Report of External Peer Review Group for the Programmatic Review of:

Programme	Code	Level	ECTS	Duration	Award Type	Embedded Awards
Bachelor of Engineering (Honours) in Software and Electronic Engineering	GA_ESOEG_H08	8	240	4	Major	Embedded Award: Bachelor of Engineering in Software and Electronic Engineering
						Embedded Award: Higher Certificate in Engineering in Software and Electronic Engineering
Bachelor of Engineering in Software and Electronic Engineering	GA_ESOEG_B07	7	180	3	Major	Embedded Award: Higher Certificate in Engineering in Software and Electronic Engineering
Higher Certificate in Engineering in Software and Electronic Engineering (Exit)	GA_ESOEG_C06	6	120	2	Exit	Parent Award: Bachelor of Engineering in Software and Electronic Engineering
Certificate in Industrial Automation	GA_EINAG_S07	7	30	1	SPA	N/A
Certificate in Robotics - Build, Programme and Automate		6	15	2	SPA	N/A

Date of Panel:

Friday, April 1st

External Peer Review Group:

Panel	
Chairperson	Prof. Dewar Finlay, Ulster University
Academic Representative	Mr. Tony Mahon, Head of Department of Electrical & Electronic Engineering, TUS. Mr. Ciaran O'Driscoll, Electrical & Electronic Engineering, TU Dublin.
Industry/Graduate Representative	Ms. Patricia Cahill Software Engineer, Intel.
Secretary	Ms. Carmel Brennan Assistant Registrar (Quality)

1   Introduction to Programmatic Review

Programmatic review involves a periodic, formal, systematic, comprehensive and reflective review and evaluation of each programme and award offered by the Institute for purposes of programme development, quality enhancement and revalidation. It is an important means of ensuring and assuring, *inter alia*:
- that required academic standards are being attained;
- that programmes and awards remain relevant and viable;
- that student needs, including academic and labour-market needs, are addressed;
- that the quality of programmes and awards is enhanced and improved;
- public confidence in the quality of GMIT's programmes and awards.

GMIT last conducted Programmatic Review in 2014 and was due to undertake it again in 2019/20. The process was delayed until this year due to the COVID-19 pandemic.

The objective of a programmatic review is to review the development of the programme over the previous five to seven years, with particular emphasis on the achievement and improvement of educational quality. The focus is principally on the evaluation of quality and the flexibility of the programmes' responses to changing needs in light of the validation criteria and relevant awards standards. In particular, a programmatic review seeks to confirm that the promise evidenced at the original validation (or since the last programmatic review) in terms of academic quality, relevance and viability has been realised, and that the programme is adapting appropriately to evolving circumstances.

The specific objectives of a programmatic review are, *inter alia,* to:
- analyse and evaluate the effectiveness and efficiency of the programme, including details of student numbers, retention rates and success rates;
- review the development of the programme in the context of the requirements of employers, industry, professional bodies, the Irish economy and international developments;
- evaluate the response of the programme to regional and societal requirements and to educational developments;
- evaluate the feedback mechanisms for students and the processes for acting on this feedback;

- review the feedback from students relating to the student experience of the programme
- evaluate stakeholder engagement including links and collaboration with industry, business and the wider community;
- review feedback from employers and graduates;
- evaluate the physical facilities and resources provided for the provision of the programme;
- review any research activities in the field of learning in the disciplinary areas and their impact on teaching and learning;
- consider likely future developments in the disciplinary areas;
- make proposals in relation to updating programmes and modules, and to discontinuing programmes or parts of programmes.

Academic Council identified three themes to be specifically addressed during the 2021/22 Programmatic Review namely:
- Assessment – ensure the assessment strategy and methodology are appropriate and aligned with learning outcomes and that students are not over-assessed.
- Employability – ensure that students develop career skills necessary to prepare them for employment. Embed professional practice (e.g., work placement, work-based projects in the programme, ensuring that there is an appropriate plan for their management)
- Sustainability – review modules and learning outcomes to ensure that the sustainability agenda is addressed, debated, and applied within student learning and assessment, as appropriate.

2   Methodology

The programmatic review process involves a self-evaluation by each programme board followed by an external peer review. The Programme board engaged in a process of the collection and review of data related to the programme and feedback from stakeholders including students, graduates and industry. The overall programme and each individual module have been reviewed and recommendation(s) for updates made as required.

The External Peer Review Group (EPRG) received a copy of the Self Evaluation Review documentation and the programme documentation including any proposed changes. The EPRG then met the Programme Board (Appendix A) to discuss the programme and the documentation provided, as well as meeting a representative sample of students (Appendix B). The schedule for the review visit is contained in Appendix C.

