature, in that the apprentice can easily identify where the apprentice can strengthen their work, in line with the assignment guidelines. |

Section 7 Programme Assessment

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| **7.1 Programme assessment strategy**  Set out the approach to assessment of this programme taking into account the apprentice profile, PLOs, provider policy and procedures for assessment. The strategy should explain how the overall grade will be calculated |

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| **Approach to Assessment**  By adopting a competency-based assessment approach the Robotics and Automation Apprenticeship programme frames assessments around specific competencies required in the field of robotics and automation, such as programming proficiency, mechanical aptitude, electrical knowledge, and systems integration skills. It will allow for opportunities to assess apprentices' competency development over time, providing opportunities for them to demonstrate achievement in each area.  LMETB have created several assessment practices which provide opportunities for the apprentice to consolidate their learning, receive feedback, reflect on their progress, and apply their knowledge in the workplace. This approach supports the development of a deeper understanding of the subject matter and enhances overall learning outcomes.  LMETB recognises that both formative and summative assessment is an integral part of the process of teaching and learning and enhances the development of the apprentice.  Assessing a Robotics and Automation apprenticeship program that incorporates both on-the-job training and off-the-job learning in college blocks requires detailed planning and a comprehensive approach tailored to the needs and backgrounds of the apprentices. Consideration must be given to both formative and summative assessment.  LMETB recognises that assessment is an integral part of the process of teaching and learning and enhances the development of the apprentice. The workplace provides an excellent opportunity to test the learning achieved and all assessments are authentic and practical whilst ensuring academic integrity is maintained. It is the responsibility of all apprentices and instructors to maintain and promote academic integrity.  For the on-the-job phases LMETB in conjunction with the employers will have designed assessment tasks which provide opportunities for the apprentice to consolidate their learning, receive feedback, reflect on their progress, and apply their knowledge in the workplace. This approach supports the development of a deeper understanding of the subject matter and enhances overall learning outcomes. Building on assessment practices can be an effective way to consolidate learning over the duration of the apprenticeship programme.  The programme delivery team will provide timely and constructive feedback to apprentices on their assessments and will encourage them to reflect on their performance and identify areas of strength and areas that require improvement. This helps the apprentice understand their learning progress and reinforces key concepts.  Regular formative assessments will be provided throughout the learning process. These assessments focus on providing feedback and identifying areas for improvement. They can take the form short assignment etc. By engaging in frequent formative assessments, apprentices can gauge their understanding, correct misconceptions, and solidify their learning.  LMETB operate a system of criterion-referenced assessment for all accredited programmes. Criterion referenced assessment is an assessment based on learning outcomes, established, and agreed upon for all modules, stages and programmes accredited by QQI and with regard to [QQI Assessment and](https://www.solas.ie/f/70398/x/9cd57e0e7d/msletb-agreement.pdf) [Standards](https://www.qqi.ie/Publications/Publications/Apprenticeship%20Programmes%20QAG%20Topic-Specific.pdf) [Revised 2022](https://www.qqi.ie/Publications/Publications/Apprenticeship%20Programmes%20QAG%20Topic-Specific.pdf)[.](https://www.qqi.ie/sites/default/files/2022-09/assessment_and_standards-revised-2022.pdf) This system ensures that assessment, in all instances is valid and reliable and applied fairly and consistently, for all apprentices, across all programmes and assessors.  By implementing a structured and multifaceted assessment approach, tailored to the needs of school leavers, FET graduates and employed individuals, the Robotics and Automation apprenticeship programme can effectively evaluate apprentices' progress and readiness for certification and progression to full-time employment or further study.  **Preparing the apprentice**  As part of the recruitment and enrol process apprentices will undertake an aptitude test. This assessment may cover technical aptitude, problem-solving skills, mathematical abilities, and familiarity with relevant software and tools The results of this test will allow the Lead Instructor and their team to implement any necessary changes or put in place supports or reasonable accommodation measures for individual apprentices. It will also inform the teaching approach; Instructors will be supported in adopting a UDL approach to both teaching and assessment.  At the start of the apprenticeship the apprentice will receive in the Apprentice Handbook a comprehensive information detailing the   * schedule of the modules * assessment techniques * assessment submission methods and deadlines.   Apprentices will complete a short Academic Skills Induction session on commencement of the initial block placement phrase in the training centre. This will prepare both apprentices unfamiliar with a continuous assessment approach e.g. Leaving Certificate students and those returning to training and education after a break.  They will be briefed on the   * Different assessment techniques and approaches across all modules * The difference between formative and summative assessment * How grades are calculated * The technical process for accessing the VLE/ Moodle and uploading assessment material * Policies associated with plagiarism, late submission and reasonable accommodation   As part of the induction process/initial block/Phrase 2 apprentices will cover the following learning outcomes from Module 2. This will enable the apprentices to develop the skills in generating the relevant assessment content.  At the commencement of each module, they will be briefed in detail on the MIMLOs contained in each module that identifies the specific skills and knowledge areas that they need to develop and how these are assessed and what they will be expected to produce.  **Reasonable Accommodation**  Providing a fully inclusive learning environment is extremely important to LMETB and creating a culture of engagement and inclusion for all apprentices is something that is central to the teaching, learning and assessment strategies employed by all instructors.  LMETB provides reasonable accommodations to apprentices to provide necessary support and adjustments to ensure equal access and participation for apprentices with disabilities.  The type of accommodations can vary depending on the specific needs of the apprentice and the nature of their disability.  Some common examples include:   * Assistive technology:   Instructors will have access to training organised by the TEL Officer on the use of Assistive Technology in the classroom and for assessment. Such resources include screen readers or speech-to-text software to assist with communication or learning. Information on such resources will be provided to apprentices at induction and where relevant throughout the duration of the programme.   * Extended time for exams:   Allowing apprentices with certain disabilities, such as learning disabilities, additional time to complete exams or assessments.  **Assessment Planning – Instructor Training**  LMETB recognises that it is critical to support instructors in the development and roll out of all aspects of assessment.  All Instructors will complete:   * Special Purpose NFQ Level 6 Award in Mentorship Practice * Special Purpose NFQ Level 6 Award in Training and Development which comprises of the following modules   + Training Needs Identification and Design   + Training Delivery and Evaluation   The purpose of this award is to enable the mentor to acquire the knowledge, skill and competence to identify training and development needs and to deliver and evaluate a training intervention within a range of training and development contexts.  In addition they will also undertake training provide by the Further Education Support Service (FESS) including sessions that will deal with the following:   1. An Introduction to Locally Devised Assessment 2. Devising Assessment Briefs and Examination Questions (Locally Devised Assessment) 3. Devising Marking Schemes (Locally Devised Assessment) 4. Marking Learner Assessment Evidence 5. Feedback to Learners on Summative Assessment Tasks   To ensure that assessment instruments are appropriately pitched instructors will also be briefed on the NALA Plain English guidelines. <https://www.nala.ie/publications/a-plain-english-checklist-for-documents/>  **UDL**  LMETB are cognisant that every learner is different, and this must be built into the curriculum using methods of teaching, learning and assessment based on the Universal Design for Learning framework. LMETB is committed to the application of the ['UDL for FET Practitioners: Guidance](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) [for Implementing Universal Design for Learning in Irish Further Education and Training'](https://www.solas.ie/guidance-for-implementing-universal-design-for-learning-in-irish-further-education-and-training-/) guidance. UDL fits perfectly into everything LMETB does to support all learners by using a variety of teaching methods to reduce barriers to learning. This means that inclusive teaching and learning approaches are built-in at design stage so that all learners' needs are addressed where possible. By applying the principles of UDL in FET programmes, accessibility, variability and the flexibility that addresses learners' strengths and needs are built-in, thereby improving outcomes for all learners.  LMETB actively encourages inclusive and alternative assessment formats, in the context of this programme this includes collections of work and skills demonstrations.  **Assessment Planning**  LMETB operates a system of criterion-referenced assessment for all accredited programmes. Criterion referenced assessment is an assessment based on learning outcomes, established, and agreed upon for all modules, stages and programmes accredited by QQI and regarding *QQI Assessment and Standards Revised 2022*. This system ensures that assessment, in all instances is valid and reliable and applied fairly and consistently, for all apprentices, across all programmes and assessors.  Regular formative assessments will be provided throughout the [learning process](#Plan). These assessments are low-stakes and focus on providing feedback and identifying areas for improvement. They can take the form of quizzes, short assignments, or class discussions. By engaging in frequent formative assessments, apprentices can gauge their understanding, correct misconceptions, and solidify their learning.  Building on assessment practices can be an effective way to consolidate learning over the duration of the apprenticeship programme.  For each summative assessment task apprentices will receive an assessment brief and marking scheme which details the criteria to be achieved at each grade level.  A standard approach to the presentation of summative assessment instructions will be adopted. All summative assessment instructions will be released via Moodle.  The integration of assessments will be encouraged.  Assessment briefs and examination papers will be internally verified (peer reviewed) as being valid i.e. they are consistent with the outcomes to be achieved.  Assessment planning meetings will take place prior to the commencement of the programme and a schedule of assessments will be prepared. Apprentices and Instructors will be informed that the schedule is subject to change due to reasons outside the control of the coordinating provider e.g. weather-related events etc.  Instructors will mark and grade the learner assessment evidence within a timely period after submission. Appropriate feedback will be provided to apprentices.  The programme team will provide timely and constructive feedback to apprentices on their assessments and will encourage them to reflect on their performance and identify areas of strength and areas that require improvement. This helps the apprentice understand their learning progress and reinforces key concepts.  **Assessment Strategies**  Different apprentices have different learning preferences and styles. Some may thrive in traditional class-based formats, while others may prefer hands-on activities, discussions, or group work. By adopting a variety of assessment techniques, the programme team has acknowledged the different learner profiles and demonstrates its’ understand of the various learning styles. This approach provides opportunities for all apprentices to succeed.  The National Programme Board wish to avoid the over-reliance on examinations. The following teaching and learning strategies have been included in this proposed programme:  The following assessment strategies have been included in this proposed programme:  **Assignments**  Written assessments will evaluate the apprentices' understanding of theoretical concepts, problem-solving abilities, and critical thinking skills. It will also allow the apprentice to develop skills in technical writing.  **Examinations**  Exposure to examinations as the apprentice may wish to progress to another programme after completing the apprenticeship programme and experience completing exams would be beneficial. Suggested Types to be utilised include:   * MCQs which are a valuable learning tool for the Level 6 learner and will test a wide range of higher order thinking skills. * Short answer questions will allow the apprentice to answer an open-ended prompt and affords the apprentice to reveal their knowledge in a few sentences. * Practical examinations which test the apprentices' technical skills.   **Authentic Assessments**:  This approach to assessment will incorporate authentic assessments that mirror real-world tasks or scenarios in the workplace. These assessments require apprentices to apply their knowledge and skills in a workplace environment.  Examples include:   * project-based assessments * case study reviews * simulations.   Authentic assessments not only consolidate learning but also promote higher order thinking, problem-solving, and creativity.  **Skills demonstrations completed across the on-the-job and off-the-job phases**  This involves the examining the skills of the Robotics and Automation Apprentice. This includes testing in a real-life environment. This assessment methodology will be used to evaluate a variety of practical learning outcomes. The apprentice will be required to execute a task or a set of tasks as part of a skills demonstration in the presence of their instructor or may be required to upload videos to their MOODLE page for correction by their instructor.  **Mentor Assessment**  The workplace provides an excellent opportunity to test the learning achieved and all assessments are authentic and practical whilst ensuring academic integrity is maintained. Regular assessments during on-the-job training to evaluate the apprentices' practical skills and ability to apply theoretical knowledge in real-world scenarios. Mentor feedback and observation can contribute to the development of the apprentice and allow them and their instructors and mentors to assess their progress.    Figure 20 RAA Mentors  **Workplace Task Logbook:**  The completion of a Workplace Task Logbook provides an opportunity for the apprentice to create evidence of their progress and achievements which they can share with their employers, mentors, instructors, and peers. Collections of work via photography, video and via the Workplace Task Logbook will be uploaded to Moodle and assessed by Instructors in consultation with the Workplace Mentor. It can also include projects completed during the off-the-job phases as well as any additional learning or achievements. By assessing the Workplace Task Logbook on a regular basis and formally during the site visits by the instructor it will allow the programme team to track progress, identify strengths and areas for improvement, and document the apprentices' development throughout the programme.  **Presentations with Questions and Answers/Debates** are an effective teaching and learning strategy that fosters critical thinking, active engagement, and the development of effective communication skills. By encouraging apprentices to research and present a proposal for a solution, defend their proposal and debate with colleagues it will stimulate their curiosity and promotes a deeper understanding of the module.  Through the process of preparing arguments and rebuttals, apprentices learn to evaluate information, analyse evidence, and construct persuasive reasoning. Additionally, it cultivates respectful discourse and tolerance for diverse viewpoints, as apprentices must listen to opposing arguments and respond with well supported rebuttals. By participating in presentations and defence of their proposal apprentices not only enhance their knowledge of the subject matter but also build confidence, teamwork, and public speaking skills.  It also encourages active participation and fosters a positive learning environment where apprentices feel encouraged to voice their opinions and engage with the content.  Active engagement promotes deeper understanding and retention of the content. When apprentices are actively involved in the learning process, they are more likely to process information, make connections, and apply concepts, leading to improved learning outcomes.  From the outset of the programme the apprentice is encouraged to engage in discussions and collaborative activities which enhances critical thinking and problem-solving skills. By awarding marks for this type of engagement, instructors are emphasising the importance of actively thinking about and analysing their subject matter content, leading to the development of higher order thinking skills.  Actively participating in class and receiving recognition for engagement can boost apprentice’s confidence and self-esteem. When apprentices feel their contributions are valued and acknowledged, they are more likely to become active learners, take risks, and develop a positive attitude towards learning.  Engaging in group discussions or collaborative projects cultivates and nurtures teamwork, collaboration, and effective communication skills. Awarding marks for engagement encourages apprentices to actively listen, articulate their thoughts, and respectfully interact with their peers, which are essential skills for success in the world of work.  The following is a detailed overview of the assessment strategies are employed in each module;  **Table 4: Assessment strategies for each module**  A screenshot of a computer  Description automatically generated  **Table4**  All assessments must be successfully completed and passed. The pass mark is 50% for each module. Where an apprentice receives an unsuccessful grade in the overall component on a first attempt in an assessment activity all apprentices can apply to repeat the assessment on two further occasions. All centres must facilitate the repeat of examinations, skills demonstrations and all other assessments. Apprentices may attempt each off-the-job assessment three times (First sitting, plus two repeats). The apprentice can request that the result be rechecked and reviewed by and appealed to the relevant training provider on each occasion. All assessments outside of the work-based Task book must be successfully completed prior to moving from one phase to the next.  An apprentice who fails to achieve a pass or higher in any module will be afforded the opportunity to re-sit the individual assessment/s in which they were unsuccessful. Re-sit opportunities are for apprentices who have not passed a module, and not for gaining a higher grade. The maximum achievable grade shall be capped at Pass for any and all subsequent attempts. Thereafter, if the failure of the assessment has been confirmed by the relevant training provider on the third and final occasion, the apprenticeship shall be automatically terminated. Apprentices and their employers shall be notified by SOLAS of this termination in writing where applicable. Apprentices may appeal such termination and request a fourth and final assessment attempt to the Apprenticeship Appeals Committee. The time limit for making an appeal is 3 months from the date of termination. SOLAS retains absolute discretion to extend this time limit.  By implementing the above assessment strategy, instructors provide opportunities for apprentices to consolidate their learning, receive feedback, reflect on their progress, and apply their knowledge in the workplace. This approach supports the development of a deeper understanding of the subject matter and enhances overall learning outcomes.  [Sample Assessments](https://www.lmetb.ie/wp-content/uploads/2024/05/Assessment-Guide-and-Instructions.pdf)  **Review and Evaluation**  The National Programme Board for the proposed apprenticeship programme will undertake periodic evaluations of the range of teaching methods and assessment methods to identify best practice as well as areas for improvement. The National Examination Board will also review the assessment techniques employed and offer recommendations where required.  **Calculation of Grade:** (explain how the overall grade will be arrived at for apprentices who complete the programme)  The RAA overall grade will be determined from a weighted average of all the programme modules including a Work Based Capstone Project. The basis for calculation is as follow: Modules 1,2, 4, 5, 6,7 & 8 will each accrue a 10.3% weighting, Module 3 will accrue a 6.9% weighting while the Work Based Capstone Project will accrue a 20.8% weighting in line with the FET Credits as assigned to each module. Each module will be marked as a percentage out of 100%.  The following formula will be used to calculate the overall mark:  Overall Mark = (M1 mark)X10.3%+ (M2 mark)X10.3%+ (M3 mark)X6.9%+ (M4 mark)X10.3%+ (M5 mark)X10.3%+ (M6 mark)X10.3%+ (M7 mark)X10.3%+ (M8 mark)X10.3%+ (M9 mark)X20.8%  Thereafter the final grade will be determined as follows using the overall mark: Referred 0-49%, Pass 50%-64%, Merit 65%-79%, Distinction 80%-100%.  It is a requirement that the apprentice must achieve a pass grade on each module.  **Example:**   |  |  |  |  | | --- | --- | --- | --- | | **Module** | **Weighting** | **Actual Mark %age** | **Weighed Mark** | | M1 | 10.3% | 64% | 6.59% | | M2 | 10.3% | 81% | 8.34% | | M3 | 6.9% | 72% | 4.97% | | M4 | 10.3% | 68% | 7.00% | | M5 | 10.3% | 89% | 9.17% | | M6 | 10.3% | 75% | 7.73% | | M7 | 10.3% | 91% | 9.37% | | M8 | 10.3% | 79% | 8.14% | | M9 | 20.8% | 92% | 19.14% | | **Overall Mark** |  |  | **80.45%** |   In this example the Overall Mark was calculated as 80.45%. This result is a Distinction as the Overall Mark falls within the range 80%-100%. |

