Course Specification

A. Course Information			
Final award title(s)	MSc Chemical Engineering and Process Management		
Intermediate exit award title(s)			
UCAS Code	**n/a**	**Course Code(s)**	4915 (Full Time) 4916 (Part Time)
	London South Bank University		
School	☐ ASC ☐ ACI ☐ BEA ☐ BUS ☒ ENG ☐ HSC ☐ LSS		
Division	Division of Chemical and Energy Engineering		
Course Director	Anna-Karin Axelsson		
Delivery site(s) for course(s)	☒ Southwark ☐ Havering ☐ Other: please specify		
Mode(s) of delivery	☒Full time ☒Part time ☐other please specify		
Length of course/start and finish dates	(see table below)		

Mode	Length years	Start - month	Finish - month
Full time	1 year +summer	Sep 2018	Sep 2019
Full time with placement/ sandwich year			
Part time	2years+summer	Sep 2018	Sep 2020
Part time with Placement/ sandwich year			

Is this course generally suitable for students on a Tier 4 visa?	Please complete the International Office questionnaire Yes Students are advised that the structure/nature of the course is suitable for those on a Tier 4 visa but other factors will be taken into account before a CAS number is allocated.	
Approval dates:	Course(s) validated / Subject to validation	February 2017
	Course specification last updated and signed off	September 2019
Professional, Statutory & Regulatory Body accreditation	Institute of Chemical Engineers (IChemE)	

Reference points:	Internal	Corporate Strategy 2015-2020 Academic Quality and Enhancement Manual School Strategy LSBU Academic Regulations
	External	QAA Quality Code for Higher Education 2013 Framework for Higher Education Qualifications Subject Benchmark Statements (Dated) PSRB Competitions and Markets Authority SEEC Level Descriptors 2016

B. Course Aims and Features	
Distinctive features of course	MSc Chemical Engineering and Process Management explores topics required for a successful career as a chemical engineer where the student study process management and how this relates to chemical engineering along with solid knowledge in reactor & process design, process simulation, energy integration and materials engineering. The course has been developed in response to relevant industry needs and it reflects our strength in research and teaching within this area.
Course Aims	The MSc Chemical Engineering and Process Management aims to: • Produce graduates trained in the core discipline of Chemical Engineering including energy, materials and reaction engineering, and project management. • To produce MSc graduates who are equipped with the relevant understanding, skills and knowledge required to operate effectively in the Chemical Engineering sector. • Produce graduates capable of contributing to the profession of Chemical Engineering in the context of modern industrial practice and sustainable development. • To enable students to develop an understanding of relevant disciplines associated with Chemical Engineering in order to operate in multidisciplinary teams. • Develop students' knowledge of mathematics, applied sciences, engineering methods and safety, in support of the central themes of the course. • Develop students' intellectual and reasoning powers, their ability to perceive the broader perspective, and their problem-solving skills through the integration of a broad range of subject material. • Teach students to communicate clearly, to argue rationally and to draw conclusions based on an analytical and critical approach to data and systems. • To encourage the development of personal qualities and professional competences of Chemical Engineers.
Course Learning Outcomes	A. Students will have knowledge and understanding of: A1. Mathematics, science and engineering underlying the practice of chemical engineering. A2. The interactions involved in chemical engineering systems and analytical and computational tools to deal with these. Mathematical and computer

