Course Specification

A. Course Information			
Final award title(s)	BEng (Hons) Advanced Vehicle Engineering		
Intermediate exit award title(s)	Cert HE in Advanced Vehicle Engineering Dip HE in Advanced Vehicle Engineering		
UCAS Code	H330	**Course Code(s)**	5656 5657
	London South Bank University		
School	☐ ASC ☐ ACI ☐ BEA ☐ BUS ☒ ENG ☐ HSC ☐ LSS		
Division	Mechanical Engineering and Design		
Course Director	Alessio Corso		
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	3	September	August
Full time with placement/ sandwich year	4	September	August
Part time	4	September	August
Part time with Placement/ sandwich year	5	September	August

Is this course generally suitable for Visa Sponsored Students	Please complete the International Office questionnaire Yes ✓ No Students are advised that the structure/nature of the course is suitable for Visa Sponsored Students but other factors will be taken into account before a CAS number is allocated.	
Approval dates:	Course(s) validated /	November 2019
	Course Review date	November 2024
	Course specification last updated and signed off	August 2022
Professional, Statutory & Regulatory Body accreditation	Institution of Mechanical Engineers	
Reference points:	Internal	Curriculum Framework Review linked to the Corporate Strategy 2020-2025

		Academic Quality and Enhancement Website School Strategy LSBU Academic Regulations
	External	QAA Quality Code for Higher Education 2018 Framework for Higher Education Qualifications QAA Subject Benchmark Statement for Engineering (October 2019) UK Standard for Professional Engineering Competence (UK-SPEC, Third Edition) The Accreditation of Higher Education Programmes (AHEP-3 2014) Competitions and Markets Authority SEEC Level Descriptors 2021

B. Course Aims and Features

Distinctive features of course	The BEng Advanced Vehicle Engineering course is unique in the marketplace, delivered through innovative project-based learning and supported by industry leading hardware and software. The courses focus on sustainable development, future low-emission technologies and urban transportation benefitting from LSBU's inner-city central London location, and links with local leading Vehicle Engineering companies. Students will develop expertise, knowledge, and the specific skills demanded by leading automotive, future vehicle and motorsport industry. Students will study modules largely common with the accredited IMechE BEng Mechanical Engineering in Year 1 of the course, to provide a fundamental understanding of Vehicle Engineering core subjects. In subsequent Years students will increasingly study specific Advance Vehicle Engineering modules, and be expected to take an active role in LSBU's IMechE Formula Student Team, LSBU's Shell ECO Marathon team, and other group and individual projects specific to Vehicle Engineering. The course provides students with the opportunity to study Advanced Vehicle Engineering to a level consistent with accreditation by the IMechE as a route to Chartered Engineer status, whilst encouraging applied work and hands-on involvement through the many opportunities available. LSBU is creating a world-class Advanced Vehicle Engineering facility to support these courses and meet the needs of the Automotive, future Low-carbon Vehicle and Motorsport industry. Placements are encouraged ion the course. Students will be offered a range of placements based on industry contacts in the Automotive OEM / tyre suppliers, and Motorsport, and London transport networks.
Course Aims	The BEng Advanced Vehicle Engineering course aims to: 1. Encourage students to acquire a deeper understanding of the essential facts, concepts, theories and principles of Advanced Vehicle Engineering and its underpinning science and mathematics. Many recruiters will look favourably on BEng graduates for this reason. Graduates from this course will have the following knowledge, skills, abilities and characteristics:

	• Committed and able to follow a career in Vehicle Engineering allowing partial progression to Chartered Engineer professional status. • Awareness of best current practice within industry, and future trends. • Industry-critical skills such as working effectively as part of a team and/or providing the leadership for the team. • Effective communication skills enabling the exchange of ideas with specialist professionals and with the public at large. • Continual Professional Development (CPD) skills including critical self-awareness, reflection, independent judgement, responsibility for decisions, original thinking, managing own learning and making use of scholarly reviews and primary sources. • Systematic and broad understanding of the key topics within Vehicle Engineering together with the skills needed to update, extend and deepen in further study and future career development. • Understanding of a cognitive map of topics within the Vehicle Engineering subject area incorporating knowledge and understanding of core Mechanical Engineering topics such as Dynamics, Thermofluids, Mechanics of Solids, and Manufacturing and Materials underpinned by understanding of relevant science and engineering topics such as Mathematics, Statics, Materials Science, Computing and Control Systems. • Ability to analyse Vehicle Engineering components and systems from first principles, through to advanced simulation techniques. Understand the advantages and disadvantages of different analysis approaches, and be able to select an appropriate method. • Competent practical skills including basic manufacturing and measurement skills, awareness of advanced manufacturing and instrumentation techniques to inform design choices. • Ability to set up projects and manage them, approach design problems with creativity and see all tasks to successful completion underpinned by an understanding of innovation and enterprise.
Course Learning Outcomes	Additionally, the defined learning outcomes that are used in this course specification are those published by the Engineering Council in the UK standard for Professional Engineering Competence (UK-SPEC). **A) Students will have knowledge and understanding of:** **A1:** Knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies **A2:** Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in mechanical and related engineering disciplines and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems **A3:** Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of mechanical and related engineering disciplines

	A4: Understanding of engineering principles and the ability to apply them to analyse key engineering processes **A5:** Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques **A6:** Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action **A7:** Understanding of, and the ability to apply, an integrated systems approach to solving engineering problems **B) Students will develop their intellectual skills such that they are able:** **B1:** Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics **B2:** Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical health, safety, security and risk issues; intellectual property; codes of practice and standards **B3:** Work with information that may be incomplete or uncertain and quantify the effect of this on the design **B4:** Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal **B5:** Plan and manage the design process, including cost drivers, and evaluate outcomes **B6:** Communicate their work to technical and non-technical audiences **B7:** Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct **B8:** Knowledge and understanding of the commercial, economic and social context of engineering processes **B9:** Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives **B10:** Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate **B11:** Awareness of the relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues

	B12: Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques **C) Students will acquire and develop practical skills such that they are able to:** **C1:** Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc.) **C2:** Knowledge of characteristics of particular materials, equipment, processes or products **C3:** Ability to apply relevant practical and laboratory skills **C4:** Understanding use of technical literature and other information sources **C5:** Knowledge of relevant legal and contractual issues **C6:** Understanding of appropriate codes of practice and industry standards **C7:** Awareness of quality issues and their application to continuous improvement **C8:** Ability to work with technical uncertainty **C9:** Understanding of, and the ability to work in, different roles within an engineering team **D) Students will acquire and develop transferrable skills such that they are able to:** **D1:** Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities **D2:** Plan self-learning and improve performance, as the foundation for lifelong learning/CPD **D3:** Plan and carry out a personal programmes of work, adjusting where appropriate **D4:** Exercise initiative and personal responsibility, which may be as a team member or leader
C. Teaching and Learning Strategy **Knowledge and Understanding:**	

Graduates must be able to demonstrate their knowledge and they must have an appreciation of the wider multidisciplinary engineering context and its underlying principles. They must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

Teaching and Learning Strategies:
Acquisition of knowledge and understanding is covered through lectures, associated handouts and supporting material on the Virtual Learning Environment (VLE). Lectures, tutorials and laboratory practicals include analysis and/or design methods for which problems will be set to enhance student learning, supported by associated problem solving sessions, which reinforce the lecture content. Tutorials, coursework and tests provide written or verbal feedback to enhance and develop students learning. There is a substantial amount of self-directed learning through individual and/or group project work. The course is designed to provide a broad foundation in mechanical engineering with emphasis on theory, analysis, and design. The course also develops analytical and applied skills that will enable students to analyse, design and test engineering principles.

Intellectual Abilities:
Graduates must be able to apply appropriate quantitative science and engineering tools to the analysis of problems. They must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. They must be able to comprehend the broad picture and thus work with an appropriate level of detail.