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| **7.3 QA of Assessment**  The various aspects of assessment QA can be explained using the headings below. Where appropriate hyperlinks / appendices to / of your Assessment Policy and Procedures will suffice. |
| **Integration of assessment tasks:**  Each module component has a corresponding set of assessment activities to be largely completed on completion of the unit. Completing assessments in the prescribed format grants the apprentice with a sound development foundation and a strong basis for incremental learning and comprehension resulting in comprehensive advancement through the programme content.  The adopted assessment techniques facilitate a continuous assessment cycle throughout the programme delivery, providing apprentices and their employers with confidence in their capacity to acquire the necessary skills knowledges and competencies. Each module assessment task is suitably aligned with the required MLOs. The apprentice will be required undertake specific assessment tasks within a restricted timeframe and or within a supervised setting. Tasks allocated, which evaluate trainees' accomplishment of the module-level learning outcomes involve an assortment of tasks, from reports writing, maintenance prevention activities, robotics configuration, application and maintenance, component design etc. relevant to the particular module component.  Key to the success of the RAA is the combination of the on-the-job (detailed in the next section) and off-the-job assessment activities, ensuring the tangible comprehension of the skills and competencies acquired and the knowledge to ensure their effective application in the workplace.  The final module in the programme, module 9, is the Work Based Capstone Project which is a synoptic project - it is the accumulation of the apprentices’ knowledge, skills and behaviours which have been developed across the apprenticeship learning journey. As such the assessment of the Work Based Capstone Project integrates assessment which covers all the learning the apprentice has accomplished throughout the programme. Synoptic assessment is invaluable because it shows that learners have achieved a holistic understanding of their sector and that they can make effective connections between different aspects of the subject content and across the breadth of the assessment objectives in an integrated way.  Samples assessments for each modules utilising an array of assessment methodologies are adopted to assess the necessary academic, theoretical and practical competencies. |
| **Opportunities for workplace assessment**:  Workplace assessment is accomplished by the completion of the Workplace Task Logbook and assessment of a Work Based Capstone Project.  The Work Based Capstone Project provides apprentices with a safe environment in which they can engage in experimentation, experience setbacks, acquire knowledge, develop communication skills and create outcomes. Apprentices can develop a proactive approach to learning, equipping themselves to effectively address challenges and opportunities in a real-world setting. The Work Based Capstone Project cultivates critical thinking skills, effective collaboration abilities, innovative approaches to problem-solving and an enthusiasm for learning.  The Work Based Capstone Project will require a degree of independent working by the apprentice, especially in the initial stages of scoping out suitable projects based on organisational need and strategy. While we encourage the employer mentor to help the apprentice locate a suitable project in the organisation, we expect the apprentice to take ownership early in the process and to scope out and explore the topic or issue in detail as they draft the Project Brief.  The Work Based Capstone Project is an excellent vehicle through which an apprentice can develop and practice a range of critical skills and behaviours (e.g. decision making, negotiation, communication etc) and in turn provide valuable evidence for assessment thus contributing towards the attainment of their certification.  The Work Based Capstone Project Brief:  The Work Based Capstone Project Brief is a short document that describes the project and its objectives. It contains the following sections:   1. Employer name and profile 2. Overview of the project 3. Project Objectives 4. Schedule 5. Controls and milestones 6. Scope of the project 7. Final report: structure and contents   The Work Based Capstone Project Brief will be approved by the LMETB/AMTCE Project Supervisor and the Employer Mentor before commencement of the project.  The Work Based Capstone Project contributes a maximum of 20.8% of the overall marks for the award. The Project Supervisor will assess the Work Based Capstone Project by evaluating the Final Project Report, covering the project implementation and outcomes attained, against the Work Based Capstone Project Brief and the module learning outcomes as outlined below.   1. Demonstrate the capacity to complete a Work Based Capstone Project through independent working which shows practitioner knowledge, skills and competency in the robotics and automation field. 2. Apply project management approaches, critical thinking skills, effective collaboration abilities, innovative approaches to problem-solving and negotiation & communication skills. 3. Produce a Work Based Capstone Project report which demonstrates attainment of a Project Brief encapsulating a proactive approach to learning, reflection and development.   The Final Project Report will comprise:   * A report of no less than 3,500 words and incorporating digital media and illustration * A PowerPoint Presentation of between 15 and 20 PowerPoint slides.   The Work Based Capstone Project is synoptic i.e. it is the accumulation of the apprentices’ knowledge, skills and behaviours which have been developed across the apprenticeship learning journey. The importance of synoptic assessment is that it shows that apprentices have achieved a holistic understanding of their sector and that they can make effective connections between different aspects of the subject content and across the breadth of the assessment objectives in an integrated way. |
| **Provider regulations for apprentices repeating assessments**:  In keeping with the SOLAS Apprenticeship Code of Practice for Employers and Apprentices, LMETB guarantee all apprentices three occasions to successfully complete any allocated assessment.  Apprentices must achieve 50% of the marks available in each assessment technique. When a learner has not achieved the minimum standards for an award the grade is recorded as “Referred”  Repeat opportunities will be provided in agreement with the apprentice, Instructors, the Workplace Mentor, Authorised Officer and the National Programme Manager or Collaborating Programme Manager. (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/)).  The scheduling of the assessment will not take place sooner than 5 days after the initial assessment.  An apprentice who is repeating an assessment can only be awarded a Pass Grade 4  Apprentices who score 50%-64% receive their actual mark. All marks above 64% will culminate at a Pass (64%). |
| **Provider regulations for apprentices appealing grades**:  The regulations for the appeal of grades are set out in the LMETB Assessment Appeals Process. (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/)).  Regarding assessment appeals and other appeals and grievances, LMETB is acutely cognizant of the need to furnish distinct protocols for each. Accordingly, the Appeals Process and the accompanying Appeals Form will be explicitly communicated to all apprentices on their commencement of the programme. It will be detailed in the Apprentice Handbook.  LMETB is of the opinion that by committing to open communications and extensive feedback and timely release of marks the process for the apprentices to query or formally appeal their grade will be handled in a professional manner designed to reduce stress or worry and to ensure that the apprentice learns from the experience while meeting national standards.  This is assuming that we allow appeals by overall result and not a formal appeal by assessment technique.  Apprenticeships will be encouraged to discuss their results informally with the relevant Instructor on the release via Moodle of the provisional results of each assessment technique. If they do have any concerns that are not addressed at this stage, they can raise the matter with the Lead Instructor or the Programme Manager who will review the issue. No formal appeal may be considered until all assessment techniques have been completed and assessed but by adopting this continuous process of review issues that might arise will be dealt with promptly.  Therefore, by the time all assessment techniques have been completed for a specific module an apprentice should be aware of their impending grade. They will be encouraged to discuss the final grade with the relevant Instructor and time will be allocated for this by Instructors.  If following this discussion an apprentice wishes to appeal their test/assessment outcome they must apply using the [Appeal Application Form](https://www.lmetb.ie/wp-content/uploads/2024/05/RAA-Assessment-Appeals-Form.pdf), which is then sent to the National Programme Manager and the Training Standard Officer. The deadline for the submission of appeals will be communicated to the apprentices on the release of the grades and will not be later than 5 working days after the release of the grades. The completed Appeal Application Form should be submitted by the deadline in order for it to be considered.  The National Programme Manager or Training Standard Officer will within 5 working days of receiving the written application, determine if the application meets the criteria to activate the appeals process.  If the application meets one of the criteria listed for activating an assessment appeals process, the application is approved to proceed.  If the application does not meet one of the criteria listed for activating the assessment appeal process, the application is not approved to proceed.  The National Programme Manager or Training Standard Officer will inform the apprentice of the decision on the appeal request in writing (by email is permissible).  If the appeal request is approved the Training Standards Officer will notify the External Authenticator of the appeal.  The EA will review the result under appeal and may decide to   * Approve the appeal and refer to the Instructor for remarking * Reject the appeal * Give the apprentice the opportunity to (re)sit an alternative test/assessment (when available), without the rules of repeats being enforced * Declare the assessment event null and void and/or the decision is deferred pending further enquiries by the Training Standards Officer in conjunction with the National Programme Manager * Refer it to a 2nd EA for consideration   The EA may, in the process of the appeal, meet with the apprentice and/or the Instructor (Assessor).  The EA in consultation with the TSO will submit a report detailing.   * The criteria that the appeal application met   The outcome of the re-check and review where applicable   * The method of consideration of evidence used e.g., d. who was interviewed e. what documentation was reviewed, e.g., the Assessor/Supervisor report * The findings of the process, i.e. what was revealed * The recommended outcome of the appeal, i.e. whether or not it should be upheld with clearly stated reasons for the decision   The decision of the EA will be final; however, a note of the appeal and the decision will be provided to the National Examinations Boards. |
| **RAA Quality checks**  **Internal Verification**  Internal Verification is the process by which LMETB’s assessment policies and procedures relating to planning, managing, and operationalising all aspects of assessment practices are internally verified, i.e. monitored by staff.  The overall purpose of the Internal Verification process is to ensure that a LMETB is monitoring its own systems and procedures regarding assessment from planning of assessment to finalising results, ensuring that there is adequate learner evidence, and that results, and grades are correctly calculated and recorded. This is in line with QQI’s publication *Quality Assuring Assessment – Guidelines for Providers, Version 2 Revised, QQI 2018*.  The policy outlines the role of the TSO/ LMETB Quality Assurance Office, Instructors, Internal Verifiers and External Authenticators in the Internal Verification process.  (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/))  The ongoing monitoring of the QA systems and procedures and the IV process will be supported through staff briefing and training of key members of the assessment team, including instructors/assessors, workplace mentors and the internal verification team.  A standard approach to the presentation of summative assessment instructions will be adopted. All summative assessment instructions will be released via Moodle.  The integration of assessments is planned and Instructors will be encouraged to identify other opportunities for integration.  Assessment briefs and examination papers will be internally verified (peer reviewed) as being valid i.e. they are consistent with the outcomes to be achieved.  Assessment planning meetings will take place prior to the commencement of the programme and a schedule of assessments will be prepared. Apprentices and Instructors will be informed that the schedule is subject to change due to reasons outside the control of the coordinating provider e.g. weather-related events etc.  Instructors will mark and grade the learner assessment evidence within a timely period after submission. Appropriate feedback will be provided to apprentices.  The moderation of grades will occur by internal peer review on a 100% sampling basis for the initial intake. This will help to ensure the commonality of standards between the assessors in terms of the acquisition of Apprentices’ skills, knowledge, and competencies. Subsequent intakes will be subject an agreed peer review schedule, subject to IV and EA reports for the initial intake.  Internal Verification (IV) will be undertaken by staff not involved in the delivery of the programme. It will involve checking that the assessment procedures have been adhered to and that the marks awarded are accurate and correct. The IV report will record any corrective actions and improvements required. All corrective actions will be completed prior to the commencement of the EA process. |
| **Sampling strategy and criteria for appoint external authenticator:**  The LMETB External Authentication Policy and Procedures sets out guidelines to assist the RAA National Programme Management in the quality assured process of External Authentication.  The role of the External Authenticator is to provide independent confirmation of fair and consistent assessment of apprentices in line with QQI requirements to ensure consistency of assessment results with national standards.  These guidelines can be read in conjunction with the Quality Assuring Assessment Guidelines for Providers (Revised 2013, version 2 – revised 2018).  (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/))  External authentication is undertaken through the appointment of an independent External Authenticator (EA) by the coordinating provider.  LMETB will advertise for a panel of suitably qualified subject matter experts.  The successful candidates should possess the following skills    **Qualifications:**  Relevant third level qualification or minimum Level 6 on the National Framework of Qualifications.  Essential:   * Knowledge of the specific field of learning/vocational area being applied for * Knowledge and experience of Awards, Assessment and Standards and knowledge of Quality Assurance Systems * Ability to communicate with National Programme Manager, Training Standard Officers, Instructors, Apprentices, and other programme staff * Administrative and Report Writing Skills * Excellent Information Technology Skills. (Familiarity with Microsoft Office 365 an advantage) Desirable:   Desirable:   * Other relevant experience of delivering subject matter training/teaching and/or 5 years relevant experience in the sector or * Experience of employment in the sector   In consideration of the relative new area experienced EAs at Level 6 may not be available. Therefore, applications will be accepted from those without EA experience but with a knowledge of the Robotics and Automation sector.  All successful applicants will be required to undertake LMETB training for EAs which is in line with the training provided by ETBI for the National Panel and which will include a comprehensive briefing on the RAA programme.  In the initial stages of the RAA Programme, the EA will sample 100% of Apprentice work. In subsequent intakes the EA will adhere to the national sampling strategy unless recommended in the initial EA reports. At no stage will the sample be less than the national sampling strategy.    The External Authenticator will:   * Perform all authentication duties in accordance with an External Authenticator Professional Code of Conduct * Be independent and external to the programme delivery, assessment development and internal quality assurance at the ETB centre. * Visit the centre and meet with appropriate staff. * Moderate assessment results in accordance with the standards outlined in the validated programme. * Apply the sampling strategy to select the portfolios to moderate assessment results consistent with QQI requirements. * Review internal verification (IV) report(s); authenticate the findings/outcomes; and note cited evidence of IV process. * Confirm the fair and consistent assessment of Apprentices consistent with the provider’s procedures and with QQI policy on quality assuring assessment (including checking that the correct assessment instrument was used) * Follow up on recommendations of previous External Authentication reports if appropriate. * Conduct a closing meeting with the relevant staff (if necessary, this may be completed by telephone). * Complete a full and comprehensive External Authentication Report and submit to the relevant persons within the agreed timeline. * Adhere to provider data protection procedures. * Participate in the results approval process if requested. * Identify any issues/irregularities in relation to the assessment process. * Recommend results to the National Examinations Board for approval. * Attend the National Examination Board meeting, if requested or provide additional information on request. |
| **Results Approval prior to requesting certification –**  LMETB’s results approval process applies to all assessment of apprentices leading to QQI and other certification bodies’ awards in all further education and training (FET) provision or by organisations funded by LMETB to provide further education and training.  (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/))  At the core of the assessment and results processes will be open communication between the apprentice and the Instructor and other programme staff.  Apprentices registered on the SOLAS ACSS (Apprenticeship Client & Support Services) in the LMETB region are subject to agreed QA procedures which has at its core the assumption that the apprentice selected for the programme meets the entry criteria as per the validated programme descriptor.  Instructors will be cognisant of the modes of assessment that are employed in order to meet individual and group learner needs so that all apprentices can demonstrate their knowledge, skill and competence in line with the MIPLOs and MIMLOs identified in the programme and modules.  Assessments will be submitted electronically via Moodle with appropriate submission dates and dates will be logged automatically on submission. Where an actual physical item is created an assessment space is created on Moodle for the apprentice to confirm submission and any associated files are uploaded.  Apprentices will be required to confirm on submission the acceptance of a declaration that the work submitted is their own and where other resources have been used that these are identified and/or referenced. Plagiarism detection software will be used as part of the process.  Instructors will be encouraged to conduct regular formative assessment tasks to prepare the apprentice for the summative assessment task. Feedback on assessment tasks – both formative and summative – will form an integral part of the assessment process.  Feedback will be provided via the VLE (Moodle) and provisional results with associated feedback will be released to the apprentice via Moodle. At all stages the apprentice will be informed that results for summative assessment tasks are provisional and subject to Internal Verification, External Authentication and the approval of the Results Approval Panel/National Examinations Board.  Detailed marking sheets are/will be developed for each assessment technique, and these will be created on Moodle. The individual assessment technique results for each summative assessment task **only** will feed into a detailed marking sheet for the overall module, a spreadsheet downloadable from Moodle (a Module Results Sheet).  The overall module results sheet will list the results for each apprentice by assessment technique. This will be presented for the IV and EA process. This will be signed by the Instructor, Internal Verifier, National Programme Manager for presentation to the External Authenticator.  The Moodle Results sheet for each module that is fully completed (as opposed to modules where MIMLOs cross over Phases) will feed into a Results sheet for that Phrase. Changes made during the IV and EA process will be noted, and the document updated.  The Results sheet for the phase with the relevant Module Results Sheets are presented as part of the RAP process for the approval of the National Examinations Board along with the External Authentication reports. Recommendations are reviewed. Actions agreed during the results approval process are documented and dealt with appropriately.  The RAA National Examinations Board (NEB) details how LMETB will ensure that appropriate decisions are taken regarding the outcomes of the assessment, verification and authentication processes in the RAA programme. It confirms the fairness, transparency and consistency of the assessment process and ensures the validity of the assessment results.  All documents presented to the NEB are signed by the Chairman of the NEB and are retained until the completion of all modules at which stage the NEB will meet and review the results for all modules leading to the overall programme.  On approval the National Programme Manager/Training Standards Officer informs the RAA National Programme Board of the final results for the programme and then the RAA specific QAGMC is also notified of the final RAA results and the TSO applies for certification via QBS.  In summary the process is as follows:   1. Submission of assessment by apprentice via Moodle. 2. Marking and feedback is conducted by the Instructor with provisional grades released to the apprentice. At this stage apprentices can seek clarification on results and are aware marks are provisional. 3. On completion of the module the individual assessment technique results will feed into a detailed marking sheet for the overall module, a spreadsheet downloadable from Moodle (a Module Results Sheet). The overall module results sheet will list the results for each apprentice by assessment technique. 4. The Modules Results sheet will be presented for IV and EA processes. 5. Changes made during the IV and EA process to Modules Results will be noted by the Training Standards Officer who will create a spreadsheet listing the results for all apprentices for all fully completed modules for that Phrase. The results sheet for the phase is presented with the Modules Results sheet to the NEB for approval. 6. All results will be compiled at the end of the programme into a Programme Results sheet and presented to the NEB for final approval. 7. The National Programme Manager/Training Standards Officer informs the RAA National Programme Board of the final results for the programme. 8. The QAGMC RAA Sub-Committee is also notified of the final RAA results and the TSO applies for certification via QBS.   **Documentation**   * Assessment Results Sheet for each technique * Module Results Sheet compiling the results of all assessments for that module * Phrase Results Sheet compiling the results of all fully completed modules for that phrase * Programme Results Sheet   In the case of the Collaborating Providers the above process are followed with the Collaborating Providers TSO presenting a spreadsheet listing the results for all apprentices for all fully completed modules for the relevant Phrase along with the Module Results Sheets to the Coordinating Providers TSO for submission to the National Examinations Board. Where the programme is not yet completed the decision of the NEB will be communicated to the Collaborating Provider who will maintain a record of the results.  When all modules are completed and following notification to the National Programme Board of the decision the National Examination’s Board the coordinating provider’s TSO will inform the collaborating providers TSO who will then apply for certification via QBS. (see RAA Relevant QA Policy and Procedures [Documents](https://www.lmetb.ie/further-education-training/quality-assurance-qa/policies-and-procedures/)) |

**Section 8: Access, transfer and progression procedures, criteria and arrangements for the programme**

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| **8.1 Information to be made available to an apprentice** |
| Information that will be available to the apprentice will focus on the key areas that were raised during the development of the programme by both prospective apprentices and their career advisors and employers.  It will focus on   * What the apprentice approach is? It will be important to explain the different between a course and an apprenticeship and the implications for the prospective applicant. * The content of the apprenticeship programme, its aims and objectives. * The level of the qualification on offer and its position on the National Framework of Qualifications. * The structure of on-the-job and off-the-job phases. * Duration of the apprenticeship and the time allocated to the different phases. * Entry requirements for access to the apprenticeship for all different categories of applicant. * The process for applying for the programme. * How to find an employer. * Financial support and supports that are available. * Location of on-the-job training * Expectations of learner engagement to include the requirement for professional practice placement. * Minimum attendance rates. * Any other supports and resources available to apprentices.   Information will be made available to prospective applicants via   * RAA specific website which will contain   + Information for apprentices   + Information for employers   This information will also be available in hardcopy format.  Information will also be made available via a variety of media regarding the course in order to provide prospective apprentices with sufficient details to enable them to make an informed choice  Programme details will be available on   * Apprenticeship.ie * Qualifax.ie * www.fetchcourses.ie, the national SOLAS funded Further Education Fand Training Course Hub * Relevant Careers websites including careersportal.ie * ETB specific websites/social media sites where this course is being delivered.   Brochures and other promotional material will be distributed at a range of locations such as   * Intreo Offices * Libraries * Secondary school guidance offices etc.   Apprentices will also be provided with information regarding this programme at a range of different events such as   * + Information fairs open to the public including Schools Summit, Apprentice Expo, Higher Options and World Skills – Ireland   The programme will also be advertised through the usual social media channels, on centre/college specific sites, such as Facebook, Instagram, LinkedIn and Twitter and other sites that may develop over the duration of the period that the programme is approved.    All communications and marketing material will adhere with LMETB policies for the publication of such material, comply with GDPR requirements and follow NALA Plain English guidelines. |
| **8.2 Entry Procedures** (refer to guidelines supporting this template) |
| Programme access arrangements are as follows:  Applicants must source a suitable employer.   * Interview: Apprenticeship applicants will be selected by an interview with the prospective employer who will be a SOLAS Approved Employer. * Registration: SOLAS registers successful apprenticeship applicants as the Regulatory Authority for the Apprenticeships.     **Figure 21 The Apprentice’s Admission Journey** |
| **Entry Criteria:**  **Minimum entry requirements are as follows:**   * Applicants will be required to complete an initial aptitude test, * Applicants must be 17 years or older, * Applicants must have achieved a passing grade (O6H/H7) in 5 or more subjects (to include Maths and English) at Ordinary Level in the Leaving Certificate **or**   A full QQI Level 5 or higher qualification.   * For those who may not hold this certification, equivalence may be decided through a Recognition of [Prior Learning procedure](https://lmetb.sharepoint.com/:w:/r/teams/RoboticsAutomationDraftPoliciesandProcedures/_layouts/15/Doc2.aspx?action=edit&sourcedoc=%7B1e9d9086-35f9-4267-a85b-dc5eca7f4d8b%7D&wdOrigin=TEAMS-MAGLEV.teamsSdk_ns.rwc&wdExp=TEAMS-TREATMENT&wdhostclicktime=1710255703162&web=1). * Applicants must hold a minimum of a grade B2 CEFR in writing, reading, listening and speaking or recognised equivalent (Common European Framework of Reference for Languages.   **Skills and attributes are as follows:**   * Must be numerate and literate, * Have good learning skills, * Be interested in manufacturing technology and customer service, * Have the ability to absorb product knowledge, * Be motivated and analytical, * Possess effective communication skills, and excellent interpersonal skills, * Be able to work as a team member, be adaptable and flexible. |
| **Recognition of Prior Learning (RPL) for Entry:**  **Process and Criteria:**  Recognition of Prior Learning (RPL) can be used to gain entry to the RAA Apprenticeship programme. Recognition of Prior Learning (RPL) is a process by which prior learning is formally valued. It is a means by which prior learning is identified, assessed, and recognised by LMETB as part of its programmes, courses, and/or modules on the National Framework of Qualifications (NFQ). This makes it possible to be considered for entry onto the programme potentially based on either Recognition of Prior Certified Learning (RPCL) and/or Recognition of Prior Experiential Learning (RPEL)  **RPCL**  Evidence required to support an application for RPCL is:   * Copy of your official transcript result * Copy of the module descriptor (syllabus) that details the level, duration, module learning outcomes.   **RPEL**  In this case, the candidate must demonstrate that the learning outcomes have been achieved by producing a Portfolio of Evidence to support the claim for access, exemption or credit (in some instances the assessor may decide to use an alternative method of assessment, e.g. project or examination).  As a general principle, credit is given for learning, not for experience per se. The portfolio of evidence must be written in such a way ensuring it is clearly demonstrated that prior learning matches the knowledge, skills and competencies of the module learning outcomes and/or relevant award standard for entry. As part of the assessment the learner may be interviewed by an appointed assessor. Learners can receive support with developing their portfolio from the RPL Coordinator.  RPL Committee will be ad hoc formed as and when required. It will comprise of mentor, assessor and National Programme Manager.  More detail can be found in the [RAA RPL policy.](https://lmetb.sharepoint.com/:w:/r/teams/RoboticsAutomationDraftPoliciesandProcedures/_layouts/15/Doc2.aspx?action=edit&sourcedoc=%7B1e9d9086-35f9-4267-a85b-dc5eca7f4d8b%7D&wdOrigin=TEAMS-MAGLEV.teamsSdk_ns.rwc&wdExp=TEAMS-TREATMENT&wdhostclicktime=1710255703162&web=1) |