	models in the design and analysis of chemical equipment and processes, and an appreciation of their benefits and limitations. A3. The scope of chemical engineering from design to simulation of unit operations and processes. The professional and ethical responsibilities in the global and social context of engineering. A thorough understanding of current practice in chemical engineering and its limitations and some appreciation of likely new developments. Current technological and commercial challenges and development of the chemical industry. A4. The economic, management and statutory requirements involved in the practice of chemical engineering. The business practices and how these may be applied appropriately. B. <u>Students will develop their intellectual skills such that they are able to:</u> B1. Use mathematics, science and engineering to support theoretical and practical analysis of complex chemical processes. B2. Employ concepts from the applied and engineering sciences to design and evaluate chemical processes. Use scientific principles in the modelling and analysis of chemical engineering processes. B3. Show awareness of the significance of safety in design work. Critically analyse commercial risks through understanding the basis of such risks. B4. Use fundamental knowledge to investigate new and emerging technologies. B5. Extract data pertinent to an unfamiliar problem, and apply in its solution using computer based tools when appropriate. B6. Integrate engineering principles of a multi-disciplinary nature in order to propose solution to problems. B7. Apply management and business practices appropriately. B8. Produce engineering solutions, which are consistent with ethical and social responsibilities. <u>C. Students will acquire and develop practical skills such that they are able to:</u> C1. Use computers and current software in quantitative and analytical work, as well as general information technology for communication and data handling. Use software commercially available in the simulation of chemical processes. C2. Plan and manage work both individually and in teams. Communicate effectively using appropriate media. C3. Evaluate designs and systems to identify areas of potential hazard and environmental threat and propose improvements.

	C4. Use laboratory, engineering and measuring equipment to provide data in support of theoretical understanding. C5. Analyse and solve engineering problems, often based on limited and imperfect data. Critically apply scientific evidence based methods in the solution of problems. C6. Apply principles of project management. <u>D. Students will acquire and develop transferrable skills such that they are able to:</u> D1. Demonstrate literacy and numeracy skills. Manipulate, sort and present data in forms useful for understanding. Select, interpret and validate data, identifying possible errors and inconsistencies. D2. Communicate clearly the findings of experiments, projects and other assignments using written reports, oral and visual presentations. D3. Work effectively in a team, recognising the roles played by different team members. D4. Manage own responsibilities, including time and task management. D5. Undertake self-development and the capacity to learn. D6. Identify and solve problems in familiar and unfamiliar situations. D7. Adapt to change in the working environment.

C. Teaching and Learning Strategy

A. Teaching and learning strategy for knowledge outcomes

All the course lectures, tutorials and laboratory practical work will deliver knowledge and understanding described in A1. The knowledge and understandings of A2, are strongly delivered in the modules: Advanced Reaction Engineering, Energy Management & Sustainability and Multi Phase Flow and further as an important outcome of the Dissertation Project. The students will gain knowledge described in A3 in the modules; Advanced Engineering Practice, Chemical Process Management, and Energy Management& Sustainability and the learning outcome is also an important feature in the Dissertation Project.

Much of the understanding described in A4 will be gained in Chemical Process Management, Engineering Management and Energy Engineering & Sustainability where various engineering management tools will be taught. In all modules an understanding of health & safety practice are featured throughout the course, in particular for the practical work undertaken.

The MSc students are encouraged to attend the seminars/event such as those organized by externally by IChemE and research seminars at LSBU. Invited guest lectures from industry will deliver presentations at LSBU on relevant and current topics.

B Teaching and learning strategies for intellectual skills

Most of the curriculum of the MSc course will support the intellectual learning skills outcomes described in B1-B8. The intellectual skills are developed through lectures, individual and group problem-based work, including the Dissertation Project. In private study, students will develop their engineering intellectual skills by report writing, and addressing problems set by the tutor or in past examinations, case studies, and projects.
The learning outcomes described in B5 are developed in computer laboratory sessions embedded in modules and projects (Multi Fluid Flow, Energy Management & Sustainability)

C. Teaching and learning outcomes for developed practical skills

Computing skills for engineering and science, C1, is expanded in the course where students will learn the principles and study the application of specialist engineering packages. (Aspen HYSYS, Aspen Energy Analyzer, STAR CCM+)
C2 and C3 will be major part of small projects embedded in some modules and in the. C4 will be acquired in practical laboratory sessions such as in Advanced Materials Engineering Coursework in modules like Chemical Process Management, Energy Engineering & Sustainability, and the Dissertation project will be open-ended, developing C5 and C6.