Teaching and Learning Strategies:
Acquisition of Intellectual Skills is developed through lectures, tutorial, individual and team problem-based work. In private study, students will develop skills by writing laboratory reports, and tackling problems set by the tutor/laboratory instructor, or in past examinations and projects. Laboratory sessions are embedded in modules and projects, where students are taught the appropriate tools to solve engineering problems. The course teaches skills which span the mechanical engineering field, and are fundamental to engineering to effectively organise information and manage design complexity. Familiarity with the taught mechanical engineering skills, the ability to deploy them in appropriate situations, and the ability to use them effectively are important Intellectual Abilities. There are strong numerical, analytical and design skills across the course, which develop ideas from research and development activities. Acquisition of Intellectual Abilities is also gained through the specialist final year modules as well as the final year individual project. Students are encouraged to attend the seminars/events such as those organised by the School of Engineering and to attend presentations from invited speakers on relevant mechanical engineering topics.

Practical Skills:
Graduates must possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control. Evidence of group working and of participation in a major project is expected. However, individual professional bodies may require particular approaches to this requirement.

Teaching and Learning Strategies:
Acquisition of Practical Skills is acquired during the practical laboratory sessions. Students will learn to record laboratory activity to document and keep track of all design activities, conducted experiments, and measured/observed results. The laboratory experience, in most of the modules, should also assist students in learning practical issues such as: proper use of computers and test equipment, building and testing prototypes, understanding processes and issues associated with product development. Laboratory experiences capitalise on providing a foundation for other important elements of practical activities. The course offers carefully planned practical assignments in a laboratory setting which help students develop confidence in their technical

ability. Laboratory experiences will help students develop the expertise needed to build new products. Engineering laboratory exercises allow students to develop skills in theory, calculations, design, and testing. Further development of these skills is acquired in the final year individual project.

General Transferable Skills:
Graduates must have developed transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

Teaching and Learning Strategies:
Acquisition of General Transferable Skills is achieved through communication of knowledge in formal reports. These constitute a part of the assessment for most modules on the course. One aspect of this is ensuring that students possess a set of transferable skills such as communication, teamwork, and presentation skills. Students can use these skills in any occupation and can convey from one type of work to another without re-training. Additionally, students acquire library and research skills as well as professional skills such as time management, project management, information literacy, information management, career development, self-awareness, and keeping up-to-date with innovations in the field. From a motivational perspective, students receive formative feedback on these skills in the context of mechanical engineering and in a way that highlights their relevance and importance to the discipline.

Overview of Teaching and Learning Activities:
This includes lectures, guest lectures from industry, tutorials, practical workshop classes, practical laboratory experiments and field trips. The course is made up of several modules (see section G below) and each module is delivered through a combination of lectures, tutorials, practical workshops, etc. all of which amounts to directed teaching (classroom contact). There is a variance in the makeup of the number of hours dedicated to lectures, workshops etc. but the total number of study hours attached to each module is dependent on the module weighting in credits. Typically, a 20-credit module is attached to 200 hours of learning which constitutes both directed learning and independent learning (1 credit is equal to 10 hours). This is split between contact time and independent learning. Generally, this equates to a maximum of 78 hours of contact time per module, and 122 hours of independent learning time.

Further, teaching and learning in this course ensures that graduates have the capacity to meet the needs of employers, producing graduates who are prepared to move into employment with skills and expectations that benefit their employers. Graduates must be able to keep abreast with changes, and a key requirement of this course is equipping students with the mechanisms for achieving this. Lifelong learning is considered in this course, which can foster such attitudes with novel approaches to teaching and learning that continually question and challenge situations and by highlighting opportunities for advances. Final year modules, including the individual project, can challenge students by exercises that seek to explore new avenues.

Subject-related and Generic Resources:
These include the Perry Library, the metalwork and woodwork workshops, the rapid prototyping laboratories, the thermodynamics laboratory, the solid mechanics laboratory, the advanced vehicle engine test laboratory, and computer labs.

The core and optional reading lists are supplied at the end of each module guide produced by the module leader. A copy of the module guide will be made available on the Virtual Learning Environment VLE (Moodle) and the reading lists can also be accessed through LSBU's Library website.

Overview of Learning Support:

To support students in their learning, academic and support staff are available during the normal operating hours of the University via prior appointment. Academic staff also operate surgery hours where no prior appointments are needed. The University buildings and library are open from 8am to 9pm during term time, while the library operates for an extended period during examinations. Some specialist workshops/computing spaces etc. are not accessible outside the normal operating hours of 9am to 5pm, unless timetabled for use in a module. Teaching sessions for PT students may run until 9pm at the latest and the relevant and required areas are open for access as timetabled.

All students are allocated to a Personal Tutor when they begin their study at LSBU and the personal tutor is the one who students would typically see about any problems or issues they face; not just academic ones (most academic problems will probably be dealt with by module teachers or Course Directors). Students are advised to establish contact with their personal tutor from the beginning of their studies, evidenced by keeping a record of at least two meetings per semester. Students are briefed about the tutoring systems during the enrolment and orientation process and during the Design and Practice module.

The LSBU Skills for Learning Centre offers students a range of interactive workshops, one-to-one tutorials and drop-in sessions delivered by experienced learning developers. It also offers Language Support for international students. Students who struggle to understand some of the basics, or feel they need additional support in understanding fundamentals of mathematics, are advised to use the drop-in sessions where they can provide comprehensive advice and guidance.

Teaching Staff:
Most modules are delivered by full-time academic staff from within the parent division where the course resides and or sometimes by staff from other areas within the School of Engineering or University where expertise lies. The primary aim is that each module is taught by a single member of staff, which most likely is the module leader (support teaching may be needed depending on the nature/size of the module etc. where students are sub-grouped into multiple tutorials or laboratory sessions). Occasionally, PG students or part-time teaching or research staff may support certain sessions, and, in such cases, the relevant tutors are trained, and care is taken to ensure the quality of the provision.

Virtual Learning Environment (VLE):
Each course has a course site on the VLE, where relevant information is posted by the respective Course Director. Each module on the course has a Module site on the VLE and all relevant teaching and learning material such as module guides, lecture notes, teaching slides, tutorial and seminar sheets, workshop exercises, past exam papers, assignments, supplement material etc. are made available by the module leader. The VLE is based on the Moodle platform, and can be accessed using the Windows OS login credentials, and from any internet-connected PC inside or outside of the LSBU campus.

D. Assessment

Assessment Overview:
University keeps an assessment and examinations procedure; a current version can be accessed at
http://www.lsbu.ac.uk/__data/assets/pdf_file/0010/84349/assessment-and-examination-procedure.pdf
Coursework in modules can be either formative or summative and the details are usually made available in the module guide and explained to students by the module leader at the beginning of the semester. The module guide will also provide details about the weightage of these assessment components and when the relevant brief will be made available, including submission instructions and deadlines.

Formative assessment and feedback is part of the learning process on the course that provides constructive feedback to the learner. This allows students to improve their quality of work. It does not contribute towards a final module grade. All modules will provide students opportunities to receive formative assessment and feedback. Formative assessment typically includes discussions in the classroom, during tutorial exercises, simulation exercises, workshop or computing exercises, questions and answer sessions, peer discussions, observations, reflection on learning, presentation rehearsals.

Summative assessment and feedback is the process of evaluating learning at the conclusion of a module. Summative assessments include standardised tests delivered by examination, and coursework submissions. The course delivers both types of assessment used by the course. Normally, as a summative assessment, Students sit an end-of-semester examination in the form of a 2 or 3-hour unseen paper, or coursework assignments. Approximately 50% of the assessment on the course is via coursework. See Section H for individual modules. To pass a module, students must obtain an overall module mark of no less than 40% and a minimum threshold mark of 30% in each component.

Knowledge and Understanding:
The assessment strategy for Knowledge and Understanding is through examinations, mini tests, practical work using logbooks, assignments and formal reports, which frequently demand that the student extend knowledge of a subject by self-learning (A1). Emphasis is made on producing a design component in assignments as well as written examinations (A2). The ability to apply and integrate knowledge is assessed by larger scale project work as well group assignments and logbooks. Additionally in written examinations, emphasis is placed on producing conceptual design solutions to projects (A3). Engineering analysis skills in applying the knowledge and understanding are assessed formatively in tutorials (A4). The more extended skills are assessed via assignments and project reports summatively. Modules at levels 5 and 6 have progressively more design-based and systems analysis questions in examinations (A5). At level 6, the Individual Project assesses students' ability to demonstrate how to apply a systems approach to solving engineering problems. At levels 5 and 6, laboratory workshops and assignments are often based on analysing systems performance in modules such as Thermofluids and Sustainable Energy among others (A6).

