Programme Specification Leading to:
BEng/MEng (Hons) Chemical Engineering
BEng/MEng (Hons) Chemical Engineering with Placement

Applicable for all undergraduate students ***starting at FHEQ Level 4 in 2021***

Version No.	Date	Notes – QUALITY ASSURANCE USE ONLY	QAO
2021-22 v1.0	*30 July 2021*	*Programme for new entrants in September 2021.*	*JP*

Undergraduate Programme	
1. Awarding institution	Brunel University London
2. Teaching institution(s)	Brunel University London
3. Home College / Department / Division	College of Engineering, Design and Physical Sciences
4. Contributing College / Department	Department of Computer Science; Department of Electronic and Computer Engineering; Department of Mathematics and Department of Mechanical and Aerospace Engineering.
5. Programme accredited by	Will be submitted for accreditation by the Institution of Chemical Engineers (IChemE)
6. Final award(s) and FHEQ Level of Award	MEng (Hons) Chemical Engineering (FHEQ level 7) MEng (Hons) Chemical Engineering with Placement (FHEQ level 7) BEng (Hons) Chemical Engineering (FHEQ level 6) BEng (Hons) Chemical Engineering with Placement (FHEQ level 6)
7. Programme title	BEng/MEng Chemical Engineering
8. Programme type (Single honours/joint honours)	Single Honours
9. Normal length of programme for each mode of study	BEng - 36 months FT, 48 months sandwich MEng - 48 months FT, 60 months sandwich
10. Maximum period of registration for each mode of study	Normal or standard duration plus 3 years
11. Variation(s) to September start	None
12. Modes of study	Standard
13. Modes of delivery	Full Time and Thick Sandwich

14. Other/Intermediate awards and titles and FHEQ Level of Award	CertHE Chemical Engineering (FHEQ level 4) DipHE Chemical Engineering (FHEQ level 5) DipHE Chemical Engineering with Placement (FHEQ level 5) BEng (Ord) Chemical Engineering (FHEQ level 6) BEng (Ord) Chemical Engineering with Placement (FHEQ level 6)
15. UCAS Code	MEng Chemical Engineering (4 year FT) – H500 MEng Chemical Engineering (5 year FSK – with placement) – H5P0 BEng Chemical Engineering (3 year FT) – H501 BEng Chemical Engineering (4 year FSK – with placement) – H5P1
16. HECoS Code	100143 (Chemical Engineering)
17. Route Code	H810UECHEM - BEng H810UMCHEM - MEng
18. Relevant subject benchmark statements and other external and internal reference points used to inform programme design UK Spec	Quality Code for Higher Education QAA Subject Benchmark Statement Brunel 2030 Brunel Placement Learning Policy, as published under the 'Placements' section of the 'Managing Higher Education Provision with Others' page. Useful pdf links:- the Engineering Benchmark Statement (http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering-.pdf) the Framework for Higher Education Qualifications (http://www.qaa.ac.uk/en/Publications/Documents/qualifications-frameworks.pdf) the IChemE's guidance for accreditation, which includes programme design (http://www.icheme.org/~/media/Documents/icheme/Membership/Accreditation/accreditationguide2016.pdf)
19. Admission Requirements	For all current entry requirements, please click here. Levels of English for non-native speakers are outlined on the University's language requirements pages.
20. Other relevant information (e.g. study abroad, additional information on placements)	Optional work placement year is available after completion of FHEQ Level 5 BEng (thick sandwich mode), or after completion FHEQ Level 6 MEng (thick sandwich mode) leading to the award of BEng/MEng Chemical Engineering with Placement
21. Programme regulations not specified in Senate Regulation 2. Any departure from regulations specified in Senate Regulation 2 must be stated here and approved by Senate.	None
22. Further information about the programme:	Link to programme information on the College website Course webpage

23. EDUCATIONAL AIMS OF THE PROGRAMME

The Chemical Engineering programme at Brunel University has been designed from the ground up in response to current industry needs and aims at equipping the students with a solid engineering background, combined with a variety of skills needed to excel in the workplace.

