PROGRAMME SPECIFICATION

1	**Awarding Institution**	Newcastle University and Singapore Institute of Technology
2	**Teaching Institution**	Newcastle University and Singapore Institute of Technology
3	**Final Award**	BEng Honours
4	**Programme Title**	Chemical Engineering
5	**UCAS/Programme Code**	1411U
6	**Programme Accreditation**	The Institution of Chemical Engineers (IChemE)
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	Level 6
9	**Date revised**	October 2021

10 Programme Aims

The aim of the Degree programme is to produce graduates who have a coherent understanding of Chemical Engineering, combining a sound theoretical grasp of the subject with practical experience and an awareness of their responsibilities to society and the environment. Graduates should be capable of becoming professional Chemical and Process engineers in industry or of following a postgraduate route into a research, industrial or academic career. To meet this aim, the Degree programme has the following objectives:

1) To produce graduates who have vision and the ability to address the challenges posed by society through the deployment of the skills and knowledge gained during their Degree course.
2) To equip students with a knowledge and understanding of the subject, including the core material specified by the accrediting professional institutions (The Institution of Chemical Engineers).
3) To enable students to eventually meet the requirements of the accrediting Institutions for Chartered Membership or Professional Engineer status.
4) To equip students with appropriate practical skills in information processing, data analysis, problem solving, teamwork, and communication skills.
5) To encourage students to develop responsible attitudes towards the needs of society and the environment in the application of their engineering and economic knowledge and to ensure that they have particular regard for the importance of safety in their industrial life.
6) To encourage students to develop appropriate attitudes towards their own future professional development.
7) To provide a programme of study which meets the UK FHEQ Honours level and which also takes account of the subject benchmarks in QAA Engineering and UK-Spec professional standards.

11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes have references to the UK Benchmark Statements for Engineering and the Singapore Engineering Accreditation Board required Student Learning Outcomes.

Knowledge and Understanding

On completing the programme students should have appropriate knowledge and understanding of:

A1 Background Mathematics, Statistics, Biology and Chemistry that are relevant to Chemical and Process (C&P) Engineering.

A2 The fundamental concepts, principles and theories of C&P Engineering.

A3 Business and management techniques relevant to C&P Engineering and Chemical Engineers.

A4 The role of Chemical Engineers in society and the constraints within which their engineering judgement will be exercised, including the professional conduct and ethical responsibilities of Chemical Engineers.

A5 The environmental and safety issues that affect C&P Engineering and the issues associated with sustainable engineering solutions.

A6 Conceptual, elemental and detailed design of processes and process plant.

A7 Safe operation of processes and plant, including the use of IT for design, control and management.

A8 Codes of practice, design, the assessment of safety and environmental risks, and the legislative framework for safety.

Learning and Teaching Methods

Knowledge and understanding is primarily imparted through a combination of lectures, tutorials, example classes, case studies, laboratory experiments, coursework and projects in all Years. In some cases, the formal lectures are supplemented by computer assisted learning (CAL). A number of visiting lecturers and professors contribute to A5, A6, A7 and A8.

Throughout the course, learners are encouraged to undertake independent reading to deepen, supplement and consolidate learning and teaching and to broaden their individual knowledge and understanding of the subject. In the final year, students are given guidance and are directed to engineering literature related to their design projects. Feedback on essays, laboratory and project reports allows students to refine their presentation techniques in these areas, and to assess the level of their knowledge and understanding.

Assessment Strategy

Testing the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of laboratory experiment write-ups, coursework reports, project reports and presentations. The proportion of in-course and written examination towards the final module assessment is usually between 25/75 to 60/40 depending on the nature of the module and can vary as appropriate for the module and level of study. Any single coursework that constitutes 3 credits or more has to be reviewed by the External Examiner, and has to be second-marked.

Intellectual Skills

On completing the programme students should be able to:

B1 Select and apply appropriate scientific principles, mathematical methods and computer based methods for modelling and analysing engineering problems.

B2 Analyse experimental or computational results and determine their strength and validity.