D. Teaching and learning outcomes for developed transferable skills

The outcomes described in D1 are developed in practical work and design tasks where students for example obtain data from handbooks and computer databases, and use it in calculations, graphical solutions and computer applications.
The transferable skills outcomes described in D2 and D3 are developed by report-writing and team-working exercises and in laboratory and project-oriented modules. D4-D6 developed along the course but in particular in the Dissertation module, which is research based

D. Assessment

A Assessment for knowledge and understanding outcomes

Content, knowledge and understanding of the taught material are assessed either by 100% coursework, or combined coursework and examination (typical 40% CW - 60% exam)
Summative coursework will be based on the practical or theoretical content of the module, as either essays, reports, group work, oral presentations, production of posters, and in-class tests.
Examinations normally take the form of a 3-hour unseen end-of-semester paper pre examined by external exam board.
Formative assessments will include tutorials exercises, computer simulation exercises, discussions in classroom, questions and answer sessions, peer discussions, observations, reflection on learning, presentation rehearsals

B Assessment for intellectual skills outcomes

Intellectual skills are normally assessed through formal examinations and student presentations. Preparation of laboratory and project reports are also considered as assessment of the developed intellectual skills.

C Assessment of practical skills

C1 will be assessed through computing assignments, C2-C6 as parts of coursework assessment, and C4 in the marking of laboratory reports. The outcomes described in C5-C6 are assessed in project based coursework and will be marked for the critical approach to problem-solving.

D Assessment for developed transferable skills

A variety of methods will be used to assess transferable skills. These assessments include computer laboratory exercises and simulations, oral presentations, written reports, and management in the Dissertation.

D1 is assessed in many of the written examination papers, and reports, and further as constructive feedback on the quality of written reports,D2. The effectiveness of teamwork, D3, is assessed as an element in several coursework tasks throughout the course. D4-D6 is heavily assess in the research based Dissertation module.

E. Academic Regulations

The University's Academic Regulations apply for this course.

http://www.lsbu.ac.uk/__data/assets/pdf_file/0008/84347/academic-regulations.pdf

For course specific protocols please refer to the School/Divisional protocol document.

F. Entry Requirements

The MSc Chemical Engineering and Process Management offers a specialisation route for chemical engineering graduates, or a conversion route for non-chemical engineering graduates. In the second case, the module Applied Engineering Practice is offered to bridge the gap in chemical engineering. The standard requirement for admission will be a 2.2 or higher first degree in engineering or a physical science from a UK university, or equivalent degree from overseas. Where entering with an engineering qualification, this must have contained sufficient study of materials and their properties to adequately prepare the entrant. It is considered that a pure software engineering background would not give suitable cover of materials, but that all other branches of engineering will be acceptable. Entrants from a science route must, by their degree or otherwise, be sufficiently prepared for the mathematical content of the course. Applicants must also meet the University's standard requirement for English, i.e. IELTS 6.5, TOEFL 580 or equivalent.

G. Course structure(s)

Course overview MSc Chemical Engineering and Process Management

Full time students (FT) are offered an option of Applied Engineering Practice and Chemical Process Management depending if they are previous a chemical engineering graduate or not. Dissertation ENG-7-CED stretches from S2 to over the summer

Part time (PT) students, will follow a similar programme over 2 years.

MSc Chemical Engineering and Process Management 4915 (Full Time)

	Semester 1		Semester 2	
Level 7	Advanced Materials Engineering ENG-7-MEN	20	Engineering Management ENG-7-EMC	20
	Energy Management and Sustainability ENG-7-EMS	20	Multiphase Fluid Flow ENG-7-MFF	20
	Chemical Process Management ENG-7-CPM	20	Advanced Reaction Engineering ENG-7-ARE	20
			CPE Dissertation (S1+S2+summer) CPE_7_DIS	60

MSc Chemical Engineering and Process Management 4916 (Part Time)

	Semester 1		Semester 2	
Year 1	Chemical Process Management ENG-7-CPM	20	Advanced Reaction Engineering ENG-7-ARE	20
	Advanced Materials Engineering ENG-7-AME	20	Engineering Management ENG-7-EMC	20
Year 2	Energy Management and Sustainability ENG-7-EMS	20	Multiphase Fluid Flow ENG-7-MFF	20
			CPE Dissertation (S1+S2+summer) CPE_7_DIS	60

H. Course Modules

Chemical Process Management (ENG_7_CPM)
Lecturer(s): Dr Donglin Zhao
Dr Abdel Fenghour
This module is designed to introduce MSc students of science and engineering background to an understanding of the design and management of modern chemical processes within the prevailing economic, regulatory and environmental constraints.

