Course Specification

A. Course Information			
Final award title(s)	MSc Data Science		
Intermediate exit award title(s)	Pg Dip Data Science Pg Cert Data Science		
UCAS Code		**Course Code(s)**	4940 (FT SEPT) 5084 (PT) 5619 (FT JAN)
	London South Bank University		
School	☐ ASC ☐ ACI ☐ BEA ☐ BUS ☒ ENG ☐ HSC ☐ LSS		
Division	Computer Science and Informatics		
Course Director	Daqing Chen		
Delivery site(s) for course(s)	☒ Southwark ☐ Havering ☐ Other: please specify		
Mode(s) of delivery	☒Full time ☒Part time (2 years) ☐ Top-up ☐ Full-time sandwich		
Length of course/start and finish dates	**Mode** / **Length years** / **Start - month** / **Finish - month** Full time / 1 / September / August Part time (2 year) / 2 / September / August		
Is this course generally suitable for students on a Tier 4 visa?	Please complete the International Office questionnaire Yes ~~No~~ 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	May 2017	
	Course Review date	May 2022 (Completed) May 2027	
	Course specification last updated and signed off	March 2021	
Professional, Statutory & Regulatory Body accreditation	BCS Partial CEng, CITP		
Reference points:	Internal	Corporate Strategy 2020-2025 Academic Quality and Enhancement Manual School Strategy LSBU Academic Regulations	
	External	QAA Quality Code for Higher Education 2018	

		Framework for Higher Education Qualifications Competitions and Markets Authority SEEC Level Descriptors 2016 BCS Guidelines for Accreditation [2020] IET Guidance for meeting AHEP learning outcomes [2015]

B. Course Aims and Features

Distinctive features of course	• Uniquely designed for both graduates or practitioners from a computing or a numerate discipline, wishing to pursue a career in the Data Science community. • Develops practical hands-on experience in data science, business Intelligence and analytics using industry standard tools including SAS, Tableau, MS SQL Server, Oracle Database, and R Programming. • Addresses the latest research and IT trends including data science, big data, machine learning, data cleansing, data quality management, analytics and data mining. Allows 'practitioner entry' for those who have had considerable industrial experience in a relevant field and are able to demonstrate an ability to work at the master's level.
Course Aims	The course aims map onto the "BCS Guidelines on course accreditation, Information for universities and colleges, January 2020": section 2.4 (available at https://www.bcs.org/media/1209/accreditation-guidelines.pdf) The MSc in Data Science aims to: 1. Provide you with employer focussed skills required in a data science role; carry out a critically evaluative review of current Data Science literature/software/process developments, and research; developing skills as self-directed learner who can set goals and select appropriate knowledge, skills, etc... as well as specifying tools/techniques for a particular purpose. *(covers BCS requirements: 2.4.1: a, b)* 2. Develop your ability to recognise and be able to respond in an appropriate way to opportunities for innovation in Data Science, as well as participating effectively in technology review and peer review processes. *(covers BCS requirements: 2.4.1: c, d)* 3. Prepare you for a career in the Data Science community using appropriate processes to specify, design, deploy, verify and maintain Data Science and Big Data information systems, including working with technical uncertainty, undertaking risk management associated with a range of activities. *(covers BCS requirements: 2.4.1: e, f)* 4. Work as a member of a Data Science/development team recognising the different roles within a team and different ways of organising teams while applying the principles of appropriate supporting disciplines for: investigating and defining a problem, identifying constraints, understanding customer/user needs, identifying and managing cost drivers, ensuring fitness for purpose and managing the design process, finally critically evaluating outcomes. *(covers BCS requirements: 2.4.1: g, h, i)*
Course Learning Outcomes	The course aims map onto the "BCS Guidelines on course accreditation, Information for universities and colleges, January 2020": sections 2.4 - 2.5 (available at https://www.bcs.org/media/1209/accreditation-guidelines.pdf)

a) Students will have knowledge and understanding of:

