VALIDATION REPORT

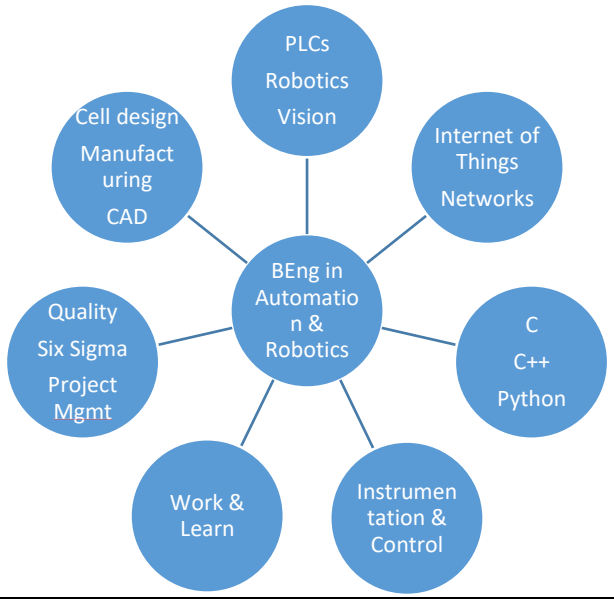
1.	Title of Programme(s): (incl. Award Type and Specify Embedded Exit Awards)	Bachelor of Engineering in Automation and Robotics Higher Certificate in Engineering in Automation and Robotics (The Higher Certificate in Engineering in Automation and Robotics will also act as an exit award for the BEng in Automation and Robotics).
2.	NFQ Level(s)/ No. ECTS:	7 and 6 180 and 120
3.	Duration:	3 Years 2 Years
4.	ISCED Code:	0714
5.	School / Centre:	School of Engineering
6.	Department:	Department of Electronic & Electrical Engineering
7.	Type of Review:	New Programme
8.	Date of Review:	16th June 2020
9.	Delivery Mode:	Blended
10.	Panel Members:	Dr Derek O'Byrne, VP for Academic Affairs & Registrar, Waterford Institute of Technology (Chair) Mr Niall Morris, Process Control & Automation Course Coordinator, Centre for Advanced Manufacturing & Management Systems, Cork Institute of Technology Dr Nikos Papakostas, Associate Professor, School of Mechanical and Materials Engineering, University College Dublin Mr Julio Zanon Diaz, Principal Technology Innovation Engineer, Boston Scientific Ms Carmel Brennan, Assistant Registrar (Quality), GMIT (Secretary)
11.	Proposing Staff:	Mr Gerard MacMichael Mr Des O'Reilly Dr Carine Gachon Ms Emily King Ms Michelle Lynch Dr Brian Ashall Dr Alan Hannon Mr Gabriel Farragher Mr Shane Coss, Thermo King Ms Denise Rocks, West Regional Skills Forum
12.	Programme Rationale:	This programme aims to meet the ongoing need for people with technical skills in automation, robotics and advanced manufacturing which has been identified in several government and industry reports and in consultations with regional manufacturing companies e.g. ThermoKing, Valeo, Boston Scientific, Medtronic, and Merit Medical.