The module will focus on process design principles, management principles within the chemical process industry, process evaluation, profitability measures, safety and environmental management.

Multiphase Fluid Flow (ENG_7_MFF)
Lecturer(s): Dr Elsa Aristodemou
Dr Donglin Zhao
To understand the governing physical principles and equations of the simultaneous motion of two or more immiscible fluids within the Chemical Engineering context. Both laminar and turbulent flows will be considered. Typical application problems to be studied are: fluidisation and fluidised beds; interaction of reacting fluids with catalyst particles in fluidised beds; aerated bioreactors; vaporisation of different fluids (e.g. water) inside heated tubes of vertical evaporators; mixing of particles with fluids and movement of mixture; two or three phase flow (liquid, gas) through vertical pipes/wells (slug flow, annular flow, mist flow, bubble flow). Understanding the design of slug catchers.

Energy Management and Sustainability (ENG_7_EMS)
Lecturer(s): Dr Anna-Karin Axelsson
Dr Paul Battersby
This Energy Management and Sustainability module will focus on the emerging field of bio-refining as compared and opposed to oil-refining. You will learn about bio-fuels, biochemical production as well as the most important biomass feedstocks, conversion technologies, final products and sustainability analysis. The module aims to demonstrate how to design, analyse and integrate sustainable processes, and clarify useful methodologies of mass- and energy integration for process optimization. The students will use sustainable refineries as a case study involving process modelling (Aspen HYSYS and Aspen Energy Analyzer) and process integration studies based on Pinch Analysis approaches.

Advanced Materials Engineering (ENG_7_AME)
Lecturer(s): Dr Suela Kellici
Prof Steve Dunn
Materials are important for engineering activity and strategically central to the research and development of any country. Understanding how to engineer materials will allow the student to learn and contribute to future development of materials used in engineering aiming to deliver related advancements with improved performance, efficiency, sustainability and profitability. This unit provides the fundamental material science together with design and engineering aspects of materials used. Material classification groups such as metals, alloys, composites, polymers, ceramics, thin film & coatings materials will be discussed from their mechanical, optical, electrical and magnetic functionalities, process methods, environmental impact. Material analysis techniques will be taught as well.

Advanced Reaction Engineering (ENG_7_ARE)
Lecturer(s): Prof Basu Saha
Dr Achilleas Constantinou
This course goal is the successful design and operation of chemical and catalytic reactors. In a typical situation engineers are faced with a variety of questions: what information is needed to tackle a problem, what is the best way to obtain it and how to select a reasonable design among many alternatives. In this course we will teach how to answer these questions through simple design methods, graphical procedures and frequent comparison of competencies of the major reactor types.

Engineering Management (ENG_7_EMC)
Lecturer(s); Dr Claire Benson
Dr Paul Battersby
This module is designed for chemical engineers to enable them for progression towards an Engineering Management role within technical projects related to chemical industries. The module helps them to understand the fundamental aspects of Engineering Management processes, techniques and skills.
This will be achieved through lectures, practical sessions, chemical engineering case studies and assessed reports.
The students will receive lectures focusing on key concepts and processes such as fundamental management principles and techniques, planning, monitoring and controlling design resources, organisational aspects and leadership basics and skill set, design practices, quality systems and tools. They will be required to develop study cases, exercises and reports.

Dissertation (ENG_7_CED)
Module Leader: Dr Fatemeh Jahanzad
Lecturer(s) Project depending
The dissertation allows the student to integrate the knowledge and skills gained in other parts of the course into a single project. The dissertation is a combination of design and research related to a particular aspect of chemical engineering. The dissertation will generally be completed at the University but may be industrially based; this may be particularly suitable for part-time students who are able to work on a project relevant to their employment.

Course Module Assessment Plan					
Module Code	**Module Title**	**Level**	**Semester**	**Credit value**	**Assessment**
ENG-7-CPM	Chemical Process Management	7	S1	20	Exam CW
ENG-7-MFF	Multiphase Fluid Flow	7	S1	20	Exam CW
ENG-7-MES	Energy Management and Sustainability	7	S1	20	Exam CW
ENG-7-AME	Advanced Materials Engineering	7	S2	20	In Class Exam CW
ENG-7-ARE	Advanced Reaction Engineering	7	S2	20	Exam CW
ENG-7-EMC	Engineering Management	7	S2	20	Exam CW
ENG-7-CED	Dissertation	7	S2	60	CW: 100% 70% Thesis 30% viva

I. Timetable information

- Students can expect to receive a confirmed timetable for study commitments; upon Week 1 of Semester 1
- Enrolled students will be announced via Moodle and in class if Timetable changes are planned

J. Costs and financial support

Course related costs

- Access to labs and consumables for projects will be applied from School of Engineering
- Field trips may be self-funded
- The tuition fee do not cover any literature (downloads or books) nor stationaries

Tuition fees/financial support/accommodation and living costs

- Information on tuition fees/financial support can be found by clicking on the following link - http://www.lsbu.ac.uk/courses/undergraduate/fees-and-funding or
- http://www.lsbu.ac.uk/courses/postgraduate/fees-and-funding
- Information on living costs and accommodation can be found by clicking the following link- https://my.lsbu.ac.uk/my/portal/Student-Life-Centre/International-Students/Starting-at-LSBU/#expenses

List of Appendices

Appendix A: Curriculum Map
Appendix B: Personal Development Planning (postgraduate courses)
Appendix C: Terminology

Appendix A: Curriculum Map

This map provides a design aid to help course teams identify where course outcomes (A1-A4, B1-B8, C1-C6 and D1 to D7) are being developed, taught and assessed within the course. It also provides a checklist for quality assurance purposes and may be used in validation, accreditation and external examining processes. The table will help students to monitor their own learning and development outcomes for their Personal Developing Plan (PDP) as the course progresses. Approach to PDP is found in Appendix C

MSc Chemical Engineering and Process Management outcome mapping

Modules		Outcomes																										
Title	Code	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	B7	B8	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6	D7
Engineering Management Chemica	ENG-7-EMC				TA							DA	DA		TA			TAD	TAD			TAD	D	D	D	D
Applied Engineering Practice		TA	TAD	TA		TA	TA	TA						TDA						DA						
Advanced Reaction Engineering		TA	TA		TA	TA	TA							TDA												
Chemical Process Management		TA	TAD	TA		TA	TA							TDA						DA						
Energy Management and Sustainability		TA		TA							DA					TDA				TA						
Advanced materials Engineering		TA							TA		D															

Multiphase Fluid Flow		TA	T A		T A D		T A			T A	T D				T D A											
Dissertation		DA	D A	D A	D A	D A	T D A	D A		D	D A	D A	D		T D A		D A			D A	D A	D A	D	D	D	

T: Taught; D: Developed; A: Assessed

Appendix C: Personal Development Planning

Personal Development Planning (PDP) is a structured process by which an individual reflects upon their own learning, performance and/or achievement and identifies ways in which they might improve themselves academically and more broadly. The MSc course team will Indicate where/how in the course/across the modules this is supported.