B3 Analyse systems, processes and components requiring engineering solutions and to produce a conceptual or elemental design to a specification.

B4 Use the scientific literature effectively and to search for information to develop concepts.

B5 Produce a full design specification for a process or process plant.

B6 Identify the required cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact of the application of the design and assess commercial risk.

B7 Project manage a task.

B8 Determine the criteria for evaluating a design solution and evaluate an outcome of the design against the original specification.

Learning and Teaching Methods

Subject-specific/professional skills are developed through laboratory experiments, assignments and project work (B1-B4), design exercises throughout years 2 and 3 (B5-B8). Lectures, tutorials, case studies and seminars of specific modules develop skills B1, B3, B5 (Computing and Simulation; Process Measurement, Dynamics and Control; Engineering Practice; Plant Design Project), B5-B6 and B8 (Plant Design Project) and B6 and B7 (Process Design, Economics and Project Management; Plant Design Project). From the first year, students are required, after appropriate guidance, to search the literature for information and submit all written work in an appropriate scientific and engineering format so that B1-B4 are thoroughly integrated into all submitted work by the final year. Students are encouraged to develop appropriate professional and practical skills (B1-B4) by monitored attendance at laboratory sessions during all years of their studies. Feedback on all submitted work enhances learning of the skills B5-B8 culminating in the year 3 Plant Design Project. Some assignments and mini-projects are carried out in small groups and some individually. All are monitored by an academic supervisor and, in some cases, industrial supervisors may provide additional support.

Assessment Strategy

Practical skills are assessed through laboratory reports; coursework, assignment and project reports; presentations, group oral discussions, and unseen written examinations. Skills B5-B8 form a major part of the assessment of the year 3 Plant Design Project.

Practical Skills

On completing the programme students should be able to:

C1 Plan, conduct and report a programme of investigative work.

C2 Analyse and solve engineering problems.

C3 Design a process or process plant to meet a need.

C4 Be creative in the solution of problems and in the development of designs.

C5 Evaluate designs and make improvements.

C6 Integrate and evaluate information and data from a variety of sources.

C7 Take a holistic approach to solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, sustainability,

Learning and Teaching Methods

Analysis and problem solving skills are developed through example classes, tutorials, coursework and project work. Experimental, research and design skills are developed through coursework activities, laboratory experiments, and design projects. Individual feedback is given to students on all work produced. Students in all years are encouraged, following appropriate guidance, to plan and carry out their investigative work and analyse the experimental data in a critical manner. Feedback provided on all submitted work provides opportunities for students to improve their skills. In particular, project work provides the opportunity to develop skills C1-C7.

Assessment Strategy

Analysis and problem solving skills are assessed through unseen written examinations and coursework. Experimental, research and design skills are assessed through laboratory experiment write-ups, coursework reports and project reports, presentations and unseen written examinations. Creative and design skills are assessed through design project reports and design presentations.

Transferable/Key Skills

On completing the programme students should be able to:

D1 Communicate effectively (orally and in writing).
D2 Apply mathematical skills through modelling and analysis.
D3 Work as a member of a team (an interdisciplinary team where appropriate).
D4 Develop ideas and solutions to engineering problems.
D5 Use information and communications technology.
D6 Manage resources and time, plan, organise and prioritise work effectively to meet deadlines.
D7 Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry.
D8 Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.

Learning and Teaching Methods

Transferable skills are developed through the learning and teaching programme outlined above (and in section 11). Basic communication skills D1 are introduced during in Year 1, via an enhancement module (Technical Writing and Communication) and developed further via individual and team projects throughout other modules and design related projects in each year. These are then enhanced through feedback on written reports and oral presentations made as part of coursework assignments. Additionally, transferable skills are also applied in many subject-specific modules with students required to find information and give oral and/or written presentations throughout all years of study. Deadlines for submission of coursework are enforced, encouraging students to develop D6 and this is supported by guidance provided during Induction week at each year of the programme. Design problems at each year provide an opportunity to develop skills D3-D8.