Intellectual Skills:
The assessment strategy for Intellectual Skills is through presentations and also formal reports at various stages of project work. Innovation and design skills are assessed by group work as well as a formal report. Formative and summative assessments in 'design and make' exercises are via standard logbooks, coursework exercises, in-class exercises and phase tests in the early modules. Further development of these skills is more indirectly assessed, since significant achievement in these areas is necessary for the highest marks in project work, which includes assessment by presentation and viva-voce examinations (B1 and B12). Practical laboratory sessions and software workshops provide a means to assess this through assignments, logbooks and in-class phase tests. Examinations are also used to challenge students to design a system based on specific user requirements. Students are encouraged to make design assumptions in order to demonstrate their understanding of the importance of requirements specification (B2, B6, B8 and B9). Modules that have a strong design component are assessed by design assignment reports at different levels across (B3, B10 and B11). Some modules specifically employ practical simulation exercises as a major part of the assessment, including engineering reports and presentations. Project management plays a primary role in assessment of the major Level 6 Individual Project, both in an initial progression report and in the final report which has to describe the projects process activity, including presentation session and viva-voce examination (B4, B5 and B12).

Practical Skills:
The assessment strategy for Practical Skills is generally via log books, coursework assignments and the level 6 individual project of which include a presentation and a viva voce examination. Lab exercises, tutorial assignments are assessed specifically via standard logbooks and reports based on laboratory activity (C1 and C2). Design assignments are used to assess C3 and C4 where students are required to provide background information as well as suitable referencing for their assignment. Simple 'design and make' exercises are used to assess C5 and C8 which also get students to demonstrate the ability to work with technical uncertainty. Further development of these skills is indirectly assessed through design assignments in specialist modules at Levels 6. Additionally, these are assessed in the Level 6

individual project of which include assessment by presentation and viva-voce examinations and various reports (C6, C7 and C9).

General Transferable Skills:
The assessment strategy for General Transferrable Skills is to focus on employability-related activities such as formal reports, presentations and viva voce examinations of the L6 individual project. Exams, coursework report and project reports are used to assess D1 and D3. Personal Development Planning coursework specifically assesses D2. Onus is made on the use of individual and group presentations to assess students' ability in demonstrating D4.

E. Academic Regulations

The University's Academic Regulations apply for this course.

School specific protocols apply, including compliance with professional, statutory and regulatory bodies' requirements.

Course specific protocols:
Students enrolled onto the BEng course may be offered an opportunity to transfer to the MEng course, after completing level 5, if they fulfil the following criteria:

1. Students must have passed all 120 credits at level 4 (no compensations)
2. Students must have passed all 120 credits at level 5 (no compensations)
3. The average percentage grade from level 4 and level 5 modules must be 55% or more

F. Entry Requirements

In order to be considered for entry to the course applicants will be required to have the following qualifications:

Full-time students
- A Level BBB **or;**
- BTEC National Diploma DDM **or;**
- Access to HE qualifications with 24 Distinctions 21 Merits including 3 distinctions in Maths and 3 merits in Physics **or;**
- Equivalent level 3 qualifications worth 128 UCAS points
- Level 3 Physical Science (Physics preferred) and Maths
- Applicants must hold 5 GCSEs A-C including Maths and English or equivalent (reformed GCSEs grade 4 or above).

We welcome qualifications from around the world. English language qualifications for international students: IELTS score of 6.0, TOFEL-550 (print-based), TOFEL-80 (internet based), Cambridge Proficiency or Advanced Grade C.

Part-time students
- A Level BBB **or;**
- BTEC National Diploma DDM **or;**
- Access to HE qualifications with 24 Distinctions 21 Merits including 3 distinctions in Maths and 3 merits in Physics **or;**
- Equivalent level 3 qualifications worth 128 UCAS points
- Level 3 Physical Science (Physics preferred) and Maths

- Applicants must hold 5 GCSEs A-C including Maths and English or equivalent (reformed GCSEs grade 4 or above).

Students interested in the course may be invited to an open day event where they will be possibly interviewed, and asked to show and discuss their experience and/or of portfolio

Accredited Prior Experiential Learning
APEL may be taken into account in determining the entry requirements for candidates with relevant work experience, but cannot replace the requirement for formal qualifications in Mathematics.

Direct Entry
Applicants may be considered for entry to the second year of the course. Applicants will be interviewed and will be required to have formal qualifications at level 4, to demonstrate preparedness for direct entry.

G. Course structure(s)

Course overview

BEng Advanced Vehicle Engineering – **Full time**

- The course is based on two semesters per academic year.
- The sandwich year alternatives involve a one-year placement away from the School between the second and third years of academic study.

All modules are compulsory. No optional modules.

	Semester 1		Semester 2	
Level 4	Engineering Mathematics and Modelling			20 credits
	Design and Practice			20 credits
	Solid Mechanics and Materials	20 credits	Electrical Circuit Analysis	20 credits
	Object Oriented Programming C++	20 credits	Fluid Mechanics and Thermodynamics	20 credits
Level 5	Advanced Engineering Mathematics and Modelling			20 credits
	Engineering Design			20 credits
	Solid Mechanics and FEA	20 credits	Machine Drives and Mechatronics	20 credits
	Thermofluids and Sustainable Energy	20 credits	Dynamics and Control	20 credits
Level 6	Individual Project			40 credits
	Innovation and Enterprise	20 credits	Electric Vehicle and Power Electronics	20 credits
	Vehicle Dynamics and System Modelling	20 credits	Vehicle Powertrain, Sustainability and 1D-CFD	20 credits

BEng Advanced Vehicle Engineering – **Part time**

All modules are compulsory. No optional modules

	Semester 1		Semester 2	
Year 1	Engineering Mathematics and Modelling			20 credits
	Design and Practice			20 credits
	Solid Mechanics and Materials	20 credits	Electrical Circuit Analysis	20 credits
	Object Oriented Programming C++	20 credits		
Year 2	Advanced Engineering Mathematics and Modelling			20 credits
	Engineering Design			20 credits
			Fluid Mechanics and Thermodynamics	20 credits
	Solid Mechanics and FEA	20 credits	Machine Drives and Mechatronics	20 credits
Year 3	Thermofluids and Sustainable Energy	20 credits	Dynamics and Control	20 credits
	Innovation and Enterprise	20 credits	Electric Vehicle and Power Electronics	20 credits
Year 4	Individual Project			40 credits
	Vehicle Dynamics and System Modelling	20 credits	Vehicle Powertrain, Sustainability and 1D-CFD	20 credits

Placement information

We work within LSBU's Student Placement procedure guidelines and practices.

An optional Industrial Placement (or sandwich year) is available to all students following successful completion of Level 5. An Industrial Placement does not contribute to the final degree award.

Students undertaking an Industrial Placement will be enrolled onto a Placement Module and will be requested to submit evidence of their placement at the end of the year, including a daily logbook. Students on an Industrial Placement will be visited once per semester, if possible, by a member of the teaching team, or by their Personal Tutor.

The university has a centralised Employability Service that works alongside the Schools to deliver a placement offer to students. They have a dedicated Placement Team that deliver pre- and post-placement workshops to students alongside supporting them secure a placement and all compliance.

Procedure and Check for Suitability:
Requiring students to complete a 'placement confirmation form'.
Returning the form to the placements inbox: ss-placements@lsbu.ac.uk at least two weeks prior to the start of the placement.

The placement officer will contact the placement provider for confirmation and to carry out any due diligence / health and safety checks / check for suitability.
Students cannot begin the placement until they have received an approval email for the placement officer.