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| **8.3 Entry – Transfer and Progression options, if applicable** If apprentices can *transfer* into your programme from another programme, yours or another provider’s, give details of that programme (note that ‘transfer’ implies a programme at the same level) | |
| **Programme Title** | **Provider** |
| N/A |  |
| If apprentices can *progress* into your programme from another programme, yours or another provider’s, give details of that programme (note that ‘progress’ implies a programme at a lower level) | |
| **Programme Title** | **Provider** |
| N/A |  |
| **8.4 Exit – Transfer and Progression options, if applicable** If apprentices can *transfer* from your programme to another programme, yours or another provider’s, give details of that programme (note that ‘transfer’ implies a programme at the same level) | |
| **Programme name** | **Provider** |
| N/A |  |
| If apprentices can *progress* from your programme onto another programme, yours or another provider’s, give details of that programme (note that ‘progress’ implies a programme at a lower level) | |
| **Programme Title** | **Provider** |
| Under consideration with Maynooth University |  |

**Section 9 Programme Module Information** *(copy and paste for each additional module)*

**Programme Module 1**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with an understanding of the evolution of Manufacturing from traditional to advanced and will review the implication of Industry 4.0/5.0 technologies and their application in the modern manufacturing process. It will incorporate an introduction to the scope and significance of manufacturing worldwide, followed by an overview of the industry in Ireland. Key industry disciplines and processes will be outlined, and their respective usage will be reviewed. Underlying principles of sustainability, lean practices, product life cycle and design will be presented. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Describe the evolution of advanced manufacturing and the impact of emerging technologies. | | | | | | |
| 1. Explain the key workshop functions, equipment, and application. | | | | | | |
| 1. Outline key manufacturing processes for component and product production. | | | | | | |
| 1. Present quality control systems and the use of statistical methods for an analysing, monitoring, and controlling process variation. | | | | | | |
| 1. Summarise key manufacturing and assembly concepts, and the importance of lean methodologies in the production process. | | | | | | |
| 1. Discuss the importance of manufacturing costs and control methods and the necessity to identify key elements of cost such as materials, labour, capital and overheads. | | | | | | |
| 1. Explain the circular economy and the contribution of digitisation to the sustainability of the manufacturing. | | | | | | |
| 1. Outline the application of Robotics Automation across Advanced Manufacturing Sectors | | | | | | |
| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 80 | 10 |  | 40 |  | 20 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(M)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Appr9.7aentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  The Lead Provider/Collaborating Provider requires access to:   * Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems. * Access to a supervised Engineering Workshop with a range of facilities such as turning, milling, welding and fabrication equipment. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is designed to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems. This will include access to software-based design and robotic programming software systems. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB, called Moodle, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1: Advanced Manufacturing and Industry 4.0 and Industry 5.0—Inception and Application**  This unit will present an overview of manufacturing in industrial and economic development. Provide a concise account of the contribution of Industry 4.0 and Industry 5.0 in the digitisation of manufacturing and the adoption of new technologies and processes in the production process; their implications with respect to productivity focus and flexibility; resource efficiency, and sustainability; and the evolution of Industry 5.0 human centric and enabling technologies.  **Component 2: Overview of Workshop Skills and Practices**  This unit describes key manufacturing methods such as turning and milling, welding and fabrication and their essential functions in the manufacturing process.  **Component 3: Summary of other key manufacturing processes**  This unit will provide the learner with an overview of other key functions in manufacturing including:   1. Injection moulding is the most widely used plastics manufacturing process. 2. Thermoforming and Sheet Metal Forming, addressing the sheet forming of plastics and metals. 3. Casting process, explaining how a metal part is made by solidification within a mould. 4. Introduce the spectrum of additive manufacturing / 3D printing, key applications and reasons for its rapid growth and significance.   **Component 4: Quality Control and Variation**  This unit will explain basic statistical methods for analysing, monitoring, and controlling process variation, including the use of quality control systems.  **Component 5: Lean Manufacturing and Assembly Systems**  This unit will give examples of key manufacturing and assembly concepts such as production rate, capacity, buffers, and provide industry and case study examples. Lean methodologies will be introduced which focus on minimising waste and maximising productivity.  **Component 6: Manufacturing Cost**  This unit will focus on the cost of manufacturing parts or products, outing the significance of cost control methods. It will present and discuss case studies of making of specific products.  **Component 7: Sustainability in Industry 4.0 / 5.0 Manufacturing**  This unit will review the role and impact of digitisation on the sustainability of the manufacturing process, product life cycle, product development and the circular economy. It will also explore digitisation and emerging technologies capability to enable innovation with respect to product development and enhancement and capacity for bespoke small batch customisation versus high volume production.  **Component 8: Application of Robotics Automation across Advanced Manufacturing Sectors**  This unit provides an overview of the usage and benefits of robotic automaton across a wide range of advanced manufacturing sectors. It outlines the advantages of utilising robotic automation in such sectors, including increased safety, accuracy, and efficiency, while exploring potential applications of the technology. It will demonstrate that advanced manufacturing encompasses a variety of sectors, including automotive, aerospace, industrial, electronics, and medical and how each sectors unique set of needs and goals, are addressed through the use of varied automaton process and technologies. Finally, it explores the socio-economic and environmental implications of advanced manufacturing and provides insights into the strategic direction of the industry. It also examines the impact of technology, government policies, sustainability and global markets on the advanced manufacturing sectors. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **80%** | |
| Workplace | **20%** | |
| Online |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Manufacturers’ Guide to Industry 4.0 Technologies, MEP National Network 2022. * **Instrumentation And Control Systems**, W. Bolton, ISBN-13 978-9385880520 * Introduction to Industrial Automation. Stamatios Manesis, George Nikolakopoulos 2020. * **Introduction to Robotics**, 3rd Addition, Saeed B. Niku, ISBN-13 978-1119527626 * **Robotics: Design, Kinematics and Motion Planning**, Maggie Ross, ISBN-13 978-1647266769 * Ross, L. T., Fardo, S. W., & Walach, M. F. (2017). *Industrial robotics fundamentals: Theory and applications*. Goodheart-Willcox Co.. * **Mechatronics**, 6th Edition, W. Bolton, ISBN-13 978-9353065881 * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1.       Describe the evolution of advanced manufacturing and the impact of emerging technologies. | | Assignment 1 |
| 2.       Explain the key workshop functions, equipment, and application. | | Exam 1 |
| 3.       Outline key manufacturing processes for component and product production. | | Exam 1 |
| 4.       Present quality control systems and the use of statistical methods for an analysing, monitoring, and controlling process variation. | | Exam 1 |
| 5.       Summarise key manufacturing and assembly concepts, and the importance of lean methodologies in the production process. | | Exam 1 |
| 6.       Discuss the importance of manufacturing costs and control methods and the necessity to identify key elements of cost such as materials, labour, capital and overheads. | | Project 1 |
| 7.       Explain the circular economy and the contribution of digitisation to the sustainability of the manufacturing. | | Assignment 1, Exam 1 |
| 8.       Outline the application of Robotics Automation across Advanced Manufacturing Sectors | | Project 1 |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 1: Introduction to Advanced Manufacturing and Industry 4.0/5.0 Technologies and Application - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| None | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 2**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Personal & Professional Career Development and Environmental Health & Safety (EHS)** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with the key skills and knowledge required to operate effectively in a professional collaborative working environment. The apprentice will acquire the practical knowledge of how to work and communicate effectively in teams, demonstrate team leadership, to include team building, supporting team members at different stages of team development, interpersonal communications and reporting structures. 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.  The apprentice will also gain an understanding of how to engage in personal and professional development activities, how to set personal goals and plan for career success. The module will also provide the learner with an understanding of the legislation and associated obligations necessary for a safe working environment and will equip the learner with an understanding of the characteristics of a functional safety culture. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Demonstrate the principles of effective communication, including verbal and nonverbal communication, active listening, communication styles, the use of technology / digital systems and communications within groups and remote teams. | | | | | | |
| 1. Demonstrate effective technical writing in the creation of high-quality technical reports and technical documentation. | | | | | | |
| 1. Demonstrate the concepts of self-awareness, self-esteem, personal responsibility, decision-making, a growth mindset, personal goal setting, resilience and motivation in the workplace. | | | | | | |
| 1. Evaluate the importance of professional development within the community of practice and apply the concepts and strategies to create a personalised plan for achieving one’s professional goals. | | | | | | |
| 1. Apply agile methodology to one’s learning and use of creative methods, design thinking and an adaptable mindset to solve problems and develop innovative ideas. | | | | | | |
| 1. Demonstrate effective team working, applying the skills to lead and motivate others, co-operate in the delegation of tasks, setting of team goals, and adoption of a shared vision. | | | | | | |
| 1. Demonstrate the fundamentals of Environmental, Health and Safety (EHS) principles, practices, legislation, regulation and standards in advanced manufacturing. | | | | | | |
| 1. Adhere to a safety mindset and culture and apply risk assessment techniques and safe practices in manual handling, working at heights, working with abrasive wheels, and the use of electrical/mechanical systems in the workplace. | | | | | | |
|  | | | | | | |
| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 75 | 15 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  Instructor A: NFQ Level 7 or above award in Communications / Communications in Business with relevant teaching / training experience. Equivalent qualifications may be considered.  Instructor B: NFQ Level 7 or above award in Manufacturing / Robotics and EHS topics/protocols or related field with relevant teaching / training experience.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as an Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:** 20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:** | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom- based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation and industrial control systems. This will include access to software-based design and robotic programming software systems. Access to an engineering workshop. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB, called Moodle, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the Moodle. | | |
| **Indicative Syllabus** | | |
| **Component 1: Communications in the Professional Workplace**  In this unit, apprentices will gain an understanding of the basic principles of communication and the various contexts in which communication occurs. Topics will include verbal and nonverbal communication, active listening, and communication styles. Apprentices will explore the dynamics of communication within groups, including the roles of each member and the importance of understanding group dynamics. This unit will explore the challenges of working within remote teams and appropriate techniques for effective communication. This unit will also explore the role of technology in communication, including the professional use of social media, email, text messaging, and other forms of digital communication. Finally, the unit will introduce the fundamentals of successful technical writing and the creation of high-quality technical specifications, reports and technical documentation.  **Component 2: Personal Development and Goal Setting**  Through this unit, participants will learn to recognize their strengths and weaknesses, identify their goals and motivations, and develop the necessary skills to reach their full potential. Apprentices will be introduced to various topics such as self-awareness, self-esteem, self-reflection decision-making and personal goal setting. They will learn strategies for dealing with challenging situations and how to maintain a positive attitude in the workplace. This unit will introduce the concept of accepting personal responsibility, the importance of taking ownership of one's actions, decisions, and outcomes. Apprentices will also explore the importance of maintaining a positive attitude and developing a growth mindset. Participants will learn how to identify and analyse problems, develop solutions, and set goals. The unit will cover self-care, stress management, resilience and how to stay motivated in the professional workplace.  **Component 3: Professional Development within the Community of Practice**  This unit is designed to help individuals gain the skills and knowledge necessary to succeed in the workplace. The unit will provide apprentices with the opportunity to explore key concepts and strategies for professional development, such as goal setting, time management and problem solving. The unit will also focus on the importance of maintaining awareness of and acquiring technical competency on emerging technologies. It will explain how to engage in professional development activities through networking, finding mentors, forums, professional bodies and industry organisations within the community of practice. This unit will provide apprentices with the opportunity to apply the concepts and strategies they have learned to create a personalised plan for achieving their professional goals. Upon completion of the unit, apprentices will have a better understanding of the importance of professional development and the strategies that can be employed to enhance their career.  **Component 4: Developing an Agile Learning, Creative, Design-Focused and Adaptable Mindset**  This unit is designed to help participants develop an agile learning, creative, and design-focused mindset. Apprentices will explore how to think outside the box and apply creative problem-solving techniques to their work. Topics will include developing an agile mindset, utilizing creative thinking to generate innovative solutions, and understanding the fundamentals of design-thinking. The unit will explore the rapidly changing future of work and technology and the adaptability challenge focusing on our ability to learn, unlearn, and adapt. Through classes, practical activities, and online resources, apprentices will explore how to apply an agile methodology to their learning, how to think creatively and design solutions to problems, and how to create and use design thinking to develop innovative ideas.  **Component 5: Teamwork and Leadership Principles and Skills**  This unit is designed to provide apprentices with the skills and knowledge to work effectively in a team, lead others, and be adaptable in the workplace. Apprentices will gain an understanding of effective team working, leadership, team goalsetting and the delegation of tasks. The unit will show how to be agile and adaptable in the face of changes and challenges in the workplace. It will explore how to successfully work with remote teams, covering the adoption of a shared vision and understanding, and strategies for collaboration and problem solving.  **Component 6: Environmental, Health, and Safety (EHS) in Advanced Manufacturing**  This unit introduces the fundamentals of Environmental, Health and Safety (EHS) principles and practices in advanced manufacturing. The unit will provide an overview of EHS in the manufacturing and industrial sectors, including an introduction to relevant standards, regulations, and best practices. The unit introduces health & safety legislation and employer/ employee responsibilities including the provision and correct use of personal protective equipment (PPE). It also focuses on safety in manual handling, working at heights, working with abrasive wheels, the use of electrical/mechanical systems and certification requirements. Apprentices will also explore how to create a safety mindset and culture in the workplace. The unit will cover risk assessment and management techniques used to identify and mitigate potential safety and environmental hazards. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **100%** | |
| Workplace |  | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Planning and Organizing Personal and Professional Development, Chris Sangster 2000. * Communication Skills for Business Professionals. Celeste Lawson, Robert Gill, Swinburne, Victoria, Angela Feekery, Mieke Witsel, Michael Lewis 2019. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1.       Demonstrate the principles of effective communication, including verbal and nonverbal communication, active listening, communication styles, the use of technology / digital systems and communications within groups and remote teams. | | Mentor Assessment 2 in Work Based Task Logbook (assessed on all phases on the job) |
| 2.       Demonstrate effective technical writing in the creation of high-quality technical reports and technical documentation. | | Assignment 1 in module 1. |
| 3.       Demonstrate the concepts of self-awareness, self-esteem, personal responsibility, decision-making, a growth mindset, personal goal setting, resilience and motivation in the workplace. | | Mentor Assessment 2 in Work Based Task Logbook (assessed on all phases on the job) |
| 4.       Evaluate the importance of professional development within the community of practice and apply the concepts and strategies to create a personalised plan for achieving one’s professional goals. | | Mentor Assessment 2 in Work Based Task Logbook (assessed on all phases on the job) |
| 5.       Apply agile methodology to one’s learning and use of creative methods, design thinking and an adaptable mindset to solve problems and develop innovative ideas. | | Mentor Assessment 2 in Work Based Task Logbook (assessed on all phases on the job) |
| 6.       Demonstrate effective team working, applying the skills to lead and motivate others, co-operate in the delegation of tasks, setting of team goals, and adoption of a shared vision. | | Mentor Assessment 2 in Work Based Task Logbook (assessed on all phases on the job) |
| 7.       Demonstrate the fundamentals of Environmental, Health and Safety (EHS) principles, practices, legislation, regulation and standards in advanced manufacturing. | | Mentor Assessment 3 in Work Based Task Logbook (assessed on all phases on the job) |
| 8.       Adhere to a safety mindset and culture and apply risk assessment techniques and safe practices in manual handling, working at heights, working with abrasive wheels, and the use of electrical/mechanical systems in the workplace. | | Mentor Assessment 3 in Work Based Task Logbook (assessed on all phases on the job) |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 2: Personal & Professional Career Development and EHS   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 2: Personal & Professional Career Development and EHS   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 2: Personal & Professional Career Development and EHS   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 2: Personal & Professional Career Development and EHS   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1,2,3, 4, 5, 6 and 7. | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 3**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Maths for Advanced Manufacturing** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| Maths for Advanced Manufacturing is a module designed to provide apprentices with the mathematical knowledge and competencies necessary for the successful implementation of advanced manufacturing processes. The module will cover topics such as the applicable arithmetic and linear algebra, calculus, numerical methods, differential equations, optimization, and probability. It will also introduce apprentices to the advanced mathematical models used in the design and analysis of manufacturing systems. The module will provide an in-depth study of the mathematical techniques used in the design, analysis, and control of these systems while providing apprentices with the opportunity to apply their knowledge and skills in the development of real-world manufacturing applications. On completion apprentices will display a level of competency and application of mathematical computation necessary to realise engineering solutions as required. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, a apprentice will be able to | | | | | | |
| 1. Solve problems in advanced manufacturing using applicable arithmetic and algebra. | | | | | | |
| 1. Apply set theory and Boolean logic to the design and control of industrial processes. | | | | | | |
| 1. Solve real-world problems in advanced manufacturing using geometry and trigonometry. | | | | | | |
| 1. Use probability and statistical techniques to analyse data and make decisions in order to optimize the manufacturing process. | | | | | | |
| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 75 |  |  | 25 |  |  | 100 |
| **9.5 Module Credits** | |  | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Mathematics with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:** | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to designed to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1**: Basic Arithmetic & Algebra  This unit will cover the fundamentals of basic arithmetic and algebra for advanced manufacturing. It will cover topics such as basic operations, equations, polynomials, factoring, and graphing. It will also the basic rules of algebra and cover the use of algebraic techniques to solve problems related to advanced manufacturing, such as using linear equations to solve for unknowns in a system or using polynomials and vector algebra to model a manufacturing process. The unit will also provide a foundation in linear programming and optimization techniques such as the evaluation of determinants and solution of systems of simultaneous linear equations by Gaussian elimination. The unit will include examples and exercises to help apprentices gain a deeper understanding of the topics. Upon completion of this unit, apprentices will have a strong foundation in basic arithmetic and algebra for advanced manufacturing.  **Component 2:** Introduction to Set Theory & Boolean Logic  This unit introduces the mathematical concepts of set theory and Boolean logic and their application in the field of advanced manufacturing. Apprentices will learn how to use these concepts to analyse and solve complex problems related to automation, robotics, and other industrial processes. Topics covered will include the basic principles of set theory (such as set notation and operations), the algebraic properties of Boolean logic, and the application of these principles in the design of logic circuits. Through a combination of classes, tutorials, and laboratory exercises, apprentices will have a solid grounding and understanding of how to apply set theory and Boolean logic to the design and control of industrial processes.  **Component 3** Geometry and Trigonometry Designing Advanced Manufacturing Solutions and Products  This unit will introduce apprentices to the application of geometry and trigonometry in advanced manufacturing. The unit will cover topics such as the use of trigonometric functions to calculate angles, lengths, and areas, as well as the use of geometric principles to understand the design of manufacturing components. Apprentices will also be introduced to basic concepts of three-dimensional space, including the use of Cartesian coordinates, vector algebra, and vector calculus. They will also gain an appreciation of sinusoidal waveforms, motion in a circle, angular velocity and acceleration. Through this unit, apprentices will gain an understanding of the importance of geometry and trigonometry in the design and manufacture of advanced products. In addition, they will learn how to apply these concepts to solve real-world problems in advanced manufacturing. The unit will include classes, tutorials, and practical exercises to help apprentices gain a deeper understanding of the subject. At the end of the unit, apprentices will be able to use their knowledge to design and manufacture advanced products.  **Component 4:** Application of Probability & Statistics in Advanced Manufacturing  This unit introduces apprentices to the application of probability and statistics in advanced manufacturing and the representation of data, and frequency distributions. Apprentices will be able to explain, and compute mean, mode, median quartile, range and standard deviation. It covers topics such as probability distributions (binominal, Poisson and normal), sampling techniques, hypothesis testing, regression analysis, and time series analysis. Apprentices will learn to identify and analyse data to make informed decisions in the manufacturing process. They will also learn to predict future outcomes based on data and to develop strategies for improving processes. The unit will provide apprentices with the skills to understand and apply probability and statistical techniques in the context of the manufacturing industry. Additionally, the unit will explore the use of software applications for data analysis, such as SPSS and Minitab. Upon completion of the unit, apprentices will be able to analyse data and make decisions to optimize the manufacturing process. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **100%** | |
| Workplace |  | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Anandan, R., Gopalakrishnan, S., Pal, S., & Zaman, N. (Eds.). (2022). *Industrial Internet of Things (IIoT): Intelligent Analytics for Predictive Maintenance*. John Wiley & Sons. * Fundamentals of University Mathematics, Colin McGregor, Jonathan Nimmo and Wilson Stothers 2010. * Evjemo, L. D., Gjerstad, T., Grøtli, E. I., & Sziebig, G. (2020). Trends in smart manufacturing: Role of humans and industrial robots in smart factories. *Current Robotics Reports*, *1*, 35-41. * Goel, R., & Gupta, P. (2020). Robotics and industry 4.0. *A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development*, 157-169. * Intro to College Math: Basic arithmetic, geometry, algebra, probability and stats (Intro to Math). Nathan Frey 2021 * Javaid, M., Haleem, A., Singh, R. P., & Suman, R. (2021). Substantial capabilities of robotics in enhancing industry 4.0 implementation. *Cognitive Robotics*, *1*, 58-75. * Oladiran, M. T., Uziak, J., Eisenberg, M., & Scheffer, C. (2011). Global engineering teams–a programme promoting teamwork in engineering design and manufacturing. *European Journal of Engineering Education*, *36*(2), 173-186. * Parmar, H., Khan, T., Tucci, F., Umer, R., & Carlone, P. (2022). Advanced robotics and additive manufacturing of composites: towards a new era in Industry 4.0. *Materials and manufacturing processes*, *37*(5), 483-517. * Sharma, V., Sharma, V., & Shukla, O. J. (2023). *Principles and Practices of CAD/CAM*. CRC Press. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1.       Solve problems in advanced manufacturing using applicable arithmetic and algebra. | | Case Study Scenario 1 |
| 2.       Apply set theory and Boolean logic to the design and control of industrial processes. | | Skills Demonstration / Exam |
| 4.       Solve real-world problems in advanced manufacturing using geometry and trigonometry. | | Case Study Scenario 2 |
| 5.       Use probability and statistical techniques to analyse data and make decisions in order to optimize the manufacturing process. | | Case Study Scenario 3 |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 3: Maths for Advanced Manufacturing   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 3: Maths for Advanced Manufacturing   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 3: Maths for Advanced Manufacturing   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 3: Maths for Advanced Manufacturing   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1,2,3, 4, 5 and 6. | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 4**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Digitisation of Manufacturing Operations** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with an understanding of the digital technologies that are transforming robotics driven manufacturing operations. The module will provide the learner with an understanding of the key technology building blocks and principles in the digital transformation of manufacturing operations. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Discuss the of application of digitisation in industry, the challenges it presents and its implications for the future of advanced manufacturing. | | | | | | |
| 1. Describe the processes and tools used to create digital designs and products and evaluate the best digital technology for specific applications. | | | | | | |
| 1. Apply the processes, tools and techniques for digitisation, that are used to improve the design and manufacturing process. | | | | | | |
| 1. Demonstrate the application of microcontroller and microprocessor technologies and demonstrate how to design, implement, programme and debug simple microcontroller-based systems. | | | | | | |
| 1. Develop and implement data capture tools and analysis techniques to optimise and enhance a robotics orientated manufacturing system. | | | | | | |
| 1. Outline the applications and challenges of IIoT and the ways in which it can be used to improve the efficiency and effectiveness of manufacturing processes. | | | | | | |
| 1. Describe how to effectively use VR/AR to support industrial use case scenarios such as industrial maintenance activities. | | | | | | |
| 1. Show an in-depth appreciation of the benefits and challenges associated with the digitisation of manufacturing enterprises and outline strategies for their successfully application. | | | | | | |
| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 70 | 20 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)module 9** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems.  Access to robotic programming and simulation software packages. | | | | | | |

