

Panel Report Phase 2, Programmatic Review of Schools of Engineering,
School School of Mechanical, Electrical and Process Engineering
Department Department of Mechanical, Biomedical and Manufacturing Engineering
Date 22 – 23 April 2015

Programmes Submitted for Review

Major Awards:

Higher Certificate in Engineering in Mechanical Engineering
Bachelor of Engineering in Mechanical Engineering
Bachelor of Engineering (Honours) in Mechanical Engineering

Higher Certificate in Engineering in Biomedical Engineering
Bachelor of Engineering in Biomedical Engineering
Bachelor of Engineering (Honours) in Biomedical Engineering

*Bachelor of Engineering (Honours) in Advanced Manufacturing Technology**
*Bachelor of Engineering (Honours) in Process Plant Technology**

NFQ8 Diploma in Mechanical Engineering Systems
Master of Engineering in Mechanical Engineering

Special Purpose/Minor Awards:

NFQ 6 Certificate in Mechanical Science
NFQ6 Certificate in 3D CAD and Solid Modelling
NFQ8 Certificate in Manufacturing Systems Design
NFQ8 Certificate in Process Plant Systems
NFQ8 Certificate in Project Management
NFQ7 Lean Sigma Green Belt
*NFQ7 Lean Six Sigma Black Belt***
NFQ7 Certificate in Automation and Control Systems
NFQ7 Certificate in Biomedical Device Manufacture
NFQ6 Certificate in Introduction to Sustainable Energy
NFQ6 Certificate in Sustainable Energy Systems

** Proposed change from Bachelor of Science (Honours)*

***Proposed title change to Lean Sigma Black Belt*

Department of Construction Sub-Panel

Chairperson: Mr Robert Simpson,
Assistant Head of School,
School of Mechanical and Design Engineering,
Dublin Institute of Technology,
Bolton Street.

Panel Members
Dr Garret O'Donnell

Assistant Professor
Mechanical & Manufacturing Engineering
Trinity College Dublin

Dr Catherine Frehill,
Office of the Registrar & Vice President for Academic Affairs,
Cork Institute of Technology

Programme Staff

Dr Ger Kelly, Head of Department, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Daithí Fallon, Head, Centre for Advanced Manufacturing & Management Systems
Ms Jackie English, Department of Mathematics
Mr Dan O'Brien, Department of Mechanical Biomedical and Manufacturing Eng.
Ms Máire Begley, Department of Biological Sciences
Ms Maretta Brennan, Department of Mathematics
Mr Richard Sheehy, Department of Mathematics
Mr David Lynch, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Declan Cuskelly, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Hugh O'Donnell, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Paul Keane, Department of Mechanical Biomedical and Manufacturing Eng.
Dr Lorraine Howard, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Michael O'Mahony, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Bernard O'Callaghan, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Michael Walsh, Department of Mechanical Biomedical and Manufacturing Eng.
Dr Keith Bryan, Department of Mechanical Biomedical and Manufacturing Eng.
Ms Sally Bryan, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Sean F O'Leary, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Tony Kelly, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Jim Calvey, Department of Mechanical Biomedical and Manufacturing Eng.
Mr Derry O'Hare, Department of Mathematics
Dr, Maryna Lishchynska, Department of Mathematics
Mr Sean Williams, Department of Mechanical Biomedical and Manufacturing Eng.

Learner Representatives

Current Students

Mr Eoghan Every, MEng in Mechanical Services
Ms Jessica Grant, B. Eng. in Biomedical Engineering, year 3
Ms Emma O'Leary, B. Eng. in Biomedical Engineering, year 3
Mr John Morrissey, B. Eng. in Biomedical Engineering, year 3
Mr Rory Clarke, B. Eng. in Mechanical Engineering, year 3
Mr William Ahern, B. Eng. in Mechanical Engineering, year 3
Mr Marcus Ryan, B. Eng. (Hons) in Mechanical Engineering, year 4
Mr Damien Dennehy, B. Eng. (Hons) in Mechanical Engineering, year 4
Ms Aisling Coleman, B. Eng. (Hons) in Biomedical Engineering, year 4
Mr Kevin Condon, B. Eng. (Hons) in Biomedical Engineering, year 4
Mr David Kitteringham, B. Sc. (Hons) in Process Plant Technology