3   Background to Programme(s) Being Reviewed

Bachelor of Engineering (Honours) in Software and Electronic Engineering
Bachelor of Engineering in Software and Electronic Engineering
Higher Certificate in Engineering in Software and Electronic Engineering (Exit)

This programme evolved from its two predecessors, the Level 7 (three years full-time) and Level 8 add-on (two years full-time): the BEng in Computer and Electronic Engineering and the BEng (H) in Computer and Electronic Engineering respectively.

In designing the programme, the team considered recent evolutions in technology and industry. An industry and graduate network provided input to the design process on current needs and trends. Requirements in the Western, Mid-Western and Midlands regions were analysed. The programme is differentiated by its location in the region, where the tech industry has evolved to be largely research and development focused,

rather than manufacturing based. Many global players in the tech industry reside here, and many local start-ups require electronic engineering and software engineering skills. The programme specifically targets this highly skilled research and development industry.

There are many opportunities for graduates in the high-tech areas such as software, electronics, semiconductor, medical technology, automotive, telecommunications, ICT, and automation. Major companies in the region where our graduates are employed include Intel, Cisco, Ericsson, Boston Scientific, Medtronic, Jaguar Landover, Valeo, Avaya, Genesys, Analog Devices, SAP, Titan HQ, and Fidelity. The strong employment record of the graduates in the multinational and SME sector demonstrates that industry values the quality and skills of the graduates.

4   General Findings of the External Peer Review Group

Having considered the documentation provided and discussed it with the Programme Board, the External Peer Review Group recommends the following:

Accredited until the next programmatic review	
Accredited until the next programmatic review subject to conditions and/or recommendations[1]	X
Re-design and re-submit to the same External Peer Review Group after additional developmental work	
Not Accredited	

5   Programme-Level Findings – BEng (hons) in Software and Electronic Engineering and embedded Awards

Consideration for the panel	Overall finding: Yes/No/Partially
Is there an ongoing need for the programme and has evidence been provided to support it?	Yes
Is the level and type of the award appropriate?	Yes
Are the entry requirements for the proposed programme clear and appropriate?	Yes
Is there a relationship between this programme and further education?	Yes
Are the access, transfer, and progression procedures appropriate?	Yes
Does the programme comply with the Institute norms for retention, both in first year and subsequent years? Where not, does the Programme Board proactively take appropriate measures to optimise student engagement and retention?	Yes

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[1] **Note:**

Approval is conditional on the submission of a revised programme document that takes account of the conditions and recommendations outlined in the report and a response document describing the actions to address the conditions and recommendations made by the External Peer Review Group (EPRG). In this report, the term 'condition' is used to indicate an action or amendment which in the view of the EPRG must be undertaken prior to the commencement of the next delivery of the programme. Conditions are mandatory if the programme is to be approved. The term 'recommendation' indicates an item to which the Programme Board should give serious consideration for implementation at an early stage and which should be the subject of on-going monitoring.

Does the programme meet the required standards for programmes at its NFQ level (i.e., conform to GMIT Award Standards[2])? For Parent Award? For Embedded Award(s) (if applicable)? For Exit Award (if applicable)? For Minor Award (if applicable)?	Yes
Is the programme structure logical, well designed, and can the stated programme intended learning outcomes, in terms of employment skills and career opportunities, be met by this programme?	Yes
Have appropriate learning and teaching strategies been provided for the programme that supports Student Centered Learning (SCL)?	Yes
Have appropriate programme assessment strategies been provided for the programme taking account of the student workload?	Yes
Is there evidence that learning and teaching is informed by research?	Partially
Have appropriate quality management procedures been implemented in line with GMIT's Quality Assurance Framework? (e.g., Induction, Programme Handbook, Programme Board, Student Feedback, External Examiners)	Yes
Does the proposed programme demonstrate an international dimension? e.g., content, mobility, collaboration)	Yes
Does the programme encompass sustainable development principles and ethos?	Yes
Does the programme embed employability through the inclusion of work placements, employment preparatory module(s) and/or work-based projects?	Yes
Is there evidence of strategies to promote diversity and inclusion?	Yes
Is entrepreneurship, creativity and innovation embedded in the programme?	Yes
Has the efficiency of the programme's design been considered? For example, does the programme meet the Institute norms on staff:student ratios for programmes of this type?	Yes
Is the programme externally facing? (e.g., Stakeholder engagement, guest speakers, fieldtrips, applied projects)	Yes

The issues of student Progression and Retention were discussed given the apparent fall off of students. It was clarified that some students complete the programme, but take longer than four years to do so, whilst others exit with embedded awards at level 6 or 7. Leaving Certificate points are not directly correlated with student success, with interest and motivation also key. There tends to be higher attrition at level 7.