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| **9.7 Module curriculum** | | | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems. This will include access to software-based design and robotic programming software systems. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | | | |
| **Component 1: Overview of Digitisation of Manufacturing Operations**  This unit will provide an overview of the digitisation of manufacturing operations, exploring the ways in which digital technologies are transforming the way in which manufacturing processes are conducted. It will introduce the concept of the fourth industrial revolution and explain the potential benefits this can bring for manufacturers. It will also look at the challenges associated with digitisation, such as the need for technical expertise and the potential for cyber security risks. The unit will cover the different digital technologies that can be used to digitise manufacturing processes, such as 3D printing, robotics, artificial intelligence, cloud computing, AR/VR technologies and application and the Industrial Internet of Things. It will explain how these technologies can be used to improve efficiency, reduce costs, and increase accuracy. Finally, the unit will provide an overview of the advantages of digitising data and processes, such as improved accuracy and efficiency, cost savings, and better access to information. It will also discuss the obligations and potential risks associated with digitisation, such as data security and privacy. Participants will gain a better understanding of the potential of digitisation and be able to make informed decisions about its use in their organisation and the implications of digitisation for the future of manufacturing operations in general.  **Component 2: Technology Utilisation in Digitisation**  This unit will provide apprentices with an introduction to the use of Automation, Robotics, Computer-aided Design (CAD), Computer-aided Manufacturing (CAM) and 3D Printing in the digital transformation of businesses. The unit will provide a comprehensive overview of the technologies and their applications, with a focus on the practical aspects of their use. Apprentices will learn the principles of automation, robotics, CAD and CAM, and gain an understanding of the processes and tools used to create digital designs and products including an introduction to software such as SOLIDWORKS and other similar software. They will also gain an understanding of the various 3D printing technologies and their applications. The unit will provide apprentices with the necessary skills to apply these technologies in the digitisation of businesses and will equip them with the knowledge to evaluate the best technology for a specific application.  **Component 3: Processes for Digitisation**  This unit provides apprentices with an in-depth exploration of processes for digitisation, including designing the digital workflow, developing a digital manufacturing plan, implementing automation and robotics, integrating CAD/CAM systems and utilizing 3D printing. Apprentices will learn the fundamentals of designing a digital workflow, including the principles of process mapping, data flow diagrams, and the use of software tools to design and implement the workflow. Apprentices will gain an understanding of the components of a digital manufacturing plan and the process of developing a plan that is tailored to the specific needs of a given manufacturing environment. They will learn the fundamentals of automation, robotics, 3D printing and CAD/CAM systems and how they can be used to improve the design and manufacturing process. By the end of the unit, apprentices will have a thorough understanding of the processes for digitisation and the tools and techniques that can be used to improve the design and manufacturing process.  **Component 4: Overview of Microcontroller Technologies, Associated Input/Output Devices and their Practical Applications.**  This unit will introduce microcontroller technologies (including an overview of microcontroller and microprocessor technologies such as Arduino and Raspberry Pi), associated input/output devices such as sensors, motors, and displays, and will explore how these devices can be used to create interactive projects and their practical applications. Apprentices will learn the fundamentals of microcontroller architectures, the different types of microcontrollers, and the basic principles of their operation. They will also be introduced to the different types of input/output devices available, such as sensors, actuators, and displays, and how they can be used to interact with the microcontroller. Apprentices will be introduced to various practical applications and will gain practical experience with programming and interfacing microcontrollers with input/output devices. The unit will also cover topics such as debugging, programming languages, and development tools. At the end of the unit, apprentices should be able to design, implement, and debug simple microcontroller-based systems. Through a series of lessons, tutorials, and practical exercises, apprentices will gain an understanding of the principles of microcontroller programming and will be able to apply this knowledge to create their own projects.  **Component 5: Data Capture Tools and Analysis Techniques.**  This unit will introduce the tools and techniques used to capture data related to equipment in the manufacturing process. Topics covered will include the use of various data capture methods, such as barcode scanning, RFID tags, and manual data entry. The unit will also cover the use of various software tools to capture, store, and analyse data related to equipment output and performance, including asset management systems, inventory management systems, and maintenance management systems.  This unit will provide apprentices with the knowledge and skills to develop and implement data capture tools and techniques for robotics orientated manufacturing systems. The unit will provide apprentices with the ability to optimise and enhance robotics orientated manufacturing systems. The unit will cover topics such as data collection and storage, data mining and analysis, data visualisation, data-driven decision making, and data-driven continuous optimisation and enhancements. Additionally, the unit will provide apprentices with the ability to apply these techniques to solve a variety of real-world problems. Finally, the unit will provide apprentices with the opportunity to develop a project that incorporates the data capture tools and techniques discussed in the unit.  **Component 6: IIoT technology Adoption and Applications**  This unit will provide apprentices with a comprehensive overview of the Industrial Internet of Things (IIoT) and its applications in advanced manufacturing. It will cover the fundamentals of IIoT technology, including the different components of the system, the challenges and benefits of implementation, and the potential applications in advanced manufacturing. Apprentices will gain an understanding of the different communication protocols used for IIoT systems, as well as the security considerations for IIoT systems. The unit will explore the application of IIoT in different aspects of advanced manufacturing such as data analytics, sustainability, environmental control, lean manufacturing, and bespoke production systems. It will cover the potential advantages and disadvantages of each of these areas, and the ways in which they can be used to improve the efficiency and effectiveness of manufacturing processes. The unit will also look at the potential risks and challenges associated with the adoption of IIoT in advanced manufacturing, and the strategies that can be employed to mitigate these. It will provide an overview of the legal and regulatory framework that governs the use of IIoT in the manufacturing sector.  **Component 7: Application of AR/VR in Preventative Maintenance / Equipment Troubleshooting**  This unit is designed to provide apprentices with an introduction to the use of Augmented Reality (AR) and Virtual Reality (VR) technologies in the field of preventative maintenance and equipment troubleshooting. Apprentices will learn how to apply AR/VR technologies to diagnose and repair common equipment problems. Topics will include an overview of the various types of AR/VR technologies, their advantages and disadvantages, and the most effective ways to use them in the maintenance and troubleshooting of equipment. The unit will also cover the practical applications of AR/VR in preventative maintenance and equipment troubleshooting, including the use of AR/VR to identify and diagnose potential problems, as well as the use of AR/VR to create virtual simulations for training and troubleshooting. Additionally, the unit will cover the safety considerations for working with AR/VR technologies and discuss the ethical implications of using these technologies in the workplace. Upon completion of the unit, apprentices will be able to identify and apply the appropriate AR/VR technologies for preventative maintenance and equipment troubleshooting. The unit will demonstrate how AR and VR can be used to create interactive, immersive training simulations and provide practical experience to trainees. It will also demonstrate the use of 3D models and simulations to display and analyse equipment performance. Finally, the unit will provide an overview of the current state of the art in AR and VR technologies and discuss the potential for future applications.  **Component 8: Implementation of a Digitisation Strategy in Manufacturing Enterprises**  This unit will explore the methodologies for digitising manufacturing enterprises in the modern era. It will provide an overview of the current state of the industry, the potential benefits of digitisation, and the challenges that need to be addressed. It will cover topics such as the need for increased automation, the need for better data management, the need for more efficient supply chain management, and the need for improved customer service. The unit will also discuss the implications of digitisation on the workforce, the need for new skills and training, and the need to manage the transition. This unit will provide an in-depth exploration of the challenges associated with the digitisation of manufacturing enterprises. It will explore the cost/benefit of digitisation, from both a financial and time perspective, and the various technical challenges that must be addressed to successfully implement a digital transformation. The unit will also explore the importance of training employees in the use of new digital technologies, and the need for robust data security measures to protect sensitive information. The unit will explore the use of AI (artificial intelligence) in robotics/cobotics and will focus on the ethical use of AI in the enterprise and society. By the end of the unit, participants will have a comprehensive understanding of the challenges associated with the digitisation of manufacturing enterprises, and the strategies that can be used to overcome them. | | | | |
| **9.7c Mode(s) of Delivery** | | **Proportion** (% of Total Directed Learning) | | |
| Classroom / Face to Face | | **80%** | | |
| Workplace | | **20%** | | |
| On Line | |  | | |
| **9.7d Teaching Resources (reading lists etc.)** | | | | |
| * Advances in Digital Manufacturing Systems - Technologies, Business Models, and Adoption 2023. R. K. Amit, Kulwant S. Pawar, R. P. Sundarraj, Svetan Ratchev. * Anandan, R., Gopalakrishnan, S., Pal, S., & Zaman, N. (Eds.). (2022). *Industrial Internet of Things (IIoT): Intelligent Analytics for Predictive Maintenance*. John Wiley & Sons. * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Sadiku, M. N., Ajayi-Majebi, A. J., & Adebo, P. O. (2023). *Emerging technologies in manufacturing*. Springer. * Sharma, V., Sharma, V., & Shukla, O. J. (2023). *Principles and Practices of CAD/CAM*. CRC Press. * Lesson plans and related materials uploaded to the VLE | | | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | | | |
| **Module Learning Outcome** | | | | **Assessment Technique(s) / Tasks** |
| 1.       Discuss the of application of digitisation in industry, the challenges it presents and its implications for the future of advanced manufacturing. | | | | **Presentation** |
| 2.       Describe the processes and tools used to create digital designs and products and evaluate the best digital technology for specific applications. | | | | **Presentation**  Mentor Assessment 4 in Work Based Task Logbook (assessed on all phases on the job) |
| 3.       Apply the processes, tools and techniques for digitisation, that are used to improve the design and manufacturing process. | | | | **Presentation** |
| 4.       Demonstrate the application of microcontroller and microprocessor technologies and demonstrate how to design, implement, programme and debug simple microcontroller-based systems. | | | | Assignment |
| 5.       Develop and implement data capture tools and analysis techniques to optimise and enhance a robotics orientated manufacturing system. | | | | Assignment |
| 6.       Outline the applications and challenges of IIoT and the ways in which it can be used to improve the efficiency and effectiveness of manufacturing processes. | | | | **Presentation** |
| 7.       Describe how to effectively use VR/AR to support industrial use case scenarios such as industrial maintenance activities. | | | | Skills Demonstration |
| 8.       Show an in-depth appreciation of the benefits and challenges associated with the digitisation of manufacturing enterprises and outline strategies for their successfully application. | | | | **Presentation**  Mentor Assessment 4 in Work Based Task Logbook (assessed on all phases on the job) |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | | | |
| See Module Assessment Handbook:  RAA Module 4: Digitisation of Manufacturing Operations   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | | | |
| See attached Module Assessment Handbook:  RAA Module 4: Digitisation of Manufacturing Operations   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | | | |
| See attached Module Assessment Handbook:  RAA Module 4: Digitisation of Manufacturing Operations   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | | | |
| See attached Module Assessment Handbook:  RAA Module 4: Digitisation of Manufacturing Operations   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructorlink/Assessor Guidance - Grading Between the Allocated Marks/Bands | | | | |
| **9.9 Pre-requisite module (if any)** | | | | |
| Module 1, 2 and 3 | | | | |
| **9.10 Co-requisite module (if any)** | | | | |
| N/A | | | | |
| **9.11 Awards available on this module, if any** | | | | |
| **Awarding Body** | **Award Code** | | **Award Title** | |
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**Programme Module 5**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Robotics Fundamentals, Operations and Automation** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with an understanding of industrial robotics, cobotics and the technical operation of robotics in advanced manufacturing operations across various business verticals such as Aerospace, Metal Fabrication, Lifesciences, Plastics, Pharma, Electronics and Food and Drink sectors. The module will examine key robotic metrics, the basics of movement geometry, axes and coordinated motion, how to build type specifications for robotics systems, robotics ecosystem and the key industry players. It will explain how to operate a robot cell compliant with robot safety regulations and how to perform operating tasks on a robot. It will discuss both existing and emerging use cases, the application of collaborative robots, which automate repetitive tasks normally carried manually. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, a apprentice will be able to | | | | | | |
| 1. Identify and justify the uses of robots in their own manufacturing contexts | | | | | | |
| 1. State the major classification/functions of robotics / cobotics and recount where they can be fittingly utilised in manufacturing operations and other sectors | | | | | | |
| 1. Describe the primary use cases of industry robotics / cobotics from a technical and business perspective and outline emerging use cases and their potential impacts on manufacturing operations | | | | | | |
| 1. Describe and apply the fundamentals of robotic motion | | | | | | |
| 1. Define the key terminology and identify the key components of a robotic system/cell | | | | | | |
| 1. Explain how to build a technical and operational specification for a robotic cell/system | | | | | | |
| 1. Demonstrate a practical understanding of the operation and application of vision driven robotics operations including camera types, image processing, and programming of vision systems | | | | | | |
| 1. Outline how to operate a robot / cobot safely and efficiently in an industrial environment | | | | | | |
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| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 80 | 10 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as an Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems. This will include access to software-based design and robotic programming software systems. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1: History of Robotics, Business Justification, New Applications, Performance Metrics and ROI**  This unit will provide an overview of the history of robotics, business justification, new applications, performance metrics and return on investment (ROI). We will discuss the development of robotics from its early days to the present, and how it has been used in industry and in research. We will also explore new applications for robotics, such as in healthcare, manufacturing, and transportation. We will identify and discuss performance metrics for robotics, such as accuracy, speed, and power consumption, and how they can be used to measure the effectiveness of a particular robot. Finally, we will examine the ROI of robotics, exploring the cost savings and other benefits that can be realized from investing in robotics  **Component 2: Industrial Robotics / Cobotics use cases, processes, and integration and optimisation in manufacturing operations**  This unit will introduce the use of industrial robotics and cobotics in manufacturing operations, their advantages and disadvantages, and how they can be used in a variety of applications providing an overview of their use cases. Apprentices will learn about the processes and integration of robotics and cobotics into manufacturing operations, as well as strategies for optimizing their use. It also provides a detailed look at the different use cases, including industrial automation, assembly, welding, additive manufacturing, machine tending, palletizing and more. The unit will introduce mobile robotics, covering Mobile Logistical Robots/ Autonomous mobile robots (AMRs)/ Automated Guided Carts (AGCs)/AGVs and Delta Robots and their applications. Finally, the unit provides an in-depth look at the challenges and opportunities that come with implementing industrial robotics and cobotics.  **Component 3: Robotic Terminology, Types, Components, Systems and Type Specification**  This unit is designed to introduce apprentices to the terminology, types, components, systems, and type specifications related to robotics. Apprentices will gain an understanding of the fundamental concepts of robotics, including robot anatomy, robot components, robot systems, and robot type specifications. Apprentices will learn about the various types of robots, such as industrial robots, service robots, and personal robots. They will also become familiar with the components that make up a robot, such as motors, sensors, and actuators.  **Component 4: Robotic Axis/DOF, Motion Control, Repeatability, Drive and Controller Systems**  This unit introduces apprentices to robotic axis/degrees of freedom (DOF), motion control, repeatability, drive, and controller systems. The unit begins by introducing the different types of robotic axes and the DOF associated with them. It then covers motion control techniques and the different types of motion control systems used in robotics. The unit then explains repeatability and the different methods used to measure and maintain it. The unit then covers drive systems and the different types of motors used to power robotic systems. Finally, the unit covers controller systems and the different types of controllers used in robotics. Apprentices will gain an understanding of the different components of robotic systems and how they work together to create a functioning robotic system.  **Component 5: Robotic End Effectors/Jaws/Clamps/Suction Cups etc. and End of Arm Tooling Considerations**  This unit will provide an overview of robotic end effectors, including jaws, clamps, suction cups, and other end of arm tooling considerations. It will discuss their various uses, advantages, and disadvantages, as well as the considerations that need to be considered when selecting the right end effector for a particular application. Additionally, the unit will cover the different types of end effectors available and their associated features, as well as the safety considerations that must be taken into account when using them. Finally, the unit will provide practical demonstrations of how to install and use end effectors in a robotic system.  **Component 6: Manipulating and control robotic operations using and Operator Panel and Teach Pendant**  This unit provides apprentices with the skills and knowledge to manipulate and control robotic operations using an Operator Panel and Teach Pendant. Apprentices will learn how to set up and operate a robot, program and debug robot motion, and use teach pendant to program and debug robot motion. Upon completion of this unit, apprentices will have the skills and knowledge necessary to control and manipulate robotic operations safely and effectively.  **Component 7: Robots vision systems, peripheral equipment and associated operations e.g. pick and place**  This unit covers the principles, fundamentals and applications of vision for robots and peripheral equipment. It covers the basics of vision systems, including camera types, image processing, and programming of vision systems. The unit also covers the principles and applications of various robotic and peripheral equipment, such as pick and place robots, automated guided vehicles, and vision-guided robotic arms. It also introduces the concepts of vision-guided operations, such as object recognition, navigation, and motion control.  **Component 8: Operating, Maintaining and Troubleshooting Robots / Cobots and essential System Safety requirements.**  This unit is designed to provide apprentices with the knowledge necessary to safely operate, maintain, and troubleshoot robots and cobots in an industrial setting. Apprentices will learn about the different types of robots and cobots, their components, and the safety requirements for their operation. The course will also cover system safety requirements, including the use of proper safety equipment, and the maintenance and troubleshooting of robots and cobots. Upon completion of the course, apprentices will know how use robots and cobots safely and effectively in an industrial setting. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **80%** | |
| Workplace | **20** | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Emerging Technologies in Manufacturing. Matthew N. O. Sadiku , Abayomi J. Ajayi-Majebi , Philip O. Adebo, 2023. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1. Identify and justify the uses of robots in their own manufacturing contexts | | **Assignment/Presentation/Podcast etc** Mentor Assessment 4 in Work Based Task Logbook |
| 1. State the major classification/functions of robotics / cobotics and recount where they can be fittingly utilised in manufacturing operations and other sectors | | **Assignment/Presentation/Podcast etc** |
| 1. Describe the primary use cases of industry robotics / cobotics from a technical and business perspective and outline emerging use cases and their potential impacts on manufacturing operations | | **Assignment/Presentation/Podcast etc** |
| 1. Describe and apply the fundamentals of robotic motion | | **Assignment supported by evidence in the Work Based Task Logbook** |
| 1. Define the key terminology and identify the key components of a robotic system/cell | | **Assignment supported by evidence in the Work Based Task Logbook** |
| 1. Explain how to build a technical and operational specification for a robotic cell/system | | **Assignment supported by evidence in the Work Based Task Logbook** |
| 1. Possess a practical understanding of the operation and application of vision driven robotics operations including camera types, image processing, and programming of vision systems | | **Assignment supported by evidence in the Work Based Task Logbook** |
| 1. Outline how to operate a robot / cobot safely and efficiently in an industrial environment | | **Assignment supported by evidence in the Work Based Task Logbook** |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 5: Robotics Fundamentals, Operations and Automation - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 5: Robotics Fundamentals, Operations and Automation - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:   * RAA Module 5: Robotics Fundamentals, Operations and Automation - Assessment Guide & Instructions * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 5: Robotics Fundamentals, Operations and Automation - Assessment Guide & Instructions   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1 | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 6**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Industrial Systems and Operations and Workshop Skills** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module is designed to equip the learner with the knowledge and practical skills required to operate, maintain, calibrate, troubleshoot, and upgrade industrial systems and their subsystem components. The learner will gain both an understanding of the fundamental workings and applications of Electro Pneumatic Systems, Industrial Electrical Systems and Industrial Mechanical Systems. The unit will introduce mobile robotics / cobotics and the various systems used and their applications. The module will also provide the learner with the knowledge and skills required to operate effectively and safely in a modern engineering workshop. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Describe the key subsystems in a modern manufacturing system including pneumatics, electrical and mechanical. | | | | | | |
| 1. Interpret engineering drawings and the symbolic representations in systems schematics. | | | | | | |
| 1. Demonstrate how to design and build Electro Pneumatic Systems. | | | | | | |
| 1. Demonstrate how to design and build Industrial Electrical Systems. | | | | | | |
| 1. Demonstrate how to design and build and Industrial Mechanical Systems. | | | | | | |
| 1. Calibrate modern manufacturing equipment and recognise when equipment is out of calibration. | | | | | | |
| 1. Outline the key principles and techniques relating to engineering workshop equipment and processes. | | | | | | |
| 1. Produce small engineering parts using a range of common workshop machining equipment in a safe and effective manner. | | | | | | |
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| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 65 | 25 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a** [**Staff**](#RAA_Job_descriptions)**ing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems including Electro Pneumatic Systems, Industrial Electrical Systems and Industrial Mechanical Systems.  Access to an engineering workshop. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom- based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems. This will include access to software-based design and robotic programming software systems. Access to an engineering workshop. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE in use by LMETB/ AMTCE which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1: Introduction to Industrial Systems, Operations and Workshop Skills**  This unit will provide apprentices with an understanding of the fundamentals of industrial systems, operations and workshop skills. It then introduces the different types of industrial systems such as Electro Pneumatic Systems, Industrial Electrical Systems, Industrial Mechanical Systems, and their applications in the modern industrial world. Apprentices will learn the principles of industrial systems and operations, such as the design, construction, and installation of industrial systems, as well as the use of tools and machinery. Apprentices will also gain practical experience in the use of tools and machinery in a workshop environment, including the use of welding, cutting and machining tools. Additionally, the unit will cover the principles of safety in the workshop, as well as the principles of quality control and assurance. The unit will also cover the basics of engineering drawing and reading and interpretation of schematic drawings.  **Component 2: Electro Pneumatic Skills and Application**  This unit will provide apprentices with an introduction to the fundamentals of electro-pneumatic systems and their applications. Apprentices will gain an understanding of the theory and principles of electro-pneumatic systems, including components, energy transfer, and control techniques. Using laboratory exercises and practical experience, apprentices will develop the ability to design, install, operate and maintain electro-pneumatic systems. Apprentices will learn how to troubleshoot and repair these systems, as well as gain the skills necessary to design and build their own electro-pneumatic systems. Additionally, the unit will cover the safety considerations and regulations for these systems. Upon completion of this unit, apprentices will be able to demonstrate a proficient understanding of the principles of electro-pneumatic systems and their applications.  **Component 3: Industrial Electrical Skills and Application**  This unit is designed to provide apprentices with an understanding of industrial electrical systems and their applications in industrial settings. It covers topics such as electrical circuits, components, and equipment; electrical safety; electrical systems; and troubleshooting and installation. It also covers topics such as wiring diagrams and electrical drawings, motor control, and electrical instruments. This unit is designed to provide apprentices with a comprehensive knowledge of industrial electrical systems and their applications in industrial settings. It will enable apprentices to gain practical skills in the installation, maintenance, and troubleshooting of industrial electrical systems, components, and equipment.  **Component 4: Industrial Mechanical Skills and Application**  This unit will provide an in-depth exploration of the principles of mechanical engineering and their practical application in industrial settings. Apprentices will learn the fundamentals of mechanics, including force, motion, energy, and power. In addition, the unit will cover the design and operation of different types of mechanical systems and their components. Topics such as mechanics of machines, machine design, fabrication, and maintenance will be covered, and apprentices will gain experience in the use of CAD/CAM software and other engineering tools. Practical applications such as welding, machining, and inspection will be demonstrated, and apprentices will also explore the safety procedures and regulations associated with industrial mechanical systems. Upon completion of this unit, apprentices will have the knowledge to operate and fault-find a simple industrial mechanical system.  **Component 5: Measurement Systems and Calibration for Industrial Systems Installation and Operation**  This unit will cover the principles of measurement systems and calibration, including measurement uncertainty, calibration techniques, instrumentation, and test equipment. Apprentices will gain practical experience with industrial systems installation and calibration, as well as an understanding of the safety procedures and regulations related to these tasks. The unit will also cover the principles of troubleshooting and maintenance of industrial systems, including the use of software tools to aid in the calibration process. At the end of the unit, apprentices will be able to apply their knowledge to the installation and calibration of industrial systems.  **Component 6: Industrial Systems Management and Integration**  Industrial Systems Management and Integration is a unit that aims to equip apprentices with the knowledge and skills to integrate industrial systems to maximize efficiency. The unit focuses on managing, controlling, and optimizing industrial systems with a particular emphasis on the integration of different technologies. The unit covers topics such as industrial system architecture, system integration, and control, industrial automation, communication protocols, and the development of control systems. Apprentices will gain a fundamental understanding of industrial systems, the challenges of integration, and how to develop systems that are reliable, stable, and cost-effective. Apprentices will learn how to read and interpret schematic drawings, and how to use the information to troubleshoot and diagnose problems. The unit will also cover topics such as safety protocols, environmental regulations, and quality control. Upon completion of the unit, apprentices will have a comprehensive understanding of factory level manufacturing systems and the ability to read and interpret schematic drawings.  **Component 7: Engineering Workshop Processes, Principles and Machining Application**  This unit is designed to provide apprentices with an understanding of the fundamental principles and processes of engineering workshops. The unit will ~~also~~ provide apprentices with an understanding of the various processes, principles and decision making involved in engineering workshops, such as the use of machines, tools, and materials, and the application of these processes to the manufacture of products. The unit will also provide apprentices with an understanding of and practical skills in the principles and techniques of machining and Computer Numerical Control (CNC) machining. It will cover the types of machines, cutting tools, and materials used in machining operations and explore the different methods and techniques of machining, such as drilling, turning, milling, grinding etc. Finally, the unit will cover the safety considerations and regulations that must be followed during machining operations. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **80%** | |
| Workplace | **20%** | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Basic Pneumatics: An Introduction to Industrial Compressed Air Systems and Components, Basic pneumatics; an introduction to industrial compressed air systems and components.. (n.d.) *>The Free Library.* (2014). Retrieved May 01, 2024, Accessed from: <https://www.thefreelibrary.com/Basic+pneumatics%3b+an+introduction+to+industrial+compressed+air...-a0133801868> * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Electric Drives and Electromechanical Systems Applications and Control, Second Edition, Richard Crowder 2019. * Hydraulics and Pneumatics - A Technician's and Engineer's Guide, 3rd Edition – 2011. Andrew Parr. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1. Describe the key subsystems in a modern manufacturing system including pneumatics, electrical and mechanical. | | Examination |
| 1. Interpret engineering drawings and the symbolic representations in systems schematics. | | Examination  Mentor Assessment 5 in Work Based Task Logbook (assessed on all phases on the job) |
| 1. Demonstrate how to design and build Electro Pneumatic Systems. | | Examination |
| 1. Demonstrate how to design and build Industrial Electrical Systems. | | Examination |
| 1. Demonstrate how to design and build and Industrial Mechanical Systems. | | **Skills Demonstration** |
| 1. Calibrate modern manufacturing equipment and recognise when equipment is out of calibration. | | **Skills Demonstration**  Mentor Assessment 5 in Work Based Task Logbook (assessed on all phases on the job) |
| 1. Outline the key principles and techniques relating to engineering workshop equipment and processes. | | Practical Project & presentation 1  Mentor Assessment 5 in Work Based Task Logbook (assessed on all phases on the job) |
| 1. Produce small engineering parts using a range of common workshop machining equipment in a safe and effective manner. | | Practical Project & presentation 1 |
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| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module :6 Industrial Systems and Operations and Workshop Skills   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 6: Industrial Systems and Operations and Workshop Skills   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 6: Industrial Systems and Operations and Workshop Skills   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 6: Industrial Systems and Operations and Workshop Skills   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1,2,3 and 4 | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 7**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Robotic Programming/Simulation, System Integration and Functional Safety** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with the technical understanding of how to programme robot operations in a manufacturing environment. The module will also provide the learner with an understanding of how robots can be integrated with peripheral equipment and End of Arm Tools (EOAT’s), Programmable Logic Controllers (PLC) and control systems into overall manufacturing systems and production environments. The module will also address the use of simulation environments for offline programming of robots and the optimisation of systems and robots outside of a production environment. The module will present an overview of Functional Safety and IEC 61508. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Outline robotic programming, simulation and system integration and benefits they deliver in the manufacturing process | | | | | | |
| 1. Describe the fundamentals of robotics and automation, including programming, control systems, sensors, actuators, robotic platforms and the application of AI. | | | | | | |
| 1. Demonstrate how to program and modify robotic movements using leading vendor specific and open-source programming and a teaching pendant. | | | | | | |
| 1. Discuss how to integrate and control a robot cell using an industrial PLC and industry standard communications protocols. | | | | | | |
| 1. Explain the relevance of robotic simulation and its use and outline the leading simulation software employed. | | | | | | |
| 1. Describe the key steps of the system integration cycle and the factors needing consideration when selecting a System Integrator. | | | | | | |
| 1. Describe the commissioning process for an integrated robotics system. | | | | | | |
| 1. Outline the International Safety Standard IEC 61508 and key aspects of Functional Safety Management systems. | | | | | | |
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| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 70 | 20 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as an Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:** 20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems.  Access to robotic programming and simulation software packages. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation systems. This will include access to software-based design and robotic programming software systems. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1: Introduction to** **Robotic Programming, Simulation and System Integration**  This unit will introduce the fundamentals of robotic programming, simulation, and system integration, and explores their applications in the development of robotic systems. It will introduce the key languages used in robotic programming to communicate to the PC/SBC/microcontroller/PLC inside a robot to perform a specific application using actuators and feedback from various sensors to initiate applications such as pick and place of objects, automating repeated tasks etc. It will explain the importance of simulation to create a digital representation (digital twin) to enable dynamic interaction with robotics models in a virtual environment to efficiently engineer robotics-based automated production systems prior to the commissioning phase of a project. It will set out the benefits of robotics integration in realising efficiencies in the manufacturing process with respects to production costs, material handling, shipping, inspection lines etc and in achieving consistency, accuracy, repeatability and speed-to-market.  **Component 2: Robotic Automation**  This unit will explore the fundamentals of robotics and automation technologies. It covers the basics of robotics and automation, including programming and control systems, sensors and actuators, and robotic platforms. It also introduces the concept of artificial intelligence (AI) and its applications in robotics, presenting several AI algorithms and their implementation. It will introduce apprentices to Robot Operating Systems and Control Software and outline the function of robotic programming, including the use of sensors and actuators, the programming of motion and behaviours, and the use of algorithms for decision-making and will present the leading programming languages in use. It will conclude with an overview of the current state of robotics and automation, as well as their potential future applications.  **Component 3: Robotic Programming in Advanced Manufacturing Environments**  The unit will present robotic programming in manufacturing environments including integration with peripheral equipment and End of Arm Tools (EOAT’s) into the overall manufacturing systems and production environment. The unit will outline and explain the five major robotics fields of operator interface, mobility or locomotion, manipulators and effectors, programming, sensing and perception. Apprentices will learn how to program robots to perform basic tasks, as well as more complex behaviours utilising the development software in its IDE (Integrated Development Environment). The unit also addresses topics such as system integration, debugging, and troubleshooting. It examines Systems Crashes, fault isolation and the debugging of failures and how to develop avoidance strategies. In gaining an appreciation of robotic programming apprentices will apply their knowledge to create robotic applications. This unit will also provide apprentices with the skills necessary to carry out robot programming using the teach pendant.  **Component 4: PLC/Robotics communications protocols and integration**  This unit examines the principles and techniques for integrating programmable logic controllers (PLCs) and robots into communication networks. It will provide apprentices with a comprehensive overview of the various communication protocols and integration techniques used in configuring Programmable Logic Controllers (PLCs) and robotics systems. Topics to be covered include the basics of PLC/robotics programming, communication protocols such as Ethernet, Modbus, and CANbus, the integration of PLCs and robots with other devices, and the development of custom communication protocols. Apprentices will gain practical experience designing and implementing communication systems for PLCs/robots, as well as troubleshooting and debugging existing systems. Upon completion, apprentices will have the necessary skills to effectively configure PLC/robotics communications protocols and integration. Apprentices learn to design, configure, and troubleshoot communications networks and protocols, as well as develop and implement integration solutions.  **Component 5: Principles of Robotic Simulation**  This unit will provide apprentices with an understanding of the principles of robotic simulation and the use of simulation environments for offline programming of robots and the optimisation of systems and robots outside of a production environment. It will cover topics such as robotic modelling, kinematics and dynamics, motion planning and control systems. Apprentices will gain an understanding of the fundamentals of robotic simulation and will be able to develop and test robotic systems using a range of software tools. The unit will demonstrate relevance of simulation to test robotic components prior to commissioning and will profile leading simulation software.  **Component 6: Robotic System Integration**  This unit will demonstrate the importance and necessity to effectively integrate different systems and applications covering topics such as system design, architecture, data structures, communication protocols, and software development. It will also discuss the integration of robotic systems into existing systems. Through classes, practical exercises, and case studies, apprentices will learn how to identify, design, and implement an integrated system and the related safety considerations. They will also explore the challenges of system integration, such as data security, scalability, and reliability. They will learn how to Identify key mistakes in system integration and how to develop avoidance strategies. The unit will review the installation and commissioning of robotic systems. The unit will also cover the factors needing consideration when selecting a System Integrator. Apprentices will gain an understanding of the importance of system integration and its role in creating a successful business environment.  **Component 7: Functional Safety**  This unit will introduce the International Safety Standard IEC 61508 which requires implementation of an FSM (Functional Safety Management) system to provide an organisational framework for the development of safety-relevant electrical, electronic and programmable safety-related systems. The unit will present the tasks and methods involved in safety management and introduce the concept of functional safety, expressed in terms of safety integrity levels (SILs). These will be placed in context, along with risk assessment, likelihood of fatality and the cost of conformance. The life-cycle approach, together with the basic outline of IEC 61508, will be explained. The unit will describe the two aspects of safety-integrity targets: quantitative targets, where the frequency of hardware failures is predicted and compared with a tolerable risk target and qualitative targets, where the occurrence of systematic failures is minimised (e.g. software errors). The unit will describe the certification and demonstration of conformance to the standard. The unit will also signpost industry certification such as the TÜV Rheinland [Functional Safety Training Program](https://www.tuv.com/landingpage/en/training-functional-safety-cyber-security/detail-pages/zertifikate/fs-technician.html) for apprentices/employers interested in pursuing these certifications which are outside the scope of the apprenticeship programme. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **80%** | |
| Workplace | **20** | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Introduction to AI Applications in Robotics, Short Blog from San Diego University, available online: https://onlinedegrees.sandiego.edu/application-of-ai-in-robotics * Robotics Simplified: An Illustrative Guide to Learn Fundamentals of Robotics, Including Kinematics, Motion Control, and Trajectory Planning 2022. Dr Jisu Elsa Jacob, Manjunath * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1. Outline robotic programming, simulation and system integration and benefits they deliver in the manufacturing process | | **Written Assignment / Presentation / etc** |
| 1. Describe the fundamentals of robotics and automation, including programming, control systems, sensors, actuators, robotic platforms and the application of AI. | | **Written Assignment / Presentation / etc**  Mentor Assessment 6 in Work Based Task Logbook (assessed on all phases on the job) |
| 1. Demonstrate how to program and modify robotic movements using leading vendor specific and open-source programming and a teaching pendant. | | **Written Assignment / Presentation / etc**  **Examination** |
| 1. Discuss how to integrate and control a robot cell using an industrial PLC and industry standard communications protocols. | | **Practical Assessment**  Mentor Assessment 6 in Work Based Task Logbook (assessed on all phases on the job)  **l Assessment** |
| 1. Explain the relevance of robotic simulation and its use and outline the leading simulation software employed. | | **Written Assignment / Presentation / etc** |
| 1. Recount the key steps of the system integration cycle and the factors needing consideration when selecting a System Integrator. | | **Written Assignment / Presentation / etc** |
| 1. Describe the commissioning process for an integrated robotics system. | | **Written Assignment / Presentation / etc** |
| 1. Outline the International Safety Standard IEC 61508 and key aspects of Functional Safety Management systems. | | **Written Assignment / Presentation / etc**  Mentor Assessment 6 in Work Based Task Logbook (assessed on all phases on the job) |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 7: Robotic Programming/Simulation, System Integration and Functional Safety   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 7: Robotic Programming/Simulation, System Integration and Functional Safety   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 7: Robotic Programming/Simulation, System Integration and Functional Safety   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 7: Robotic Programming/Simulation, System Integration and Functional Safety   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1 and 2 | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 8**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Equipment Control, Automation and Actuation** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with an understanding of industrial control systems and their key constituent components. The module will also provide the learner with a clear understanding of how industrial controls systems are used to control, adapt, and maintain the stability of manufacturing operations. The learner will gain the skills necessary to approach troubleshooting these systems in a systematic manner when operational issues arise. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, a apprentice will be able to | | | | | | |
| 1. Describe the various types of industrial control systems and their components and explain how they are used to operate or automate a wide range of industrial processes. | | | | | | |
| 1. Identify the hardware and software components of PLC systems; configure their inputs and outputs; and show how to programme, configure and troubleshoot them. | | | | | | |
| 1. Explain the key principles of industrial sensors and transducers and how they are used in industrial manufacturing and robotic systems. | | | | | | |
| 1. Describe the use of cloud and edge computing in industrial control systems and how to optimise their use and avoid potential security issues in industrial control systems. | | | | | | |
| 1. Design, implement, and optimise industrial actuation and deterministic control systems in manufacturing operations. | | | | | | |
| 1. Outline different types of software tools and languages used to develop applications for controlling and monitoring equipment and show how to develop a simple application. | | | | | | |
| 1. Discuss key techniques and practices used to identify and resolve faults in industrial control systems and how preventive maintenance and automation can improve reliability. | | | | | | |
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| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 70 | 20 |  | 30 |  | 30 | 150 |
| **9.5 Module Credits** | | **15** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  NFQ Level 7 or above award in Manufacturing / Robotics, industrial control systems or related field with relevant teaching / training experience. Equivalent qualifications may be considered.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  20:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  Access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems including Industrial Control Systems. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * Providing classroom-based instructor led training delivered by experienced instructors who meet the profile outlined in 9.6a. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation and industrial control systems. This will include access to software-based design and robotic programming software systems. Access to an engineering workshop. * Reinforcement of learning in the workplace with the support of an Employer Mentor, who will encourage the apprentice to integrate theory and practice, enabling them to gain deeper knowledge through exploring real-world operations, challenges and problems. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. * Embedding formative assessment in the classroom-based learning facilitating feedback from the instructor and through the provision of self-testing instruments e.g. quizzes, multiple choice questions etc. in the VLE. | | |
| **9.7b Module Content –** set out *what* will be taught in this module. | | |
| **Component 1: Industrial Control Systems, Operations, Customisation, and Evolution in Manufacturing Environments.**  This unit will present on overview of Industrial Control Systems (ICS), their history and their evolution from simple systems to highly complex ones. It will describe Operational Technology (OT) and the benefits / challenges of its integration with Information Technology (IT) systems. Apprentices will learn how an ICS can refer to any device, network, or system and the associated instrumentation that’s used to operate or automate common industrial processes. The unit will cover the application of ICSs and how they are used in a range of industrial sectors and in critical infrastructure industries, including energy, manufacturing, transportation, and water treatment. It will explore the different types of ICSs and their components, how they vary in size and complexity, and how they are built with different industries and different tasks in mind. Finally, it will introduce the main classes of industrial control systems e.g. SCADA, DCSs, PLCs and examine how they are used and combined.  **Component 2: Programmable Logic Controllers, Inputs/Outputs, Programming Methods and Troubleshooting Techniques.**  This unit is designed to provide apprentices with an understanding of the hardware and software components of Programmable Logic Controllers (PLCs). Apprentices will learn about the various inputs the various types of inputs and outputs devices associated with programmable logic controllers (PLCs), as well as the various programming methods used to control them. The unit will cover topics such as digital and analogue inputs and outputs, input/output wiring and configuration, and programming techniques. It will also provide an overview of the main components to the different types of PLCs and functions. Apprentices will also gain practical experience in programming and configuring inputs and outputs in a PLC system. Upon completion of this unit, apprentices should be able to identify and configure inputs and outputs in a PLC system, as well as programme and troubleshoot PLC systems. By the end of the unit, apprentices should have a comprehensive understanding of PLCs and their associated hardware and software components.  **Component 3: Sensors for industrial systems and robotics.**  This unit introduces the principles of sensors and transducers and their application in industrial systems and robotics. It covers topics such as types of sensors, sensor characteristics, sensor principles, sensor selection, signal conditioning, and sensor interfacing. The unit also discusses the various types of industrial systems and robotics, their applications, and the role of sensors in these systems. Practical applications and examples of sensors used in industry will be discussed.  The unit will introduce the primary types of light sensors used in robotics namely photoresistors and photovoltaic cells as well as the less common CCDs, phototubes, phototransistors and explain a range of other types of sensors in general use such as Temperature Sensor, Proximity Sensor, Accelerometer, IR Sensor (Infrared Sensor), Pressure Sensor, Light Sensor, Ultrasonic Sensor, Smoke, Gas and Alcohol Sensor etc. It will explain the most used sensors for industrial robots namely two-dimensional visual sensors, three-dimensional visual sensors, force/torque sensors, and collision detection sensors. On completion apprentices will have attained the knowledge and skills to design, develop and implement sensor systems in industrial and robotic systems.  **Component 4: Industrial Actuation and Deterministic Control and Operation**  This unit introduces the principles and applications of industrial actuation and deterministic control and operation. It covers topics such as the fundamentals of industrial actuation, control systems, sensing and feedback, and deterministic control. In addition, the unit will explore the types and use of actuators in industrial applications, including the selection, installation, and maintenance of actuators. Apprentices will gain an understanding of the various types of actuators, their control characteristics, and the various control algorithms and strategies used in industrial operation. The unit also covers topics such as the design of industrial actuation systems, the selection of components for industrial actuation systems, and the integration of actuation systems with other manufacturing systems. In addition, the unit provides an in-depth understanding of the principles of deterministic control, their application in manufacturing processes, and the importance of system optimization. The unit will also include practical exercises to reinforce the concepts and principles covered. At the end of the unit, apprentices should be able to design, implement, and optimize industrial actuation and deterministic control systems in manufacturing operations.  **Component 5: Factory Cloud and Edge Compute in Industrial Control Systems.**  This unit provides a comprehensive introduction to the use of cloud and edge computing in industrial control systems. It covers the fundamentals of cloud and edge architectures, cloud and edge services, and the use of cloud and edge computing in industrial control systems. The unit begins with an overview of cloud and edge computing and their differences, followed by a discussion of the advantages and disadvantages of using cloud and edge computing in industrial control systems. It then focuses on the different types of cloud and edge services available, such as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). It also covers the different types of industrial control systems and their applications, such as process control, machine learning, and predictive analytics. The unit also covers the integration of cloud and edge computing with industrial control systems, such as the use of cloud and edge services for data storage, data processing, and communication. The unit enables apprentices to connect to cloud-based resources and to utilise them to monitor and control industrial processes in a secure and reliable manner. It provides apprentices with the knowledge and skills to develop and deploy applications that are tailored to specific industrial control needs. Additionally, it provides a platform for the analysis of data from the cloud and edge computing environment, allowing apprentices to gain insight into a variety of industrial processes. The unit provides tools and instruction for the management and maintenance of cloud and edge computing systems, showing apprentices how to optimize industrial control systems for maximum efficiency. Finally, the unit provides an overview of the security issues associated with cloud and edge computing in industrial control systems.  **Component 6: Software Tools and Developing Applications for Equipment Control and Monitoring.**  This unit will provide apprentices with an introduction to the fundamentals of software development for equipment control and monitoring and discuss the importance of software development in the manufacturing process. Apprentices will learn about the different types of software tools and languages used to develop applications for controlling and monitoring equipment. The unit will cover topics such as software design, programming, debugging, and testing. The unit will cover the fundamentals of software development, including the purpose and use of different software development tools and languages. Topics discussed will include the basics of software development, such as coding, debugging, and testing, as well as more advanced topics such as object-oriented programming and software architecture. The unit will also provide an overview of the various types of software development tools and languages used in the manufacturing industry, as well as the advantages and disadvantages of each. The unit will provide practical exercises and demonstrations to help apprentices understand the concepts and apply them to their own projects. By the end of the unit, apprentices should be able to develop their own applications for controlling and monitoring equipment.  **Component 7: Troubleshooting Skills and Methodologies for industrial Control Systems.**  This unit will provide apprentices with a comprehensive understanding of troubleshooting skills and methodologies for industrial control systems. It will discuss the various troubleshooting techniques used to identify and resolve problems within industrial control systems. It will cover topics such as common industrial control system components and their functions, troubleshooting techniques for identifying and resolving system faults, and strategies for troubleshooting system hardware and software. It will also cover the basics of fault tree analysis and how it can be used to identify and resolve system faults. Additionally, the unit will discuss the importance of preventive maintenance and the use of automation to reduce downtime and improve system reliability. Finally, it will provide an overview of safety and security considerations when troubleshooting industrial control systems. Apprentices will learn how to identify and diagnose common problems, utilise simulation tools to evaluate system performance and identify potential issues as well as how to develop strategies to prevent future issues. The unit will also cover best practices for documenting problems, as well as how to effectively communicate with system operators and technicians. Upon completion, apprentices will have a thorough understanding of troubleshooting skills and methodologies for industrial control systems. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **80%** | |
| Workplace | **20%** | |
| Online |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Industrial Robotics Fundamentals: Theory and Applications, 4th Edition 2023. Larry T. (Tim) Ross, Stephen W. (Steve) Fardo, and Michael F. Walach * Programmable Logic Controllers, Edition 6 2015. William Bolton. * Integrating PLCs with SCADA Systems for Real-time Control and Monitoring, teckhme – 2023. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module following the initial completion of various formative assessment activities and practice elements. Successful completion of the summative assessment provides confidence that the apprentice can apply this learning in the workplace setting. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1. Describe the various types of industrial control systems and their components and explain how they are used to operate or automate a wide range of industrial processes. | | Examination |
| 1. Identify the hardware and software components of PLC systems; configure their inputs and outputs; and show how to programme, configure and troubleshoot them. | | Skills Demonstration |
| 1. Explain the key principles of industrial sensors and transducers and how they are used in industrial manufacturing and robotic systems. | | Examination |
| 1. Describe the use of cloud and edge computing in industrial control systems and how to optimise their use and avoid potential security issues in industrial control systems. | | Assignment 7 supported by evidence in the Work Based Task Logbook |
| 1. Design, implement, and optimise industrial actuation and deterministic control systems in manufacturing operations. | | Examination |
| 1. Outline different types of software tools and languages used to develop applications for controlling and monitoring equipment and show how to develop a simple application. | | Skills Demonstration |
| 1. Discuss key techniques and practices used to identify and resolve faults in industrial control systems and how preventive maintenance and automation can improve reliability. | | Assignment 7 supported by evidence in the Work Based Task Logbook |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 8: Equipment Control, Automation and Actuation   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 8: Equipment Control, Automation and Actuation   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 8: Equipment Control, Automation and Actuation   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 8: Equipment Control, Automation and Actuation   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1,2,3, 4 and 5 | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Programme Module 9**