Graduate Representative

Ms Lauren Clancy, Bachelor of Engineering in Biomedical Engineering, 2013
Mr Tim O'Leary, Bachelor of Engineering (Honours) in Biomedical Engineering, 2014
Mr Michael Breen, Bachelor of Engineering (Honours) in Mechanical Engineering, 2014
Mr Maurice Malone, Bachelor of Engineering (Honours) in Mechanical Engineering, 2013
Mr Brian Hand, Bachelor of Engineering (Honours) in Mechanical Engineering, 2014
Mr Darren Dawson, Bachelor of Engineering (Honours) in Biomedical Engineering, 2013
Mr Patrick Byrnes, Bachelor of Engineering (Honours) in Mechanical Engineering, 2013
Mr Sean Walsh, Bachelor of Science (Honours) in Advanced Manufacturing Technology, 2005
Mr Eoin O'Callaghan, Bachelor of Science (Honours) in Advanced Manufacturing Technology, 2006

Employer Representatives

Mr Eoin O'Callaghan, DePuy Synthes
Mr Jerry Larkin, GE Healthcare
Mr Brian O'Connell, Cork University Hospital

Overall Recommendation on Revalidation

The Panel recommends continuing validation of the

Higher Certificate in Engineering in Mechanical Engineering
Bachelor of Engineering in Mechanical Engineering
Bachelor of Engineering (Honours) in Mechanical Engineering

Higher Certificate in Engineering in Biomedical Engineering
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NFQ6 Certificate in Sustainable Energy Systems

for a further period of five years, subject to the implementation of all requirements and ensuring the earliest possible implementation of the recommendations set out below.

** Proposed change from Bachelor of Science (Honours)*

***Proposed title change to Lean Sigma Black Belt*

Background

The Department of Mechanical, Biomedical and Manufacturing Engineering comprises 23 whole-time academic staff, supplemented by staff from other departments as necessary. There are currently 604 full-time and 525 part time students engaged in a range of programmes.

The primary focus of the department is to provide students with the opportunity to pursue appropriate mechanical engineering educational opportunities at all levels. The Department values its links with the relevant professional bodies and emphasises the importance of professional body accreditation of its programmes. Programmes offered by the Department are accredited by Engineers Ireland and the Department will continue to maintain its accreditation to ensure the optimum employability and professional standing of its graduates. Both level 7 programmes in Mechanical and Biomedical engineering were reaccredited by Engineers Ireland in October 2014 for a further 5 years.

The Department continues to deliver conversion, preparatory or bridging programmes, and suites of industry focused short courses or special purpose awards (SPA) predominantly offered through the Centre for Advanced Manufacturing Systems (CAMMS).

In addition the Department of Mechanical, Biomedical and Manufacturing Engineering also offers research Masters and PhD degrees. The Department has a significant number of research active staff who collaborate across the faculty with research centres such as NIMBUS, MEDIC and Halpin. In addition to Full Time postgraduate students the department supports research based Masters students in industrial settings. Currently the department has four full time PhD students, two M.Eng. students (Masters by research), and is co supervising 2 further PhD students.

The most significant programme developments in the department since the previous Programmatic Review include:

1. The launch of Taught Masters in Mechanical Engineering. This development has been primarily driven by student demand to progress to postgraduate level studies and advance their skills and knowledge in specialist areas. It has provided the opportunity for students from to progress to Level 9 Masters Studies in CIT.
2. The development of eleven minor awards ranging from NFQ level 6 to 8 – listed above for revalidation. The department has continued to respond to the needs of industry and Government initiatives (e.g. Springboard) by developing tailor made individual programmes.

Programme Changes Proposed

Since the last Programmatic Review, the Department has availed of the module and programme amendment processes to regular review and update their offerings.

Higher Certificate in Engineering in Mechanical Engineering

Bachelor of Engineering in Mechanical Engineering

The most significant structural change from the existing programme structure has been bringing forward the maths stream of modules in their entirety by one semester. Therefore maths is introduced in semester 1 rather than semester two in previous years. In addition one of the current Stats Modules STAT7003 has been replaced with a new module “Intro to Probability and Stats” in semester 4 with an elective “The Truth with Data Analysis Elective (New)” in semester 6. Therefore

in semester 5 there is the potential for a student to take a mandatory Maths module and an elective Statistics module.

The following are the changes proposed as part of this review

Year 1: Module Swap: Tech. Maths 1 (MATH6014) (M) replaces Mechatronics 1 (MECH6017) (M)
Module Status: COMP6014 (ICT for Eng Techs) (M) becomes Elective
Stage Change: MATH6015 (Tech. Maths 2) (M) from Year 2
Additional Electives: PHYS6025 (Introduction - Process Control)

Year 2:
Additional Electives: ELEC6031 (Electrical Principles 1), STAT7003 (Technological Maths 302), STAT6010 (Intro. To Probability and Stats)

Year 3:
Additional Electives: INTR6018 (Microcontroller Applications), ELEC7017 Electrotechnology for Mech L7), The Truth with Data Analysis, INTR7011 (Biomedical Electronics)
New Module: Intro to SCADA & Robotics

Higher Certificate in Engineering in Biomedical Engineering
Bachelor of Engineering in Biomedical Engineering

The most significant structural change from the existing programme structure has been bringing forward the maths stream of modules in their entirety by one semester. As outlined above maths is introduced to learners in semester 1.

