

## EXTERNAL REVIEW REPORT OF NEW PROGRAMMES


1.	<b>Title of Programme(s): (incl. Award Type and Specify Embedded Exit Awards)</b>	BEng in Manufacturing Engineering Higher Certificate in Manufacturing Engineering  (The Higher Certificate in Manufacturing Engineering is also an embedded exit award in the BEng in Manufacturing Engineering).				
2.	<b>NFQ Level(s):</b>	7 and 6				
3.	<b>Duration:</b>	3 years/2 years				
4.	<b>ISCED Code:</b>	0720				
5.	<b>School / Centre:</b>	School of Engineering				
6.	<b>Department:</b>	Department of Mechanical & Industrial Engineering				
7.	<b>Type of Review:</b>	<b>New Programme:</b>	<b>Yes:</b>	x	<b>No:</b>	
		<b>Differential Validation:</b>	<b>Yes:</b>		<b>No:</b>	x
8.	<b>Date of Review:</b>	8 <sup>th</sup> May 2017				
9.	<b>Delivery Mode:</b>	<b>Full-time</b>	x	<b>Part-time</b>		<b>Blended</b>
10.	<b>Panel Members:</b>	Dr Joe McGarry, Retired IoTI, Chair Dr Philip Cardiff, UCD Ms Fiona Cranley, IT Tallaght Mr Donal Collins, R&D Manager, McHale Engineering Ms Carmel Brennan, GMIT, Secretary				
11.	<b>Proposing Staff:</b>	Mr Gerard MacMichael Dr Carine Gachon Ms Clare London Mr Pdraig Audley Dr Aurora Dimache Mr Gabriel Costello Dr Laurentiu Dimache Dr Gabriel J Costello Dr Paul O'Dowd Dr Kate Goggins Mr James McGivern Mr Sean Howe				

12.	<p><b>Programme Rationale:</b></p>	<p>These programmes address the shortage of manufacturing technicians and engineers in industry and will also position GMIT to respond to the future needs of manufacturing, as Industry 4.0 (driven by the convergence of automation, the Internet of Things and cloud computing) becomes a reality.</p> <p>A review of research into skills needs and trends in manufacturing, interaction with local employers and a specific request for assistance from the Irish Medtech Association indicate that there is a demand for skilled manufacturing technicians and engineers. It is envisaged that the proposed programmes will attract candidates and will help fulfil the identified demand.</p> <p>There were 12,790 manufacturing enterprises in Ireland in 2012 (Future Skills Requirements of the Manufacturing Sector, 2012). Ireland’s manufacturing operations provided direct employment for 218,500 people in 2014 (Action Plan for Jobs, Department of Jobs Enterprise and Innovation, 2016). The Medtech sector in Ireland, a sizeable portion of which is clustered in the west, employs 27,000 people alone, with over 2000 jobs publicly announced since 2013 (IMDA, 2016). There are plans to introduce a minimum of 92 additional IDA projects in the West region by 2019 (Action Plan for Jobs, Dept. of Jobs Enterprise and Innovation, 2016).</p> <p>Productivity improvements and increased cost competitiveness are needed in the manufacturing sector in the short term (Enterprise 2025: Innovative, Agile, Connected, 2015) Manufacturing engineers will be the agents of this change, and they need the right skillset.</p> <p>National reports have identified several baseline skills needed by engineers in manufacturing, to improve productivity, reduce costs, and increase value. They include expertise in: lean principles, Six Sigma, the application of ICT, robotics and automation, polymer processing and materials (Making it in Ireland – Manufacturing 2020, 2013), (Enterprise 2025, Dept. of Jobs, enterprise and Innovation, 2015), (Action Plan for Jobs, Dept. of Jobs Enterprise and Innovation, 2016). Industry requires these skills at level 6, level 7 as well as level 8 (Future Skills Requirements of Manufacturing Sector to 2020, Forfás, 2012). The proposed programmes address these skills needs. The National Skills Bulletin 2014, A Report by the Skills and Labour Market Research Unit (SLMRU) in SOLAS for the Expert Group on Future Skills Needs, highlighted difficulties in filling posts</p>
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		<p>requiring engineering skills in quality and validation, project management and production planning.</p> <p>Shortages have also been identified of technicians capable of working on advanced machinery that combines mechanical, electrical, electronic and IT/software technologies (Future Skills Requirements of Manufacturing Sector to 2020, Forfás, 2012) (The National Skills Bulletin 2014, (SLMRU) SOLAS).</p> <p>Manufacturing firms have requested that their engineers need to have the core skills associated with one or other of the main engineering disciplines, such as mechanical engineering (Future Skills Requirements of Manufacturing Sector to 2020, Forfás, 2012). The structure of these programmes, built on a core of Mechanical Engineering, addresses this requirement.</p>
13.	<b>Potential Demand for Entry:</b>	It is proposed to initially offer 20 places on the Level 7 award.
14.	<b>Stakeholder Engagement:</b>	A range of employers were consulted as was the Irish MedTech Association as part of the development of this programme. Feedback confirmed the need for a manufacturing focussed programme.
15.	<b>Graduate Demand:</b>	<p>Graduates from the HC in Manufacturing Engineering and B.Eng. in Manufacturing Engineering degree will have the skills and experience necessary to build a career in:</p> <ul style="list-style-type: none"> <li>* Manufacturing Engineering;</li> <li>* Quality Engineering;</li> <li>* Lean / Six Sigma Engineering;</li> <li>* Production and Process Engineering;</li> <li>* Process improvement and Industrial automation;</li> <li>* Operations management, production planning and supply chain engineering;</li> <li>* Project management;</li> <li>* CAD / CAM and CNC specialists;</li> </ul>