The provision of Level 7 and Level 8 pathways was viewed as a strength of the programme. Level 7 entrants can include mature students who may be unwilling to commit to four years due to confidence or personal situation. An O4 maths entry level was introduced to the programme following an analysis of student performance which found that students with less than that were unlikely to succeed. The minimum points level is not necessarily indicative of the calibre of students who enter the programme, with high point students also registering. Whilst these students may have more advanced maths skills, the diverse range of subjects on the programme keeps them interested.

The Programme Board outlined the companies that employ graduates and the types of careers including software design and development, and hardware design and text. A module relating to the medical device industry is being included on the programme given the number of related employers in the region. The module has a significant regulatory focus as this is what companies want.

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[2] GMIT has adopted QQI's award standards which are available HERE.

A suite of electives is provided as an alternative for students who are not successful in finding a work placement. However, this is used rarely as evidenced by the fact that during the pandemic only two students were not placed in industry. Students are prepared for work placement through approximately six days of work placement in the semester preceding the placement.

The programme utilises a hybrid system of semester-long and year-long modules. Whilst it might be expected that as students transition to higher education that the first semester may prove problematic, it is actually the second semester that students find more challenging. There is a high degree of practical work in the programmes. Students get feedback on their first semester performance early in semester two. Student attendance is deemed a key factor in overall performance.

The panel and Programme Board considered the most appropriate programming languages to be used. Graduates and industry had been surveyed, as a result of which programming has been restructured within the programme. Students start programming in first year using C++ which the first-year project gives them a chance to practice. Object oriented programming is used in second year, and machine learning with Python is taught in third year. The Internet of Things project allows students to engage in web design and in year four students use Java script, cloud technology and C++.

There was little evidence of staff being actively involved in academic research, industry-based research or postgraduate supervision. However, this may have been a result of a narrow interpretation of research by the Programme Board.

The panel noted a lot of deliverables in the assessment matrix. The Programme Board had considered this and have introduced some small examinations to take pressure off students completing continuous assessment during term time.

The Programme Board are aware of the urgency and importance of students being educated about sustainability and it is incorporated in the programme from first year where students are introduced to the Sustainable Development Goals and how the role of the software engineer can impact. In second year, students are asked how their project impacts on the SDGs, both positively and negatively. In other aspects of the programme students might look at the sustainability philosophy of local companies, evaluate power management or component reuse.

The panel met with a number of students who were generally positive about their experience. They viewed the programme as having a good mix of software and hardware content. Occasionally the workload is challenging, and deadlines on Moodle are not always up to date. There were mixed experiences in relation to assessment feedback, with in some instances students not receiving it in time for it to influence performance. Similarly, in a small number of modules assessment instructions and rubrics would have been helpful. Students weren't clear on the term 'semesterisation' and its implications for them. Students' perceptions as to the reasons people left the course was that it was typically for personal reasons of that the 'course wasn't for them'. Some students left at the end of year 3 as they wanted to get experience in industry. Maths was viewed as challenging, but manageable. It was also challenging in first year if students had no previous experience of engineering at school. However, lecturers were deemed helpful in supporting students with additional explanations and resources if required. It was felt that a 3D printer would be useful, as would a lab where student can access the tools required for project work outside of class time.

The Programme Board proposed a number of changes relating to Programme Learning Outcomes, updating content to reflect industry trends, increasing emphasis on sustainability, employability and equality, diversity and inclusion, updating module assessment strategy and inclusion of a new module – Medical Device Electronics. Individual modules were updated to reflect the findings of the review process. All changes as outlined in Appendix D were approved and the programme was accredited until the next programmatic review subject to the recommendations below.

Commendation(s):
1. The portfolio of programmes is built on a very solid technical basis.
2. Students reflected positively on their experiences and highlighted the work of specific staff members in being student facing and championing certain disciplines.
3. The work placement is well designed and executed.

Condition(s):
1. Ensure that the Approved Programme Schedule is correct i.e., attach System on Chip Design and Verification module and correct mathematics module to the programme.

Recommendation(s):
1. Undertake a study in relation to the retention and completion rates of students on these programmes and the factors driving this, with a view to developing and implementing a student retention strategy.
2. Reflect on the research, in all its facets, that is being undertaken by staff and how this can inform the teaching on this programme.
3. Review the level of assessment in the programme to ensure that the workload is manageable in all instances.
4. Ensure that there is clear communication in relation to assessment and deadlines, and that there is coordination between lecturers/modules. In addition to an assessment schedule, a standard assessment template across the programme with assessment guidelines, due dates and marking rubrics would be useful in this regard.
5. Students should have clear expectations in relation to the type and timing of assessment feedback they will receive.
6. Consider covering a narrower range of software and doing so in more depth.
7. Ensure that students, particularly first years, are clear on the impact of semesterisation in relation to progression.

