

Programmatic Review of the School of Mechanical, Electrical & Process Engineering (Phase 2)

Department of Process, Energy & Transport Engineering

22nd – 23rd April, 2015

Process Engineering Programmes Reviewed:

MAJOR AWARDS

Higher Certificate in Science in Good Manufacturing Practice and Technology
Bachelor of Science in Good Manufacturing Practice and Technology
Bachelor of Engineering (Honours) in Chemical and Biopharmaceutical Engineering
Master of Engineering in Chemical and Biopharmaceutical Engineering

SPECIAL PURPOSE AWARDS

Certificate in Biopharmaceutical Manufacturing Operations
Diploma in Biopharmaceutical Manufacturing Operations
Certificate in Food Manufacturing Operations
Certificate in Biopharmaceutical Processing
Certificate in Chemical Process Safety
Certificate in Chemical and Biopharmaceutical Process Operations
Certificate in Process Industries Advancements and Innovation
Postgraduate Certificate in Professional Practice

Process Engineering Sub-Panel:

Dr Jenny Lawler, Lecturer, School of Biotechnology, Dublin City University
Frank Riederwald, Process Engineering Consultant
Dr Stephen Cassidy, Dean of Academic Quality Enhancement, CIT

Programme Representatives:

Dr Michael J O'Mahony, Head of Department of Process, Energy & Transport Engineering
Noel Duffy, BE, CEng, MIChemE, FIEI
Aisling O'Gorman, BEng, PhD, AMIChemE
Cilian Ó Súilleabháin, BE, MA, CEng, MIEI
Patrick Kennedy, BE, MSc, CEng, FIChemE, MIEI
Sandra Lenihan, BSc, PhD
Ian O'Sullivan, BEng, MEngSc, HDip(Biopharma)
Caroline O'Sullivan, BSc, MSc, PhD
Mary Quirke, BSc, MSc
Ann Toebes, BSc, PhD,

Panel Findings, Requirements and Recommendations

1 Good Manufacturing Programme Stream

The Pharmaceutical, biopharmaceutical, medical device and food sectors are major contributors to the success of the Irish economy. Their continuing success, which is predicted to grow, generates a need for technically qualified personnel and offers significant career opportunities for technically qualified staff. These sectors include multinational and high profile Irish companies. Two programmes leading to major awards were reviewed as part of this programmatic review, namely, the Higher Certificate in Science in Good Manufacturing Practice and the Bachelor of Science in Good Manufacturing Practice and Technology.

1.1 Higher Certificate in Science in Good Manufacturing Practice and Technology

This programme, which emphasises Good Manufacturing Practice and Technology, is designed to attract students seeking success in the pharmaceutical, biopharmaceutical, medical device and food sectors. The programme is an 18 month accelerated programme encompassing eighteen modules delivered over three academic semesters. Six modules are delivered in Semesters 1, 2 and 3. Modules have 3 or 4 hours contact with the time split between practicals and lectures. All semesters are 15 weeks in duration and there is a 12 week placement at the end of semester 2. A number of electives are available in semesters 2 and 3 to suit the interests of the individual students.

There is currently no entry onto this programme via CAO. Usually the student cohort comprises a mix of graduates, recently redundant workers, long term unemployed and further education graduates. The vast majority of students on this course are over 23 years of age.

A number of changes to the structure and operation of the Higher Certificate were made in September 2014 having been approved by Academic Council. The list below outlines the key changes:

1. Updating modules to ensure currency.
2. Replacing certain modules with equivalent modules from the Biological Sciences, Physical Sciences and Maths Departments as outlined in Table 1. The reason for this was to achieve improved delivery efficiencies, where the students share modules with other science students.

Module in current approved programme	Module which has been replaced
Biomolecules and Cells (BIOL6007)	Mammalian Cell Biology (BIOL6014)
Chemical Principles (CHEM6002)	Fundamentals of Chemistry (CHEI6001)
Microbes, Energy and the Environment (BIOM6001)	Introduction to Microbiology (BIOM6002)
Essential Mathematical Skills (MATH6000)	Applied Maths for Manufacturing Operations (MATH6009)

Table 1 Higher Certificate in Science in GMP & Technology modules replaced with equivalent modules in September 2014.

