VALIDATION REPORT

1.	Title of Programme(s): (incl. Award Type and Specify Embedded Exit Awards)	Certificate in Robotics - Build, Programme and Automate (SPA, 15 ECTS, Level 6)
2.	NFQ Level(s)/ No. ECTS:	Level 6 15 ECTS
3.	Duration:	2 Semesters
4.	ISCED Code:	0710
5.	School / Centre:	School of Engineering
6.	Department:	Department of Mechanical and Industrial Engineering
7.	Type of Review:	New Programme
8.	Date of Review:	Friday April 1st, 2022
9.	Delivery Mode:	Blended
10.	Panel Members:	Prof. Dewar Finlay, Research Director, School of Engineering, Ulster University (Chair) Mr. Tony Mahon, Head of Department, Electrical & Electronic Engineering, TUS. Mr. Ciaran O'Driscoll, Electrical & Electronic Engineering, TU Dublin. Ms. Patricia Cahill, Software Engineer, Intel. Ms Carmel Brennan, Assistant Registrar (Quality), GMIT (Secretary)
11.	Proposing Staff:	Dr. Oliver Mulryan Dr. Carine Gachon Dr. Oliver Mulryan Mr. Vlad Teleanca
12.	Programme Rationale:	Robots are becoming more ubiquitous in our daily lives and are currently used in a wide diversity of applications in the following sectors: Agricultural, Biomedical, construction, Domestic, Military, High volume manufacturing, etc. In this digital age of data collection and artificial

		intelligence, the adoption of robotics by both industry and society is going to rise exceptionally.
		In Ireland, there are over 200+ overseas companies, who employ 23,000 engineers directly. This number is to set to grow further as we aim to become a hub for cutting edge research and development in new areas such as IOT, Industry 4.0 and Autonomous Vehicles, etc. To
		facilitate this vision, we need a greater number of students to partake in engineering programmes or cognate disciplines.
		This introductory "Bot Builder Essentials" programme is designed to give the learner (i.e., either a professional or school-leaver) an insight into the importance of robotics, as well as an understanding on how they can be designed (Mechanical & Electrical), programmed and automated.
		Ultimately, this programme will provide a pathway for the graduates to gain employments as robotic technicians, while others may be inspired into apprenticeships or even directly into technical degrees in disciplines such as Smart Manufacturing, Automation and Robotics or Engineering.
13.	Proposed Student Intake:	22
14.	Stakeholder Engagement:	The demand and development of the programme was informed through a consultation process with various stakeholders within the region. To gauge the potential demand for the programme, a questionnaire was sent to several industrial employers to determine their stance on the importance of robotics, robotic training, and shift towards industry 4.0 - digitalisation of industry. In the same survey additional questions were asked regarding what learning areas which should be incorporated into a Bot Builder Essentials programme. The outcomes of this survey were used to inform the design of the programme.
15.	Graduate Demand/Employment:	The programme is designed for secondary school-leavers and for engineering graduates and any other graduates who wish to up-skill in the field of robotics, which has its feet firmly planted in industry. Furthermore, the programme caters for anyone who wishes to gain an insight in
		the design and programming of electro - mechanical systems. The programme will provide the learners with some of the skills and knowledge required to gain employment for example as a robotic technician or engineer. Robot technicians build, maintain, and repair robots in automated manufacturing plants and other settings, using computer programming and electromechanical engineering skills and knowledge to promote increased efficiencies in facilities. Additionally, it will prepare and inspire

		many others to transition onto either apprenticeships or full-time education in "Industry 4.0" or "Society 5.0" disciplines such as Robotic Engineering or cognate programmes in higher education.
16.	Entry Requirements, Access, Transfer & Progression:	The minimum entry requirements are those stated by the Institution in its Access, Transfer and Progression Policy at any given time. At present they are a Grade O6/H7 or better in five Leaving Certificate subjects including English or Irish and Mathematics with a minimum of 160 points. OR Equivalent qualifications and scores from other countries which will be assessed and scored by the Institute. OR A Pass in any QQI FET Major Award at level 5 or 6. OR A Pass in a QQI FET Foundation Certificate, the NUIG/GMIT Foundation Certificate or any Foundation Certificate delivered by the regional cluster (GMIT, NUIG, IT Sligo or IT Letterkenny). Mature Applicants Applications from mature applicants (aged 23 on or before 1st January of the course commencement year) are welcomed by GMIT. A quota of places is reserved for mature applicants. 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. English Language Requirements English Language Requirements will be as determined by GMIT 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 GMIT. 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. Recognition of Prior Learning GMIT 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. In accordance with GMIT's policy, RPL can be used to gain admission to this programme. There are several routes for progression from this Certificate. The most cognate route is that this Certificate allows exemptions on up to 30 credits on the BEng in Automation & Robotics.
17.	Programme Structure:	The programme consists of two consecutive modules adapted from the departments Full-Time (FT) Engineering programme offerings; the first 5 ECTS credit module introduces the fundamentals of embedded Controllers, while the second 10 ECTS module will teach the learner to an intermediate level by getting them to develop a bot for a given Internet of Things specification.
18.	Learning, Teaching & Assessment Strategies:	The programme was designed specifically for learners with a keen interest in Technology or professionals who wish to up-skill. Unlike the full-time Engineering programmes, the modules of this programme will be delivered in a blended learning format consisting of weekly onsite practical and remote lecture classes facilitated by the cloud and Microsoft TEAMs. Both modules of the programme will use a variety of pedagogical and assessment practices including practical demonstrations, discussions, individual and groups projects which will allow students to practice and hone their programming and building skills. The modules will be assessed continually via ongoing assignments, coupled with extensive individual and group project work thereby simulating real world industrial engineering practices.
19.	Resource Implications:	This programme will be self-financing. Lecturing hours: For the student cohort, and average of 5 hrs will be required per week. Technical support: 1 hr per week will be required to prepare the manufacturing laboratory. Student supports: Approximately, 1000 Euro will be required to print the booklet of notes for the student cohort, and to replace the consumables, such as embedded controllers, wiring, bootlaces, soldering kits and 3D printer resins, used in the Automation and Additive Manufacturing printing laboratories. In addition, another 2000 - 3000 Euro will be needed for the students to deliver the group projects.

