Irish Medtech Skillnet

Bachelor of Engineering in Advanced Manufacturing Systems

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Introduction

BEng (Hons) in Advanced Manufacturing Systems is specifically designed for holders of a B.Eng. in Manufacturing Engineering (level 7), working in the manufacturing industry, and wishing to up-skill with the aim to support their organisation in the transition to Industry 4.0.

ABOUT THE COURSE

This programme aims to up-skill, from a level 7 to a level 8, mature learners working (or having worked) in the manufacturing industry. Taking into consideration their background and work situation, the programme is designed to take advantage of this prior or/and current experience to allow flexibility in their learning while minimising the requirement for face-to-face interaction with their lecturers. The programme is delivered to allow flexibility to people who wish to upskill while continuing to work.

ABOUT IRISH MEDTECH SKILLNET

Irish Medtech Skillnet is a business network operating in the Medtech and Manufacturing Sector, proactively nurturing technical and non-technical skills and talent development, and driving best practice knowledge sharing to its network, in enhancing Ireland's position as an emerging global Medtech hub. The Irish Medtech Skillnet is promoted through the Irish Medtech Association, an Ibec business association and our skills support to business is funded through Skillnet Ireland. The Irish Medtech Skillnet ecosystem is vast and multilayered from the Skillnet's Steering Committee, and it's directly engaged staff, to all its stakeholders, partners and existing or potential collaborators.

ABOUT IRISH MEDTECH ASSOCIATION

The Irish Medtech Association is the business association within Ibec representing the medical technology sector. The Irish Medtech Association has more than 250 members, located throughout the island of Ireland. The Irish Medtech Association is led by a Board of CEO's and Chief Representatives. It implements its strategy through working groups and taskforces.

In collaboration with Atlantic Technological University (ATU), Galway

Ollscoil Teicneolaíochta an Atlantaigh

Atlantic Technological University

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Entry Requirements

The entry requirement for this programme is a B.Eng. in Manufacturing Engineering L7 degree, or cognate discipline with a minimum of one year experience in the manufacturing industry. As the Industrial engineering project is an applied project to be conducted in industry, applicants should either be employed or have an agreement with a company that will allow them to conduct their project in their manufacturing facilities.

English Language Requirements

English Language Requirements will be as determined by ATU Galway and as published in the Access, Transfer and Progression code. The current requirements are as follows:

Non-EU applicants who are not English speakers must have a minimum score of 5.5 (with a minimum of 5.0 in each component) in the International English Language Testing System (IELTS) or equivalent. All results must have been achieved within 2 years of application to ATU Galway.

EU applicants who are not English speakers are recommended to have a minimum score of 5.5 (with a minimum of 5.0 in each component) in the International English Language Testing System (IELTS) or equivalent. Further details on English language requirements are available at:
www.gmit.ie/international/english-language-requirements-0

Recognition of Prior Learning

ATU Galway is committed to the principles of transparency, equity and fairness in recognition of prior learning (RPL) and to the principle of valuing all learning regardless of the mode or place of its acquisition. Recognition of Prior Learning may be used for admission.

Once admitted in the programme, students can apply for exemptions based on prior qualification and experience. Academic Code of Practice No. 6 outlines the policies and procedures for the Recognition of Prior Learning. Guidance for applicants is provided on: myexperience.ie

Start Date:	September 2023
Application Deadline:	28 August 2023
Fees:	€4,500 Inclusive of subsidised funding from the Irish Medtech Skillnet
ATU Certification:	Level 8 – 60 credits

Applications & Queries should be made directly to Irish Medtech Skillnet. To book a place please contact Siobhán Hennessy at siobhan.hennessy@ibec.ie

Duration

To allow flexibility in students' learning while taking into consideration the practical skill requirements of an engineering degree, a blended mode of learning is being offered. The programme will run over 52 weeks, including 36 weeks of tuition. Each semester, three modules will run for 12 weeks, and the others will run for 18 weeks. Students will attend two evenings of online classes per week, engage in self-paced modules and attend 8 onsite days to include induction and examination. The programme also includes an industry project.

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ATU, Galway outline

Module	Title	Level	Credit	Duration
INFO08042	Cloud Infrastructure and Enterprise Services	8	5	13 weeks
BUST08048	Decision Theory and Data Visualisation	8	5	13 weeks
ENGI08039	Lean Enterprise Engineering	8	5	18 weeks
ENGI08040	Six Sigma Engineering	8	5	18 weeks
ELEC08067	Advanced Manufacturing Systems	8	5	17 weeks
ELEC08065	Digital Twin Technology	8	5	13 weeks
ELEC08061	System Integration	8	5	13 weeks
ENGI08042	Innovation and Enterprise	8	5	18 weeks
ENGI08043	Industrial Engineering Project	8	20	52 weeks

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CLOUD INFRASTRUCTURE AND ENTERPRISE SERVICES

Upon completion of the module, the student will understand the transition from a traditional enterprise in-house environment to a Cloud based enterprise environment. This involves an examination of concepts such as virtualization at each layer – compute, storage, network, desktop, and application – along with business continuity in a Cloud environment. The student will understand Cloud computing fundamentals, infrastructure components, service management activities, security concerns, and considerations for Cloud adoption.