Support Mechanisms: Documentation and Placement Tutors
Support documents are available from:
https://our.lsbu.ac.uk/article/our-students/student-placements

Three documents are available, and will be supplied to:

- Students (placement handbook)
- Staff / placement tutors (placement organisers handbook)
- Placement providers (placement provider handbook)

Students in MED will be assigned a placement tutor; a member of the academic team who will be their point of contact during the placement. Students will be notified before and during the placement that they can contact their placement tutor as often as they wish for advice and mentorship during their placement.

Support Mechanisms: Visits
Within the course team, it is the responsibility of each placement tutor to make contact with their respective student(s) and their placement provider regularly while the student is on placement. This can take the form of a visit, email or phone call. In line with LSBU placement procedures, it is the student's responsibility to liaise with their supervisor at their placement so that they are available to meet or speak to their placement tutor at LSBU for 15 to 40 minutes to discuss their progress. There will be a minimum requirement of one meeting or conversation per semester.

H. Course Modules

All modules are compulsory. No optional modules.

Module Code	Module Title	Level	Semester	Credit value	Assessment	
					CW (%)	Exam (%)
EEE_4_EMM	Engineering Mathematics and Modelling	4	1+2	20	50	50
MED_4_SMM	Solid Mechanics and Materials	4	1	20	50	50
MED_4_FMT	Fluid Mechanics and Thermodynamics	4	2	20	30	70
EEE_4_ECA	Electrical Circuit Analysis	4	2	20	50	50
MED_4_DAP	Design and Practice	4	1+2	20	100	
EEE_4_OOP	Object Oriented Programming C++	4	2	20	100	
MED_5_AMM	Advanced Engineering Mathematics and Modelling	5	1+2	20	40	60
MED_5_EDE	Engineering Design	5	1+2	20	100	
MED_5_SMF	Solid Mechanics and FEA	5	1	20	30	70
MED_5_DAC	Dynamics and Control	5	2	20	30	70
MED_5_TSE	Thermofluids and Sustainable Energy	5	1	20	50	50
MED_5_MDM	Machine Drives and Mechatronics	5	2	20	30	70
MED_6_EVP	Electric Vehicle and Power Electronics	6	2	20	30	70

MED_6_VSM	Vehicle Dynamics and System Modelling	6	1	20	30	70
MED_6_VPS	Vehicle Powertrain, Sustainability and 1D-CFD	6	2	20	30	70
MED_6_IAE	Innovation and Enterprise	6	1	20	100	
EEE_6_PRO	BEng Project	6	1+2	40	100	

I. Timetable information

Students can expect to receive a confirmed timetable for study commitments by early-mid September

Full time students: Wednesday afternoon is generally a teaching-free afternoon set aside for sporting/cultural activities.

Part-time students: Timetabled classes fall on the following days: Year 1 – Monday, Year 2 – Tuesday, Year 3 – Thursday, Year 4 - Friday

J. Costs and financial support

Course related costs

- Tuition fees do not cover the following course-related costs: Books, workshop laboratory coats and protective eyewear, clothing required for industrial work placements, field trips etc.

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://www.lsbu.ac.uk/student-life/our-campuses/southwark/cost-of-living-in-london https://www.lsbu.ac.uk/admin/backups/accommodation

List of Appendices

Appendix A: Curriculum Map
Appendix B: Educational Framework (undergraduate courses)
Appendix D: Terminology
Appendix E: Compliance with PSRB Requirements

Key to abbreviations used in Appendix A:

T: Taught
A: Assessed
D: Developed

Appendix A: Curriculum Map

This map provides a design aid to help course teams identify where course outcomes 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. Making the learning outcomes explicit will also help students to monitor their own learning and development as the course progresses.

Modules	Level	Assessment Method	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	C1	C2	C3	C4	C5	C6	C7	C8	C9	D1	D2	D3	D4
Engineering Mathematics and Modelling (ENG_4_401)	4	50% Phase Test;50% Exam	TA	TA	TA	TA	TA	TA	TA										TA												TA			
Solid Mechanics and Materials (MED_4_XXX)	4	50% CW; 50% Exam	TA		TA		TA	TA							TA						TA		TA	TA										
Fluid Mechanics and Thermodynamics (MED_4_XXX)	4	30% CW (Lab) 70% Exam	TA			TA	TA	TA							TA									TA	TA				TA		TA			
Electrical Circuit Analysis (EEE_4_XXX)	4	50% CW ; 50% Exam	TA	TA		TA	TA								TA						T		TA	TA										
Design and Practice(ENG_4_403)	4	Course work 100%									TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD		TAD	TAD	TAD	TAD		TAD	TAD	TAD		TAD	TAD	TAD	TAD
Object Oriented Programming (EEE_4_XXX)	4	50% CW;50% Phase Test	TAD	TAD		TAD	TAD				TAD												TAD		TD									
Advanced Engineering Mathematics and Modelling (ENG_5_410)	5	100% Exam	TA	TA	TA	TA	TA	TA	TA				TA						TA												TA			
Engineering Design (ENG_5_442)	5	Course work 100%				TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD	TAD			TAD	TAD	TAD	TAD		TAD	TAD	TAD		TAD	TAD	TAD	TAD
Solid Mechanics and FEA (ENG_5_443)	5	30%CW; 70% Exam	TA	TA	TA	TAD	TAD	TAD			TA		TA				TD		TD	TD		TA	TA		TA		TA				TAD			
Dynamics and Control (ENG_5_447)	5	30%CW; 70% Exam	TA	TA		TA		TA	TD			TA	TD												TA						TA			
Thermofluids and Sustainable Energy (ENG_5_446)	5	50% CW; 50% Exam	TA	TA	TA	TA	TA	TA	TA						TA		TAD		TAD	TAD				TA	TA						TA			
Machine Drives and Mechatronics (ENG_5_445)	5	30%CW; 70% Exam	TA	TA		TA	TA		TA								TA		TD				TA	TA	TA						TA			
Electric Vehicle and Power Electronics (MED_6_XXX)	6	30%CW; 70% Exam	TA			TA	TA													TA	TA	TAD	TAD	TAD	TAD		TAD			TAD	TAD		TAD	
Vehicle Dynamics and System Modelling (MED_6_VSM)	6	30%CW; 70% Exam	TA		TA	TA											TA	TA					TAD								TAD			
Vehicle Powertrain, Sustainability and 1D-CFD (MED_6_VPS)	6	30%CW; 70% Exam	TA	TA	TA	TA	TA		TA	TAD		TD		TD	TD		TAD	TAD					TAD						TAD		TAD			
Innovation and Enterprise (ENG_6_422)	6	Course work 100%								TA	TA	TA	TA		TA	TA	TA	TA	TA	TA	TA													A
Individual Project (ENG_6_424)	6	Course work 100%	AD	AD	TA	AD	AD	TA	AD	AD	AD	AD	AD	AD	AD	TA	TA	TA	TA	TA	TA	AD	AD	AD	AD		AD	AD	AD		AD		AD	

Appendix B: Embedding the Educational Framework for Undergraduate Courses

The Educational Framework at London South Bank University is a set of principles for curriculum design and the wider student experience that articulate our commitment to the highest standards of academic knowledge and understanding applied to the challenges of the wider world.

The Educational Framework reflects our status as University of the Year for Graduate Employment awarded by *The Times and The Sunday Times Good University Guide 2018* and builds on our 125 year history as a civic university committed to fostering social mobility through employability and enterprise, enabling our students to translate academic achievement into career success.

There are four key characteristics of LSBU's distinctive approach to the undergraduate curriculum and student experience:

- Develop students' professional and vocational skills through application in industry-standard facilities
- Develop our students' graduate attributes, self-awareness and behaviours aligned to our EPIIC values
- Integrate opportunities for students to develop their confidence, skills and networks into the curriculum
- Foster close relationships with employers, industry, and Professional, Statutory and Regulatory Bodies that underpin our provision (including the opportunity for placements, internships and professional opportunities)

The dimensions of the Educational Framework for curriculum design are:

- **informed by employer and industry** needs as well as professional, statutory and regulatory body requirements
- **embedded learning development** for all students to scaffold their learning through the curriculum taking into account the specific writing and thinking requirements of the discipline/profession
- **high impact pedagogies** that enable the development of student professional and vocational learning through application in industry-standard or authentic workplace contexts
- **inclusive teaching, learning and assessment** that enables all students to access and engage the course
- **assessment *for* learning** that provides timely and formative feedback

All courses should be designed to support these five dimensions of the Educational Framework. Successful embedding of the Educational Framework requires a systematic approach to course design and delivery that conceptualises the student experience of the curriculum as a whole rather than at modular level and promotes the progressive development of understanding over the entire course. It also builds on a well-established evidence base across the sector for the pedagogic and assessment experiences that contribute to high quality learning.