The programme is highly innovative with respect both to its content and its delivery strategy. The first two years will focus on providing the students with the necessary knowledge in fundamental disciplines (e.g. Maths, Chemistry, Thermodynamics, Materials) and basic understanding of key topics at the basis of the profession (e.g. Reaction Engineering, Heat & Mass Transfer, and Fluid Mechanics). The following two years, traditional topics (e.g. Process Design, Process Control and Sustainability) are complemented by novel ones such as Industrial Internet of Things, Big Data Analytics and Cybersecurity which address pressing needs and opportunities in today's industry. Key pillars running throughout the programme are sustainability, system thinking, bio and safety, problem solving and innovation. Specific focus is also on the practical aspects that form a well-rounded Engineer with the introduction of the novel Chemical Engineer's Toolbox and the Innovation Toolbox modules (as described below).

24. PROGRAMME AND INTERMEDIATE LEARNING OUTCOMES

The programme provides opportunities for students to develop and demonstrate knowledge and understanding (K) cognitive (thinking) skills (C) and other skills and attributes (S) in the following areas:

FHEQ	Category (K = knowledge & understanding, C = cognitive (thinking) skills, S = other skills and attributes)	**Learning Outcome**	**Associated Assessment Blocks Code(s)**	**Associated Study Blocks Code(s)**	**Associated Modular Blocks Code(s)**
4					
	K	Knowledge, understanding, skills gathering and comprehension of the specific engineering disciplines relevant to engineering or chemical engineering.			BE1603 BE1604 BE1605 CL1620
	K/C	Knowledge of the fundamental scientific principles that underpin an education relevant to engineering and demonstrating their application (e.g. basic energy and mass balance and fundamentals of thermodynamics and fluid mechanics)			BE1601 BE1603 CL1620
	K/C	Knowledge and understanding of the fundamental mathematical and statistical principles that underpin basic calculations in engineering			BE1601
	K/C	Apply a systems approach to identify the problems and apply			BE1602 CL1620

		core chemical engineering principles to their analysis			
	C	Ability to formulate basic problems, apply and demonstrate mathematical methods together with computational tools (Matlab, Excel) in the analysis of engineering problems			BE1601 CL1620 BE1604
	C	Ability to apply and demonstrate scientific principles to relevant engineering applications, collect, manipulate and interpret data (e.g. labs)			BE1602 CL1620
	K/S	Knowledge and understanding in the use of computer tools in solving basic chemical engineering problems (e.g. Matlab, Excel, etc.)			BE1601 BE1602 CL1620
	S	Basic knowledge of management, entrepreneurship and safety culture			BE1602 CL1620
	S	Effective communication of technical material, ethics demonstration, in the form of written reports and oral presentations			BE1602 BE1604 CL1620
	S	Working effectively as a member of a team; managing time and resources to given constraints			BE1602 CL1620
	K/S	Knowledge and understanding of the safe operation of laboratory and workshop equipment, obtaining data and assessing measurement error			BE1604 BE1605
5					
	K/C	Knowledge, critical understanding and application of various unit operations in chemical engineering and the ability to analyse, duplicate and manipulate such processes			CL2602 CL2606 CL2601 CL2607
	K/S	Critical knowledge and understanding of chemical engineering-oriented thermodynamics and transport mechanisms and their application to analyse of chemical processes and their design			CL2604 CL2606