- Demonstrating a systematic understanding of the domain of Data Science, with depth being achieved in areas such as: data understanding data cleansing/transformation, algorithms for analytics/prediction, visualization techniques; This includes issues at the forefront of professional practice in the discipline; it also includes a critical/evaluative understanding of the role of these areas/issues in developing bespoke Big Data information systems. *(covers BCS requirements: 2.4.2: a; 2.4.3 a, b)*
- Importance of methodologies (both current and emerging) for Data Science, and analytic processes, a through and critical understanding of the subject literature/research, driving innovation and contributing to the knowledge in the domain. *(covers BCS requirements: 2.4.2: b, d; 2.4.3 b, d)*
- Consistently produce work which applies and is informed by research at the forefront of the developments in the domain of Data Science; this will demonstrate critical evaluation of aspects of the domain *(covers BCS requirements: 2.4.2: d; 2.4.3 d, e)*
- The study and management of Data Science projects including: timescales, risk identification/management, cost and quality constraints, as well as ethics, data security, working within professional frameworks and social/legal constraints. The project solution will demonstrate a sound justification for the approach adopted as well as a self-critical evaluation of effectiveness but also a sense of vision about the direction of developments in aspects of the Data Science discipline *(covers BCS requirements: 2.4.3 a-f; 2.5.2 a-h)*

Teaching and learning strategy:

Achievement of the learning outcomes is normally through exposition, demonstration, and practical work, the latter being divided between tutorials and assignments. Module co-ordinators provide material via the VLE and are encouraged to explore the use of innovative on-line technologies that provide enhanced e-learning and assessment environments. Lectures will be used to introduce and provide new information and update existing knowledge while seminars and tutorials allow smaller group exercises, discussion of ideas amongst students and researchers, developing a research informed culture.

Assessment:

Assessment methods are specified in each module guide and cover the module and course learning outcomes. Content, knowledge and understanding is assessed through unseen written examinations, presentations and coursework. The course lays a strong emphasis on the synthesis of practical expression & theoretical technical knowledge. For this reason, the dominant form of assessment used is coursework rather than examination.

b) Students will develop their intellectual skills such that they are able to:

- Conduct a critically evaluative analysis of a case-based domain using appropriate analytic and quantitative methods *(covers BCS requirements: 2.4.2: a, b, c; 2.4.3 a, b, c)*

	• Develop the in-depth knowledge necessary to identify and apply suitable techniques in order to synthesize advanced theory/practical concepts. *(covers BCS requirements: 2.4.2: d; 2.4.3 d, e, f)* • Specify/critically evaluate a project applying appropriate techniques, life-cycle/methodology *(covers BCS requirements: 2.4.2: a; 2.4.3 a, b; 2.4.4 a, b, c)* • Conduct effective independent research *(covers BCS requirements: 2.4.2: a, d, e; 2.4.3 a, b)* Teaching and learning strategy: Acquisition of the course intellectual outcomes is normally through a range of tutorial and seminar work and assignments, including use of literature searches and comparisons, case studies, and projects. Students can expect, as part of the teaching and learning strategy, to be pro-active participants in the development of intellectual skills through discussion and peer presentation, and subject reporting Assessment: Intellectual skills are typically assessed through coursework / examinations and the final masters project **c) Students will acquire and develop practical skills such that they are able to:** • Be able to make concise, engaging and well-structured oral presentations, arguments and explanations *(covers BCS requirements: 2.4.2: d, e; 2.4.3 d, e)* • Develop the knowledge necessary to identify Data Science project domains and apply suitable techniques in order to synthesize advanced (theory/practical) concepts to design, develop, deploy, and maintain bespoke/innovative Data Science/Big Data solutions. *(covers BCS requirements: 2.4.2: d, e; 2.4.3 d, e, f)* • Communication /Presentation of advanced Data Science projects and concepts to a wide range of audiences. *(covers BCS requirements: 2.4.3 a-f; 2.5.2: a-k)* • Be able to construct and manage a project applying appropriate technology, techniques, life-cycle/methodology *(covers BCS requirements: 2.4.3 a-f; 2.5.2: a-k)* Teaching and learning strategy: Practical skills are normally developed through practical coursework, frequently in groups, skill- based sessions, case studies and problem-solving approaches. Assessment: Typically assessed via a variety of coursework types (although examination may be used where appropriate). The typical coursework types include: reports, software engineering tasks, in-class tests, blogs and presentations. The exact allocation of assessment types and weightings depending on the subject content and the learning outcomes. **d) Students will acquire and develop transferrable skills such that they are able to:** • Be creative/innovative, self-motivated and self-aware with the ability to review the literature, current developments/software/processes

