VALIDATION REPORT

1.	Title of Programme(s): (incl. Award Type and Specify Embedded Exit Awards)	Master of Engineering in Automation and Digital Engineering
2.	NFQ Level(s)/ No. ECTS:	NFQ Level 9 90 ECTS
3.	Duration:	2 Years
4.	ISCED Code:	0720 – Manufacturing and Processing
5.	School / Centre:	Engineering
6.	Department:	Mechanical and Industrial Engineering
7.	Type of Review:	New Programme
8.	Date of Review:	26/01/2023
9.	Delivery Mode:	Part Time, Online
10.	Panel Members:	Dr Ken Thomas (Chair) Head of School of Engineering, SETU Ms Sabine Giron, Chamber of Commerce & Industry, Pau, France Ms Jane Hanratty Lecturer in Mechatronics TUD Blanch Dr Ángel Miguel Cuenca Lacruz, (Technical University of Valencia) Ms Carmel Brennan (Secretary)
11.	Proposing Staff:	Prof Graham Heaslip, Head of School of Engineering, ATU Galway Mayo Dr Carine Gachon, Head of Transcend Project, ATU Galway Mayo Dr Aurora Dimache, Lecturer, ATU Galway Mayo Dr Trevor Clohessy, Lecturer, ATU Galway Mayo Mr Gabriel Farragher, Lecturer, ATU Galway Mayo Dr Jack Saad, Lecturer, ATU Galway Mayo Mr Noel Mulkeen, HCI 4.0 Project, ATU Galway Mayo Dr Philip Long, Lecturer, ATU Galway Mayo Mr Stephen Foy, Lecturer, ATU Galway Mayo Mr Dermot O'Neill, Bobotics Skillnet Manager Mr Shane Coss, Advanced Engineering Leader, Thermo King Mr Julio Zanon, Automation & Technology Engineer, Boston Scientific
12.	Programme Rationale:	Industry 4.0 is the digital transformation of the manufacturing sector where computers and automation come together to monitor and control the physical

processes of the factory and integrate the factory with all elements of the supply chain. Industry 4.0 marries advanced manufacturing techniques with the Internet of Things to create manufacturing systems that are not only interconnected, but communicate, analyse, and use information to drive further intelligent action back in the physical world.

At European level, the new Horizon Europe funding, launched in 2021, put the digitalisation of industry at the forefront, as highlighted in "Annex 4- Horizon
Europe Cluster 4 Digital, Industry and Space". The document recognises that:

- Europe's industry faces fierce global competition, combined with difficulties in financing high-risk investments in complex technological areas, including digitisation and circularity.
- It is also hampered by ageing infrastructures, including machinery that is not ready for digitisation and plants not fit for a fully circular and climate neutral industry;
- SMEs tend to implement new technologies at slower rates than larger companies. For instance, 36% of companies with 50-249 employees use industrial robots, compared to 74% of companies with over 1000 employees. Only a fifth of EU companies are highly digitised.
- Research and Innovation are recognised as an important source of economic growth and competitiveness, but there is an urgent need for more investments in Europe, in industry.

'Ireland's Industry 4.0 Strategy 2020-2025', sets out the vision and goals for Industry 4.0 in Ireland and the strategic actions required to achieve those goals. According to the report, there are 227,000 manufacturing jobs in Ireland, of which 85% are outside Dublin. The digital technologies have already begun to transform global manufacturing value chains, supply chains and business models, redefining sources of competitive advantage for both firms and national economies.
In February 2020, the Irish MedTech association released the report "The race to embrace digital manufacturing: Lesson's from Ireland's journey". The report includes the following key findings of a survey of their members (n=43):

- 80% reported that Automation of manufacturing is critical to their success
- Robotics, AI, data analytics, additive manufacturing were all cited as important
- 96% are planning to hire more staff
- Only 11% rates their internal digital skills as "Very high skills".

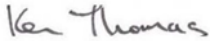
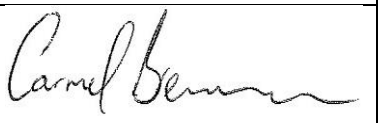
In May 2020, the Regional Skills Forum West created the Manufacturing Excellence group to look at the regional needs for

		training/upskilling and help improve the cohesion between Industry and educational providers. Some of the comments included: • Disconnect between what is being taught and is needed • A lot of the employees at the bigger companies are already L8 engineers, so an add-on course would need to reflect this and be interesting enough • to attract participants. • Need for a level 9 programme. • Need for academia to lead Research in Automation in the region The need for upskilling is at all levels of manufacturing operations. As the field of automation and digital manufacturing are relatively new, there is a need for skills in research and development that can be developed through a research master.
13.	Proposed Student Intake:	20
14.	Stakeholder Engagement:	A survey was conducted to analyse the skills needed for an Engineer working in the manufacturing industry. Practitioners were also interviewed to identify the optimal content for the programme. Since December 2018, in partnership with Thermoking, ATU Galway City has engaged in the development of a level 6, 7 and 8 in Automation and Robotics. As part of the development of the programmes, the design team engaged in extensive consultation with Industry, the Regional Skill Forum and the IDA.
15.	Graduate Demand/Employment:	The course will position graduates to move into advanced positions in manufacturing (such as digitalisation of manufacturing, data analytics, automation) in the manufacturing sectors.
16.	Entry Requirements, Access, Transfer & Progression:	<u>Minimum Entry Requirements:</u> Candidates must hold level 8 Bachelor (H) degree in Automation & Digital Manufacturing, B.Eng. (H) in Mechatronics or cognate discipline with a minimum grade classification of H2.2 or equivalent. As the research is industry based, applicants must either have the support of their employer to conduct research or have an agreement with a company to use their facilities for the purpose of their research. The outline of the project must be agreed in advance of admission and an interview to discuss the validity of the project will be conducted. <u>English Language Requirements:</u>