This appendix to the course specification document enables course teams to evidence how their courses meet minimum expectations, at what level where appropriate, as the basis for embedding the Educational Framework in all undergraduate provision at LSBU.

Dimension of the Educational Framework	Minimum expectations and rationale	How this is achieved in the course
Curricula informed by employer and industry need	<u>Outcomes focus and professional/employer links</u> All LSBU courses will evidence the involvement of external stakeholders in the curriculum design process as well as plan for the participation of employers and/or alumni through guest lectures or Q&A sessions, employer panels, employer-generated case studies or other input of expertise into the delivery of the course provide students with access to current workplace examples and role models. Students should have access to employers and/or alumni in at least one module at level 4.	**LEVEL 4.** Students have an introduction to the engineering profession and professional bodies in Design and Practice. **LEVEL 5.** Students attend a presentation about industrial placements and are given additional support to prepare their CV for potential placements. Additional preparation sessions are provided and students use the Job Shop and Career Gym support services for interview training etc. **LEVEL 6.** The IMechE representative gives a lecture on the graduate advantage to final year BEng students.
Embedded learning development	<u>Support for transition and academic preparedness</u> At least two modules at level 4 should include embedded learning development in the curriculum to support student understanding of, and familiarity with, disciplinary ways of thinking and practising (e.g. analytical thinking, academic writing, critical reading, reflection). Where possible, learning development will be normally integrated into content modules rather than as standalone modules. Other level 4 modules should reference and reinforce the learning development to aid in the transfer of learning.	**LEVEL 4.** All students allocated a personal tutor—coordinated by the Senior Personal Tutor. Personal tutoring is embedded in the level 4 module, Design and Practice where students are given the opportunity to learn about the aspects of PT on their courses. PT open surgeries are bookable on demand. Induction course, including: 1. Meeting with personal tutor 2. Use of library and learning resources (LLR) 3. Use of University IT facilities/VLE 4. Study skills. 5. Access to University support facilities Embedded sessions are run in the level 4 Design and Practice module whereby the Skills for Learning team teach students about analytical thinking,

		academic writing, critical reading, reflection and how all of this is relevant to all modules. **LEVEL 5.** Induction for direct entry students, Course Director will take up role of personal tutor for direct entry students. (See Level 4). Additionally, Skills 4 Learning run embedded sessions to help students in the level 4 module, Fluid Mechanics and Thermodynamics. **LEVEL 6.** At Level 6 CD and Project Supervisor support the PT system.
High impact pedagogies	<u>Group-based learning experiences</u> The capacity to work effectively in teams enhances learning through working with peers and develops student outcomes, including communication, networking and respect for diversity of perspectives relevant to **professionalism** and **inclusivity**. At least one module at level 4 should include an opportunity for group working. Group-based learning can also be linked to assessment at level 4 if appropriate. Consideration should be given to how students are allocated to groups to foster experience of diverse perspectives and values.	**LEVEL 4.** Design and Practice—this module aims to introduce and develop the skills needed by professional engineers to enable them to make use of their technical knowledge, in particular: -Develop students' technical communications, basic report writing and team-working skills -Develop students' skills in project planning and management through group projects such as the Mayor's Entrepreneurial Challenge, and the Engineering for People Design Challenge (both are real-world engineering group projects) **LEVEL 5.** Engineering Design L5 prepares students for their role as professional engineers in a number of ways, including: -Additional group work on the IMechE Design Challenge project, and a second group project involving the designing of real-world engineering systems. -Planning and preparation for the major project at L6 -Introduction to systems thinking **LEVEL 6.** Innovation and Enterprise—this module develops skills required to manage the process of gathering, analysing, criticising and disseminating

		information which students will use in their engineering career. A series of weekly lectures in S1 provides students with guidance and practical advice to further develop specific skills such as information searches, referencing, software documentation, data presentation, and practical design, prototyping and testing. This module also develops project management skills of students.
Inclusive teaching, learning and assessment	<u>Accessible materials, resources and activities</u> All course materials and resources, including course guides, PowerPoint presentations, handouts and Moodle should be provided in an accessible format. For example, font type and size, layout and colour as well as captioning or transcripts for audio-visual materials. Consideration should also be given to accessibility and the availability of alternative formats for reading lists.	**LEVELS 4-6.** All academic staff who teach on the course offer weekly drop-in surgery hours to all students. For academic staff, this is currently set to 4 hours per week. During this time, students can visit the lecturer in their office to ask for academic help on any topics covered in lectures, tutorials, laboratory sessions, coursework and exam preparation. School email and telephone response time: All academic staff must respond to student emails and telephone voicemails left on their office phone within 3 working days. Staff contact details are communicated to students in all module guides. Personal tutoring: The School of Engineering integrates a Personal Tutor Scheme as part of the Engineering courses offered at London South Bank University. In year 1, students will be notified who their Personal Tutor is early in semester 1. A Personal Tutor is a member of the academic team that can help or advise a student throughout the academic year. Direct entry students are also allocated a Personal Tutor in semester 1. Academic clinic: The Academic Clinic is a weekly 2-hour drop-in

		session that runs every Wednesday (1:00-3:00pm). It is intended for students at all levels; especially those studying at levels 4 and 5. The Academic Clinic is aimed at students that require extra one-to-one help with any particular area of the syllabus that would be beneficial to them. The academic advice provided to students is related specifically each individuals study needs. Skills 4 Learning: Based in the Learning Resources Centre (LRC), a dedicated team called Skills for Learning offer an extensive range of workshops, drop-ins and one-to-one sessions designed for all students enrolled at LSBU and all levels of study, from foundation year to PhD. The support offered includes: • Mathematics • Academic Practices, English Language Skills for Learning also have their own site on the VLE which all students can access, which contains support material and information on the workshops, drop-in sessions and one-to-one sessions that are run. Subject specific tutorial support: Many timetabled lectures are further supported by a separate accompanying timetabled tutorial. The aim of the tutorials is for students to take the theories and material learnt in the lecture and apply it by solving tutorial questions.
Assessment *for* learning	<u>Assessment and feedback to support attainment, progression and retention</u> Assessment is recognised as a critical point for at risk students as well as integral to the learning of all students. Formative feedback is essential during transition into university. All first semester modules at level 4 should	**LEVELS 4-6.** The University protocol is that all academic staff provide summative feedback within 15 working days of a deadline or exam, which is adhered to.

	include a formative or low-stakes summative assessment (e.g. low weighted in final outcome for the module) to provide an early opportunity for students to check progress and receive prompt and useable feedback that can feed-forward into future learning and assessment. Assessment and feedback communicates high expectations and develops a commitment to **excellence**.	Additionally, all timetabled tutorial sessions are set up so that formative feedback is provided to students to help them when completing their summative exams and coursework. **LEVEL 4.** The Design and Practice module embeds formative feedback in the weekly design and Computer-Aided Design classes which aims to help the students for their eventual summative coursework assignments and in-class tests.
High impact pedagogies	<u>Research and enquiry experiences</u> Opportunities for students to undertake small-scale independent enquiry enable students to understand how knowledge is generated and tested in the discipline as well as prepare them to engage in enquiry as a highly sought after outcome of university study. In preparation for an undergraduate dissertation at level 6, courses should provide opportunities for students to develop research skills at level 4 and 5 and should engage with open-ended problems with appropriate support. Research opportunities should build student autonomy and are likely to encourage **creativity** and problem-solving. Dissemination of student research outcomes, for example via posters, presentations and reports with peer review, should also be considered.	**LEVEL 4.** Team projects in Design and Practice concentrate on the processes necessary to produce and market practical engineering solutions. Mini projects and assignments are featured in modules at L5. **LEVEL 5.** The Engineering Design module specifically tasks a team of students to take a project from requirements through to design solution. **LEVEL 6.** The main individual Project will require the student to develop and demonstrate skills including: -Project planning and time management -Keeping a detailed project log book -Technical report writing and presentation -Preparation of material and participation in an oral technical presentation session with other students and staff -Preparation for an individual oral examination (viva). All of these components form part of the project assessment in addition to the technical aspects.
Curricula informed by employer and industry need	<u>Authentic learning and assessment tasks</u> Live briefs, projects or equivalent authentic workplace learning	**LEVEL 4.** Students participate in real-world projects such as the Mayor's Entrepreneurial Challenge, and the Engineering