		'Ireland's Industry 4.0 Strategy 2020-2025'[1], sets out the vision and goals for Industry 4.0 in Ireland and the strategic actions that will help to achieve those goals. It says that there are 227,000 manufacturing jobs in Ireland, of which 85% are outside Dublin. The strategy says that 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. 'Ireland's National Skills Strategy 2025'[2] has 6 objectives and this programme strongly meets 4 of these, namely: • Education and training providers will place a stronger focus on providing skills development opportunities that are relevant to the needs of learners, society and the economy • Employers will participate actively in the development of skills and make effective use of skills in their organisations to improve productivity and competitiveness • People across Ireland will engage more in lifelong learning • We will support an increase in the supply of skills to the labour market There is predicted to be 'above average employment growth in science, engineering and IT (STEM) occupations'. Sector-specific skills needs are identified: • Manufacturing: scientists with experience and engineers • Medical Devices: mechanical, automation and validation engineers; polymer technicians, software engineers, quality engineers and regulatory compliance experts.
13.	Potential Demand for Entry:	This programme has been designed in conjunction with Thermo King, who have committed to providing students. Surveys of relevant employers also provided feedback on potential numbers for the programme, with evidence of sufficient numbers to make the programme viable.
14.	Stakeholder Engagement:	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 questionnaire, and included major employers in the region and Skillnet networks.
15.	Graduate Demand:	The proposed programmes are work-based programmes designed for people working within manufacturing companies. They provide upskilling opportunities for staff to contribute to the increasing demands of a high-tech manufacturing environment. There is evidence of a shortage of manufacturing/industrial engineers. Graduates will be well placed to offer enhanced value to existing or new employers working in roles such as automation, robotics, manufacturing engineering, quality

[1] 'Ireland's Industry 4.0 Strategy 2020-2025', 2019. Future Jobs Ireland 2019. https://dbei.gov.ie/en/Publications/Publication-files/Irelands-Industry-4-Strategy-2020-2025.pdf

[2] 'Ireland's National Skills Strategy 2025', 2016. https://www.skillnetireland.ie/publication/national-skills-strategy-2025/

		engineering, lean/six sigma engineering production and process engineering.
16.	Entry Requirements, Access, Transfer & Progression:	The minimum requirements are: Grade O6/H7 or better in five Leaving Certificate subjects including English or Irish and Mathematics and a minimum of 160 Points. OR Foundation Certificate OR QQI FE Level 5/6 award. Applications from mature applicants (aged 23 on or before 1st January of the course commencement year) are welcomed by GMIT. These applicants do not have to meet the Leaving Certificate entry requirements and are considered on an individual basis (previous education, work experience, and demonstration of ability and competence to undertake the programme). They may be invited for interview. This will be used to rank applicants where demand exceeds the available places on a programme. Recognition of Prior Learning (RPL) can be used as a means to gain entry to the programme, or gain exemptions in accordance with Code of Practice No. 6 (Policy and Procedures for the Recognition of Prior Learning). Prior learning can be certified or experiential, and will be assessed in accordance with the code and engagement with the RPL assessment tool at www.myexperience.ie Students with a cognate QQI HE Level 6 (e.g. Technicians) may avail of advanced entry into Year 2 by successfully completing the 2 weeks of Industry training that is part of the Industry Module in Semester 3 of Year 1. Students with a cognate QQI FE LEVEL 6 (e.g. Electricians) may avail of advanced entry into Year 2 by successfully completing the 2 weeks of Industry training that is part of the Industry Module in Semester 3 of Year 1, plus the module ENGI06053 'Applied Science, Technology, Engineering and Maths'. Applicants who gain advanced access to the programme will likely have to attend all of the industry training elements (2 weeks per year) of the Industry Modules on the programme for the stages they are exempt from. Students who have completed in Software & Electronic Engineering, Mechanical Engineering, Energy Engineering, Biomedical Engineering, Manufacturing Engineering, Agricultural Engineering, Common Entry Engineering, or equivalent may apply for advanced entry to year 2, but will be required to take the 2 weeks of Industry training which is a part of 'Industry Module 1' over the summer semester. In order to apply there would need to be commitment from an industry partner to take such a student on a Work Placement for all the subsequent 'Industry Module' elements of the programme (that is, Semester 3 in Year 2 and Year 3).