	reflecting critically on successes and failures *(covers BCS requirements: 2.4.1: a, b)* • Recognise and be able to respond in an appropriate way to opportunities for innovation, as well as participating effectively in technology review and peer review processes *(covers BCS requirements: 2.4.1: c, d)* • Specify, design, deploy, verify and maintain Data Science and Big Data information systems, including working with technical uncertainty, undertaking risk management associated with a range of activities. *(covers BCS requirements: 2.4.1: e, f)* • Recognise the different roles within a Data Science team and different ways of organising teams while applying the principles of appropriate supporting disciplines for: investigating and defining a problem, identifying constraints, understanding customer/user needs, identifying and managing cost drivers, ensuring fitness for purpose and managing the design process, finally critically evaluating outcomes. *(covers BCS requirements: 2.4.1: g, h, i)* Teaching and learning strategy: Acquisition of transferrable skills is encouraged throughout the course, via, seminar and tutorials, formative assessments, e-learning, group projects, open discussions and personal tutoring. Assessment: Assessment is usually through coursework/exams and through the master's project.

C. Teaching and Learning Strategy

Overview of teaching and learning activities

There will be a combination of lectures, tutorials and computer laboratory activities to inform, contextualise, discuss, analyse, explore and critically evaluate the material in order to enable students to assimilate the material and develop students' intellectual abilities around it.

The delivery will aim to ensure a balance of cognitive tasks involving the demonstration and application of factual knowledge, problem-solving, analysis and critique with practical exercises in computer laboratories to reinforce learning through direct experience. Practical/research-based applications and utilising real-world examples will be used wherever possible.

Independent (non-contact) study hours will be predominantly concerned with assimilation, at knowledge acquisition will take place as part of analytical study and students will be engaging in independent research and critical evaluation. Students will undertake an independently managed project which will involve making use of practical (and other) skills acquired during the course.

Modules exist to support the development of study and communication skills, to develop self-management skills and develop effective team-working (in certain modules cross discipline). In addition, classroom activities in many other modules will be used to foster these abilities.

Importance of independent learning

Students are required to undertake directed self-study and prepare solutions/discussions to questions relative to various topic areas. Students will be encouraged to identify for themselves particular problems of difficulty and to use seminar discussions, where appropriate, for the resolution of these. Students must regularly access the Moodle site for this module. They should download the class/lecture material from the Moodle site, and do the recommended reading,

before each lecture/class. Where appropriate, students are also expected to download the relevant seminar questions and study them in advance of each seminar, in order to derive maximum benefit from seminar time. The programme of teaching, learning and assessment gives guidance on the textbook reading required for each week, the purpose of which is to encourage further reading both on and around the topic.

Each 20-credit module has a total of 200 study hours, out of which:

- At level 7, there are 52 direct contact hours and 148 independent study hours
- Project module has 10 direct contact hours and 590 independent study hours

Subject-related and generic resources available

Students will have access to approximately 200 PCs and 15 Macs in 10 teaching computer labs, which typically have the following ICT software facilities: Microsoft SQL Server 2015, NetBeans with JDK8, Oracle, Python, SAS, Visual Paradigm, Microsoft Imagine, etc. We also have a cyber security lab, which is used for specialised modules and several printers, including large format printers.

Generic resources include:

- Perry library - provides access to traditional books, journal sources, PCs to use and laptops to borrow. The Perry Library is open throughout the week, and during the term are staffed from 08.30 until 21.00 from Monday – Thursday, and 10.30 to 16.20 at weekends. There is seating capacity for 600 students in the library and the book-stock is in excess of 600,000 volumes. The building provides wireless access.
- The Students' Support Centre - provides a first stop service for students on academic, personal and financial matters. It is aimed at improving student experience and offers LSBU's best employability, development and student services. The centre also offers home to our Students' Union.
- Fitness - there is also a sports hall, fitness suite and gymnasium
- Catering - there is a large refectory, with a selection of smaller cafes and eating outlets on campus.

Learning support

We support students throughout their course in many different ways, such as:

- personal tutoring
- support sessions on core maths & programming skills taking place weekly
- peer student led support sessions
- practical skills workshops
- labs equipped with the latest hardware and software
- lectures, seminars, personal tuition
- online learning materials
- varied assessment methods
- advice on work experience and career options
- opportunities for internships, work placements and projects with employers
- tailored field trips
- training in research methods and assistance with independent research projects.