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| **9.1 Module title** (Refer to guidelines supporting this template. Note that a module title can be but does not have to be the same as the QQI component associated with the module) | | | | | | |
| **Work Based Capstone Project** | | | | | | |
| **9.2 Purpose of this module** | | | | | | |
| This module will provide the learner with an opportunity to undertake a Work Based Capstone Project. This project will integrate theory and practice, enabling apprentices to gain deeper knowledge through exploring real-world challenges and problems in the workplace – and designing practical solutions to those problems. Such a project will involve an element of change management and critical thinking, requiring the apprentice to manage a project through various stages or milestones to achieve agreed objectives as set out in a Work Based Capstone Project Brief. | | | | | | |
| **9.3 Module learning outcomes (MIMLOs)** | | | | | | |
| On completion of this module, an apprentice will be able to | | | | | | |
| 1. Demonstrate the capacity to complete a Work Based Capstone Project through independent working which shows practitioner knowledge, skills and competency in the robotics and automation field. | | | | | | |
| 1. Apply project management approaches, critical thinking skills, effective collaboration abilities, innovative approaches to problem-solving and negotiation & communication skills. | | | | | | |
| 1. Produce a Work Based Capstone Project report which demonstrates attainment of a Project Brief encapsulating a proactive approach to learning, reflection and development. | | | | | | |
| **9.4 Minimum typical apprentice effort in hours for this module** (Refer to guidelines supporting this template) | | | | | | |
| **Directed classroom (or equivalent) contact (hours)** | **Directed practical activities** **(hours)** | **Directed e-learning (hours)** | **Independent learning (hours)** | **Other hours (specify)** | **On-the-Job learning**  **(hours)** | **Total effort (hours)** |
| 50 |  |  | 250 |  |  | 300 |
| **9.5 Module Credits** | | **30** | | | | |
| **9.6 Specific module-related requirements** | | | | | | |
| **9.6a Staffing requirements – set out instructor profile to include any module specific required professional and educational qualifications and / or experience:**  Instructor: NFQ Level 7 or above award in Manufacturing / Robotics and EHS topics/protocols or related field with relevant teaching / training experience.  The competency profile details several mandatory **(M)**, important **(I)**, and desirable **(D)** qualities. In summary, instructors and assessors will demonstrate all mandatory requirements, some important requirements, and some desirable requirements.  **Knowledge and Experience**   1. Knowledge of the curriculum, Moodle, and some Virtual Learning Environments. **(M)** 2. Significant experience in using marking and grading systems. **(M)** 3. Strong subject matter expertise. **(M)** 4. Prior experience as an Assessor. **(I)** 5. Considerable knowledge of Awarding Bodies. **(I)** 6. Knowledge of Apprenticeship models. **(I)** 7. Understanding of the relevant Occupational Profile. **(I)** 8. Knowledge of the applicable standards. **(I)** 9. Industry experience as a Robotics and Automation practitioner. **(D)** 10. Knowledge of QQI Results Approval Processes. **(D)** 11. Knowledge of learner Complaints and Appeals Procedures. **(D)** 12. Knowledge of Internal Verification procedures. **(D)** 13. Knowledge of quality systems (e.g., competency frameworks, ISO). **(D)** 14. Knowledge of External Authentication procedures. **(D)** 15. Experience in writing assessments (incl. grading systems, assessment criteria, and marking schemes). **(D)**   **Skills and Attributes**   1. Report writing. **(M)** 2. Marking. **(M)** 3. Annotating. **(M)** 4. Proofreading. **(M)** 5. Reviewing. **(M)** 6. Corresponding with team members, instructors (where applicable) and Apprentices. **(M)** 7. Providing formative and summative feedback to Apprentices. **(M)** 8. Meticulous attention to detail. **(M)** 9. Always meets deadlines. **(M)** 10. Quality-driven and accountable. **(I)** 11. Good computational skills. **(I)** 12. Excellent oral communication skills. **(I)** 13. Presenting at individual and group levels. **(I)** 14. Corresponding verbally with team members. **(I)** 15. Good team player. **(I)** 16. Comfortable working autonomously. **(I)** 17. Flexible and adaptive towards changing requirements. **(I)** 18. Evidence of Continuous Professional Development (CPD). **(D)** | | | | | | |
| **9.6b Apprentice: Staff Ratio:**  1:1 | | | | | | |
| **9.6c Module Specific Physical resource requirements, if any:**  The Work Based Capstone Project requires the apprentice to have access to the relevant processes, equipment and software at their employer location(s) that is needed to enable the agreed Project Brief to be fulfilled.  If required for the project, access to a supervised Advanced Manufacturing Lab equipped with state-of-the-art robotics, cobotics and manufacturing automation systems in the provider’s training centre. | | | | | | |