The following are the changes proposed:

Year 1:
Module Removed: COMP6014 (ICT for Eng Techs)
New Module: MECH6040 (Intro 3-D Parametric Modelling)
Stage Change: MATH6015 (Tech. Maths 2) (M) from Year 2
Module Removed: PHYS6009 (Instrumentation & Measurement) (M) to stage 2

Year 2:
New Module: MECH6021 (3-D Mech Analysis & Design) (M), PHYS6009 (Instrumentation & Measurement) (M) from stage 1
Module Removed: BIOE6005 (Biomedical Graphics & Design) (M), BIOE6004 (Biomedical Devices) (M) to stage 3
Electives (New): STAT7003 (Technological Maths 302), STAT6010 (Intro. To Probability and Stats)

Year 3:
New module: BIOE6004 (Biomedical Devices) (M) stage 2, BIOE7004 (Biomedical manu) (M)
Electives (New): The Truth with Data Analysis
Status Change: INTR7011 (Biomedical Electronics) now Elective
Module Removed: BIOE8001 (Biomedical Manufacture) (M)

Bachelor of Engineering (Honours) in Mechanical Engineering

Year 1:

Module Removed: INTR6012 (Energy Resources & Conversion) (E)

Year 2:

Module Removed: INTR7008 (Solar Energy) (E)

Year 3:

Module Removed: MECH8022 (Energy Power Systems) (E),
INTR8011 (Instrumentation for Sensors) (E)

New Electives: MANU8004 (Manufacturing Systems), Metrology Systems

Year 4:

Module Removed INTR8018 (Energy Systems Modelling) (E)

New Electives: INTR8021 (Energy Systems Modelling),
INTR8011 (Instrumentation for Sensors) (E)

Bachelor of Engineering (Honours) in Biomedical Engineering

The following changes are proposed:

Year 1:

Module Removed: MECH6006 Engineering Workshop Practice (M) to stage 2 (E)

New Module: BIOE7005 Biomedical Eng. Design 1 (M) from stage 2

Year 2:

Module Removed: BIOE7005 Biomedical Eng. Design 1 (M) to stage 1

Status Change: MECH7007 (Manufacturing Technology) from E to M

New Elective: MECH6006 (Engineering Workshop Practice)

Semester 4 – elective option removed: BIOE7007 (Biomedical Instrumentation 1)

New Module: Biomedical Eng. Design 8.3 (M)

Year 3:

Module Removed: INTR8011 (Instrumentation for Sensors) (E)

New Module: MANU8001 (Advanced Materials and Processes) (E) from elective semester 7

Year 4:

Module Removed: MANU8004 (Manufacturing Systems) (E)

New Module: INTR8011 (Instrumentation for Sensors) (E) from semester 5

Bachelor of Science (Honours) in Advanced Manufacturing Technology

The Department proposes to change the classification of the award from Bachelor of Science (Honours) to Bachelor of Engineering (Honours).

Year 4: New Module: Metrology Systems (E)

Bachelor of Science (Honours) in Process Plant Technology

The Department proposes to change the classification of the award from Bachelor of Science (Honours) to Bachelor of Engineering (Honours).

Year 4: New Module: MANU8004 Manufacturing Systems (E)

NFQ8 Diploma in Mechanical Engineering Systems

Year 1:

Modules swapped: MECH8007 (Fluid Mechanics) (M) from 1 to 2
MECH8008 (Heat Transfer) (M) from 2 to 1
New Module: MECH8014 (Mechatronics System Design) (E)

Master of Engineering in Mechanical Engineering

Semester 2:

New Modules: MECH8028 Advanced PLC Programming (E)
MECH8029 Integrating Mechatronics (E)
PHYS8020 Advanced Process Control (E)

Modules Removed: CHEP8027 Industrial Control Systems (E)

NFQ 6 Certificate in Mechanical Science

No programme-level changes proposed. Mechanical Engineering modules MECH6035 and MECH6036 descriptors updated.

NFQ6 Certificate in 3D CAD and Solid Modelling

No programme-level changes proposed. Module descriptors not updated.

NFQ8 Certificate in Manufacturing Systems Design

No programme-level changes proposed.
Module descriptors updated: MANU8007, MANU8002, MANU8003 and MECH8019.