		Students can apply for progression to the final stage of cognate level 8 degree programmes.
17.	Programme Structure:	This is a work-based learning programme with year-long academic modules followed by a semester long industry module in each stage of the programme. The programme is built around the development of student knowledge and skills in the following areas: 
18.	Learning, Teaching & Assessment Strategies:	The programme uses blended delivery with lectures, labs, online delivery and industry content. In addition, students can expect to engage with significant self-directed research, assignments, projects and study. There is a strong emphasis on hands-on practical learning for the students. There are 20 credits per year of the programme allocated to the Industry Module. This recognises the strong 'Work and Learn' element of the programme. The Industry Module in each year consists of three elements: OEM automation modules, industry project and work experience. The use of continuous assessment strategies allows the student to grow with the curriculum and start on the path of becoming a self-learner. The student is encouraged to interact with the knowledge base through the directed use of the likes of component/equipment data sheets and other electronic resources and employ this knowledge towards the solution of real electronic automation engineering problems. A key goal of the lecturing team is to develop and foster a working community of learners. Each year of the programme includes a significant project element as part of the Industry Module. Project allows the integration of the learning from each of the other modules on the programme. For example, in Year 1, the project builds closely on the learning from Electrical Science, CAD, Automation 1 and the OEM industry training. This allows for cross-module assessment where students are assessed for skills and competences in modules which they can then apply in their projects. This is a feature of the project in each year of the programme.

19.	Resource Implications:	Each year of the programme will require approximately 20 hrs per week of lecturing time. Training robots and PLC workstations are required for delivery of the programme with an associated cost of €192,000. Thermo King are making available their new automation lab which accommodates 8 robot workstations and 12 PLC workstations. These will be used for the OEM training element, for automation and project modules.
20.	Synergies with Existing Programmes:	None
21.	Findings and Recommendations:	General: The panel approved the programme subject to the following conditions (3) and recommendations (7). The panel note the very strong value of the proposed programme and the need it will fulfil in the region and recommend that GMIT proceed with its roll out. The panel complimented the proposing team for their openness and enthusiasm in discussing the proposed programme. They are congratulated for the development of this programme, the collaborative nature of the programme with Thermo King and the wider consultation with industry which informed its development. Special conditions attaching to approval (if any): 1. The relationship between GMIT and Thermo King in relation to the delivery of this programme needs to be formalised. Clarity and certainty are required in relation to how the programme will work, the responsibilities of both parties, and the structures which will be put in place. This all needs to be codified in an MOU between both organisations. 2. Further clarity is required in relation to how the industry modules at each stage of the programme will operate and be quality assured. The work-based learning element of the programme needs to be structured and codified in a stronger manner so that the quality assurance is evident and that the student experience is consistent and supported for the duration of the placement. 3. The programme documentation including output in relation to the above conditions must be submitted to the panel for approval.

		Recommendations of the panel in relation to award sought:	
		1. Consideration should be given to the sustainability of the programme. This may involve considering how the design of the programme can contribute to ongoing viability. 2. Consider whether 'Automation 1' is the most appropriate module title given the content of the module. 3. Consider whether 'Automation 3' is very content heavy and whether some of the material could be covered in the context of other modules. 4. Safety for robots and robotic devices needs additional coverage. The course should cover a review of the high-level review of the directive and the different types of standards (A, B1, B2 and C) so to give the students the context and regulatory framework of safety design requirements. Then the course should cover some of the most relevant and lower level B standards first such as EN 60204-1 and EN ISO 13849-1, and then could cover some C specific standards such as EN ISO 10218-1 and EN ISO 10218-2. 5. Consider inclusion of modern and emerging technologies within the programme such as collaborative robots, ROS (Robot Operating System), and Industry 4.0 concepts including the use of digital twins for improving the performance of cells, realistic real-time simulation utilising, for instance, physics engines, discrete event simulation. 6. Consider inclusion of the following topics within modules: industrial protocols, industrial network architectures, historian architectures and time series databases Vs relational databases, equipment data acquisition and data interpolation for visualisation and troubleshooting, data storage technologies and challenges. 7. In light of the exit award after two years, consideration should be given to the movement of theoretical content related to Robotics to year two with the addition of an advanced Robotic workshop or another form of practical interaction with a physical robot.	
22.	FAO: Academic Council:	Approved:	
		Approved subject to recommended changes:	X
		Not approved at this time:	
	Signed:		
		Chair	Secretary