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| **9.7 Module curriculum** | | |
| **9.7a Teaching and learning strategy**, (describe teaching and learning methodologies and suggestions for formative assessment. If applicable the following should also be considered: Work-based learning and work practice-placement, E-learning) | | |
| The teaching and learning strategy is to facilitate active engagement of apprentices in a proactive approach to learning in a multi-faceted fashion by:   * The Work Based Capstone Project is a synoptic project - it is the accumulation of the apprentices’ knowledge, skills and behaviours which have been developed across the apprenticeship learning journey. * Apprentices will be allocated a instructor by AMTCE who will act as their work-based Project Supervisor. Apprentices are encouraged to be pro-active and seek the support of their project supervisor. As part of their role supervisors will: * Talk over ideas with apprentices * Suggest reading materials and resources * Help with structuring, write-up and particular unit requirements * Agree objectives and targets * Offer 1-to-1 supervisions for the project * Offer remote support via telephone/ email (where appropriate) * Facilitation of learning in the workplace by an Employer Mentor, who will: * M: Meet regularly with apprentices and plan to ensure dates are scheduled for reviewing project milestones and review of deliverables * E: Encourage apprentices through the whole project, helping them to identify barriers to success and strategies for overcoming these. Not all projects will run smoothly, and you can provide a valuable sounding for apprentices when things go awry. * N: Negotiate project topics and scope with apprentices to ensure that they link to their organisation and have clear and meaningful impact. Ensure that the complexity of the project enables the apprentice to apply knowledge and demonstrate a range of practical skills and behaviours that align with the Robotics and Automation Apprenticeship programme. * T: Target development areas and guide apprentices on resource or training information for the required knowledge, skills and behaviour gaps to be addressed. * O: Offer ongoing support and attend progress reviews and other manager and mentor information sessions to share best practice and stay up to date with requirements and developments. * R: Remind apprentices about positive time management. This is key and managing this is a skill apprentices should demonstrate as part of any project. * S: Signpost apprentices to helpful information, share knowledge and expertise in relation to the organisation and enable apprentices to gain access to relevant internal resources and information. * Ensuring that the apprentice get exposure and practical experience of using state-of-the-art robotic, and manufacturing automation and industrial control systems. This will include access to software-based design and robotic programming software systems. Access to an engineering workshop. * Provision of a proven and highly interactive Virtual Learning Environment (VLE) already successfully in use by LMETB/ AMTCE, called VLE, which will support and reinforce the instructor delivered classes and facilitate independent and proactive apprentice learning. LMETB (AMTCE) has invested considerable resources to create this convenient online repository of teaching and learning materials which will support the effective and efficient delivery of the RAA Apprenticeship Programme while reinforcing the associated quality assurance requirements. | | |
| **Indicative Syllabus** | | |
| The Work Based Capstone Project provides apprentices with a safe environment in which they can engage in experimentation, experience setbacks, acquire knowledge, develop communication skills and create outcomes. Apprentices can develop a proactive approach to learning, equipping themselves to effectively address challenges and opportunities in a real-world setting. The Work Based Capstone Project cultivates critical thinking skills, effective collaboration abilities, innovative approaches to problem-solving and an enthusiasm for learning.  The Work Based Capstone Project will require a degree of independent working by the apprentice, especially in the initial stages of scoping out suitable projects based on organisational need and strategy. While we encourage the employer mentor to help the apprentice locate a suitable project in the organisation, we expect the apprentice to take ownership early in the process and to scope out and explore the topic or issue in detail as they draft the Project Brief.  The Work Based Capstone Project is an excellent vehicle through which an apprentice can develop and practice a range of critical skills and behaviours (e.g. decision making, negotiation, communication etc) and in turn provide valuable evidence for assessment thus contributing towards the attainment of their certification.  The Work Based Capstone Project is carried out after the off-the-job learning phases are completed. It commences in month seventeen and continues for a seven-month period concluding in month twenty-three upon submission of the Final Project Report. The employer will arrange for the apprentice to carry out the Work Based Capstone Project on-the-job over a 30-week period spending one day per week on this activity supported by their Employer Mentor.  A Work Based Capstone Project ‘lifecycle’ will be highly dependent on the nature of the individual project and how it fits with the wider organisational planning of the employer. Work-based projects allow the apprentice to demonstrate critical skills throughout the entire project life cycle. Guidelines for the Work Based Capstone Project:   * Define: a clear purpose or goal is defined based on a valid business problem or case. Clear objectives and deliverables are set which are aligned to strategic aims. * Design: a plan of work is constructed which might include visual plans, terms of reference, assumptions and consequences, stakeholder engagement and financial plans. Controls and milestones are clearly outlined prior to the start of a project. * Do: on-project activities are undertaken and there is evidence of analysis and reflection on how these contributed to the achievement of the project purpose or goals. Decisions are taken and controls utilised. * Review: project delivery and outcomes are analysed and reviewed. Barriers and challenges to success, and strategies used to overcome these, are analysed.   **The** **Work Based Capstone Project Brief**  The Work Based Capstone Project Brief is a short document that describes the project and its objectives. It contains the following sections:   1. Employer name and profile 2. Overview of the project 3. Project Objectives 4. Schedule 5. Controls and milestones 6. Scope of the project 7. Final report: structure and contents   The Work Based Capstone Project Brief will be approved by the AMTCE Project Supervisor and the Employer Mentor before commencement of the project. | | |
| **9.7c Mode(s) of Delivery** | **Proportion** (% of Total Directed Learning) | |
| Classroom / Face to Face | **25%** | |
| Workplace | **75%** | |
| On Line |  | |
| **9.7d Teaching Resources (reading lists etc.)** | | |
| * Project Management: Absolute Beginner’s Guide, Third Edition, Que Publishing. Gregory M. Horine 2012. * Communication Skills for Business Professionals. Celeste Lawson, Robert Gill, Swinburne, Victoria, Angela Feekery, Mieke Witsel, Michael Lewis 2019. * Lesson plans and related materials uploaded to the VLE | | |
| **9.8 Module summative assessment strategy** (consider work-based learning, work practice-placement and e-learning where applicable) | | |
| The assessment strategy for this module is targeted towards the apprentice, documenting that they have achieved the learning outcomes for this module by effectively implementing the Work Based Capstone Project Brief.  The Work Based Capstone Project Brief is a short document that describes the project and its objectives. It contains the following sections:   1. Employer name and profile 2. Overview of the project 3. Project Objectives 4. Schedule 5. Controls and milestones 6. Scope of the project 7. Final report: structure and contents   The Work Based Capstone Project Brief will be approved by the AMTCE Project Supervisor and the Employer Mentor before commencement of the project.  The Work Based Capstone Project is an excellent vehicle through which an apprentice can develop and practice a range of critical skills and behaviours (e.g., decision making, negotiation, communication etc) and in turn provide valuable evidence for assessment.  Synoptic assessment is an important because it shows that apprentices have achieved a holistic understanding of their sector and that they can make effective connections between different aspects of the subject content and across the breadth of the assessment objectives in an integrated way. | | |
| **9.8a Mapping of module learning outcomes to assessment techniques/tasks** (Refer to guidelines supporting this template.) | | |
| **Module Learning Outcome** | | **Assessment Technique(s) / Tasks** |
| 1. Demonstrate the capacity to complete a Work Based Capstone Project through independent working which shows practitioner knowledge, skills and competency in the robotics and automation field. | | Task 1 – Project |
| 1. Apply project management approaches, critical thinking skills, effective collaboration abilities, innovative approaches to problem-solving and negotiation & communication skills. | | Task 1 – Project |
| 1. Produce a Work Based Capstone Project report which demonstrates attainment of a Project Brief encapsulating a proactive approach to learning, reflection and development. | | Task 1 – Project |
|  | |  |
| **9.8b Guidelines for Assessors designing briefs / exams** (Refer to guidelines supporting this template.) | | |
| See Module Assessment Handbook:  RAA Module 9: Work Based Capstone Project   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8c Assessment criteria** (Refer to guidelines supporting this template. These may be presented as apprentice marking sheets which can be included as appendices) | | |
| See attached Module Assessment Handbook:  RAA Module 9: Work Based Capstone Project   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8d Guidelines for Assessors when assigning grades** (Refer to guidelines supporting this template.) | | |
| See attached Module Assessment Handbook:  RAA Module 9: Work Based Capstone Project   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.8e Sample assessment materials** (Refer to guidelines supporting this template. Samples to be supplied) | | |
| See attached Module Assessment Handbook:  RAA Module 9: Work Based Capstone Project   * Assessor Instructions * Assessor Marking Scheme * Apprentice Assessment General Instructions and Assessment Tasks * Apprentice Assessment Cover Sheet * Instructor/Assessor Guidance - Grading Between the Allocated Marks/Bands | | |
| **9.9 Pre-requisite module (if any)** | | |
| Module 1,2,3, 4, 5, 6, 7 and 8. | | |
| **9.10 Co-requisite module (if any)** | | |
| N/A | | |