Approach to PDP	Level M
1. Supporting the development and recognition of skills through scheduled one-to-one meeting	Module coordinator and course director interaction
2. Supporting the development and recognition of skills in academic modules/units.	Across modules, presentations and CW feedback
3. Supporting the development and recognition of skills through purpose designed modules/units.	Dissertations, simulation projects, presentations, and report writing
4. Supporting the development and recognition of skills through research projects and dissertations work.	Dissertation
5. Supporting the development and recognition of career management skills.	In Dissertation, Engineering Management, Chemical Engineering Management, Energy Management & Sustainability
6. Supporting the development and recognition of career management skills through taught materials and invited guest lecturers	In Dissertation, Engineering Management, Chemical Engineering Management, Advanced Materials
7. Supporting the development of skills by recognising that they can be developed through extra curricula activities.	IChemE seminars/events attendance. Visit at other universities
8. Supporting the development of the skills and attitudes as a basis for continuing professional development.	Dissertation, Engineering Management, IChemE seminars/events attendance
9. Other approaches to personal development planning.	
10. The means by which self-reflection, evaluation and planned development is supported e.g. electronic or paper-based learning log or diary.	In Dissertation, Engineering Management, , Chemical Engineering Management, Energy Management & Sustainability

Appendix D:

Terminology

awarding body	a UK higher education provider (typically a university) with the power to award higher education qualifications such as degrees
bursary	a financial award made to students to support their studies; sometimes used interchangeably with 'scholarship'
compulsory module	a module that students are required to take. (opposite to Optional)
contact hours	the time allocated to direct contact between a student and a member of staff through, for example, timetabled lectures, seminars and tutorials
coursework	student work that contributes towards the final result but is not assessed by written examination
current students	students enrolled on a course who have not yet completed their studies or been awarded their qualification
delivery organisation	an organisation that delivers learning opportunities on behalf of a degree-awarding body
extracurricular	activities undertaken by students outside their studies
feedback (on assessment)	advice to students following their completion of a piece of assessed or examined work
formative assessment	a type of assessment designed to help students learn more effectively, to progress in their studies and to prepare for summative assessment; formative assessment does not contribute to the final mark, grade or class of degree awarded to students

higher education provider	organisations that deliver higher education
independent learning	learning that occurs outside the classroom that might include preparation for scheduled sessions, follow-up work, wider reading or practice, completion of assessment tasks, or revision
intensity of study	the time taken to complete a part-time course compared to the equivalent full-time version: for example, half-time study would equate to 0.5 intensity of study
lecture	a presentation or talk on a particular topic; in general lectures involve larger groups of students than seminars and tutorials
learning zone	a flexible student space that supports independent and social earning
material information	information students need to make an informed decision, such as about what and where to study
mode of study	different ways of studying, such as full-time, part-time, e-learning or work-based learning
modular course	a course delivered using modules
module	a self-contained, formally structured unit of study, with a coherent and explicit set of learning outcomes and assessment criteria; some providers use the word 'course' or 'course unit' to refer to individual modules
optional module	a module or course unit that students choose to take (opposite to Compulsory)
professional body	an organisation that oversees the activities of a particular profession and represents the interests of its members
prospective student	those applying or considering applying for any programme, at any level and employing any mode of study, with a higher education provider

regulated course	a course that is regulated by a regulatory body
regulatory body	an organisation recognised by government as being responsible for the regulation or approval of a particular range of issues and activities
scholarship	a type of bursary that recognises academic achievement and potential, and which is sometimes used interchangeably with 'bursary'
semester	either of the parts of an academic year that is divided into two for purposes of teaching and assessment (in contrast to division into terms)
seminar	seminars generally involve smaller numbers than lectures and enable students to engage in discussion of a particular topic and/or to explore it in more detail than might be covered in a lecture
summative assessment	formal assessment of students' work, contributing to the final result
term	any of the parts of an academic year that is divided into three or more for purposes of teaching and assessment (in contrast to division into semesters)
total study time	the total time required to study a module, unit or course, including all class contact, independent learning, revision and assessment
tutorial	one-to-one or small group supervision, feedback or detailed discussion on a particular topic or project
workload	see 'total study time'
written examination	a question or set of questions relating to a particular area of study to which candidates write answers usually (but not always) under timed conditions