NFQ8 Certificate in Process Plant Systems

No programme-level changes proposed.
Module descriptors updated: MANU8007 and MANU8003.

NFQ8 Certificate in Project Management

No programme-level changes proposed. Module descriptors not updated.

NFQ7 Lean Sigma Green Belt

No programme-level changes proposed. Module descriptors not updated.

*NFQ7 Lean Six Sigma Black Belt**

Title change proposed: Lean Sigma Black Belt

No programme-level changes proposed. Module descriptors not updated.

NFQ7 Certificate in Automation and Control Systems

No programme-level changes proposed. Module descriptors not updated.

NFQ7 Certificate in Biomedical Device Manufacture

No programme-level changes proposed.

BIOE7004 descriptor updated. BIOE7011 not updated.

NFQ6 Certificate in Introduction to Sustainable Energy

No programme-level changes proposed. Module descriptors not updated.

NFQ6 Certificate in Sustainable Energy Systems

No programme-level changes proposed. Module descriptors not updated.

Commendations

In our interactions with students, graduates and employers, the programmes and staff of the Department were universally praised. In particular, students and graduates commended the Innovative Product Laboratories modules and the project modules. The panel would like to commend the programme teams on their engagement with the A Good Start initiative and PALS module.

The hard work of the staff in preparing the documentation for the panel review is acknowledged and the positive attitude and enthusiastic engagement with the panel is noteworthy.

Based on the overall sense from the past graduates and the employers, it is clear that the programmes are held in high esteem and positions graduates well to succeed in industry or further research. It was also noted that the feedback from employers and industry was taken on-board by the Department and this is to be commended.

The investment in up to date facilities and the upgrading of equipment is another strong feature of the programme and is to be encouraged, in particular the mechatronics, and robotics were impressive labs. Considering the industry base in the Cork region it is critical that the students have exposure to as much state of the art technology as possible.

The lecturers should also be commended for their willingness in offering a Masters level 9 course, noting the technical competence of the staff in developing level 9 content and their willingness to take on this additional work.

Requirement

1. The panel **requires** that the assessment regime of each module be reviewed to ensure that issues such as timing of assessments, over-assessment and repeat assessments are addressed.
2. The panel **requires** that the Recommended and Pre-requisite modules section for each module be reviewed to ensure that the modules specified are appropriate.
3. The panel **requires** that proposed module titles incorporating numbers be reviewed and new titles be proposed where appropriate.
4. The panel **requires** that the repeat the module reassessment be applied to modules where Health and Safety are of concern.

5. The panel **requires** that the department review Semester schedules to remove the Group Elective format where unnecessary and the Free Choice module added in the appropriate semesters.
6. The panel notes the substantial number of modules which are being moved between stages across the programmes. The panel notes that much of this material is central to the programme. The panel is concerned that potentially students may miss this material in the interim period between the current approved schedule and the proposed schedule being fully enacted. Thus the panel **requires** that a full set of transition schedule for stages 2, 3 and 4 of the programmes be developed for the number of years that it takes to transition to the proposed course schedule. These schedules should be accompanied by proposed arrangements to put be in place for legacy and repeat students.

Recommendations

The panel recommend the following

1. The department should continue to research the feasibility of developing an integrated five year master's programme. This is critical to the ongoing success of CIT who together with DIT are the only institutions in the IOT sector that had L8 accreditation in Mechanical and Manufacturing programmes. This is a very important issue also considering the proximity to UCC and other significant changes expected in the third level sector. A key issue in the success of the level 9 integrated taught masters will be the standard of the incoming students and the department should consider transfer, progression and award criteria in detail.
2. Based on the limited understanding of the recent graduates, and the complete misunderstanding of the current students interviewed, the panel recommends that the department should explain Engineers Ireland Accreditation of programmes to learners, and the significance of becoming a Chartered Engineer.
3. Considering the industry base in the region around Cork, the panel recommends that the equipment in the department should be updated to reflect latest state of the art. While it is clear that it will not be possible to always have latest machine tools etc., it is important in the Department to have latest/recent machine tools, 5 axes milling, additive machines for metal additive manufacturing, precision turning and grinding, with appropriate inspection systems. The panel recommend that the Department take a critical look at this issue and try to secure the appropriate resources to procure this equipment. The Cork region has the greatest density of metal cutting industry on the Island of Ireland.
4. The core of Mechanical Engineering appears to have dependencies on service teaching from other departments, it is recommended that the department look at the profile of the staff required to deliver the programme with a strong core staff and perhaps the School can then make strategic appointments.