1.2 Bachelor of Science in Good Manufacturing Practice and Technology

The principal aim of this programme is to develop the knowledge, skills and competences of people wishing to progress to team lead and higher levels in production, quality assurance or validation roles within leading pharmaceutical, biopharmaceutical and medical device manufacturing companies. The programme is an add-on course to the Higher Certificate Science in Good Manufacturing Practice and Technology.

The changes proposed in this programmatic review include:

1. Updating modules to ensure currency and reflect recent trends.
2. Sequencing mandatory and elective modules over the programme's cycle.
3. Adding free choice electives to broaden the student's learning.
4. Adding a Food Processing elective in the course schedule.

1.3 Feedback from stakeholders

The panel met with students, graduates and employers associated with the two programmes. In general,

- a) For both programmes, students were very positive in regard to their overall learning experience. In particular, they praised the support they received from their programme teams.
- b) Students of the Higher Certificate viewed the work placement module as a key element of the programme. They believed that this module offered them the opportunity to gain valuable work experience in their preferred industry with the potential to subsequently gain employment after graduation often with their work placement company. Students felt that a larger work placement module would make them more attractive to companies looking for placement students.
- c) Furthermore, students felt that if the work placement module took place in the last semester of the programme, that companies would be more likely to extend their contracts potentially leading to full-time employment.
- d) Students felt that preparation for aptitude tests, cv and interview preparation etc. would be useful.
- e) Graduates of the programmes who formerly worked in the construction industry felt that the programmes gave them the necessary skills to find employment in the pharmaceutical industry. They commented that more emphasis on Right First Time / Documentation / technical writing would be of benefit for future graduates entering employment.
- f) Employers were broadly supportive of the programmes. Communication skills, both presentation and technical writing, were areas where they felt graduates could show improvement.

1.4 Requirements, Recommendations and Commendations

1. The Panel would like to **commend** the programme board on their open and transparent engagement with the review process and on their hard work, efforts and enthusiasm evident in relation to the delivery of the programmes. The panel also **commends** the overall quality of the documentation presented in relation the programmes and the associated modules.
2. On review of the programme documents and discussion of the programmes with the programme teams, the Panel **recommends to Academic Council that the Good Manufacturing Programmes listed be revalidated** for a period of five years or until the next Programmatic Review, whichever is sooner, subject to implementation of any panel requirements and successful completion of the module moderation process.

3. The panel **recommends** that the programme team investigate the duration and positioning of the work placement module within the Higher Certificate programme. The panel is cognisant that any change to the current work placement model may be difficult to implement due to the constraint of an eighteen month delivery period for the programme.
4. The panel **recommends** that the programme team review the development of communication skills of graduates within the programmes

2. Process Engineering Stream

2.1 Bachelor of Engineering (Honours) in Chemical and Biopharmaceutical Engineering

The programme aims to produce broad-based, professional chemical and biopharmaceutical engineers who will become responsible for the areas of Design, Development, Research, Production and Maintenance. A strong emphasis is placed on practical application of chemical engineering fundamentals throughout the course, without compromising a high academic standard. The range of subjects has been chosen to enable graduates to enter all sectors of industry. The programme is accredited by the Institution of Chemical Engineers (IChemE).

The traditional entry mechanism for school leavers is via the CAO process. In recent years, CIT has also introduced a 'Common Entry' Engineering programme for school leavers which allows students to spend a year studying various engineering disciplines (including Chemical and Biopharmaceutical Engineering) before deciding which programme to join in their second year. Mature student entry to later stages of the programme is evaluated on a case by case basis, with students joining stage 2 or stage 3 of the programme depending on their background and experience. Recently the department has formalised this process by offering a suite of modules (60 credits) to Level 8 graduates of science and engineering. Completion of these credits entitles students to 'qualify' into stage 4 of the B.Eng. (Hons) in Chemical and Biopharmaceutical Engineering programme.