Assessment Strategy

Transferable and communication skills are assessed through coursework reports, presentations and oral examinations. The assessment of the final year Design Project includes an assessment of key skills.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The three year programme will be delivered by Newcastle University and Singapore Institute of Technology over nine trimesters.

The programme consists of 180 ECTS credits. One ECTS credit at SIT is equivalent to two credits at Newcastle University.

On successful completion of the programme students will receive a joint award from Newcastle University and Singapore Institute of Technology.

The programme has 2 entry pathways, entry at Year 1 and for suitably qualified applicants, entry directly into Year 2.

Year 1 Entry

Year 1 introduces the underpinning science and mathematics that is required in the study of the various Chemical Engineering topics in subsequent years. It also introduces Mass and Energy Balances which is fundamental to Chemical Engineering. Computational methods and tools to solve Chemical Engineering Problem is also introduced in Year 1 (Computing and Simulation). There is also an 'enhancement' module Technical Writing and Communication while the module Career and Professional Development prepares the students for the world of work - the Integrated Work Study Programme (IWSP) which commences in trimester 3 of year 2.

The first trimester of Year 2 introduces core Chemical Engineering topics such as Thermodynamics, Heat and Mass Transfer, Reactor Engineering; and Separations Processes 1. One part of Engineering Practice in trimester 1 of this year teaches the students about materials typically used in the construction of chemical engineering equipment, focusing on pressure vessels. The other part introduces the students to the utilities that are essential to the operation of a typical chemical processing plant, e.g. steam generation, air, inert gases, process cooling and water utilities.

In trimester 2 of year 2, Separations Processes 2 covers more complex situations involving more advanced methods. Reactor Engineering 2 extends the knowledge of the area to include bioreactors and catalytic reaction systems while Process Safety gives a comprehensive coverage of the safety aspects of the chemical and allied sectors, with particular reference to Singapore. The module on Fluids Mechanics covers fluid flows problems usually encountered in process engineering environments. Students are also taught the basic principles of Process Control in Process Measurement, Dynamics and Control.

For the first 2 months of trimester 3 in Year 2, the students will continue to study in Singapore before going on their 3 weeks Overseas Immersion Programme (OIP) in July. On their return, they will start their IWSP which will run for 6 months, returning to continue their academic studies in Trimester 2 of Year 3, where they will learn more advanced Chemical Engineering topics (Process Control 2; Process Design, economics and Project management; Solids handling; Chemical process optimization; Renewable Energy Technologies & Clean Technology Applications; Sustainable Industry, Design and Manufacture).

A major component of Year 3 is the group Process Plant Design project that requires candidates to apply their Chemical Engineering knowledge in a holistic and integrated manner. This is performed during Trimester 2 and 3. This project draws on the materials and knowledge gained in all the taught modules, including practical and transferable skills, to provide (hopefully) innovative solutions to a complex Chemical Engineering plant design problem.

Direct Entry to Year 2

Candidates with diplomas in Chemical Engineering or closely related disciplines may enter directly to Year 2 of the programme. Essentially, these students are given exemption of some Year 1 subjects such as Mass and Energy Balances, Chemistry, Biomolecular Science.

There will be no exemption for Engineering Mathematics 1 and 2, and Computing and Simulation, and students opting for direct Year 2 entry will have to take these in Year 2. The students will also have to take the Career and Professional Development module in preparation for the IWSP. These modules will be taken in addition to the Year 2 subjects mentioned above.

Key features of the programme (including what makes the programme distinctive)

This is a three year joint programme between Newcastle University and Singapore Institute of Technology delivered in Singapore at the Ngee Ann Polytechnic as well as Dover campuses.

Suitably qualified candidates may apply for direct entry into Year 2 of the programmes.

There is a mandatory industrial attachment component (IWSP), lasting 6 months and running from the beginning of the third trimester of Year 2 till the beginning of the second trimester in Year 3. This will enhance the employability of graduates of the programme.

In July of Year 2, students will spend 3 weeks at the Newcastle campus on the Overseas Immersion Programme.