Teaching staff

Majority of academics have standing with a professional body (e.g. BCS, ACM, IEEE), and either a research background or an industry experience in their teaching area. Some modules may be supported with postgraduate students, who will either support tutorials at a lower level or provide support on modules related to their research area. Module leader with the division management will establish the suitability of the teaching team and support and training will be provided where necessary to ensure quality of teaching is delivered.

Virtual Learning for students

Moodle, the university's Virtual Learning Environment (VLE) provides online resources and support for all students. It enables students with access to resources and tools to support their teaching and learning, ensuring that any student will have access to the same electronic curriculum resources irrespective of their location (on or off-campus).

VLE also provides facilities such as on-line timetables, assessment submissions, lecture and tutorial resources, assessment results, as on-line timetables, lecture resources, course information, examination results, module selection and submission systems, revision tools, video, podcasts, module feedback, forums and other systems for both students and staff to support their courses.

VLE is also used in collaboration with Lynda.com website, through which students have free access to a wide range of training materials supporting their course.
Typically, the content from Lynda.com is used via embedded links in the VLE (Moodle) to prescribe playlist sequences of audio/video and various media content in support of students learning.

D. Assessment

Formative assessment

Formative assessment is essential as it is effective in promoting student learning and it helps seek to determine how students are progressing through a certain learning goal. Wherever possible formative assessment will be used to allow students to gauge their own progress and address weak areas. Formative assessment will also provide assessors with the opportunity to learn about the extent to which students have developed expertise and can tailor their teaching accordingly.
Formative assessment will take different forms depending on the module level and type, but in general a selection and combination of the following will be used:

- interactive revision quizzes
- think-pair-share concept and class discussions
- verbal feedback on tutorial activities
- observation and questioning to provide instant feedback as the student takes part in learning activities
- self and peer assessment

Summative assessment

For all modules summative assessment consists of either 100% coursework or a combination of

coursework and two-hour typically closed-book examination. All modules have a 50% pass mark which has to be achieved for each component individually (exam and coursework).

Students' acquisition of knowledge and understanding will be assessed by coursework tasks requiring the demonstration of such, including assessed practical tasks, report writing, in-class tests and presentations, individual and team-projects, etc. There is typically one coursework per module, which may consist of two or more components.

Examinations will be closed-book and will require students to demonstrate that knowledge and understanding have been achieved.

Progression

Students must pass all core modules in order to progress to the following year and pass any final year core modules to be eligible for classification.

E. Academic Regulations

The University's Academic Regulations apply for this course. For course specific protocols please refer to the Divisional protocol document.

F. Entry Requirements

- 2:2 UK honours first degree or international equivalent in a relevant Computing/Mathematical/Statistical subject; **or**
- A Higher National Diploma in a relevant subject and a minimum of three years relevant professional experience; **or**
- We recognise that many people have a wealth of valuable skills and knowledge they've developed at work or through training. If candidates have the potential to succeed in postgraduate or post-experience studies we'll consider their application on its individual merit. Applications may be considered where candidates demonstrate a combination of educational qualifications and work experience.
- For all applicants experience of Computing/Programming will be sought.
- We welcome qualifications from around the world. English language qualifications for international students: IELTS score of 6.5.

G. Course structure(s)

Course overview

All full time and part time courses are organized into two semesters, each lasting 15 weeks.
Top-up course has a slightly different structure, as it consists of three semesters, the third one being a summer semester.
Semester one starts in September, Semester 2 in January and Semester 3 in June.
The standard 'building block' of all course delivery are modules – identified in size by CATS (Credit Accumulation and Transfer Scheme) credits. All module size across the course is 20 CATS credits; with the exception of the Dissertation project, which is a triple module worth 60 credits, and Research Methods which is zero credits (non-credit-bearing).