Table 2 shows the direct entry statistics to the programme. It may be seen that over the last two years there is an upward trend in terms of the number of students recruited and the final cut-off points for the programme. Based on the latest CAO data, the programme team are confident that this upward trend will continue for the forthcoming academic year.

	08/09	09/10	10/11	11/12	12/13	13/14	14/15
Final Cut-off	350	375	360	395	335	360	410
Mid-point1	450	450	450	470	470	475	495
<i>Year 1 Registrations</i>	26	15	14	9	11	15	19

Table 2 CAO Entry Points - Direct Entry to B.Eng. (Hons) Chemical and Biopharmaceutical Engineering

Since 2007/08 a number of modules have been replaced by similar modules to facilitate cost saving within the institute by module sharing across cognate programmes. The replacement of these modules has had negligible impact on programme outcomes.

2.1.1 Proposed Programme Changes

The biggest proposed structural change to the programme relates to semesters 6 and 7. Heretofore students undertook a 10 credit placement in semester 6 which was facilitated by the students covering the 20 credits of taught modules in an 8 week block prior to taking up employment. This situation is deemed by the programme team to be wholly unsatisfactory due to the condensed nature of the lecture delivery and assessment deadlines. It is proposed that the students will spend the entire 7th semester in industry with 15 credits being allocated to the placement and the remaining 15 credits being allocated to the completion of an industrial research project. The increase of both the placement and research elements by 5 credits each is facilitated by reducing the weighting on the design project in semester 8 from 15 credits to two 5 credit design projects (one group and the second an individual detailed design project) and the removal of one of the elective options from the final stage of the programme. The programme team feel that with the student on placement for the entire seventh semester that, in effect, the student could be placed with the company from June to the start of February, a period of up to eight months. This would be a unique selling point for the programme in terms of marketing the programme and would be attractive to companies.

Table 3 overleaf gives a summary of proposed changes to the programme.

2.1.2 Derogations

2.1.2.1 Compensation

This programme is accredited the Institution of Chemical Engineers (IChemE). New accreditation requirements stipulate that programmes allowing compensation may only be accredited if there is a maximum of 10 ECTS compensation in the final stage of the programme.

4.1.2.2 Free Choice Elective – Semester 8

For accreditation purposes, programmes seeking accreditation must meet a minimum credit threshold of advanced chemical engineering. The programme team request that the free choice elective option be removed from Semester 8 to allow this credit threshold to be met.

2.1.2.3 Award Classification

The programme team wishes to propose that the classification of award results be based on a weighted 25% third year, 75% final year. The purpose of this award classification criteria is to adjust the "out of CIT project and placement" / taught module balance in final year, due to the new Semester 7 in industry.

Module changes within Stages				
	Stage	Module	From	To
1	2	CHEP7006 Particulate Systems	4	3
2	2	CHEP8009 Equipment Design	3	4

Module changes between Stages						
	Stage	Sem	From Stage	From Semester	Module	Rationale
3	2	4	4	7	CHEP8016 Process Energy Analysis	Free space for introduction of work placement into Stage 4
4	3	5	4	7	STAT8004 Statistics 4302	Move to earlier in the programme to support projects
5	3	6	2	4	CHEP7004 Control & Instrumentation	
6	4	7	3	6	CHEP8021 Work Placement (10 ECTS)	Work placement moving to Stage 4 with increased ECTS size
7	4	8	3	6	CHEP8014 Process and Properties Analysis	

Replacing Modules				
	Stage	Current Module	Replacement Module	Note
8	2	MECH6012 Material Science and Eng.	MECH6009 Engineering Mechanics (E)	The material relevant to chemical engineers from MECH6012 will be incorporated into CHEP8009 Equipment Design. Some material relating to mechanics will be removed from CHEP8009 to facilitate the addition of new material. MECH6009 Engineering Mechanics will be added to the programme as an elective.
9	2	MATH7015 Numerical Methods 1 (E)	CHEP8018 Process Modelling (E)	Standard numerical methods replaced with similar module necessitating unique delivery
10	3	CHEP8021 Work Placement (10 ECTS)	CHEP8023 Chemical Process Safety	
11	4	Research Project (10 ECTS)	Industrial Project (15 ECTS)	
12	4	CHEP8006 Design Project (15 ECTS)	CHEPXXXX Detailed Design Project (5 ECTS) CHEP8006 Group Design Project (5 ECTS)	