/ Assessment *for* learning	experiences and/or assessments enable students, for example, to engage with external clients, develop their understanding through situated and experiential learning in real or simulated workplace contexts and deliver outputs to an agreed specification and deadline. Engagement with live briefs creates the opportunity for the development of student outcomes including **excellence**, **professionalism**, **integrity** and **creativity**. A live brief is likely to develop research and enquiry skills and can be linked to assessment if appropriate.	for People Design Challenge. For the latter, the charity Engineers Without Borders UK launch the project as an external client. **LEVEL 5.** Students participate in the IMechE Design Challenge. **LEVEL 6.** The individual project will always be focused on a real-world application, and in some instances will be supported by an external client; particularly for part-time students that work in industry. **LEVELS 4-6.** Students are encouraged to develop skills through the IMechE Formula Student and Shell Eco Marathon Projects. Both of which enable theory to be put into practise.
Inclusive teaching, learning and assessment	<u>Course content and teaching methods acknowledge the diversity of the student cohort</u> An inclusive curriculum incorporates images, examples, case studies and other resources from a broad range of cultural and social views reflecting diversity of the student cohort in terms of, for example, gender, ethnicity, sexuality, religious belief, socio-economic background etc. This commitment to **inclusivity** enables students to recognise themselves and their experiences in the curriculum as well as foster understanding of other viewpoints and identities.	Through the Engineering for People Design Challenge, run in level 4, students are taught about the societal impact that engineering has. The case studies discussed in class, and from external clients and guest lecturers are rich in diversity. Issues such as the environmental, economic, and social and community impacts that engineering decisions have are explored through mini projects and coursework. These lessons build a foundation for future project work at level 5 and level 6.
Curricula informed by employer and industry need	<u>Work-based learning</u> Opportunities for learning that is relevant to future employment or undertaken in a workplace setting are fundamental to developing student applied knowledge as well as developing work-relevant student outcomes such as networking, **professionalism** and **integrity**. Work-based learning can take the form of work experience, internships or placements as well as, for example, case studies, simulations and role-play in industry-standards settings as	**LEVEL 4.** Course Director makes students aware of potential sandwich placements. This is also discussed in Design and Practice, at level 4 which requires a Personal Development Plan to be submitted as part of a coursework assignment. **LEVEL 5.** LSBU's Job Shop and Career Gym assists students to obtain sandwich and summer work placements. A member of the teaching team, or the students' Personal Tutor visits the

	relevant to the course. Work-based learning can be linked to assessment if appropriate.	student during their placement and they must maintain a daily log and compile a reflective and evaluative final report. They attend the placement meeting to feedback to the following year's students.
Embedded learning development	<u>Writing in the disciplines: Alternative formats</u> The development of student awareness, understanding and mastery of the specific thinking and communication practices in the discipline is fundamental to applied subject knowledge. This involves explicitly defining the features of disciplinary thinking and practices, finding opportunities to scaffold student attempts to adopt these ways of thinking and practising and providing opportunities to receive formative feedback on this. A writing in the disciplines approach recognises that writing is not a discrete representation of knowledge but integral to the process of knowing and understanding in the discipline. It is expected that assessment utilises formats that are recognisable and applicable to those working in the profession. For example, project report, presentation, poster, lab or field report, journal or professional article, position paper, case report, handbook, exhibition guide.	**LEVEL 4.** Students must keep a personal technical logbook for each module with a laboratory or computer workshop component. This is marked periodically and returned with comments and advice. At L4 this forms the basis of the majority of the coursework mark in technical modules. **LEVEL 5.** See L4. The logbook may form part of the coursework in some modules but this is supplemented by formal reports, mini-projects, and dissertations in most technical modules. **LEVEL 6.** Project students meet their supervisors at least once/fortnight where progress is monitored and objectives are discussed. In the individual Project students are expected to keep a logbook, which provides a platform for skills development.
High impact pedagogies	<u>Multi-disciplinary, interdisciplinary or interprofessional group-based learning experiences</u> Building on experience of group working at level 4, at level 5 students should be provided with the opportunity to work and manage more complex tasks in groups that work across traditional disciplinary and professional boundaries and reflecting interprofessional work-place settings. Learning in multi- or interdisciplinary groups creates the opportunity for the development of student outcomes	**LEVEL 6.** Innovation and Enterprise covers this through the module content and through grouping students together in multi-disciplinary teams across the different courses in the School of Engineering, promoting networking opportunities as well as the opportunities to learn from other engineering disciplines. **LEVELS 4-6.** Similarly, all students are given an opportunity to participate in either Formula Student Project or Shell ECO

	including **inclusivity**, communication and networking.	Marathon project. The School maintains active industry links through our industrial panel. With regular meetings this panel ensures that industry requirements and needs are fed back into the teaching on our courses and the preparation of our graduates for the workplace. This also improves personal development planning.
Assessment *for* learning	<u>Variation of assessment</u> An inclusive approach to curriculum recognises diversity and seeks to create a learning environment that enables equal opportunities for learning for all students and does not give those with a particular prior qualification (e.g. A-level or BTEC) an advantage or disadvantage. An holistic assessment strategy should provide opportunities for all students to be able to demonstrate achievement of learning outcomes in different ways throughout the course. This may be by offering alternate assessment tasks at the same assessment point, for example either a written or oral assessment, or by offering a range of different assessment tasks across the curriculum.	**LEVEL 4.** The methods of assessment include, across all modules: Exams, in-class tests (phase tests), coursework reports, group reports, group drawings, logbooks, lab reports, group PechaKucha presentation, digital logbook, CAD models, CAD drawings, reflective writing, PDP etc. **LEVEL 5.** The methods of assessment include, across all modules: Exams, in-class tests (phase tests), coursework reports, group reports, group drawings, logbooks, lab reports, group presentation, individual presentation, digital logbook, CAD models, CAD assemblies, CAD drawings etc. **LEVEL 6.** Includes all of the methods noted above. Additionally, as part of the individual project students will submit a Project Arrangement Form and risk assessment documents as part of their submission process.
Curricula informed by employer and industry need	<u>Career management skills</u> Courses should provide support for the development of career management skills that enable student to be familiar with and understand relevant industries or professions, be able to build on work-related learning opportunities, understand the role of self-appraisal and planning for lifelong learning in career development, develop resilience and manage the career building	**LEVEL 4.** Students are encouraged to join the relevant professional body for the course; the IMechE. The LSBU Outreach initiative gives talks to student cohorts to encourage individuals to join the University Student Ambassadors scheme and the Mentoring scheme in local schools. The

	process. This should be designed to inform the development of **excellence** and **professionalism**.	department maintains a course VLE site including information about professional bodies and this is open to all students throughout their course. Students are encouraged to start their own Student Union Societies or 'clubs'; specific notice-boards are made available for this. **LEVEL 5.** See L4. Students can study a language to prepare for exchange courses with overseas links. **LEVEL 6.** Students are made aware of the need for CPD in the level 6 module Innovation and Enterprise.
Curricula informed by employer and industry need / Assessment *for* learning / High impact pedagogies	<u>Capstone project/dissertation</u> The level 6 project or dissertation is a critical point for the integration and synthesis of knowledge and skills from across the course. It also provides an important transition into employment if the assessment is authentic, industry-facing or client-driven. It is recommended that this is a capstone experience, bringing together all learning across the course and creates the opportunity for the development of student outcomes including **professionalism**, **integrity** and **creativity**.	**LEVEL 6.** This is covered in the individual project module, which is weighted at 40 credits.

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'
collaborative provision	a formal arrangement between a degree-awarding body and a partner organisation, allowing for the latter to provide higher education on behalf of the former
compulsory module	a module that students are required to take
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
distance-learning course	a course of study that does not involve face-to-face contact between students and tutors
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
national teaching fellowship	a national award for individuals who have made an outstanding impact on student learning and the teaching profession
navigability (of websites)	the ease with which users can obtain the information they require from a website
optional module	a module or course unit that students choose to take
performance (examinations)	a type of examination used in performance-based subjects such as drama and music
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
work/study placement	a planned period of experience outside the institution (for example, in a workplace or at another higher education institution) to help students develop particular skills, knowledge or understanding as part of their course
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

Appendix E: Compliance with PSRB Requirements

Course Learning Outcomes

A) Students will have **knowledge and understanding** of:
The wider multidisciplinary engineering context and its underlying principles. Graduates must be able to demonstrate this knowledge and they must have an appreciation of it. They must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

B) Students will develop their **intellectual skills** such that they are able to:
Apply appropriate quantitative science and engineering tools to the analysis of problems. They must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. They must be able to comprehend the broad picture and thus work with an appropriate level of detail.

C) Students will acquire and develop **practical skills** such that they are able to: Possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops; in industry through supervised work experience; in individual and group project work; in design work; and in the development and use of computer software in design, analysis and control. Evidence of group working and of participation in a major project is expected. However, individual professional bodies may require particular approaches to this requirement.

D) Students will acquire and develop **transferrable skills** such that they are able to: Apply the developed transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

Teaching and Learning Strategy

Knowledge and Understanding

Acquisition of knowledge and understanding is acquired through in the main by the following modules:

- Engineering Mathematics and Modelling L4
- Solid Mechanics and Materials L4
- Electrical Circuit Analysis L4
- Fluid Mechanics and Thermodynamics L4
- Solid Mechanics and Finite Element Analysis L5
- Dynamics and Control L5
- Thermofluids and Sustainable Energy L5
- Vehicle Dynamics and System Modelling L6
- Vehicle Powertrain, Sustainability and 1D CFD L6

All of these modules teach and develop knowledge and understanding within a multidisciplinary engineering context and those at higher levels involve a degree of commercial awareness through design of systems to specifications.

Intellectual Skills

- Acquisition of Intellectual Abilities is gained through the Level 5 Engineering Design as well as the level 6 BEng honours project. In these modules students are taught the appropriate tools to solve engineering problems. Innovation is covered in the module entitled Innovation and Enterprise at Level 6, which develops business ideas from innovative research and development activities.

Practical Skills

- Acquisition of Practical Skills is acquired during the practical laboratory sessions which constitute a part of nearly every module for this course.
- Fluid Mechanics and Thermodynamics at Level 4 incorporate a significant practical laboratory element.
- Engineering Design at Level 5 offers physical prototypes to be made using practical workshops and rapid prototyping equipment
- Thermofluids and Sustainable Energy at Level 5 offers a practical workshop to analyse the performance of a sustainable-energy power-producing device
- Vehicle Powertrain, Sustainability and 1D-CFD at level 6 offers advanced engine research lab exercise as well as a variety of computer based exercise.
- Dynamics and Control at Level 5, Dynamics and System modelling at Level 6 offers classical control workshops, dynamics workshop as well as a variety of computer based laboratory exercises.
- Machine Drives and Mechatronics at Level 5 will offers the workshop and lab exercise in electric motors, gears, clutches and bearings.
- Further development of these skills is acquired in the Level 6 Individual Project.

General Transferable Skills

Acquisition of GTS is achieved through communication of knowledge in formal reports. These constitute a part of the assessment for the majority of modules on the course to include,

- Design and Practice L4
- Engineering Design L5
- Innovation and Enterprise L6
- Individual Project L6

1. Knowledge and understanding

- **A1:** Acquisition starts in Level 4 lectures and tutorials concentrating on the basic essentials of science and mathematics. The Solid Mechanics and Materials and Fluid Mechanics and Thermodynamics modules cover the essential physics behind the study of thermodynamics, mechanics, materials and matters. This work continues in the Electrical Circuit Analysis module which covers the science behind DC and AC circuit behaviour and the sensing of light, temperature, movement and force in terms of basic laws and principles.
- In Levels 5 and 6 this appreciation of scientific principles in engineering continues in Solid Mechanics and FEA, Thermofluids and Sustainable Energy, Dynamics and Control, Vehicle Dynamics and Systems Modelling, and Vehicle Powertrain, Sustainability and 1D-CFD.

- **A2:** This is covered primarily by the mathematics module, which teaches the mathematical techniques and tools needed to model, understand and predict the science behind engineering designs and operations. In Level 5 these techniques are continued in another mathematics module where studies cover more advanced mathematical and computational techniques—advanced vector and matrix algebra, experience in solving differential equations analytically, numerical methods and optimisation techniques. Evidence of achieving this LO can also be found in several other analytical modules, in particular Dynamics and Control, and Vehicle Dynamics and Systems Modelling.

- **A3:** The acquisition starts in Level 4 with practical examples in the use and interfacing of transducers, sensors and basic I/O devices in the Electrical Circuit Analysis module. This is covered further in the teamwork design exercises in the Design and Practice module, where integration of mechanical design and software engineering is introduced for product prototyping. The Engineering Design, and Machine Drives and Mechatronics modules at Level 5 and the Dynamics and System Modelling module at Level 6 also utilise design problems taken from electro-mechanical engineering and a wide variety of engineering subjects. Additionally, the multidisciplinary nature of the Level 6 Individual Project explores this integration of engineering disciplines more than other modules. Students undertaking their project are routinely required to demonstrate their knowledge from other engineering fields.

- Acquisition of **A4** and **A5** is achieved by study in Level 4 modules: Solid Mechanics and Materials; Fluid Mechanics and Thermodynamics; and Electrical Circuit Analysis. This continues in Levels 5 and 6 via the study of Solid Mechanics and FEA, Thermofluids and Sustainable Energy, Engineering Design and Dynamics and Control. These modules include the development and use of mathematical models for components and systems for analysis and synthesis, performance evaluation, and understanding practical operation. standard analytical methods for representation and analysis of systems and components are also studied, for example, Finite Element Analysis, Computational Fluid Dynamics.

- The **A6** learning outcomes are achieved in the Level 4 Mathematics and Modelling module where for example, node and mesh analysis and matrix manipulation methods are taught. In Level 5 computer-based mathematical tools such as Matlab/Simulink are used to solve problems, including matrix inversion, iterative techniques, finite difference analysis of nodes and meshes. Students use industry standard software at Levels 5 and 6 for quantitative analysis of performance, to evaluate scenarios, and produce designs. The Level 6 Individual Project requires acquisition of quantitative analysis and software skills to complete and demonstrate understanding of the work undertaken.

- The **A7** learning outcome is achieved after the basic design building blocks have been taught and understood in earlier years. An approach to systems is found in Engineering Design at Level 5 where systems thinking are covered within the context of project management. A number of modules at higher levels utilise systems design strategies.

2. Intellectual skills

- **B1:** Essential design constraints including environmental and sustainability considerations are introduced at Level 4 through the Design and Practice module, which is common to all engineering courses. Engineering Design project at Level 5 also contains material on resources and budgets for engineering project management. Design exercises in specialist modules at Levels 5 and 6 also focus on environmental, sustainability and health and safety compliance.

- **B2** is covered in the common module entitled Design and Practice at Level 4. User needs are covered in the Innovation and Enterprise module at Level 6.

- **D3:** Cost as a factor in design is taught at Levels 5 in modules that deal with project management and at Level 6 through design of systems from specifications and user requirements.

- **B4:** Innovative technical solutions are taught in the design component of each specialist module, mainly at Levels 6. The generic creative and innovative process is covered in the Innovation and Enterprise module at Level 6.

- **B5:** Fitness of purpose as well as life-cycle product management is considered in modules in the professional and industrial thread.

- **B6:** Managing the design process and evaluating outcomes features in many modules where the design thread runs in order to enable students to exercise their ability to be creative in providing solutions to engineering problems.

- **B1–B6** are also addressed in varying degrees in the Level 6 Individual Project, where students are expected to find fit for purpose creative solutions by managing and applying the design processes taught in earlier years. An evaluation of the outcomes of their solution is required.

- **B7** and **B8** are acquired in Design and Practice at Level 4 and at higher levels through Engineering Design at level 5 and at Level 6 Innovation and Enterprise.

- Sustainable development **B9** is introduced at level 4 in Design and Practice. Further work is done at higher levels through modules that embody systems features and components, for example, Engineering Design at Level 5, Thermofluids and Sustainable Energy at Level 5.

- **B10** is acquired at Level 4 in Design and Practice, and continues at level 5 through Engineering Design.

- **B11** is acquired through the modules in the professional and industrial thread, which permeates throughout the course namely, Design and Practice at Level 4, Engineering Design at Level 5, and Innovation and Enterprise at Level 6. Depending on its particular emphasis, aspects of **B7–B12** will also be acquired in the Level 6 Individual Project.

3. Practical skills

- The **C1** outcome is delivered in Level 4 by the study of different materials and measurement principles in the Solid Mechanics and Materials module along with use of CAD tools and measurement equipment in the Design and Practice module. This is also covered in Level 5 through the projects set in the Engineering Design module. This continues throughout the course where characteristics of materials and equipment are covered in later technical modules.

- **C2** is acquired through a large number of modules where laboratory activity is recorded in logbooks. At Level 4 in Design and Practice a general approach to engineering workshop and laboratory work is taken. In later years this activity continues with more technically specific laboratory, design and computer-based workshops which include practical investigations, design exercises and CAD simulations to develop more advanced skills.

- The achievement of **C3, C4** and **C5** is facilitated mainly by the team design project of the Engineering Design module that covers planning, research and communication process in project management but also in other modules. The ability to understand and use technical literature along with the understanding of intellectual property, starts in the professional and industrial thread in Level 4 Design and Practice module and gradually builds throughout the course, to include the coverage of industry standards and environmental impact issues in the Innovation and Enterprise module at Level 6.

- The industrial codes of practice and quality issues of **C6** and **C7** are similarly covered in the professional modules on the course and in some other modules.

- **C8:** Working with uncertainty, outcome is introduced in the Level 4 practical sessions, with its theory being covered in the Level 4 Mathematics module. In the project modules at Levels 6 students are expected to discuss their outcomes in terms of error predictions, measurements and the optimisation of technical uncertainties.

4. Transferrable Skills

- The **D1** outcome of applying their skills in problem solving, information retrieval is acquired in Level 4 Engineering Mathematics and Modelling, Fluid Mechanics and Thermodynamics and Design and Practise modules. Level 5 Advanced Engineering Mathematics and Modelling, Solid Mechanics and FEA, Thermofluids and Sustainable Energy, Dynamics and Control. Machine Drives and Mechatronics and Level 6 Dynamics and System modelling, Thermofluids and Turbomachinery and Level 7 Advanced Powertrain Systems, Vehicle Performance and 3D-CFD, Advanced Vehicle Dynamics, NVH, Structures and Crash-Safety modules. The communications, information retrieval, working with others are covered in Level 4, and 5, Level 6 Individual Projects and Level 7 Group Projects. The use of general IT facilities is integral part of the learning process across all levels.

- The achievement of **D2** is acquired through Level 4 Design and Practice and integrated with personal tutoring system. This will also be facilitated by registering all students to become IMechE student membership and encouraging them to attend the free talks and making them to work closely with their professional body by laying a strong foundation for lifelong learning/CPD. This will also continue in Level 5 Engineering Design with IMechE design challenge and further continues in Level 6 Individual Project, Formula Student and Shell ECO Marathon projects.

- The achievement of **D3** is facilitated mainly by the Level 6 Individual Project and Level 6 Group Project

- The achievement of **D4** is initiated and monitored in the group project from Level 4 Design and Practice, Level 5 Engineering Design and Level 6 Innovation and Enterprise

Assessment

1. Knowledge and understanding

- **A1:** Assessment of the knowledge base is through examinations, mini tests and assignments, which frequently demand that the student extend knowledge of a subject by self-learning.

- **A2:** Underpinning the understanding of their engineering discipline is assessed via assignments and laboratory activity. Emphasis is made on producing a design component in assignments as well as written examinations.

- **A3:** Ability to apply and integrate knowledge is assessed by larger scale project work as well group assignments (where appropriate) and logbooks. Additionally in written examination emphasis is placed on producing conceptual design solutions to projects that span across engineering disciplines.

- **A4:** Engineering analysis skills in applying the knowledge base are assessed in tutorials. The more extended skills are assessed via assignments and project reports.

- **A5:** Modules at Levels 5 and 6 have progressively more design based and systems analysis questions in examinations.

- **A6:** Level 6 Individual Project offers the best chance for students to demonstrate their ability to apply a systems approach to solving engineering problems. At Levels 5 and 6, laboratory workshops and assignments are often based on analysing systems performance in modules such as Thermofluids and Sustainable Energy among others.

2. Intellectual skills

- **B1** is assessed specifically via standard logbooks and some exercises and tests in the early modules, and later by forming part of the checklist of elements for which marks are awarded in the assessment of small and larger projects. These are formally assessed in Level 4 in simple 'design and make' exercises. Further development of these skills is more indirectly assessed, in that significant achievement in these areas is necessary for the highest marks, particularly in project work, which includes assessment by presentation and viva-voce examinations.

- **B2:** Practical laboratory sessions and software workshops provide a means to assess this through assignments and logbooks. Examinations are also used to challenge students to design a system based on specific (that are necessarily brief) user requirements. Students are encouraged to make design assumptions in order to demonstrate their understanding of the importance of requirements specification.

- **D3** is assessed by design assignment reports at different levels across modules that have a strong design component.

- **B4** and **B5** are assessed via engineering reports and presentations. Some modules specifically employ practical simulation exercises as a major part of the assessment. Project management plays a primary role in assessment of the major Level 6 Individual Project, both in an initial (progress) report and in the final report which has to describe the projects process activity.

- In early years **B8** and **B9** are assessed primarily by logbooks and assignments based on tutorial work and laboratory activity. In Level 6 these are assessed by the project modules assessment criteria. **B10** and **B11** are assessed by assignments which are based on tutorial work and laboratory session and which require formal design based on user requirements.

- **B7** is assessed in project work, through various components including presentation session and viva-voce examination.

3. Practical skills

- **C1** is assessed by laboratory exercises and tutorial assignments.

- **C2** is assessed specifically via standard logbooks and reports based on laboratory activity.

- **C3** is assessed by design assignments and also some exercises and tests in the early modules, and later by forming part of the checklist of elements where marks are awarded in assessing small and larger projects.

- **C4** is assessed by project work where students are required to provide background information as well as suitable referencing for their assignment.

- **C5** and **C6** are initially assessed in year 1 in simple 'design and make' exercises. Further development of these skills is indirectly assessed through design assignments in specialist modules at Levels 6. Additionally these are assessed in the Level 6 individual project of which include assessment by presentation and viva-voce examinations.

- **C7** is specifically assessed through Design and Practice at Level 4, and Engineering Design at Level 5. It is also indirectly assessed by work on the Individual Project at Level 6.

- **C8** is assessed in design exercises during tutorial session as well as assignments. The coursework assignments set in the Level 5 module Engineering Design also assesses the ability to work with technical uncertainty. It is also assessed in and Level 6 Individual Project work.

- **C9** is assessed in project work, report, individual presentation and group presentation at Level 6 Innovation and Enterprise module.

4. General Transferrable Skills

- **D1** is assessed by exam, course work report and project reports.

- **D2** is assessed by course work and PDP report.

- **D3** is assessed in project report and presentation.

- **D4** is assessed in the individual and group presentation.