Module Recommendation(s)

Module Title	Findings
Work Placement	Correct the hours on the Work Placement module so that they reflect the contract with the student and the hours allocated to the preparatory modules are no more than those attached to The Next Step.

For office use only (To be completed by Head of Department)	
Changes due to be implemented in:	
Changes to be implemented on phased or simultaneous basis:	
NB: If the programme changes are to be implemented simultaneously (all stages at once) then the Academic Information Systems Office must be notified immediately where modules have moved stages and an interim APS is required.	

Signed:

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Dewar Finlay

Chairperson

Date:
8thJuly2022

Appendix A - Programme Board Members

The panel met with the following staff:

Name	Position
Prof. Graham Heaslip	Head of School of Engineering
Mr. Des O'Reilly	Head of Department Electronic & Electrical Engineering

Academic Staff representatives Software and Electronic Engineering

Mr. Niall OKeeffe	Mr. Des O'Reilly	Ms. Michelle Lynch
Mr. Gabriel Farragher	Ms. Natasha Rohan	Mr. George Anderson
Mr. Mairtín O'Conghaile	Mr. Brian O' Shea	

Appendix B - Student Representatives

The panel met with the following student representatives:

Student Name	Programme	Stage
Mr. Simon Gaborit	Bachelor of Engineering (Honours) in Software and Electronic Engineering	4
Ms. Shannon Fernandes	Bachelor of Engineering (Honours) in Software and Electronic Engineering	2
Ms. Sarah Mitchell	Bachelor of Engineering (Honours) in Software and Electronic Engineering	2
Mr. Liam Nilan	Bachelor of Engineering (Honours) in Software and Electronic Engineering	4

Appendix C - Schedule of Meetings

Agenda	
Date:	Friday April 1st, 2022
9am	Panel Meet
9.30am	Software and Electronic Engineering
11.30am	Break
11.45pm	Meet with Students
12.15pm	Lunch
1.15pm	Industrial Automation and Robotics Programmes
3pm	Panel Discussion
3.45pm	Initial Feedback
The Agenda may be subject to slight alteration on the day.	

Topic	Proposed Change	Rationale
Programme Learning Outcomes		
Overall Contact Hours	Stage 1 reduce by 0.5 hours Stage 2 increase by 1 hour Stage 3 reduce by 2 hours Stage 4 increase by 0.5 hours	
Structure or Sequencing of Modules		
Addition of New Module(s)	Smart Teams (Stage 2)	A team-based project gives the learners the opportunity to work in an agile team environment.
	CICD 1 (Stage 3)	Software Engineering with Test (10 credits) was in Year 4, but it is now split in half, and rebranded as Continuous Integration Continuous Delivery. It is delivered over Year 3 and 4.
	Medical Electronic Systems (stage 4)	Provides better continuity of electronics over the full 4 years. The module introduces the Irish health technology industry, the standards, and the design challenges
New APS Regulations		
Minimum Entry Requirements		
Changed transfer or progression routes		
Teaching & Learning Strategy		
Assessment Strategy		
Module Changes		
Stage 1		
Industrial Automation 1A	Name change to Web Technologies	Web design and deployment is more in line with the programme themes
Telecoms	Name change to Internet Tech 1	The ICT stream is rationalised.
Stage 2		
C/C++ (5), Java (5)	Object Oriented Programming (10)	Java was spread over year 2 and Year 3, but now the 10 credits are consolidated into Year 2.
Internet Tech 1	Internet Tech 2	The ICT stream is rationalised.
Maths	Changing Maths from 10 credits to 5	loses only one hour over the year and this frees up 5 credits for the new Smart team's module.
	Smart Teams	A team-based project gives the learners the opportunity to work in an agile team environment.
Stage 3		
Internet Tech 2	Moved to year 2	
	CICD 1	Software Engineering with Test (10 credits) was in Year 4, but it is now split in half, and rebranded as Continuous Integration Continuous Delivery. It is delivered over Year 3 and 4
Adv Java	ML w/ Python	With Java moving to Year 2, there is the excellent opportunity to introduce Machine Learning with Python to the programme.

Work Placement	Adjust hours	To Ensure they reflect the contract with the student and the preparatory modules are no more than those attached to The Next Step.
Stage 4		
Network Prog w/ Java	Full Stack Development	Better meets the job opportunities for graduates.
SW Eng w/Test (10)	CICD 2 (5)	Software Engineering with Test (10 credits) was in Year 4, but it is now split in half, and rebranded as Continuous Integration Continuous Delivery. It is delivered over Year 3 and 4.
	Medical Electronic Systems	Provides better continuity of electronics over the full 4 years. The module introduces the Irish health technology industry, the standards, and the design challenges