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| **9.11 Awards available on this module, if any** | | |
| **Awarding Body** | **Award Code** | **Award Title** |
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**Section 10 Coordinating Provider Authorisation/Declaration**

**11.1 Provider declaration**

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| I, the undersigned,  verify the accuracy of the information in this application for programme validation  provide assurance that resources to deliver the programme are in place.  Assure QQI that programmes are being developed, delivered and reviewed in accordance with the policies and procedures agreed at the time of Provider registration.  Confirm compliance with QQI requirements in relation to monitoring.  Confirm that all necessary rights and permissions have been secured to use properties required by the programme.  Confirm that all validation criteria have been addressed and the programme complies with applicable statutory, regulatory and professional body requirements. |

**A close-up of a person

Description automatically generated11.2 Provider authorisation signature and date**

**Section 11: APPENDICES**

**Appendix I: Robotics and Automation Apprenticeship (RAA) Progression Pathway Development**

The ability to demonstrate a clear progression is an important element of the development of the Robotics and Automation Apprenticeship. Potential pathways options at Level 8 in ROI currently available within the higher education system are shown in Figure 1. Upon completion of the programme apprentices would have the option of joining year two on these programmes.

**A diagram of several blue arrows

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Maynooth University have formally expressed their Support for the exploration and development of a progression pathway from the proposed apprenticeship in Robotics and Automation under development by LMETB to the BSc in Robotics and Intelligent Devices that is offered in Maynooth University

Southern Regional College (SRC), Newry, Co. Armagh, Northern Ireland formally joined the RAA consortium in January 2023 to explore the possibility of progression utilising their Higher-Level Apprenticeship delivery model. SRC are ranked as the best performing college in the UK for Automation/Mechatronics skills and recently topped the leader board in the highest number of medals won at the UK World Skills competition for two consecutive years. Southern Regional College has an extensive curricular offering in the subject specialisms of Construction and Engineering from Level 3 right up to their successful Degree Apprenticeships in both Construction and Engineering.

Over the course of 2003 members from RAA consortium engaged with SRC in an extensive dialogue to investigate the feasibility of providing a potential progression pathway from the L6 RAA programme onto a Degree programme delivered by SRC. Following consultation with their Awarding Organisation Open University, they commenced an initial mapping between the RAA and their Foundation Degree which comprises three of the following pathways:

* Mechatronics
* Product Design and Manufacture
* Electrical and Electronics

Following a full mapping in collaboration with OU and QQI, SRC now have identified a clear progression pathway utilising accreditation of prior learning. The L6 RAA programme is equivalent to 150 UK Credit Value, therefore all Apprentices should they wish to progress will be required to complete a further 90 UK Credits to achieve the L7 ROI equivalency which will be the Foundation Degree in Engineering (Mechatronics) in NI.

The Apprentices will complete the PLC Automation and Industrial Robotics (20 Credits) module on entry as an APEL exercise, followed by the completion of three additional modules across the academic year:

* Mechanical Fundamentals (20 Credits)
* BIT & Project Management (20 Credits)
* Work Based Learning (40 Credits)

The progression route for L7 ROI equivalency will be completed within one academic year on a part time basis, with a view to progression onto the top up BEng Degree in Engineering in September of that year. If an Apprentice does not wish to progress, they will have the exeat option with the award of a Foundation Degree in Engineering (Mechatronics) validated by OU, which equates to the L7. Both these Degree’s will be accredited by the OU which is recognised on both sides of the border.

Apprentices progressing to the top up Degree in SRC, will complete a Bachelor’s in Engineering (BEng). Apprentices will attend college one day week over a further two years. This pathway with SRC provides several key advantages over the more traditional higher education pathways. Apprentices can remain in employment while completing their degrees. Employers retain their apprentices within in their organisation and their investment in developing the apprentice is not lost. Employers also benefit from their apprentices increasing the knowledge and skills levels as they attain their Degree in Engineering.

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**Appendix II: Robotics and Automation Apprenticeship (RAA) Required Equipment Specification and Costs**

1. **LMETB-AMTCE Equipment and Costs Related to RAA**

(Price quotes from 2023) subject to yearly price increases

**Robotics Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
| **Description of Equipment** | **Unit Cost**  **(€)** | **AMTCE** | **Total**  **(€)** |
| KUKA ready2\_educate | 30,000 | 16 | 480,000 |
| KUKA LBR iisy Cobot | 25,000 | 4 | 100,000 |
| Fanuc Educational Cell (FANUC ER-4iA) | 22,500 | 4 | 90,000 |
| Second Hand - Robot Arm Maintenance | 30,000 | 1 | 30,000 |
| Fanuc Cobot Educational Cell (FANUC CRX-10iA) | 30,000 | 1 | 30,000 |
| ABB Educate Package (CRB 15000 GoFa) | 80,000 | 1 | 80,000 |
| Engineers Tool Kit with Box | 3,000 | 16 | 48,000 |
| Bear Robotics Service Robot | 15,000 | 1 | 15,000 |
| KUKA Sim Educational Licenses (free with robot purchase) | 0 | 100 | 0 |
| ABB Robot studio Education Licenses (free with robot purchase) | 0 | 100 | 0 |
| Fanuc Roboguide Education Licenses (free with robot purchase) | 0 | 100 | 0 |
| Quadruped Four-Legged Robot | 230,000 | 1 | 230,000 |
| Robotic Welding Cell | 90,000 | 7 | 630,000 |
| Robotic 3D Metal Printing | 350,000 | 1 | 350,000 |
| Miscellaneous e.g., grippers, cameras etc. | 50,000 | N/A | 50,000 |
| **Ex. VAT Total** |  |  | **2,133,000** |
| **VAT@23%** |  |  | **490,590** |
| **Total** |  |  | **2,623,590** |

**Automation Equipment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Unit Cost (€)** | **AMTCE** | | **Total (€)** |
| PCT-200.PLC-Siemens S7-1200 (Software Included). HMI-Siemens KTP-700 7" HMI | 12,000 | 9 | | 108,000 |
| PCT-200.PLC-AB MicroLogix 1400 (Software Included). HMI-AB 7" Micro PanelView (Software Included). | 12,800 | 9 | | 115,200 |
| Sorting Conveyor | 6,000 | | 1 | 6,000 |
| PID Pressure Application | 6,200 | | 1 | 6,200 |
| IO-Link masters, sensors, and electric actuator application | 8,000 | | 1 | 8,000 |
| Industrial control trainer | 16,000 | | 16 | 256,000 |
| AC Variable Speed Drive with 3-Phase Motor (Single or 3-Phase input voltage) | 3,200 | | 16 | 51,200 |
| Sensor Trainer-200 | 13,000 | | 16 | 208,000 |
| Mechanical Training Systems | 24,000 | | 8 | 192,000 |
| MEC-200 Add-on | 20,000 | | 8 | 160,000 |
| PNEUTRAINER-200 | 15,000 | | 16 | 240,000 |
| Dual Channel Oscilloscopes | 800 | | 16 | 12,800 |
| Function Generator | 500 | | 16 | 8,000 |
| DC Power Supplies | 400 | | 16 | 6,400 |
| Multimeter | 250 | | 16 | 4,000 |
| VDE Approved Tool Kit | 100 | | 16 | 1,600 |
| Miscellaneous | 10,000 | | N/A | 10,000 |
| **Ex. Vat Sub Total** |  | |  | **1,393,400** |
| **VAT@23%** |  | |  | **320,482** |
| **Total** |  | |  | **1,713,882** |

**Manufacturing Operations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Unit Cost**  **(€)** | **AMTCE** | **Total**  **(€)** |
| Ultimaker S5 PRO 3D Printer Bundle | 11,000 | 8 | 88,000 |
| Arduino Development Kits | 150 | 16 | 2,400 |
| **Ex. VAT Sub Total** |  |  | **90,400** |
| **VAT@23%** |  |  | **20,792** |
| **Total** |  |  | **111,192** |

**Software/IT Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Unit Cost**  **(€)** | **AMTCE** | **Total**  **(€)** |
| I7 Laptop/32GB RAM or Desktop | 2500 | 16 | 40,000 |
| LapCabby | 2500 | 1 | 2,500 |
| SolidWorks Licenses (60 Users) - Annual | 870 | 1 | 870 |
| Automation Studio Licenses (34 Users) - Annual | 25,000 | 1 | 25,000 |
| Oculus VR Headset or equivalent | 500 | 10 | 5,000 |
| **Ex. VAT Sub Total** |  |  | **73,370** |
| **VAT@23%** |  |  | **16,875** |
| **Total** |  |  | **90,245** |

1. **Other ETB Providers: RAA Equipment Minimum Required and Related Costs for Delivery of Programme** (Price quotes from 2023) subject to yearly price increases)

**Robotics Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
| **Description of Equipment** | **Unit Cost**  **(€)** | **Minimum No required** | **Total**  **(€)** |
| Robotic Educational Cell (Manufacturer 1) | 30,000 | 4 | 120,000 |
| Cobot Educational Cell (Manufacturer 1) | 25,000 | 1 | 25,000 |
| Robotic Educational Cell (Manufacturer 2) | 22,500 | 4 | 90,000 |
| Second Hand - Robot Arm Maintenance | 30,000 | 1 | 30,000 |
| Cobot Educational Cell (Manufacturer 2) | 30,000 | 1 | 30,000 |
| Cobot Educational Cell (Manufacturer 3) | 80,000 | 4 | 320,000 |
| Robotics Training System | 45,000 | 4 | 180,000 |
| Production, Application Add-on | 6,000 | 4 | 24,000 |
| Add-on Applications e.g., Quality Control and Inspection, CNC Tender | 7000 | 8 | 56,000 |
| Engineers Tool Kit with Box | 3000 | 2 | 6000 |
| Robotic AGV | 25,000 | 1 | 25,000 |
| Robotics Service Robot | 15,000 | 1 | 15,000 |
| Manufacturer 1 Software Educational Licenses (free with robot purchase) | 0 | 16 | 0 |
| Manufacturer 2 Education Licenses (free with robot purchase) | 0 | 16 | 0 |
| Manufacturer 3 Education Licenses (free with robot purchase) | 0 | 16 | 0 |
| Miscellaneous e.g., grippers, cameras etc. | 50,000 | N/A | 50,000 |
| **Ex. VAT Total** |  |  | **971,000** |
| **VAT@23%** |  |  | **223,330** |
| **Total** |  |  | **1,194,330** |

**Automation Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
| **Description of Equipment** | **Unit Cost (€)** | **Minimum No** | **Total (€)** |
| PLC-Siemens S7-1200 (Software Included). HMI-Siemens KTP-700 7" HMI | 12,000 | 8 | 96,000 |
| PLC-AB MicroLogix 1400 (Software Included). HMI-AB 7" Micro PanelView (Software Included). | 12,800 | 8 | 102,400 |
| Sorting Conveyor | 6,000 | 8 | 48000 |
| PID Pressure Application | 6,200 | 4 | 24,800 |
| IO-Link masters, sensors, and electric actuator application | 8,000 | 4 | 32,000 |
| Industrial control trainer | 16,000 | 8 | 128,000 |
| AC Variable Speed Drive with 3-Phase Motor (Single or 3-Phase input voltage) | 3,200 | 8 | 25,600 |

|  |  |  |  |
| --- | --- | --- | --- |
| Sensor Trainer-200 | 13,000 | 4 | 52,000 |
| Mechanical Training Systems | 24,000 | 2 | 48,000 |
| Mechanical Training Systems Add-on | 20,000 | 1 | 20,000 |
| PNEUMATIC TRAINER | 15,000 | 8 | 120,000 |
| Dual Channel Oscilloscopes | 800 | 16 | 12,800 |
| Function Generator | 500 | 16 | 8,000 |
| DC Power Supplies | 400 | 16 | 6,400 |
| Multimeter | 250 | 16 | 4,000 |
| VDE Approved Tool Kit | 100 | 16 | 1600 |
| Miscellaneous | 10,000 | N/A | 10,000 |
| **Ex. Vat Sub Total** |  |  | **739,600** |
| **VAT@23%** |  |  | **170,108** |
| **Total** |  |  | **909,708** |

**Manufacturing Operations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Unit Cost**  **(€)** | **Minimum No** | **Total**  **(€)** |
| Ultimaker S5 PRO 3D Printer Bundle | 11,000 | 2 | 22,000 |
| Arduino Development Kits | 150 | 16 | 2,400 |
| **Ex. VAT Sub Total** |  |  | **24,400** |
| **VAT@23%** |  |  | **5,612** |
| **Total** |  |  | **30,012** |

**Software/IT Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Unit Cost**  **(€)** | **Minimum No** | **Total**  **(€)** |
| I7 Laptop/32GB RAM or Desktop | 2500 | 16 | 40,000 |
| LapCabby | 2500 | 1 | 2,500 |
| SolidWorks Licenses (60 Users) - Annual | 870 | 16 | 13,920 |
| Automation Studio Licenses (34 Users) - Annual | 25,000 | 1 | 25,000 |
| Oculus VR Headset or equivalent | 500 | 8 | 4,000 |
| **Ex. VAT Sub Total** |  |  | **85,420** |
| **VAT@23%** |  |  | **19,646** |
| **Total** |  |  | **105,066** |

**Appendix II: Robotics and Automation Apprenticeship (RAA) Required Equipment Specification and Costs**

**RAA 2 Year Programme Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Phase** | **Month** | **Delivery Days** | **Module** |
| **1** | 1-On the Job | 1,2,3 | 62 |  |
|  | **2-Off the Job** | **4,5,6** | **64** | **1,2,3,4** |
|  | 3-On the Job | 7,8,9 | 65 |  |
|  | **4-Off the Job** | **10,11,12** | **66** | **5,6** |
| **2** | 5-On the Job | 13-18 | 130 |  |
|  | **6-Off the Job** | **19,20** | **43** | **7,8** |
|  | 7-On the Job | 22,23,24 | 88 | 9 |
|  |  | **Total** | **173 Teaching Days** |  |

**Preparation Costs**

|  |  |
| --- | --- |
| Item | Cost |
| Training Plan development - 60 days@ €594 (Premium Tutor rate €495 + 20% Management & Administration Fee) | €35,640 |
| Promotion and Advertising | €20,000 |
| Total | **€55,640** |