20.	Synergies with Existing Programmes:	None.
21.	Findings and Recommendations:	Commendations: None.
		Conditions: 1. Clearly specify the minimum academic entry requirements for the programme and any specific work experience requirements plus the criteria used to evaluate mature applications not meeting the minimum requirements. **Programme Entry Requirements – Module Manager** The minimum entry requirement for the programme is either: • The minimum Leaving Certificate requirements necessary for entry onto the programme are a grade O6/H7 or better in five Leaving Certificate subjects, including Mathematics and English or Irish, with a minimum of 160 points. • A pass in any FETAC/QQI Award at Level 5/6. In line with institute policy, a quota of places will be reserved for Mature Learners who do not meet the above requirements. Mature applications are EU nationals of age 23+, on the year of entry. This category of learner will be assessed based upon their previous education, work and life experiences pending a demonstration of their suitability to join the programme. Mature candidates will be ranked upon learning, but relevant learning in either programming, technology, engineering, or science will be considered advantageous. All applications will be assessed on a case-by-case basis. For entrants who hold an L6 or higher qualification in an engineering discipline. In accordance with GMIT policy, Recognition of Prior Learning (RPL) can be used, where applicable, to gain exemption(s) from a specific module of the programme. GMIT is committed to the principles of transparency, equity, and fairness in RPL and to the principle of valuing all learning regardless of the mode or place of its acquisition. For further information on RPL, refer to the Institutes Academic Code of Practice No 6. 2. Distinguish characteristics that are desirable and will be stipulated in promotional material but do not form part of minimum requirements. In addition to the mandatory requirements, the applicants should: be avidly interested in tinkering with technology, have a logically inquisitive mind, and have good ICT skills – as the programme is delivered blended. Furthermore, any educational or experiential learning in either programming, technology, engineering or science would be extremely desirable.

Recommendations:

1. The module learning outcomes should explicitly link the name of the programme with the outcomes expected of the programme.
The module learning outcomes of the Internet of Things module have been revised to better reflect the programme offering

- Explain the fundamentals of Robotics and IoTs.
- Outline how Robotics and IoT can be used to improve industrial productivity and improve society (Industry 4.0 and Society 5.0).
- Examine and select suitable hardware for a Robotic and IoT project.
- Apply problem solving techniques to issues in a Robotic and IoT project.
- Contribute to a solution of a well-defined problem through collaborative and individual work.
- Create a simple solution to a well-defined problem.
- Demonstrate and critique the functionality of a project.
- Communicate project ideas, design and deliverables, using professional tools and guidelines.
- Set project milestones and manage deliverables in an agile project environment.

2. Use the delivery section of the programme document to clearly outline the planned sequencing and delivery of modules.
Module Manager – Structure of Programmes
The 15-credit programme consists of two consecutive modules adapted from the departments Full-Time (FT) Engineering programme offerings, namely: Agricultural Engineering and Automation and Robotics Engineering. The first 5 ECTS credit module introduces the fundamentals of embedded Controllers, while the second 10 ECTS module will teach the learner to an intermediate level by getting them to develop a Robot or equivalent Smart Machine for a given Internet of Things application. This major collaborative project will be an ongoing project, and consist of a series of milestones and deliverables, which will afford the learners the opportunity to demonstrate their skills and competency to design and programme a predetermined robotic system. As part of the programme curriculum, the students will be given an overview of Industry 4.0 and Society 5.0.

The programme itself will be delivered over a conventional academic calendar, consisting of 24 weeks of tuition, 5hrs per week, delivered across two semesters. Each module of this programme will be delivered blended and in block format; the first module (5 ECTS credits) will be delivered in the first 8-week block,