Miscellaneous					
		Stage	Semester	Module	Note
13	Additional Elective	4	8	CHEP8026 Process Tech Transfer	
14	Removed Module	4	8	CHEP8026 Process Tech Transfer	Material covered in CHEP8023 Chemical Process Safety
		4	8	MECH9002 Computation Fluid Dynamics	Moved to elective on Masters programme
15	Module Designation	1	2	BIOT6003 Introduction to Ind Biotech	Elective to mandatory

Table 3 Summary of proposed programme changes to the Bachelor of Engineering (Hons) in Chemical and Biopharmaceutical Engineering

2.1.3 Feedback from stakeholders

The panel met with students, graduates and employers associated with the programme. In general,

- a) Students were very positive in regard to their overall learning experience. In particular, they praised the support they received from their programme team.
- b) Employers said that CIT graduates were on a par with graduates from other accredited chemical engineering programmes.
- c) Employers felt that possibly there could be more emphasis on biopharmaceutical engineering in the programme reflecting the title of the programme. At present, employers would tend to encourage graduates to undertake further courses of study to increase their knowledge of this sector.
- d) Graduates were happy with the programme and felt it prepared them well for their future careers.

2.14 Findings

In general, the panel found that the programme is comprehensive in its diversity and content, and is appropriate to a Level 8 Chemical Engineering degree. The fundamental principles are well represented, with advanced chemical engineering modules covered. It is clear that the programme team have taken on board suggestions from graduates and employers and external examiners, and are continually striving to enhance the programme delivered. Specific examples of this include the move of statistics from 4th year to 3rd year. The panel also found that the content of the programme is regularly reviewed and updated.

The module learning outcomes are generally clear and appropriate and, in general, are appropriately measured through the coursework/examination structure. Some concerns were expressed over the weighting of formal written exam in mathematics and statistics modules; while the students of course need to understand the theory, computer programmes are utilized in industry and perhaps assessment weighting should reflect this.

In relation to the proposed work placement and industrial project in the award stage, the panel spent considerable time discussing the proposal with the programme team and the various stakeholders. The panel heard universally from the various stakeholder groupings that the current work placement module is working well. Graduates of the current programme are highly sought after by industry with the majority of students attending job interviews in October of final year and receiving an offer of a job prior to sitting their semester 7 examinations. Students and graduates believe that under the current arrangement, student attending for interview are well positioned to talk to employers having completed their work placement. Students were concerned about their availability to attend interviews for other companies while on placement putting them at a disadvantage in respect to students from other HEIs. Employers are familiar with the current arrangement which they believe works well in terms of graduate recruitment cycle with the newly hired graduate engineer starting in September closing projects undertaken by the student during their placement. Employers also expressed a concern about interviewing students halfway through their placement and the effect on the student/fellow student/employer relationships if they were unsuccessful. Employers also expressed some reservations with respect to the proposed industry project. They would like to hear how the work of the student on

placement is to be divided between the work placement module and the proposed project. The current work placement module was also praised in the external examiner reports.

The panel would have been happy to approve current arrangement with respect to work placement if it had been proposed. It was clear that the programme team had put in considerable thought into how to affect a longer work placement module into their programme. In discussions, it became evident that a number of permutations of module and semester schedules had been considered to affect this change. The panel feels that moving from a 10 credit work placement module in the third stage of the programme to the present proposal where 30 credits of the award stage will be based in industry is significant. The panel raised concerns such as the increased need for a) formal student induction, b) formal employer induction and training in assessment and mentoring, c) ensuring fair and consistent opportunities to students across a broad range of companies, d) measures to be put in place where issues arise during the placement, e) processes regarding student repeat/deferral options etc. The programme team acknowledged that they will need to plan for these issues but pointed out that they had considerable experience of operating work placement and believe that the issues raised are not unsurmountable within the lead-in period of at least a year required to implement this change.