MSc Data Science FT (4940)
Level 7
S1
Future Internet Technologies (CSI_7_FIT)
Statistical Analysis and Modelling (CSI_7_SAM)
Machine Learning (CSI_7_MAL)
Data Management
S2
Future Internet Technologies (CSI_7_FIT)
Data Mining and Analysis (CSI_7_DMA)
Research Methods (CSI_7_RME)
Systems - Cyber Threats, Vulnerabilities and Countermeasures (CSI_7_SYS)
Dissertation (CSI_7_PRO)

Within this new course, we are proposing a variety of well-structured modes of study. Course availability is subject to applicant numbers. The study modes include:

- Semester Based learning (Full-time: 1 year and Part-time: 2 years);
- Block Mode learning (Full-time: 1 year and Part-time: 2 years);

Students will need to attend and pass the Research Methods module before being allowed progression to the Dissertation module.
For a full explanation of the study modes please see the Validation and Rationale document.
The image below shows how the module delivery is structured for each study mode.

MSc Data Science :Semester Mode

Full-time							
Semester 1				**Semester 2**			
Day 1		Day 2		Day 1		Day 2	
Machine Learning	Statistical Analysis and Modelling	Future Internet Technologies	Data Management	Data Mining and Analysis	Systems - Cyber Threats Vulnerabilities and Countermeasures	Research Methods	Future Internet Technologies
Part-time Year 1		**Part-time Year 2**		**Part-time Year 1**		**Part-time Year 2**	

MSc Data Science :Block Mode

Full-time							
Semester 1				**Semester 2**			
Week 1 - 3	Week 4 - 7	Week 8 - 9	wk 10-12	Week 1 - 3	Week 4 - 7	Week 8 - 10	
Machine Learning	Statistical Analysis and Modelling	Future Internet Technologies	Data Management	Data Mining and Analysis	Systems - Cyber Threats Vulnerabilities and Countermeasures	Research Methods	
Part-time Year 1		**Part-time Year 2**		**Part-time Year 1**		**Part-time Year 2**	

NOTE: Usually within each course there will be Private Study Periods (actual scheduling may vary), which we will use to provide the opportunity to attend the School of Engineering's series of PG research seminars. The research seminar series is attended by all PG students including the Doctoral (PhD/MPhil) students as well as academics both internal and external. In these seminar sessions, invited guest speakers from various backgrounds including engineering, science, business and enterprise deliver talks on their current work/research, sharing knowledge and expertise in their chosen specialism. This is an excellent opportunity for our students to: gain direct experience of a research informed culture, learn new skills, network and engage with fellow professionals; also to explore new concepts encouraging collaboration, innovation and enterprise.

H. Course Modules

Module Code	Module Title	Level	Semester	Credit value
CSI_7_SYS	Systems Cyber Threats, Vulnerabilities and Countermeasures	7	2	20
CSI_7_DAT	Data Management	7	1	20
CSI_7_DMA	Data Mining & Analysis	7	2	20
CSI_7_MAL	Machine Learning	7	1	20
CSI_7_SAM	Statistical Analysis & Modelling	7	1	20
CSI_7_FIT	Future Internet Technologies	7	Both	20
CSI_7_RME	Research Methods	7	2	0
CSI_7_PRO	Dissertation	7	2	60

I. Timetable information

- Timetables will be made available via the university VLE.
- Full Time students will usually be expected to be timetabled for 2-3 days per week
- Part-Time students will usually be expected to be timetabled for 1-2 days per week

J. Costs and financial support

Course related costs

The course fee does not include the cost of text books or personal devices (student laptops). These items are not required for study as alternatives exist: All text books that are mandatory for study are usually available via the library in a free form (for example as e-books) and the computer labs provide the essential equipment. The costs of field trips are not included, but where a field trip is required for the purpose of study costs will not exceed typical transport costs within the London area.

Tuition fees/financial support/accommodation and living costs

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

List of Appendices

Appendix A: Curriculum Map
Appendix B: Educational Framework (undergraduate courses)
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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.

MSc Data Science

Modules			Programme outcomes														
Level	**Title**	**Code**	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**	**C4**	**D1**	**D2**	**D3**	**D4**
7	Systems _Cyber threats, Vulnerabilities and Countermeasures	CSI_7_SYS	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	TDA	TDA	TDA	TDA	DA	TDA	DA	TDA
7	Data Management	CSI_7_DAT	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	DA	TDA	DA	TDA	DA	TDA	DA	TDA
7	Data Mining & Analysis	CSI_7_DMA	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	TDA	TDA	TDA	TDA	DA	TDA	DA	TDA
7	Machine Learning	CSI_7_MAL	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	TDA	TDA	TDA	TDA	DA	TDA	DA	TDA
7	Statistical Analysis & Modelling	CSI_7_SAM	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	TDA	TDA	TDA	TDA	DA	TDA	DA	D
7	Future Internet Technologies	CSI_7_FIT	TDA	TDA	DA	TDA	TDA	DA	TDA	DA	TDA	TDA	TDA	TDA	DA	TDA	DA	TDA
7	Research Methods	CSI_7_RME	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA	TDA	TDA	TDA
7	Dissertation	CSI_7_PRO	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA

As the division will initially be seeking accreditation: Chartered Engineer (CEng), Chartered Scientist (CSci) as well as Chartered IT Professional (CITP) accreditation by the British Computer Society, the Chartered Institute for Information Technology. We have created curriculum maps using:
"BCS Guidelines on course accreditation, Information for universities and colleges, January 2020",

available at: https://www.bcs.org/media/1209/accreditation-guidelines.pdf)

The curriculum map for the MSc Data Science, mapping each module to the BCS requirements follows on the next page.

Appendix C: Curriculum Map

MSc Data Science

KEY to tabulated values: T= Taught D= Developed A=Assessed

TS = Transferrable Skills
CA = Cognitive Abilities
PA = Practical Abilities
PR = Project Requirements

	Learning Outcomes (Based on BCS: CEng, CSci, and CITP masters requirements)		Level 7 modules	Future Internet Technologies	Statistical Analysis and Modelling	Research Methods	Data Management	Data Mining and Analysis	Systems - Cyber Threats Vulnerabilities & Countermeasures	Machine Learning	Dissertation
2.4.1 Core requirements for accreditation of specialist masters programmes											
a	• Carry out a critical review of the literature, current developments and available software as well as the associated software processes	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
b	• Support the development of the self-directed learner who can set goals and select appropriate knowledge, skills, etc... as well as supporting tools for a particular purpose	TS	DA	DA	DA	DA	DA	DA	DA	DA	DA
c	• Recognise and be able to respond in an appropriate way to opportunities for innovation	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
d	• Participate effectively in the peer review process	TS	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
e	• Undertake risk management associated with a range of activities	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
f	• Use appropriate processes to specify, design, deploy, verify and maintain computer-based systems, including working with technical uncertainty	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
g	• Investigate and define a problem, identify constraints, understand customer and user needs, identify and manage cost drivers, ensure fitness for purpose and manage the design process and evaluate outcomes	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TD	DA
h	• Apply the principles of appropriate supporting disciplines	TS	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
i	• An ability to work as a member of a development team recognising the different roles within a team and different ways of organising teams	TS	TDA	TDA	TDA	TDA	TD	TD	TD	TD	DA
	N.B. This core set of transferable skills meets the requirements for CITP Further Learning, CEng and CSci. Therefore no additional transferable skills are presented in 2.4.2 and 2.4.3.										
2.4.2 Additional requirements for CITP Further Learning											
a	• Demonstrate a systematic understanding of the knowledge of the domain of their programme of study, with depth being achieved in particular areas. This should include the foundations of the discipline and/or issues at the forefront of professional practice in the discipline; it should also include an understanding of the role of these in contributing to the effective design, implementation and usability of relevant computer-based systems	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
b	• Demonstrate a comprehensive understanding of the essential principles and practices of the domain of the programme of study including current standards, processes, principles of quality and the most appropriate software support; the reasons for their relevance to the discipline and/or professional practice in the discipline; and an ability to apply these	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
c	• Understand and be able to participate within the legal, social, ethical and professional framework within which they would have to operate as professionals in their area of study	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
d	• Consistently produce work which applies and is informed by research at the forefront of the developments in the domain of the programme of study; this should demonstrate critical evaluation of aspects of the domain	PA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
e	• Demonstrate the ability to apply the principles and practices of the discipline in tackling a significant technical problem; the solution should demonstrate a sound justification for the approach adopted as well as a self-critical evaluation of effectiveness but also a sense of vision about the direction of developments in aspects of the discipline	PA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
2.4.3 Additional requirements for CEng											
a	• A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights in the development and implementation of systems, much of which is at, or informed by, the forefront of their field of study	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
b	• A comprehensive understanding of the state-of-the-art techniques and methodologies for developing systems	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
c	• Understand and be able to participate within the legal, social, ethical and professional framework as professionals in systems, software or information engineering	CA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
d	• