Course Specification

A. Course Information			
Final award title(s)	MSc Future Energy Engineering		
Intermediate exit award title(s)	PG Dip in Future Energy Engineering PG Cert in Future Energy Engineering		
UCAS Code	**n/a**	**Course Code(s)**	5585 (Full Time) 5728 (Part Time)
	London South Bank University		
School	☐ ASC ☐ ACI ☐ BEA ☐ BUS ☒ ENG ☐ HSC ☐ LSS		
Division	Division of Chemical and Energy Engineering		
Course Director			
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 - mor
Full time	1 year +summer	Sep 2021	Sep 2022
Full time with placement/ sandwich year			
Part time	2years+summer	Sep 2021	Sep 2023
Part time with Placement/ sandwich year			

Is this course generally suitable for students on a Tier 4 visa?	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	July 2019
	Course specification last updated and signed off	
Professional, Statutory & Regulatory Body accreditation	Institute of Chemical Engineers (IChemE) Will seek from IoM^3	

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	The MSc Future Energy Engineering cover both the theoretical knowledge and advanced technical skills in demand from the evolving process and energy engineering sectors and will therefor includes both oil & gas as well as renewable technologies. The student will study topics such as process management and how this relates to sustainable chemical & process engineering, along with detailed knowledge in process design and simulation, energy integration and optimisation, as well developing an understanding of the limitations of natural resources, how they can be accessed and alternative approaches to a more sustainable energy production. The course has been developed in response to relevant industry needs and it reflects our strength in research and teaching within this area. The course will develop aspects of sub surface energy reserves, and relate those to technologies that are being used to support 'green infrastructure' such as carbon capture and storage.
Course Aims	The MSc Future Energy Engineering aims to: • Produce graduates trained in the core discipline of energy engineering that have a strong focus and interest in improvement and development of technologies to produce energy more efficiently and sustainably. • To produce MSc graduates who are equipped with the relevant understanding, skills and knowledge required to operate effectively in both the chemical engineering and energy sector. • Produce graduates capable of contributing to the profession of chemical engineering and energy in the context of modern industrial practice and sustainable development. • To enable students to develop an understanding of relevant disciplines associated within the chemical - and energy engineering sector in order to operate in multidisciplinary teams. • Develop students' knowledge of applied technologies, engineering methods, and management tools in support of the central themes of the course. • Develop students' intellectual and reasoning powers, their ability to perceive the broader perspective, and their real life problem-solving skills through the integration of subject material and research.

	• Teach students to communicate clearly, present technical reports and findings and to draw analytical conclusions based on a critical approach to data and systems. • To encourage the development of personal qualities and professional competences of future chemical and energy engineers.
Course Learning Outcomes	A. Students will have knowledge and understanding of: A1. Mathematics, science and engineering underlying the practice of chemical and energy engineering. A2. The interactions involved in energy engineering systems and analytical and computational tools to deal with these. Mathematical and computer models in process design, integration and analysis of processes and an appreciation of their benefits and limitations. A3. The scope of chemical and energy engineering from design to simulation of unit operations and processes. The professional and ethical responsibilities in the global and social context of energy engineering. A thorough understanding of current practice in energy engineering and its limitations and some appreciation of likely new developments. Current technological and commercial challenges and development of energy efficient and sustainable industry. A4. The economic, management and statutory requirements involved in the practice of chemical and energy engineering. The business practices and how these may be applied appropriately in content. B. Students will develop their intellectual skills such that they are able to: B1. Use mathematics, science and engineering to support theoretical and practical analysis of complex industrial processes and energy conversions. B2. Employ concepts from the applied and engineering sciences to design and evaluate processes. Use scientific principles in the modelling and analysis of energy engineering. 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 for a sustainable future. 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 commercially software and numerical methods in the simulation of process integration and energy optimisation. 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 analytical 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 problem solving. C6. Apply principles of process 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 limitations& 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 learning outcome. The knowledge and understandings of A2, are strongly delivered in the modules: Advanced Energy Technologies and Subsurface Engineering. These are further developed and delivered as an important outcome of the Dissertation Project. The students will gain knowledge described in A3 in the modules; Process Management and Subsurface Engineering. This learning outcome is also an important feature in the Dissertation Project.

Much of the understanding described in A4 will be gained in Advanced Energy Technologies, Earth Resources and Process Management or Advanced Materials Engineering 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, Energy Institute 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, and in 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 covered in Earth Resources and Subsurface Engineering.