In respect to the derogation requests in relation to compensation and free choice in Semester 8, the panel reviewed the draft IChemE document "Accreditation of chemical engineering programmes – A guide for higher education providers and assessors based on learning outcomes". In this document it outlines minimum programme content (sec 4.1.3) and compensation strategy (sec 4.6). The panel were informed that this draft is at an advanced stage and is expected to be ratified shortly. The panel consider that professional accreditation of this programme by IChemE to be of the utmost importance and would support both of these derogation requests upon the adoption of abovementioned policy document.

The panel reviewed the derogation request with respect to award classification. The panel noted that, unusually, currently students tend to perform better in third year than fourth year. The programme team speculated that this may be the effect of work placement increasing the third year average or that students being less committed in fourth year having already secured employment. An analysis undertaken with a range of award classification profiles on student third and fourth year results on this programme for the last five years had minimal effect on the award classification achieved by the students. However the panel also notes that the practice of award classification by weighted averages is employed in other HEIs.

At module level, a number of issues were identified. A summary of the issues is given in the table overleaf. For each issue raised, a sample module is given to illustrate the point. The table does not attempt to give an exhaustive list of modules for each of the issues described.

<p>Reading Lists Update reading list to reflect current edition of recommended text book</p> <p>Recommended textbook not available</p>	<p>BIOL6007 CHEP6002 MATH6005 CHEM6001</p>	<p>Mader, S.S., "Biology", 2009, 10 ed - 11th ed now available Fogler .. "Strategies for Creative problem Solving", 1995 - 2014 edition now available Stroud, K.A. and Booth, D.J., "Engineering Mathematics", 5ed, 2007 – 7ed 2014 now available</p> <p>Burns, R. "Fundamentals of Chemistry", 4th ed, 2003</p>
<p>Assessment Coursework final submission date</p> <p>Coursework submission too close to final exam</p> <p>Possible over-assessment</p> <p>Terminal Exam with low weighting</p> <p>Assessment not adding to 100% (coursework missing)</p> <p>Re-assessment</p>	<p>CHEP8009</p> <p>CHEP7005</p> <p>CHEP7001</p> <p>CHEP8023</p> <p>CHEP8023 CHEP8016</p>	<p>Should be specified as Week 13 not Week 12</p> <p>Coursework submission specified in Week 12 for a module with a terminal exam</p> <p>Proposed assessment regime a) open book exam every 2 weeks b) Group Report Week 8 c) Group Project sem end d) individual report sem end</p> <p>Terminal exam valued at 30%</p> <p>Consider if re-attending the module is the only method of re-assessment where a student may have failed an individual assessment of the module</p>
<p>Recommended Modules Elective module specified for subsequent mandatory module</p> <p>Module specified which has been removed from the programme</p>	<p>CHEP7005</p> <p>CHEP8023</p>	<p>CHEP6002 specified as a recommended module</p> <p>CHEP8007 specified as a recommended module</p>
<p>Use of numbers in module titles (inferred sequencing)</p> <p>(semester number)</p>	<p>CHEP6003 CHEP6002</p> <p>STAT8004</p>	<p>CHEP6003 <i>Process Principles & Design 2</i> is a mandatory module in Semester 2 CHEP6002 <i>Process Principles & Design 1</i> is an elective module in Semester 3</p> <p>STAT8004 <i>Statistics 4302</i> is now proposed as a mandatory module in Semester 5</p>
<p>Module Valid From Dates Dates should read from start of academic year</p>	<p>CHEP8023</p>	<p>In September, programme and module information will not show approved version of modules with valid from dates specified later in the academic year</p>

2.1.5 Requirements, Recommendations and Commendations

2.1.5.1 Overall

1. Following a review of programme documentation and discussions with the programme teams and with learner, graduate and employer representatives, the Panel **approves** the changes to programmes and modules proposed by the department overall and **recommends to Academic Council that the Honours Bachelor of Engineering in Chemical and Biopharmaceutical Engineering be revalidated** for a period of five years or until the next Programmatic Review, whichever is sooner, subject to implementation of any panel requirements and successful completion of the module moderation process, and with all due regard for a timely implementation of the individual panel recommendations set out below.
2. The Panel would like to **commend** the programme teams on their open and transparent engagement with the review process and on their hard work, efforts and enthusiasm evident in relation to the delivery of the programmes. The panel also **commends** the overall quality of the documentation presented in relation to the programmes and the associated modules.