Current developments with respect to IS technologies and their impact on business models will also be examined; the student will have a knowledge of significant new technology approaches.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Evaluate the traditional Enterprise Infrastructure
2. Identify and implement a Virtualized Storage solution
3. Design and develop virtualization technology of compute, storage, network, desktop and application layers of IT infrastructure
4. Analyse business continuity solutions in a virtual data centre
5. Analyse the key considerations for migration to the Cloud
6. Investigate the emerging technology environment for manufacturing

Assessment Strategy

Continuous assessment project which is worth 70% and multiple-choice questions (MCQ) which will be administered over course of the module totalling 30%. Each MCQ will be worth 10%.

DECISION THEORY AND DATA VISUALISATION

The objective of this module is to examine how different decision theories, decision tools and data analytical and data visualisation approaches can improve the performance of employees & organisations, and to decide the types of business problems that these theories, tools and approaches can best address. Learning materials include online videos, forum based discussions and problem based learning.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Critically evaluate the role of decision theory in enhancing employee and organisational performance as well as contributing to sustainable development goals
2. Evaluate different decision-making methods, tools, visualisations, and interactive dashboards
3. Contrast the different data analytical, data visualisation tools and methods used by organisations
4. Consider risk and uncertainty issues in decision making
5. Critically evaluate different methods for managing risk and uncertainty
6. Appraise how digital transformation can impact decision making and analysis

Assessment Strategy

Applied assignments and projects that will involve the learners using module techniques and concepts to solve a real world decision making and data visualisation problem with specific emphasis on the communication of results and insights.

One project integrated in their main project where possible.

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LEAN ENTERPRISE ENGINEERING

This module covers the application of Lean Manufacturing techniques to Enterprise-level problems in manufacturing and service industries. Students will identify the Current State of an organisation's processes and, by mapping the process, identifying waste, introducing flow, and making process improvements, develop a Future State. They will look at Lean in the Services Industry and Design. The people related aspects of Lean will be considered.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Evaluate the modern approach to Enterprise-level Engineering, using lean manufacturing techniques and business process reengineering
2. Assess the principles of Lean Services and develop lean solutions to service problems in an enterprise
3. Apply Lean principles to the process of product development, evaluate problems and choose solutions
4. Apply Lean Enterprise engineering techniques such as Value Stream Mapping to map the processes in a value chain, analyse value and waste, identify areas for improvement and solve enterprise problems
5. Select and apply appropriate change management tools and strategies to optimise the implementation of Lean Thinking in an enterprise

Assessment Strategy

The assessment strategy is composed of a report on a value stream mapping, another one on lean tools, two numerical simulations and one case study. As this module includes a significant amount of asynchronous teaching, the assessment is used to scaffold the learning.

Students can choose to utilise the value stream mapping to support their Industrial Engineering project.

ADVANCED MANUFACTURING SYSTEMS

This module will look at technologies that can support digitalisation of manufacturing, continuous improvement, and faster time to market.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Investigate the use of additive manufacturing in the manufacturing industry
2. Select the appropriate technology for optimised traceability
3. Investigate the use of Automated Guided Vehicles (AGV), Autonomous Mobile Robots (AMR) and intelligent conveyors in process flow
4. Select and programme a Cobot for a given application

Assessment Strategy

The module will be assessed through a combination of online quizzes, practical evaluations, and a report where students will analyse which technology is or should be used in their company to support continuous improvement.

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SIX SIGMA ENGINEERING

This module looks at the application of Six Sigma techniques and tools and the "Define, Measure, Analyse, Improve, and Control" (DMAIC) process to solve industry problems and improve processes. It gives students a toolkit of techniques with which to define a problem, collect data about it, look for trends in the data, design experiments to develop new solutions, and ensure that process improvements are sustained.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Distinguish and utilise Lean Six Sigma concepts and explain why organisations use them
2. Identify, select and apply Lean and Six Sigma tools for problem solving, prioritizing problems, evaluating process performance, and propose solutions for process improvement and waste reduction, and improved sustainability of the company
3. Collect, summarise, analyse and interpret data using graphical methods, descriptive and inferential statistics
4. Communicate findings effectively, accepting responsibility for their own contribution and performance
5. Examine various codes of ethics for engineers and apply the concepts of ethics and integrity

Assessment Strategy

The choice of assessment methods is aligned with the overall aims of the module and programme and the qualities or abilities being sought from the student. The assessment types which are used on the module include assignments, Moodle quizzes, Socrative quizzes, group work, problem and scenario-based exercises, presentations, individual projects, as well as traditional assessment methods such as written examinations.

This combination of formative and summative assessments are used as learning techniques that seek to develop each student's capability to identify and solve problems which arise in engineering practice.

Assessments such as individual projects and small group assignments are used to assist with the development of each students' communication, time management and conflict resolution skills so as to allow them to work effectively individually and as team members.

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DIGITAL TWIN TECHNOLOGY

This module introduces the learner to Digital twins, which are a virtual replica of the manufacturing process, and can, not only speed up the planning of a new product, but also support training, continuous improvement and maintenance planning when combined with IIoT and other technologies like AR and VR. Learners in the module will gain practical experience on building a digital twin and extracting data to support decision-making.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Appraise the benefits of adopting digital twin technologies when planning a new manufacturing process
2. Discuss how Industrial Internet of Things (IIoT) and digital twin technology combine to give a live model of manufacturing processes
3. Investigate the use of Virtual Reality (VR) and Augmented Reality (AR) for the design, optimisation and planning of manufacturing processes
4. Develop a 3D model of a manufacturing process

Assessment Strategy

The module will be assessed by a discussion essay on the benefits of IIoT and Digital Twins, lab work and a project.

SYSTEM INTEGRATION

This module will look at the data architecture of a manufacturing plant from manufacturing floor up to ERP level in accordance with the ISA-95. Students will learn how to assess an existing data architecture and plan for a new one considering validation requirements. On a practical level students will build a SCADA system integrating data from various equipment.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Assess the existing data architecture of a manufacturing plant and its components
2. Design specification for a data architecture based on user requirements considering sustainable development goals
3. Plan horizontal and vertical integration of a data architecture in a manufacturing system
4. Develop a data management system at SCADA level
5. Develop an integration plan considering validation

Assessment Strategy

The assessment strategy will include online quizzes, practical evaluations, and a report where students will discuss aspects of the data architecture of their company and propose improvement.

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INNOVATION AND ENTERPRISE

The aim of this module is to provide students with the knowledge of entrepreneurship in a business context, and the skills to develop a business plan to enable the commercialisation of a product or service.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Analyse the nature of entrepreneurship and entrepreneurs
2. Design an innovation process to develop a product or service
3. Develop an industry standard business plan
4. Present a business plan
5. Identify and validate sources of funding for a new venture
6. Demonstrate the broader business context in which start-ups take place

Assessment Strategy

The assessment strategy is aligned to the teaching and learning strategy with a majority of 80% marks allocated to the output of the project and 20% of the marks allocated for an assessment related to the online delivery.

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INDUSTRIAL ENGINEERING PROJECT

This module is industry based. Students will use the knowledge, skills and competences acquired in the programme to identify and implement savings in a manufacturing plant. Students must use the DMAIC Cycle in a structured manner to eliminate waste (MUDA) from processes, products, and other business activities of the student's employer / work experience organisation, while having a positive impact on financial performance.

Students have a target of €50,000 annual savings (if the saving from the project were calculated over a year, they would result in saving over € 50,000). The project can be one big project or multiple smaller projects.

Learning Outcomes

On completion of this module the learner will/ should be able to:

1. Develop their ability to work as an individual
2. Apply the engineering knowledge and experience accumulated throughout the course to a specific problem
3. Independently conduct research in a particular field of engineering
4. Apply the DMAIC (Define, Measure, Analyse, Improve, & Control) Cycle to demonstrate the ability to develop original solutions to moderately complex engineering problems
5. Develop and present a project plan which modularises the project into work packages and identify the resources required to complete the work packages
6. Report on the Performance of the Project including Scope, Schedule, Cost and Customer Acceptance
7. Communicate findings and make recommendation through different media

Assessment Strategy

Students are assessed by submitting written reports, a poster and making presentations. The breakdown of the marks are:

Company Background Report	3%
Approved Project Charter	3%
Project Plan and Define Phase Report	15%
Define Phase Presentation	5%
Final Project Report	44%
Project Performance Report	15%
A3 Poster	5%
Final Presentation	10%

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Irish Medtech Association is a business sector within Ibec

Irish Medtech Skillnet is co-funded by Skillnet Ireland and network companies. Skillnet Ireland is funded from the National Training Fund through the Department of Further and Higher Education, Research, Innovation and Science.

An Roinn Breisoideachais agus Ardoideachais, Taighde, Nuálaíochta agus Eolaíochta
Department of Further and Higher Education, Research, Innovation and Science

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