**Contract Training 2 Year Programme Costs 2024**

|  |  |  |  |
| --- | --- | --- | --- |
| **Cost Centre** | **Description** | **Cost Breakdown** | **Total Costs (€)** |
| Instructor/ Tutor | Premium Tutor rate applied | 173 days x €495 | 85,635 |
| Course Development |  | 15 Days x €495 | 7,425 |
| Recruitment | Intermediate Tutor rate applied | 5 days x €260 | 1,300 |
| Sundry |  |  | 1,000 |
| Other Costs | Contingency over 2 years |  | 10,000 |
| Certification | AMTCE/LMETB TSO | LMETB guidelines | 0 |
| Per Learner | 16 Learners | 16 Learners x €10 | 160 |
| Management & Administration Fee | (105,520 x 20%)  Tutor = €85,635  Course Dev =€7,425  Recruit = €1,300  Sundry = €1,000  Other Costs = €10,000 |  | 21,104 |
|  |  | **Ex. VAT Total** | **€126,624** |
|  |  | **Vat at 23%** | **N/A** |
|  |  | **Total – Contracted Training Expected Cost** | **€126,624** |

**LMETB Senior Tutor Indicative Cost 2024**

Robotics Tutor €70,000 per Annum x 2 Years **= Total €140,000 -** Includes Training Plan Development Costs and Programme Review/Plan Revision Every 18-24 Month

Automation Tutor €70,000 per Annum x 2 Years **= Total €140,000 -** Includes Training Plan Development Costs and Programme Review/Plan Revision Every 18-24 Month

**Appendix III QA Reporting Summary**

**Types of Reports Summary- The reports are summarised in the tables below**.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Name | Content\* | Source | Frequency\* | Recipient | Review | Action |
| Admission Report | Numbers, gender, non- standard, nationality (Irish, EU, International), qualifications, evaluation of induction and admission process per site | Provider12 | Following each new cohort of apprentice | National Programme Board | See Consolidated Admissions Report below | See Consolidated Admissions Report below |
| Consolidated Admissions Report | Overall figures and suggestions for admission induction process changes | Provider Admission reports | On receipt of Provider Admission  Report | National Programme Board | Apprenticeship Quality Council, Consortium  Steering Group | National Programme Board |
| Examinations | Results of the examinations at a site, comments from teachers/trainers/instructors and other stakeholders on results and on examination process | Provider | Following examinations | National Examination Board | See Consolidated Examinations Report below | See Consolidated Examinations Report below |
| External Examiners Report | Standard report covering an assessment of how the programme is achieving its aims and a report on quality and results of the assessments | External Examiner | For each Examination | National Programme Board, Examinations Board | Apprenticeship Quality Council, Board, Consortium Steering Group, the Public | National Programme Board or external independent experts |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Name | Content\* | Source | Frequency\* | Recipient | Review | Action |
| On-the-job | Records of individual | Mentor, Programme | TBA | National | National | National |
| Observation | apprentice achievement | Team Member |  | Programme | Programme | Programme |
|  | on-the-job |  |  | Board | Board | Board, local |
|  |  |  |  |  |  | lead |
|  |  |  |  |  |  | programme |
| Process | Periodic update on | Provider | Prior to | National | Apprenticeship | National |
|  | progress of cohort of |  | National | Programme | Quality Council | Programme |
|  | learners |  | Programme | Board |  | Board |
|  |  |  | Board |  |  |  |
|  |  |  | meeting |  |  |  |
| Learner | Standard survey form on | Initiated by mentors and | Annually | National | National | National |
| feedback | content, delivery and | generated by learners |  | Programme | Programme | Programme |
|  | management of |  |  | Board and | Board | Board and |
|  | programme |  |  | Providers |  | Providers |
| Consolidated | Consolidated comments | Individual Provider | Annually | Consortium | Consortium | National |
| Learner | from learners | Reports consolidated by |  | Steering Group, | Steering Group, | Programme |
| Feedback |  | Programme Manager |  | National | National | Board directed |
|  |  |  |  | Programme | Programme | by Consortium |
|  |  |  |  | Board, | Board, | Steering Group |
|  |  |  |  | Apprenticeship | Apprenticeship | and |
|  |  |  |  | Quality Council | Quality Council | Apprenticeship |
|  |  |  |  |  |  | Quality Council. |
| Individual | Matters relating to the | Learner or | Occasionally | As detailed in |  | See Complaints |
| Complaints | training of learners, | Teacher/trainer/instructor |  | these | Procedures |
|  | through a formal process. | or another stakeholder |  | procedures |  |
|  | This excludes informal or |  |  |  |  |
|  | anonymous complaints |  |  |  |  |
| Examination | Matters relating to | Learner | Following | Programme |  | See |
| Appeals | examinations |  | examination | Coordinator/ | Examination |
|  |  |  |  | Programme | Appeal |
|  |  |  |  | Manager | Procedures |

**Stakeholder, Programme and QA Efficiency and Effectiveness Reports**

The stakeholder reports are intended to give an overview of the programme outcomes following the completion of the programme by a cohort of apprentices. The reports outlined below, can be combined into a single report to the Apprenticeship Quality Council and the Consortium Steering Group.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Name | Content | Source | Frequency | Recipient | Review | Action |
| Apprentice Graduate Report | Employment status, year of graduation, career expectations, attitude to programme, etc. | Graduates | Six months following graduation of  each cohort | Collaborating Provider | National Programme Board | See Consolidated Graduate Report  below |
| Consolidated Apprentice Graduate Report | Overall figures and suggestions for admission induction process changes | Provider Graduate Reports | On receipt of Provider Graduate Report | National Programme Board | Apprenticeship Quality Council, Consortium Steering Group,  regulator | National Programme Board |
| Employer Report | Comments on operation of programme, employment of graduates, changes to programme | Linked Employers | Annually or biannually (TBD) | Consortium Steering Group or Programme Manager for Consortium Steering  Group | Consortium Steering Group, Apprenticeship Quality Council | National Programme Board |
| Staff Report | Operation of the programme, of the National Programme Board and of QA systems, changes to  programme | Staff including Mentors | Annually or biannually (TBD) | National Programme Board | Apprenticeship Quality Council, Consortium  Steering Group | National Programme Board |
| Provider Report | Operation of the programme, of the National Programme Board and of QA systems, changes to  programme | Providers | Annually or biannually (TBD) | National Programme Board |  |  |

**Appendix IV : RAA Job Descriptions**

**The National Programme Manager/Co-ordinator (Grade VII) Job Description**

Reporting to the nominated AMTCE senior line manager/FET Director, the National RAA Apprenticeship Programme Manager will be responsible for management of the programme provision. A key objective of this role is to have a high-level overview of RAA apprentice provision and ensure that the lines of communication remain clear between all stakeholders.

S/he will hold a professional qualification with appropriate experience including line management responsibility, financial management, management of staff development, project evaluation, and continuous improvement cycles, with the ability to take lead responsibility for the management of the programme on a local and national basis.

The National Programme Manager (NPM) will be responsible for:

* integrity of the RAA Apprenticeship Programme.
* management of the apprenticeship programme and its effective and efficient co-ordination, development, growth, and delivery.
* Managing the operational planning and scheduling, ensuring all relevant input is made to development and /or adjustment of supporting policies and procedures.
* Managing the day-to-day activities of the programme including apprentice registration, induction, administrative support, monitoring activities, and the programme calendar.
* Acting on an ongoing basis as the point of contact for all key stakeholders involved in delivery of the apprenticeship, including the Authorised Officer network, the National Apprenticeship Office, employers, RAA apprentices, potential apprentices and employers and collaborating provider programme managers.
* Managing the development of all programme information and communications including policies, procedures, marketing collateral, etc.
* Setting, monitoring and reporting on all programme performance.
* Delivery of employer briefings to new employers and briefings on induction for apprentices to ensure consistency across all regions.
* Supports employers in the approval process on behalf of the CSG. The NPM will have a role in establishing the suitability of the companies for training prior to commencement e.g. ensuring that potential employers have the required physical resources for apprentices to undertake the relevant workplace learning activities.
* Represent the ETB on the Consortium Steering Group (CSG) and report to it on a regular basis.
* Chairing the Programme Board of the National Examination Board.
* Ongoing Stakeholder engagement (CSG, SOLAS, QQI, Mentors, Apprentices, National Apprentice Office and collaborating providers.)
* Implementing changes to the programme as per recommendations of the PMB/QAGMC
* The NPM will conduct an exit interview with all on apprentice terminations, offers advice as to the steps required should s/he wish to return. Broad details as to the reason why the apprentice opts out are brought to the Programme Board and the CSG.
* Ensure the management, administrative, assessment and internal verification procedures both on and off-the-job are implemented correctly and consistently across the Collaborating Providers nationally.
* Ensure the on-the-job Mentors are suitably qualified and trained to conduct training and assessment for the National RAA Apprenticeship Programme.
* Managing the co-ordination of Collaborating Provider approval process.
* Have day-to-day responsibility for discharging the LMETB’s role as Coordinating Provider
* Engage with the Collaborating Provider Programme Managers to ensure that Instructors, Internal Verifiers and Workplace Mentors are familiar with the recording systems, Validated Programme documentation and procedures for assessment and internal verification of the approved QA framework for the RAA apprenticeship.
* Ensuring any recommendations and/or corrective actions of the National Programme Board or QAGMC are progressed.
* Ensuring consistent monitoring of the programme, so that the NPM receives weekly updates from the programme team and regular updates from each collaborating provider that notes any deviation regarding attendance in off-the-job elements.
* Schedules operations meetings on a weekly basis and after each module discusses the feedback with the instructors to ensure learning outcomes are addressed and improvements identified.
* Completing an annual report for the National Programme Board consolidating feedback from all stakeholders at coordinating and collaborating provider level and will include findings from reports contributed by: apprentices programme instructors; Quality Assurance (TSO and associated staff IV etc); External Authenticators; Authorised Officers; Employers and work-based mentors; Collaborating Providers; Meetings with Regional Skills fora and other employer focused organisations e.g. Enterprise Ireland, IDA. Local Enterprise Boards etc
* Managing the operational planning and scheduling, ensuring all relevant input is made to develop supporting policies and procedures.
* Acting as the management point of contact for all apprentices, ETB Training centre and workplace mentors, and collaborating provider programme leaders.
* Managing the development of all programme information and communications across stakeholders including policies, procedures, marketing collateral, etc.
* Establishing a strong working relationship with the apprenticeship employers involved in the programme and proactively engaging with and securing new apprenticeship employers.
* Ensuring effective coordination of the on- and off-the-job elements of the apprenticeship programme, and ongoing quality assurance.
* Promoting the apprenticeship locally, nationally, and regionally to maintain and expand the apprenticeship programme Under the umbrella of Generation Apprenticeship, and on behalf of the CSG.
* Supporting recruitment and registration of apprentices.
* Be a key contact point as the Course Director and Consortium Steering Group and with individual employers and the main point of contact for the funding and statutory agencies.
* Convening meetings of the CSG and the NPB, the NEB, and the Community of Practice and provide the secretariat for these bodies.
* Gathering, Analysing, and providing Programme Statistical Data to the LMETB QAGMC sub-committee, the National Programme Board, the National Examination Board, and the Consortium Steering Group; coordinating and providing data returns and updates to the National Apprenticeship Office as required.
* Organising mentor training for Workplace Mentors.
* Managing continuous professional development for LMETB Instructors.
* To undertake any other duties of a similar level and responsibility, as may be required, or assigned, from time to time.

**Instructor (Automation and Control)**

The Automation and Controls Instructor reports to the AMTCE Operations Manager. The Automation and Controls Instructor delivers training under Apprenticeship, Traineeship and Skills to Advance provision. The Automation and Controls Instructor works with the AMTCEs assistant Engineering manager to identify and respond to the emerging training needs of employers and their employees. The Automation and Controls Instructor also works with AMTCE Quality Assurance Manager to ensure that courses are delivered in a quality assured manner and that feedback from learners is collated. The Automation and Controls instructor also supports the AMTCE’s employer engagement team with industry engagements.

**Key Responsibilities**

* Instruct learners in all aspects of Industrial Automation and Control Systems applications i.e., practical skills, personal skills, and all related knowledge to the prescribed standard and in accordance with the relevant syllabus.
* Deliver practical and theory lessons to learners in the areas of, Control Applications, Programmable Logic Controllers, Embedded Systems & Software, Electronics & Electrical Science, Simulation Environments, Robotic systems control, Fault Finding and Diagnostics, System Maintenance, etc.
* Deliver programmes in line with all LMETB FET Quality Standards.
* Schedule, conduct, correct and mark examination materials in a timely manner in line with LMETB’s Further Education (FET) Quality System (QS) standards and procedures.
* Work with LMETB’s FETQS, AMTCE technical staff and curriculum development staff to design new programmes in line with industry needs.
* Update course content, delivery, assessments, and module descriptors in line with industry and technological changes.
* Deliver effective and quality training to meet module learning outcomes.
* Contribute to Automation Engineering activities and reputation both internally and externally.
* Prepare, deliver, and continuously review instructional material to an excellent standard and maintain as technology advances. Prepare lesson plans, course notes and hand-outs as appropriate.
* Supervise learners in respect of their timekeeping, attendance, behaviour, and application.
* Maintain prescribed course records.
* Make decisions and solve problems in a timely manner and inform others of decisions that have implications for them, making sure the team knows how to action them.
* Ensure regular two-way communication happens between line management and senior management.
* Ensure adequate security of equipment and materials located in the training area.
* Identified and use new technology, as appropriate, to assist in delivering training.
* Ensure training equipment and materials are available and to the required standards at all times.
* Ensure observation and implementation of health and safety and legislative protocols at all times.
* Supervise learners and ensure that correct methods, quality standards and safety procedures are observed.
* Plan and raise requests for purchase orders for the supply of course materials and equipment for the delivery and development of delivered programmes.
* Ensure deadlines are met and that service levels are maintained.
* Plan and deliver courses in line with QQI and Industry standard certification.
* Deliver programs in a blended manner using VLE’s (Moodle) and MS 365 as requested.
* Select, design and lead on training programme design and Communities of Practice (COP) for related programmes from awarding bodies and industry certifications.
* Work with AMTCE Employer Engagement Team to establish and maintain links with industry partners and to create bespoke industry lead training courses for the Skills to Advance initiative.
* Promote all LMETB/AMTCE programmes and services to the unemployed, job seekers, employers, those in employment.
* Identify new and emerging trends in the programme area, and design and deliver courses to meet these needs.

**Summary of Position**

The initial role is to instruct learners in all aspects of Industrial Automation and Control Systems applications including practical skills, industry context, applications, personal skills, and all related knowledge to the prescribed standard in accordance with relevant syllabus. The provision of courses and programmes across specific upskilling/reskilling courses under Skills to Advance, Apprenticeships, and Traineeship programmes. The role will involve utilising innovative teaching and learning pedagogies to reach a variety of learners. Assessment of student learning to ensure student success. Remaining abreast of current and emerging trends in the area of automation and control systems and supporting technologies.

The successful candidate will design, create, and deliver instruction materials in line with modern industry practices and LMETBs Quality Assurance Standards to learners and ensure delivery of material is regularly reviewed and meets sectorial needs. The successful candidate will also collaborate with curriculum development experts to develop new and innovative certified programme in response to industry needs and technology development. The role will also involve promoting LMETB/AMTCE programmes with employers, at industry events, school’s visits etc.

**Robotics Instructor**

The Robotics Instructor reports to the AMTCE Operations Manager. The Robotics Instructor delivers training under Apprenticeship, Traineeship and Skills to Advance provision. The Robotic Instructor works with the AMTCEs assistant Engineering manager to identify and respond to the emerging training needs of employers and their employees. The Robotics Instructor also works with AMTCE Quality Assurance Manager to ensure that courses are delivered in a quality assured manner and that feedback from learners is collated. The Robotics instructor also supports the AMTCE’s employer engagement team with industry engagements.

Key Responsibilities

* Coordinates and oversees the delivery of FET Robotics training provision to ensure that it meets the needs of learners and employers under the remit of the AMTCE.
* Deliver practical and theory lessons to learners in the areas of, Robotics, Robotic Applications, End Effector Technologies, Robotic Simulation Environments, Robotic systems integration, Fault Finding and Diagnostics, Maintenance, etc.
* programmes in line with all LMETB FET Quality Standards.
* Schedule, conduct, correct and mark examination materials in a timely manner in line with LMETB’s Further Education (FET) Quality System (QS) standards and procedures.
* Work with LMETB’s FETQS, AMTCE technical staff and curriculum development staff to design new programmes in line with industry needs.
* Update course content, delivery, assessments, and module descriptors in line with industry and technological changes.
* Deliver effective and quality training to meet module learning outcomes.
* Contribute to Robotics Engineering activities and reputation both internally and externally.
* Prepare, deliver, and continuously review instructional material to an excellent standard and maintain as technology advances. Prepare lesson plans, course notes and hand-outs as appropriate.
* Supervise learners in respect of their timekeeping, attendance, behaviour, and application.
* Maintain prescribed course records.
* Make decisions and solve problems in a timely manner and inform others of decisions that have implications for them, making sure the team knows how to action them.
* Ensure regular two-way communication happens between line management and senior management.
* Ensure adequate security of equipment and materials located in the training area.
* Identified and use new technology, as appropriate, to assist in delivering training.
* Ensure training equipment and materials are available and to the required standards at all times.
* Ensure observation and implementation of health and safety and legislative protocols at all times.
* Supervise learners and ensure that correct methods, quality standards and safety procedures are observed.
* Plan and raise requests for purchase orders for the supply of course materials and equipment for the delivery and development of delivered programmes.
* Ensure deadlines are met and that service levels are maintained.
* Plan and deliver courses in line with QQI and Industry standard certification.
* Ability to deliver classes in a face-to face manner
* Ability to Deliver programs in a blended manner using VLE’s (Moodle) and MS 365 as requested.
* Select, design and lead on training programme design and Communities of Practice (COP) for related programmes from awarding bodies and industry certifications.
* Work with AMTCE Employer Engagement Team to establish and maintain links with industry partners and to create bespoke industry lead training courses for the Skills to Advance initiative.
* Promote all LMETB/AMTCE programmes and services to the unemployed, job seekers, employers, those in employment.
* Identify new and emerging trends in the programme area, and design and deliver courses to meet these needs.

**Summary of Position**

The initial role is to instruct learners in all aspects of Industrial Robotics and applications including practical skills, industry context, applications, personal skills, and all related knowledge to the prescribed standard in accordance with relevant syllabus. The provision of courses and programmes across specific upskilling/reskilling courses under Skills to Advance, Apprenticeships, and Traineeship programmes. The role will involve utilising innovative teaching and learning pedagogies to reach a variety of learners. Assessment of student learning to ensure student success. Remaining abreast of current and emerging trends in the area of Industrial Robotics and supporting technologies.

The successful candidate will design, create, and deliver instruction materials in line with modern industry practices and LMETBs Quality Assurance Standards to learners and ensure delivery of material is regularly reviewed and meets sectorial needs. The successful candidate will also collaborate with curriculum development experts to develop new and innovative certified programme in response to industry needs and technology development. The role will also involve promoting LMETB/AMTCE programmes with employers, at industry events, school’s visits etc.

1. See Validation Website for link to ISCED table of ISCED codes [↑](#footnote-ref-2)
2. An ‘Intake’ refers to a group / cohort of learners enrolled onto a programme [↑](#footnote-ref-3)
3. Teaching staff and staff dedicated to the monitoring, development and administration of the programme should be included [↑](#footnote-ref-4)
4. This should be a generic description of the profile of and not specific to any named person. Qualifications and experience should be explicitly stated. For example, it is not sufficient to simply state a level 8 qualification. The award type and discipline area(s) should also be included [↑](#footnote-ref-5)
5. WTE is the whole-time equivalent number. The number 1 indicates a fulltime person fully dedicated to the programme. 0.5 indicates a part-time person available to this programme half of the time. [↑](#footnote-ref-6)
6. Employer staff engaged in training, assessment and / or mentoring [↑](#footnote-ref-7)
7. Qualifications and experience should be explicitly stated. For example, it is not sufficient to simply state a level 8 qualification. The award type and discipline area(s) should also be included [↑](#footnote-ref-8)
8. WTE is the whole-time equivalent number. The number 1 indicates a fulltime person fully dedicated to the programme. 0.5 indicates a part-time person available to this programme half of the time. [↑](#footnote-ref-9)