2.1.5.2 Programme Level

3. The panel **requires** that the current Group Elective format on the semester schedule be removed and the Free Choice module added in the appropriate semesters.
4. The panel **recommends** that the swapping of modules between semesters within the same stage be approved.
5. The panel **requires** that the module BIOT6003 Introduction to Ind Biotech remain as an elective on the programme.
5. The panel notes the substantial number of modules which are being moved between stages. 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 programme 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.
6. The panel notes the proposal to move the Advanced Module CHEP8016 Process Energy Analysis from Stage 4 of the programme to Stage 2. In discussions with the programme team it was said that the material would be taught in a different manner to reflect the module's new position within the programme. The panel feel that this new teaching paradigm should be reflected in the module descriptor. Thus the panel **requires** that an intermediate module be written addressing the content of the CHEP8016 module but with its learning outcomes and assessment regime aligned at intermediate level.
7. The panel notes the comments from a variety of stakeholders that the current arrangements in respect to work placement are working well. The panel believes that there are substantial reputational and operational risks to undertaking such a fundamental change to an established programme. The panel would ask the programme team to reflect whether the perceived benefits in terms of removal of short delivery modules and longer work placement outweigh these risks. With a full semester of learning associated with the award stage of a programme and in line with IChemE

requirements in respect to learning periods external to the Institute, the panel **requires** a robust quality assurance system for the work placement and associated industry project be put in place. This system to include, but not limited to, documented processes with regard to a) suitability of placement organization; b) induction of placement mentors in the workplace; c) supervision arrangements; d) arrangements where suitable placements are not available; e) arrangements where suitable projects within organisations are not available; f) learning agreements between CIT and placement organisation outlining the roles and responsibilities of each partner etc.

2.1.5.3 Module Level

8. The panel **requires** that the reading lists associated with modules of the programme be updated.
9. 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.
10. The panel **requires** that the Recommended modules section for each module be reviewed to ensure that the modules specified are appropriate.
11. The panel **requires** that proposed module titles incorporating numbers be reviewed and new titles be proposed where appropriate.

2.1.5.4 Derogations

12. Subject to confirmation that the current draft IChemE policy has been approved with the requirement that students may not compensate more than 10 ECTS in the award stage of the programme, the panel **recommends** that a special regulation to enact this requirement be formulated and submitted to Academic Council for approval.
13. Subject to confirmation that the current draft IChemE policy has been approved with the requirement that students must meet a minimum threshold of advanced chemical engineering credit, the panel **recommends** that programme receives a derogation from the requirement to incorporate a free choice elective in the award stage of the programme.
14. The panel notes the derogation request with respect to award classification for the programme. The panel are unsure as to what adjustment is required resulting from the new proposed semester 7 in industry. The panel **recommends** that the programme team carefully monitor the new programme implementation and, if after careful analysis, they consider that an adjustment to the manner in which award classification is undertaken is required that they bring a proposal to Academic Council for consideration.

2.2 Master of Engineering in Chemical and Biopharmaceutical Engineering

This programme is designed as an additional three semester add-on to a NFQ Level 8 Bachelor of Engineering (Hons.) in Chemical and Biopharmaceutical Engineering, or similar cognate programme. In Semester 1 the learners undertake six modules, each module worth five ECTS credits. In Semester 2 the learners take a further four modules, each worth five credits, and one module, Research Project Preparation (INTR9016), worth ten credits. In Semester 3 the learners complete the 30 credit Research Project Realisation (Dissertation) module.