		English Language Requirements will be as determined by ATU 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 6.0 (with a minimum of 6.0 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. EU applicants who are not English speakers are recommended to have a minimum score of 6.0 (with a minimum of 6.0 in each component) in the International English Language Testing System (IELTS) or equivalent. Further details on English language requirements are available at http://www.gmit.ie/international/english-language-requirements-0 <u>Recognition of Prior Learning</u> ATU 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 to: 1. gain access or advanced entry to the programme 2. gain credits and exemptions from programme modules after admission 3. in award years RPL will be considered to a maximum of 50% of the credits. <u>Application</u> Applications for this programme are made directly to the Institute. <u>Selection</u> Applicants will be offered places in decreasing order of performance until all available places are exhausted following the initial application deadline. Thereafter, if additional places remain unfilled, offers will be made to eligible applications until all places are filled.
17.	Programme Structure:	The programme will be delivered on a part-time basis over two years divided in 4 semesters. In semester 1 and 2, students attend 4 hr of online synchronous workshops per week and engage in 6 hr of asynchronous material per week. The Research Project is integrated in the taught modules in semesters 1&2 and continues in semester 3 and 4 under the guidance of an individual supervisor. Whilst the programme is online research project supervision and site visits will normally be face-to-face.

		In semester 1, students take on three taught modules concentrating on: • Research Methods where they will conduct a literature review and develop a project plan for their Research Project by the end of the semester. • Lean Automation where they will analyse and optimise flow and variation in the manufacturing process they are planning to automate/digitalise. • Data Driven Decision-Making that will work in parallel with Lean Automation to identify the key data that needs to be captured from the manufacturing process and determine how these data should be utilised to support decision-making. In Semester 2, students take on a new taught module and continue with two of the first semester modules, concentrating on: • Lean automation is integrated with the Research Project to ensure that the automated process is optimised from a Lean and Six Sigma point of view. • Data Driven Decision-Making is integrated with the Research Project to investigate the data analytics side of the Research Project. • System Integration supports the Research Project in the design of the data architecture of the process and the selection of hardware and software. In Semester 3 and 4 The Research Project continues under the guidance of the individual supervisor.
18.	Learning, Teaching & Assessment Strategies:	<u>Teaching & Learning:</u> The main Teaching and Learning Strategy of this research Master combines work-based and problem-based learning, where students will take a real problem in their workplace and, through research, develop a solution for their company that will improve quality, efficiency, productivity, sustainability of a process and/or well-being of the employees. Students will have access to a repository of recorded lectures, asynchronous activities, case studies and literature and benefit from the expertise of their academic supervisor to bring their knowledge of Automation and Digital Manufacturing to the next level. In the taught modules, the flipped classroom and collaborative learning are the dominant strategies. Students enter the programme with a wide range of expertise in the field. By using the flipped classroom, students can study at their own pace and follow the asynchronous activities that allow them to bridge the gap between their current knowledge and the requirement of the programme. The workshops allow them to meet experts in the field, ask questions, bring their own expertise to the group, and engage in collaborative learning with their peers.

		Assessment: The choice of assessment methods is aligned with the overall aims of the programme and the qualities or abilities being sought from the student. The modules' continuous assessment strategies are aligned directly with the module learning outcomes. The assessment types which are used on the modules include assignments, contribution to collaborative forums, Moodle quizzes, group work, problem and scenario-based exercises, presentations, individual projects. This combination of formative and summative assessments is 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, leadership, and conflict resolution skills to allow them to work effectively individually and as team members or team leaders. The individual projects in taught modules are integrated into the Research Project in Automation and Digital Manufacturing module.
19.	Resource Implications:	The resources required to deliver this programme: • Lecturing hours: two lecturers will have to be recruited to cover the suite of programmes. • Labs or equipment: significant investment in equipment is planned for this field of study, so no additional funding will be required specifically for this programme. 3000 euros per year will be required for software licences and class material. • Library resources: the library resources requirements are shared with other programmes in the department. • The programme is self-financing.
20.	Synergies with Existing Programmes:	None.
21.	Findings and Recommendations:	Commendations: 1. The panel commended the programme team on the industry academia partnership which was very strongly evident in the development of the programme. The inclusion of industry representatives on the programme team was welcomed.
		Conditions: 1. Entry requirements should be revised to remove automatic direct entry from the Higher Diploma into the final 60 ECTS of the programme. Graduates of the Higher Diploma can be considered for individual exemptions based on the Recognition of Prior Experiential Learning in accordance with the ATU Policy.

		Recommendations: 1. Develop a student handbook to clarify and manage the expectations and role of the student, the supervisor and the employer. The handbook should contain a weekly schedule for students to allow them to plan their time. Ensure that there is a policy in place in relation to IP for projects and that this is clearly communicated to students and employers. 2. Provide further detail on the assessment of each of the modules to provide clarity for students. 3. Explore whether students can be offered or obtain a professional qualification (e.g., Green Belt) on completion of the Lean Automation module. 4. Notwithstanding the fact that groundwork on the research project begins in semester 1 and 2, revise the overview diagram of the masters to show that the Research Project in Automation and Digital Manufacturing and associated supervision takes place in semester 3 and 4.	
22.	FAO: Academic Council:	Approved:	
		Approved subject to recommended changes:	X
		Not approved at this time:	
	Signed:		
		Chair	Secretary