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 modules. C4 will be acquired in practical laboratory sessions such as in Subsurface Engineering.
Coursework across the program 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 2 to 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 reportsD2. 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 Future Energy Engineering offers a specialization route for chemical engineering graduates, or a conversion route for non-chemical engineering graduates to upskill in the area of energy engineering based on advanced chemical engineering principles and skills. 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 engineering chemistry& physics, thermodynamic principles and engineering computer skills to adequately prepare the entrant. It is considered that a pure software engineering background would not give suitable cover, 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 Future Energy Engineering

Full time students (FT) are offered Future Energy Engineering if they are previous engineering graduate or not. Dissertation (CPE_DISS) stretches over the full academic year.

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

MSc Future Energy Engineering XXXX (Full Time)

	Semester 1		Semester 2	
Year 1	Earth Resources CEE_7_XXX	20	Advanced Energy Technologies CEE_7_XXX	20
	Emerging Energy and Sustainability CEE_7_XXX	20	Subsurface Engineering CEE_7_XXX	20
	Process Management CEE_7_XXX (Optional)	20	Process Safety and Hazards CEE_7_XXX (Optional)	20
	Safety, Health and Environment CEE_7_XXX (Optional)	20	Process Control and Instrumentation CEE_7_XXX (Optional)	20
	Advanced Materials Engineering CEE_7_XXX (Optional)	20	Dissertation (S1 /S2 +summer) CEE_7_XXX	60

MSc Future Energy Engineering XXXX (Part Time)

	Semester 1		Semester 2	
Year 1	Earth Resources CEE_7_XXX	20	Advanced Energy Technologies CEE_7_XXX	20
	Process Management CEE_7_XXX (Optional) or Safety Health and Environment CEE_7_XXX (Optional) or Advanced Materials Engineering CEE_7_XXX (Optional)	20	Process Safety and Hazards CEE_7_XXX (Optional) or Process Control and Instrumentation CEE_7_XXX (Optional)	20
Year 2	Emerging Energy and Sustainability CEE_7_XXX	20	Subsurface Engineering CEE_7_XXX	20
			Dissertation (S1/S2 +summer) CEE_7_XXX	60

H. Course Modules

Course Module and Assessment Plan

Module Code	Module Title	Level	Semester	Credit value	Assessment
CEE_7_XXX	Emerging Energy and Management	7	S1	20	Exam CW
CEE_7_XXX	Earth Resources	7	S1	20	CW
CEE_7_XXX	Process Management (Optional)	7	S1	20	Exam CW
CEE_7_XXX	Safety, Health and Environment (Optional)	7	S1	20	Exam CW
CEE_7_XXX	Advanced Materials Engineering (Optional)	7	S1	20	Exam CW
CEE_7_XXX	Advanced Energy Technologies	7	S2	20	Exam CW
CEE_7_XXX	Subsurface Engineering	7	S2	20	Exam CW
CEE_7_XXX	Process Control and Instrumentation (Optional)	7	S2	20	Exam CW
CEE_7_XXX	Process Safety and Hazards (Optional)	7	S2	20	Exam CW
CEE_7_XXX	Dissertation	7	S1/S2/S	60	CW: 100% 75% Thesis 25% Viva

I. Timetable information

- Students can expect to receive a confirmed timetable for study commitments; during welcome week 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

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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 - 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 B

MSc Future Energy Engineering 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
Safety Health and Environment	CEE_SAFENV				TA							DA	DA		TA			TA D	TA D			TA D	D	D	D	D
Process Modelling and Simulation	CEE_PMS	TA	TA D	TA		TA	TA	TA						TD A						DA						
Emerging Energy and Sustainability	CEE_EES				TA							DA	DA		TA			TA D	TA D			TA D	D	D	D	D
Earth Resources	CEE_ER	TA	TA D	TA		TA	TA	TA						TD A						DA						
Process Management	CEE_MAN	TA	TA D	TA		TA	TA							TD A						DA						
Emerging Energy and Sustainability	CEE_EMERSUS	TA		TA							DA					TD A				TA						
Advanced Materials Engineering	CEE_ADMAT	TA							TA																	
Advanced Energy Technologies	CEE_AET	TA	TA		TA D		TA			TA	TD				TD A											
Subsurface Engineering	CEE_SUBENG	TA	TA		TA D		TA			TA	TD				TD A											
Process Control and Instrumentation	CEE_PMS	TA	TA D		TA	TA		TA						TD A						DA						
Process Safety and Hazards	CEE_PSH	TA	TA D		TA	TA		TA						TD A						DA						
Dissertation	CEE_DIS	DA	DA	DA	DA	DA	TD A	DA		D	DA	DA	D		TD A		DA			DA	DA	DA	D	D	D	

T: Taught; D: Developed; A: Assessed

Appendix B: 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 C: 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