The programme was approved by Academic Council in June 2011 following a review by an external expert panel. The programme to date has not been offered. However all modules on the programme

have been offered as part of either as a Special Purpose Award; Certificate in Process Industries Advancements and Innovation, delivered as a Springboard programme in 2013-2014 or on cognate masters programmes. The specialised Chemical and Biopharmaceutical Engineering modules were delivered on the above SPA with the more generic and research modules delivered on cognate masters programmes in Civil Structural and Environmental Engineering which have been running since 2010 and Mechanical Engineering which has been running since September 2013.

2.2.1 Proposed Changes

The programme team propose to add two further electives to Semester 2 of the programme, namely, PHYS8028 Advanced Process Control and MECH9004 Control System Design.

2.2.2 Requirements, Recommendations and Commendations

1. Following a review of programme documentation, the Panel **approves** the changes to programmes and modules proposed by the department overall and **recommends to Academic Council that the Masters of Engineering in Chemical and Biopharmaceutical Engineering be revalidated** for a period of five years or until the next Programmatic Review, whichever is sooner, subject to implementation of any panel requirements and successful completion of the module moderation process, and with all due regard for a timely implementation of the individual panel recommendations set out below.
2. The panel **requires** that a draft schedule for the programme be created on Akari Document reflect the proposed elective changes.
3. The panel **requires** that the reading lists associated with modules of the programme be updated.

2.3 Special Purpose Awards

2.3.1 Certificate in Biopharmaceutical Manufacturing Operations

The principal aim of this programme is to enhance the student's knowledge and skills base to improve their prospects when applying for employment in the pharmaceutical or biopharmaceutical sector at technician level in production, quality assurance or validation roles within leading pharmaceutical, biopharmaceutical, medical device or food manufacturing companies. The programme is at level 6 on the National Framework of Qualifications and attracts 55 ECTS credits.

The changes proposed in this programmatic review include:

1. CRAF6016 Fluids and Gases will replace CHEP7010 Transfer Processes 1. CHEP7010 Transfer Processes 1 and CRAF6016 Fluids and Gases cover similar content but the experience of delivering this module has shown that a level 6 module is more appropriate to the mathematical skills of the student intake cohort.
2. BIOM6003 Cleanroom Management will move from Semester 2 to Semester 1 to facilitate co-delivery with another cohort group.

2.3.2 Diploma in Biopharmaceutical Manufacturing Operations

This special purpose award provides an accredited qualification for people wishing to work in production, quality assurance or validation roles within Pharmaceutical/Biopharmaceutical manufacturing companies. Key topics addressed include GMP and Quality Assurance, Lean Manufacturing, Validation, Manufacturing Technology, Technology Transfer, Biopharmaceutical Upstream and Downstream operations. The programme is at level 7 on the National Framework of Qualifications and attracts 60 ECTS credits.

The changes proposed in this programmatic review include:

1. Technology Transfer (MGMT7047) – It is proposed to a) amend the learning outcomes, b) update the indicative content to and reduce the level of overlap with the Validation Science module (MANU7007), c) include a presentation in the assessment regime.

2.3.3 Certificate in Food Manufacturing Operations

This special purpose award provides an accredited qualification for people wishing to work in production, quality assurance or food safety management roles within Food manufacturing companies. Key topics addressed include GMP and Quality Assurance, Essential Mathematical Skills, Cells and Biomolecules, Transfer Processes, Thermofluids, Quality Assurance in Food Manufacturing and Food Processing. This programme is at level 6 on the National Framework of Qualifications and attracts 50 ECTS credits.

This programme is in its first year of delivery and no changes are proposed.

2.3.4 Postgraduate Certificate in Professional Practice

This programme is in its first year of delivery and no changes are proposed.

2.3.5 Certificate in Biopharmaceutical Processing

The principal aim of this programme is to upskill Bachelor of Engineering, Bachelor of Science and Higher Certificate graduates in the area of Biopharmaceuticals focusing on both upstream and downstream processing. This certificate will allow students to attain a knowledge and understanding of the principles of Biopharmaceutical processing and its underpinning science. The programme is at level 7 on the National Framework of Qualifications and consists of two 5 ECTS credit modules.