The quality and standards of the programmes delivered in Singapore are equivalent to similar provision delivered on campus at Newcastle University. Successful candidates will be awarded a BEng degree with Honours by Newcastle University and Singapore Institute of Technology.

Progression from each trimester and the award of the final degree are subject to the regulations and guidelines contained in the NU-SIT Joint Programmes Regulations and Exam Conventions.

Programme regulations (link to on-line version, requires login)

PROGRAMME REGULATIONS TEMPLATE: UNDERGRADUATE 3 & 4 STAGE SINGLE/JH ROUTE (ncl.ac.uk)

13 Criteria for admission

Entry qualifications

Entry into the programme is normally through Year 1, and open to those with relevant A-levels and Diplomas. Those who hold a Diploma in Chemical Engineering or equivalent qualification from the polytechnics in Singapore with good cGPA (3.5 and above) may seek exemption from Year 1 and enter directly into Year 2.

Admissions policy/selection tools

All applicants will be interviewed by representatives of Singapore Institute of Technology and Newcastle University and offers are made based on the joint decisions of these representatives.

14 Support for Student Learning

The Student Services portals provides links to key services and other information and is available at:

NU: https://my.ncl.ac.uk/students/

SIT: https://students.singaporetech.edu.sg/

Induction
Students will be provided inductions organised by the Singapore Institute of Technology and Newcastle University. During the week prior to the first trimester, new students will be given a general introduction to campus life as a student on the joint programme. Students will also be informed the principal support services available and the general information about their programme as described in the NU-SIT Joint Programmes Student Handbook. New and continuing students will be provided the timetable of lectures and tutorials/labs/etc.

Services and facilities available to support students' learning including the following:

- NU-SIT Joint Programmes Student Handbook
- Ngee Ann Library, SIT Library and Newcastle University's electronic Library
- Email account and online learning facilities (e.g. Learning Management System)
- Extensive laboratories and computing facilities

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification. Students are tutored on their work approach to both group and individual projects.

Academic support
The initial point of contact for a student is with a lecturer or module leader or their tutor in the first instance. Thereafter the Degree Programme Director or the Newcastle University Director of Undergraduate Studies may be consulted in conjunction with the SIT Programme Director. Issues relating to the programme may be raised at the Student-Staff Committee (SSC), and/or at the Joint Programmes Operations Committee (JPOC).

Pastoral support
All students are assigned a personal tutor in Singapore whose responsibility is to monitor the academic performance and overall well-being of their tutees.

NU has a senior tutor who acts as an additional point of contact for a student in the event of the allocated personal tutor's absence from the University and/or in the event of complicated issues.

In addition, Newcastle University Singapore Institute of Technology and offer a range of well-being support services, details of which are available on the following websites:

NU: https://www.ncl.ac.uk/wellbeing/
SIT: https://www.singaporetech.edu.sg/life-sit/student-support#

Support for students with disabilities
The SIT Student Care team provides help and advice for disabled students. It provides individuals with advice about facilities, services and the accessibility of the campus; details about the technical support available; guidance in study skills and advice on financial support arrangements; a resources room with equipment and software to assist students in their studies. For more information, see https://www.singaporetech.edu.sg/life-sit/student-support

Learning resources
Newcastle University's main learning resources are provided by the Robinson Library (for books, journals, online resources). Increasingly, library material is available electronically via remote access so some of Newcastle University's library holdings will be available to students in Singapore.

Students on this programme will have access to a wide range of computing facilities through Newcastle University's "Remote Access System" or ras.ncl.ac.uk. For more information see
https://services.ncl.ac.uk/itservice/core-services/software/ras/

Increasingly, library material is available electronically via remote access so a database of Newcastle University's library holdings will be available to students in Singapore.