		<p>* Facilities, maintenance and safety.</p> <p>Furthermore some graduates may become self-employed.</p>
16.	<b>Access, Transfer &amp; Progression:</b>	<p>Entry shall be in accordance with GMIT code of Practice No 4 Access, Transfer and Progression. Applicants will have to meet the standard entry requirements for a level 6/7 programme at any given time.</p> <p>Students in other programmes in the Department of Mechanical &amp; Industrial Engineering may transfer into the Manufacturing Engineering programmes up to the start of year 2. Depending on the maths and engineering science modules taken and/or the level achieved in these modules by Manufacturing Engineering students they may be facilitated in moving into other programmes within the Department.</p>
17.	<b>Programme Structure:</b>	<p>Year 1 of the programme is highly common with the first year of other programmes within the Department to allow for enhanced flexibility of student pathways. The programme is semesterised with a work placement in semester 6.</p>
18.	<b>Learning, Teaching &amp; Assessment Strategies:</b>	<p>Active learning will be a key feature of this programme. Active learning is a mode of instruction, which focuses the responsibility of learning on the learner, the key features of which include: less “chalk and talk”, and more student involvement. Student involvement is accomplished by involving the student in “doing things” and participating in the manner that is best suited to their individual learning styles.</p> <p>Where possible, traditional laboratories and tutorials will be replaced with problem based learning, project based learning, and experience based learning teaching methods.</p> <p>In designing the programmes, the programme board considered the balance between continuous assessment and terminal examinations. They also ensure that a range of assessment methodologies are utilised as appropriate to assess the module and programme learning outcomes, and to develop transferable skills.</p>

19.	<p><b>Resource Implications:</b></p>	<p>GMIT currently offers Level 7 and Level 8 Degrees in Mechanical and Energy Engineering. It is envisaged that the cohort of students on these proposed programmes will not only share common modules with the current programmes but will share lecturing, laboratory, workshop and support facilities.</p> <p>Replacing a group of Mechanical Engineering (intake of 20 students in year 1) by one group of Manufacturing Engineering will require a 0.72 post for the three years of the Programme (total of 50 students).</p> <p>If the group was to be created in addition to the current intake, then 3 additional posts would be required for the roll out of the Programme in GMIT. A second group will require an additional 2.33 posts in both situations. For the second group, student numbers would increase at a rate of 23 students per academic staff.</p> <p>The present reference library stock and journal subscriptions will have to be increased to reflect the specific requirements of Manufacturing Engineering. The estimated cost of this material is €5,000. However, the e-learning resources (subscription or reference databases etc.) are sufficient and appropriate for the proposed programme.</p> <p>In general, the physical resources and support facilities currently available on the Galway Campus will be adequate for the generic needs of the programmes; however, it is envisaged that there will be a need to invest in the workshop and automation laboratories for all departmental programmes. It is envisaged that these facilities will be upgraded for the new manufacturing apprenticeship programme and can be shared with the proposed programmes.</p> <p>A dedicated project room is required and should be populated by adequate computer system, printers and plotters. The anticipated cost of this equipment is €20,000.</p> <p>It is anticipated that the financial costing of offering the proposed programme is €25,000 (library and project room equipment) in direct cost and the provision of a dedicated space for self-directed learning.</p>
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20.	Synergies with Existing Programmes:	The Manufacturing Engineering programmes are designed to have high commonality with existing or newly proposed programmes within Mechanical & Industrial Engineering Department.	
21.	Findings and Recommendations:	<b>General:</b>	
		The panel welcomed the addition of manufacturing engineering programmes to the suite of programmes offered by the Department of Mechanical and Industrial Engineering, and approve the programme with the following recommendations:	
		<b>Special conditions attaching to approval (if any):</b>	
		None.	
<b>Recommendations of the panel in relation to award sought:</b>		<ol style="list-style-type: none"> <li>1. Consider the inclusion of the word 'design' in the title to reflect the strength of the programme in relation to design. This may enhance the attractiveness of the programme to second level students.</li> <li>2. Include an introduction to processing of materials within the first two years of the programme, before students reach Polymers in year 3. Manufacturing engineers should be very familiar with diverse types of materials, their merits, and processing.</li> <li>3. Ensure students are very clear about the expectations of them during work placement and the assessment of same.</li> <li>4. Ensure that the resources required to successfully deliver the programme are made available.</li> </ol>	
22.	FAO: Academic Council:		
		<b>Approved:</b>	
		<b>Approved subject to recommended changes:</b>	x
		<b>Not approved at this time:</b>	
	<b>Signed:</b>		
			
		<b>Chair</b>	<b>Secretary</b>