The changes proposed in this programmatic review include:

1. Modules (BIOT7005 and BITO7006) are updated to incorporate Single Use Technology/PAT and other recent trends.

2.3.6 *Certificate in Chemical Process Safety*

The programme is at level 8 on the National Framework of Qualifications and consists of two 5 ECTS credit modules, namely Chemical Process Safety (CHEP8023) and Chemical Safety Applications (CHEP8024).

No changes are proposed to this programme.

2.3.7 *Certificate in Chemical and Biopharmaceutical Process Operations*

This programme is at level 8 on the National Framework of Qualifications and attracts 60 ECTS credits. The programme provides an opportunity for level 6 graduates in engineering and science to take a suite of modules from the early stages of the Chemical and Biopharmaceutical (Honours) degree programme and the second year of the Higher Certificate in Science in Good Manufacturing Practice & Technology. This programme differs in content from the department's 'Good Manufacturing Practice' Level 6 offering as it immerses students in engineering concepts and technical aspects of manufacturing operations (fluid mechanics, heat transfer, biotechnology, manufacturing, solvent separation, process design etc). These modules serve to enhance the student's prospects when applying for employment as a process operator or process supervisor in the pharmaceutical or biopharma sector. In exceptional circumstances graduates may progress to Stage 2 of the B.Eng. (Hons) Chemical & Biopharmaceutical Engineering Programme.

The changes proposed in this programmatic review include:

1. Updating the content of programme modules to ensure currency, reflecting new trends.
2. Updating the resource list to keep this information current.

2.3.8 *Certificate in Process Industries Advancements and Innovation*

This programme is designed to broaden and deepen the knowledge and skill base of graduates of a level 8 degree in an engineering or science discipline. This is a Postgraduate level award which develops 'Transition Skills' for process development. Engineering graduates have shown particular interest in enhancing their knowledge of issues such as Emerging Technologies in Biopharma-Processing, Process Technology Transfer and Lean Manufacturing. Modules have been designed specifically to meet these requirements. This programme is at level 9 on the National Framework of Qualifications and attracts 35 ECTS credits.

No changes are proposed for this programme.

2.3.9 *Requirements, Recommendations and Commendations*

1. Following a review of programme documentation, the Panel **approves** the changes to programmes and modules proposed by the department overall and **recommends to Academic Council that the**
 - Certificate in Biopharmaceutical Manufacturing Operations
 - Diploma in Biopharmaceutical Manufacturing Operations
 - Certificate in Food Manufacturing Operations
 - Certificate in Biopharmaceutical Processing
 - Certificate in Chemical Process Safety
 - Certificate in Chemical and Biopharmaceutical Process Operations

Certificate in Process Industries Advancements and Innovation
Postgraduate Certificate in Professional Practice

be revalidated for a period of five years or until the next Programmatic Review, whichever is sooner, subject to implementation of any panel requirements and successful completion of the module moderation process, and with all due regard for a timely implementation of the individual panel recommendations set out below.

DRAFT

APPENDIX 1

External and internal stakeholders met by the panel

Employer Representatives

Ger Downing, Production Superintendent, Phillips 66

Diarmuid O'Connor, Director of Biopharmaceutical Manufacturing, Lilly

Austin Geraghty, Consultant, Hovione

Student Representatives

John Daly, Bachelor of Science in Good Manufacturing Practice

Kenneth Casey, Higher Certificate in Good Manufacturing Practice

Lauren Daly, Higher Certificate in Good Manufacturing Practice

Fergus O'Brien, Year 4, BEng (Hons) in Chemical & Biopharmaceutical Engineering

Sarang Joshi, Year 4, BEng (Hons) in Chemical & Biopharmaceutical Engineering

Matthew Halpin, Year 4, BEng (Hons) in Chemical & Biopharmaceutical Engineering

Roisin Kelleher, Year 4, BEng (Hons) in Chemical & Biopharmaceutical Engineering

Graduate Representatives

Maria McShane, Chemical Engineer, Phillips66

Kieran Kearney, Chemical Engineer, Lilly

Jevan McAuliffe, Chemical Engineer, Pfizer

Sean McLaughlin

David Pomeray

Claire Willis