The SIT library provides students access to books, periodicals and audio-visual materials. The library also has access to leading academic databases such as ScienceDirect, SpringerLink and other electronic resources. There is still a substantial physical collection in the library with a large proportion being recommended course textbooks. For more information, see https://libguides.singaporetech.edu.sg/library

The Singapore Institute of Technology, through facilities available at Ngee Ann Polytechnic, provides an extensive and advanced library facility with access to media, e-books, databases, e-journals and many other information resources such as OPAC on their library catalogues. More information can be found at: https://www.np.edu.sg/library/Pages/default.aspx

15 Methods for evaluating and improving the quality and standards of learning and teaching

Module reviews
All modules are subject to review by questionnaires which are considered by the Joint Programmes Operations Committee (JPOC). Changes to, or the introduction of new, modules are presented and approved at JPOC.

Student opinion is sought at the Student-Staff Committee (SSC) and/or at the JPOC. New modules and major changes to existing modules are subject to the final approval and endorsement by the Newcastle University SAgE Faculty Education Committee (FEC) and the SIT Board of Studies (BOS).

Programme reviews
The JPOC conducts an Annual Monitoring and Review of the degree programme and reports to the SAgE FEC and the SIT BOS.

The SAgE FEC takes an overview of all programmes within the Faculty and reports any the University Education Committee (UEC).

External Examiner reports
External Examiner reports are considered and the JPOC responds to these reports through FEC. External Examiner reports are shared with institutional student representatives, through the SSC.

Student evaluations
All modules and stages* are subject to review by student questionnaires. Informal student evaluation is also obtained at the SSC, and the JPOC. The results from student surveys are considered as part of the Annual Monitoring and Review of the programme and any arising actions are captured at programme and School / institutional level and reported to the appropriate body.

*With the exception of intercalating years and the final stages of undergraduate programmes.

Mechanisms for gaining student feedback
Feedback is channelled via the SSC and the JPOC.

Faculty and University Review Mechanisms
Every six years degree programmes in each subject area undergo a Newcastle University Learning and Teaching Review. This involves both the detailed consideration of a range of documentation, and a review visit by a review team (normally one day in duration) which includes an external subject specialist and a student representative. Following the review, a report is produced, which forms the basis for a decision by University Learning, Teaching and Student Experience Committee on whether the programmes reviewed should be re-approved for a further six year period.

A review was completed in October 2020.

16 Regulation of assessment

Pass mark
Students will be assessed on a letter scale A-F, with each letter assigned an associated Grade Point (GP) on a 5 point scale.

A D Grade with corresponding grade point of 1.0 is a pass grade.

Course requirements
Progression from one trimester to another is subject to the NU-SIT Joint Programmes Regulations and Examination Conventions.

Students should attain at least a 2.0 Cumulative GPA (CGPA) after each trimester in order to maintain good academic standing.

After each study trimester and/or consecutive trimester, the joint Board of Examiners will track the academic standing of students with CGPA < 2.0 and issue the students with the following:

- Academic Warning – in any study trimester, CGPA < 2.0
- Academic Probation – in the next consecutive study trimester, CGPA < 2.0
- Academic Termination – in the 3rd consecutive study trimester, CGPA < 2.0

Students from AY2021/2022 cohort and onwards

Students obtaining an F grade or grade point of 0 in any module will be entitled to one re-sit/re-submission as of right.

If the failed module is a pre-requisite for a higher-level module, the student will not be able to take the higher-level module until the pre-requisite of the previous module has been met.

If the student fails the re-sit, a single re-module attempt will be offered at the next available opportunity.

Students obtaining an F grade undertaking a re-sit/re-submission attempt will have their grade point capped at 1.00 for the calculation of the CGPA

Students obtaining a D+/D or F grade have the option to undertake a re-module attempt and the grade point will be capped at 2.00 for the calculation of the CGPA.

Students from AY2020/2021 cohort and before

Students obtaining a D+/D/F grade will have a maximum of one re-sit/re-submission and one re-module attempt, unless a successful Personal Extenuating Circumstances (PEC) application has been made.

If the failed module is a pre-requisite for a higher-level module, the student will not be able to take the higher-level module until the pre-requisite of the previous module has been met.

If the student fails the re-sit, a single re-module attempt will be offered at the next available opportunity.

Re-sit and re-module attempts will be capped at grade point 2.00 for the calculation of CGPA.