	K/S/C	Critical understanding and skills in the analysis and synthesis of chemical engineering process units and application in a different context			CL2602 CL2605 CL2603 CL2555 CL2600 CL2607
	K	Critical understanding and knowledge of the scientific principles of chemical reactions, chemical reaction engineering and reactor design			CL2602 CL2603 CL2605 CL2600
	K/S	Apply knowledge and understanding of process heat transfer and system integration in the design of heat transfer equipment			CL2602 CL2601
	K/C	Explain general safety concepts in chemical engineering and their evaluation in design			CL2602 CL2605 CL2555 CL2601
	S/C	Demonstrate critical thinking, effective team work, ethics and communication in Chemical Engineering problem solving			CL2602 CL2605 CL2600
	S/C	Show understanding of knowledge limits and its impact on analysis, manipulation and interpretation of data			CL2602 CL2603 CL2604 CL2606 CL2600 CL2601
6					
	K/S	Apply advanced statistical methods and their reflective application in data analysis			CL3605 CL3600 CL3601 CL3604
	K/S	Systematic understanding and appraisal at the forefront of the practice of design of chemical engineering processes incl. control and instrumentation and the ability to make use of these to synthesise control problems			CL3602 CL3606 CL3601 CL3604
	K/C	Assess safety requirements and its deployment in the safe design and operation of chemical engineering plants			CL3602 CL3606 CL3605
	K/C	Systematic understanding, differentiating knowledge and application of particulate and solid state unit operation and handling			CL3602 CL3606 CL3605 CL3603

	K	Appraise the legislative framework and how it is applied to the management of safety, health and the environment			CL3605 CL3603 CL3600
	K/C	Ability to deploy accurate established techniques of analysis and enquiry to look up and apply information from technical literature, including codes of practice and industry standards			CL3602 CL3606 CL3603 CL3600
	K/C/S	Employ relevant chemical engineering principles to critically evaluate abstract concepts, to deliver credible conclusions through both independent and teamwork, using creative approaches on complex industrial relevant open-ended technical problems to an optimised design			CL3605 (Design Project CORE BLOCK)
	K/C/S	Conceptual understanding of key aspects and critical evaluation of state of art methodologies and practice in Bioprocess Engineering			CL3600 CL3602 CL3606
	C/S	Independently interpret, analyse and synthesise an open-ended major process engineering problem including detailed health and safety, environmental and economic considerations			CL3605 CL3603 CL3600
	C/S	Teamwork in the solution of an interactive process or product engineering problem using appropriate engineering approximations and assumptions, with evaluation of the suitability of the solution reached. Communicate the problem and justify the solution to external parties and defend the decisions made			CL3602 CL3606 CL3605 CL3603

7					
	K	Originality in the systematic application of comprehensive knowledge and evaluation of complex scientific principles of Chemical Engineering through creative thinking principles			CL5653 CL5654 CL5AAA CL5BBB CL5650 CL5652 CL5655
	K	Systemic approach, extensive knowledge and understanding of a wide range of cutting-edge chemical engineering processes and process equipment			CL5653 CL5654 CL5AAA CL5BBB CL5650 CL5655
	K	Critically evaluate and implement key aspects of artificial intelligence and cybersecurity related to chemical, biochemical and nuclear plants			CL5653 CL5654
	K/S	Originality in the application of knowledge and ability to use first principle modelling skills to creatively solve complex engineering problems			CL5652 CL5655 CL5BBB
	K	Conceptual understanding of key aspects and critical evaluation of state of art methodologies and practice in Bioprocess Engineering			CL5653 CL5AAA CL5BBB
	K/C	Categorise future societal challenges relating to the water-food-energy nexus and assess key innovative technologies for sustainable energy production, transportation and use			CL5AAA CL5653
	K	Conceptual understanding of advanced state of art thermodynamic cycle ramifications and innovative materials to low carbon process cycles and power.			CL5653 CL5655
	C/S	Analyse step-change scientific principles and to evaluate them in an engineering context			CL5653 CL5654 CL5650 CL5652 CL5655 CL5AAA CL5BBB

	S	Combine engineering principles, judgement and knowledge to investigate complex problems in the context of a range of commercial and industrial constraints			CL5653 CL5650 CL5652 CL5655 CL5BBB
	S	Hypothesise analytical solutions to creative complex open-ended problems			CL5650 CL5AAA CL5BBB
	K/C/S	Understanding and critical evaluation of current research and applied knowledge and potential impact on current practice.			CL5653 CL5650 CL5652

Learning/teaching strategies and methods to enable learning outcomes to be achieved, including formative assessments

Modern teaching methodologies and technologies will be used to ensure maximum engagement from the students. Flipped classrooms and virtual reality approaches will be incorporated into teaching all way through. Team learning exercises will provide students with training in communication skills and ability to work in teams as well as ability to hold a debate and justify choice of their design or solution to a set problem.

Summative assessment strategies and methods to enable learning outcomes to be demonstrated.

The assessment strategy is developed in mind to cover all needs and abilities of students and to help them to achieve the programme learning outcomes, to make studying more interactive for the students and to help them to benefit from continued professional development.

FHEQ Level 4 is the common Engineering Year 1 which provides students with a unique opportunity to study together with all engineering students and to gain fundamental knowledge of engineering, science and professional development. Assessment will be done in both a traditional way (when learning outcomes of a module are tested directly) and in a summative way (when more than one module's learning outcomes are tested).

For the FHEQ Levels 5, 6 & 7 each modular block (apart from the Design and Research projects) is designed to be 15 credits and each one will be taught and assessed within one term. Students will be tested through a combination of exams and assignments, evenly spread throughout each year.. FHEQ Level 6 and FHEQ Level 7 will have a minimal number of exams (2-3) with the majority of the assessment based on coursework, lab reports, in-class tests and presentations. This will allow the students to demonstrate the knowledge, skills and system thinking they have acquired in each module and to better prepare them for the workplace.

Each learning outcome is covered by more than one assessment.

25. Programme Structure, progression and award requirements

Programme structures and features: levels, assessment blocks, credit and progression and award requirements

- **Compulsory block:** one which all students registered for the award are required to take as part of their programme of study. These will be listed in the left hand column;

- **Optional block:** one which students choose from an 'option range'. These will be listed in the right hand column**;**

- A **core assessment** is an assessment identified within an assessment block or modular block (either compulsory or optional) which must be passed (at grade D- or better) in order to be eligible to progress and to be eligible for the final award. All core assessments must be specified on the programme specification next to the appropriate assessment or modular block:

Where students are expected to pass the block at D- or better, but not necessarily all elements, then the block itself is core.
e.g. AB3000 Project (40)
Core: Block

Where only some elements of assessments are required to be passed at D- or better, these will be identified by listing each element that is core
e.g. AB3001 Title (20 credits)
Core: 1 & 4

Where students are expected to pass all assessments in a block then this will be identified. By setting the assessment this way, students are also required to pass the block by default. This will be identified thus:
e.g. AB3002 Title (20 credits)
Core: All, Block

- A **non-core assessment** does not have to be passed at grade D- or better, but must be better than a grade F, in order to progress and to be eligible for the final award.

FHEQ Level 4 – Year 1	
Compulsory assessment block codes, titles and credits	**Optional assessment block codes, titles and credits**
Compulsory study block codes, titles and credit volume	**Optional Study block codes, titles and credit volume**
Compulsory modular block codes, titles and credits BE1601 Engineering Mathematics & Programming (Core Block) – (20 credits) BE1602 Engineering Practice (Core Block) – (20 credits) BE1603 Engineering Systems and Energy – (30 credits) BE1604 Engineering Mechanics and Materials I – (15 credits) BE1605 Engineering Mechanics and Materials II – (15 credits) CL1620 Chemical Engineering Introduction (20 credits)	**Optional modular block codes, titles and credits**
FHEQ Level 4 – Year 1 Progression and Award Requirements **As per Senate Regulation 2**	

FHEQ Level 5 – Year 2	
Compulsory assessment block codes, titles and credits	**Optional assessment block codes, titles and credits**
Compulsory study block codes, titles and credit volume	**Optional Study block codes, titles and credit volume**
Compulsory modular block codes, titles and credits CL2602 Chemical Engineer's Toolbox (15) CL2603 Engineering Computing & Statistics (15) CL2604 Chemical Engineering Thermodynamics (15) CL2605 Chemical Reaction Engineering (15) CL2606 Fluids Mechanics (15) CL2600 Engineering Chemistry (15) CL2601 Heat and Mass Transfer (15) CL2607 Separation Processes I (15)	**Optional modular block codes, titles and credits**
FHEQ Level 5 – Year 2 Progression and Award Requirements **As per Senate Regulation 2**	

Placement	
Compulsory assessment block codes, titles and credits	**Optional assessment block codes, titles and credits**

Compulsory study block codes, titles and credit volume	Optional study block codes, titles and credit volume
Compulsory modular block codes, titles and credits CL2555 Industrial Training (120) Core: Block	**Optional modular block codes, titles and credits**
Placement Progression and Award Requirements **As per Senate Regulation 2** For BEng Chemical Engineering with Placement, (CL2555) will contribute 25% of the FHEQ Level 5 – Year 2 profile and 8.3% of the overall degree calculation. Module CL2555 must be undertaken between FHEQ Level 5 – Year 2 and FHEQ Level 6 – Year 3. For MEng Chemical Engineering with Placement, (CL2555) will contribute 25% of the FHEQ Level 5 – Year 2 profile and 5% of the overall degree calculation. Module CL2555 must be undertaken between FHEQ Level 5 – Year 2 and FHEQ Level 6 – Year 3 or between FHEQ Level 6 – Year 3 and FHEQ Level 7 – Masters Year.	

FHEQ Level 6 – Year 3	
Compulsory assessment block codes, titles and credits	**Optional assessment block codes, titles and credits**
Compulsory study block codes, titles and credit volume	**Optional study block codes, titles and credit volume**
Compulsory modular block codes, titles and credits CL3602 Process Design and Safety I (15) CL3605 Chemical Engineering Design Project (30) (Core) CL3603 Separation Processes II (15) CL3606 Process Design and Safety II (15) CL3600 Biochemical Engineering (15) CL3601 Process Control (15) CL3604 Big Data Analytics (15)	**Optional modular block codes, titles and credits**

FHEQ Level 6 – Year 3 Progression and Award Requirements

As per Senate Regulation 2

BEng (Honours) Chemical Engineering: 360 Credits
BEng (Honours) Chemical Engineering with Placement: 480 Credits

For BEng Chemical Engineering with Placement, (CL2555) will contribute 25% of the FHEQ Level 5 – Year 2 profile and 8.3% of the overall degree calculation. Module CL2555 must be undertaken between FHEQ Level 5 – Year 2 and FHEQ Level 6 – Year 3.

For MEng Chemical Engineering with Placement, (CL2555) will contribute 25% of the FHEQ Level 5 – Year 2 profile and 5% of the overall degree calculation. Module CL2555 must be undertaken between FHEQ Level 5 – Year 2 and FHEQ Level 6 – Year 3 or between FHEQ Level 6 – Year 3 and FHEQ Level 7 – Masters Year.

If registered on BEng Chemical Engineering with Placement, (CL2555) and the Industrial Training module is not passed at D- or above, the degree of BEng Chemical Engineering may be awarded by the Board of Examiners.

FHEQ Level 7 – Masters Year	
Compulsory modular block codes, titles and credits CL5653 Emerging Low Carbon Technologies (15) CL5654 Industrial Internet of Things & Cyber Security (15) CL5650 Chemical Engineering Research Project (30) (Core) CL5652 Innovation Toolbox (15) CL5655 Process Systems Engineering (15) CL5AAA Sustainable and Environmental Engineering (15) CL5BBB Advanced Process Engineering (15)	**Optional modular block codes, titles and credits**

Progression and Award Requirements

As per Appendix B of Senate Regulation 2

MEng (Honours) Chemical Engineering: 480 Credits
MEng (Honours) Chemical Engineering with Placement: 600 Credits

For MEng Chemical Engineering with Placement, (CL2555) will contribute 25% of the Level 5 profile and 5% of the overall degree calculation.
If registered on MEng Chemical Engineering with Placement, (CL2555) and the Industrial Training module is not passed at D- or above, the degree of MEng Chemical Engineering may be awarded by the Board of Examiners.