Students are permitted no more than 10 credits at each level (UK FHEQ 4, 5, 6) at Grade D/grade point 1.5 or Grade E/grade point 1.0 for modules undertaken in 2019/2020 and 2020/2021.

Degree classifications
Degree classifications are based upon the Cumulative GPA for their programme of study.

All modules contribute to the final award and all years of study contribute equally.

The Cumulative Grade Point Average is calculated as follows:

$$\frac{\sum_{X=1}^{n} [\text{Grade Point} \times \text{Credits for Module X}]}{[\text{Total Credits attempted in all trimester}]}$$

Only letter-graded modules will be included in the computation of cGPA

NU-SIT Joint Programmes Marking Scheme

The standard NU-SIT Joint Programmes marking scheme is:

Modules taken from AY2021/22 onwards		
Letter Grade	**Grade Point**	**Descriptor**
A+	5.00	Excellent attainment of learning outcomes
A	5.00	
A-	4.50	
B+	4.00	Very Good attainment of learning outcomes
B	3.50	
B-	3.00	
C+	2.50	Good attainment of learning outcomes
C	2.00	
D+	1.50	Adequate attainment of learning outcomes
D	1.00	
F	0.00	Failed to attain learning outcomes

Modules taken up to AY2020/21		
Letter Grade	**Grade Point**	**Descriptor**
A+	5.00	Excellent attainment of most learning outcomes
A	5.00	
A-	4.50	
B+	4.00	Good attainment of most learning outcomes
B	3.50	
B-	3.00	
C+	2.50	Satisfactory attainment of most learning outcomes
C	2.00	
D	1.50	Limited attainment of most learning
E	1.00	Inadequate attainment of most learning outcomes
F	0.00	Failure to attain most learning outcomes

Degree classifications are based upon the Cumulative GPA for their programme of study:

Degree	**CGPA Requirement**	**Final Year Project**
Honours with highest distinction	4.5 ≤ CGPA ≤ 5	Minimum GP of 4.5
Honours with distinction	4.0 ≤ CGPA < 4.5	
Honours with merit	3.5 ≤ CGPA < 4.0	
Honours	3.0 ≤ CGPA < 3.5	
Pass	2.0 ≤ CGPA < 3.0	

Role of the External Examiner
An External Examiner, a distinguished member of the subject community, is appointed by the University following recommendation from the Joint Programmes Operations Committee. The External Examiner is expected to:

i. See and approve assessment papers
ii. Moderate examination and coursework marking
iii. Attend the Board of Examiners
iv. Report to the University on the standards of the programme.

17 In addition, information relating to the programme is provided in:

Newcastle University in Singapore website:

https://www.ncl.ac.uk/singapore/study/undergraduate/

Singapore Institute of Technology website: http://www.singaporetech.edu.sg

NU-SIT Joint Programmes Regulations and Examinations Conventions

SIT-NU Programmes Academic Guide

SIT-NU Programmes Academic Guide (Annex)

SIT Student Handbook

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided.

Annex 1

Intended Learning Outcome	Module codes
A1	CHE1015; CHE1012; CHE1011; CHE1022; CHE1023; CHE1021; CHE1024; CHE2016;
A2	CHE1014; CHE2017; CHE1025; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014;
A3	CHE2031; CHE3022; CHE3024; CHE3025; CHE3031; CHE2033
A4	CHE2031; CHE3022; CHE3024; CHE3025; CHE3031; CHE2033
A5	CHE2021; CHE2015; CHE2022; CHE2031; CHE3025; CHE3031; CHE2033
A6	CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE3024; CHE3025; CHE3031; CHE2033
A7	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE3024; CHE3031;
A8	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE3024; CHE3025; CHE3031; CHE2033
B1	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
B2	CHE1014; CHE1015; CHE1012; CHE1011; CHE1023; CHE1021; CHE2017; CHE2016; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
B3	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
B4	CHE1013; CHE1015; CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
B5	CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE3021; CHE3022; CHE3023; CHE3025; CHE3031; CHE2033

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B6	CHE2021; CHE2015; CHE2022; CHE2031; CHE3021; CHE3022; CHE2032; CHE3031; CHE2033
B7	CHE2031; CHE3022; CHE3031
B8	CHE3022; CHE2032; CHE3031;
C1	CHE2017; CHE2021; CHE2015; CHE2031; CHE3021; CHE3031
C2	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
C3	CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
C4	CHE2017; CHE2021; CHE3021; CHE3031;
C5	CHE2017; CHE2021; CHE2031; CHE3021; CHE3025; CHE3031; CHE2033
C6	CHE1023; CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
C7	CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
D1	CHE1013; CHE1023; CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
D2	CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031;
D3	CHE1023; CHE2017; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3025; CHE3031; CHE2033
D4	CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2031; CHE3021; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033

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D5	CHE1014; CHE1013; CHE1015; CHE1012; CHE1011; CHE1022; CHE1023; CHE1021; CHE2017; CHE2016; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2025; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
D6	CHE1014; CHE1013; CHE1015; CHE1012; CHE1011; CHE1022; CHE1023; CHE1021; CHE2017; CHE2016; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2025; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
D7	CHE1014; CHE1013; CHE1015; CHE1012; CHE1011; CHE1022; CHE1023; CHE1021; CHE2017; CHE2016; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2025; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033
D8	CHE1014; CHE1015; CHE1012; CHE1011; CHE1022; CHE1023; CHE1021; CHE2017; CHE2016; CHE2021; CHE2012; CHE2013; CHE2011; CHE2015; CHE2014; CHE2024; CHE2023; CHE2022; CHE2025; CHE2031; CHE3021; CHE3022; CHE3023; CHE2032; CHE3025; CHE3031; CHE2033

Annex 1

KEY

Module Code		**Module Title**
CHE	1011	Engineering Mathematics I
CHE	1012	Statistics *
CHE	1013	Technical Writing & Communication
CHE	1014	Mass and Energy Balance*
CHE	1015	Biomolecular Science 1*
CHE	1021	Engineering Mathematics 2
CHE	1022	Organic Chemistry
CHE	1023	Organic Chemistry Laboratory
CHE	2011	Fluid mechanics
CHE	2012	Heat and Mass Transfer
CHE	2013	Reactor Engineering
CHE	2014	Separation processes 1
CHE	2015	Engineering Practice (2 semesters)
CHE	2016	Thermodynamics
CHE	2017	Computing & Simulation
CHE	2021	Process measurement, dynamics and control
CHE	2022	Process Safety
CHE	2023	Reactor Engineering 2
CHE	2024	Separation processes 2
CHE	2025	Career and Professional Development
CHE	2032	Chemical process optimization
CHE	2033	Sustainable Industry, Design and Manufacture
CHE	3021	Process Control 2
CHE	3022	Process Design, economics and Project management
CHE	3023	Solids handling
CHE	3025	Renewable Energy Technologies & Clean Technology Applications
CHE	3031	Plant design project
CHE	2031	Integrated Work Study Programme

Annex 2

Engineering Accreditation Board Mapping of Module Learning Outcomes to Overall Programme Learning Outcomes

EAB Student Learning Outcomes (SLO)											
a	b	c	d	e	f	g	h	i	j	k	l
●	●	●	●	●	●	●	●	●	●	●	●

Explanations:

1. EAB has a list of 12 Student Learning Outcomes (SLO) which graduates from accredited programmes must fulfill [labelled as (a) to (l):

   (a) **Engineering knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
   (b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
   (c) **Design/development of Solution**s: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
   (d) **Investigation**: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
   (e) **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
   (f) **The engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
   (g) **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
   (h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
   (i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
   (j) **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(k) **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

(l) **Life-long Learning**: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2. Please use the following as stipulated by EAB for the mapping:

● Fully consistent (contributes to more than 75% of EAB's criterion)
◐ Partially consistent (contributes to more than 50% of EAB's criterion)
○ Weakly consistent (contributes to less than 25% of EAB's criterion)
Blank Not related to EAB's criterion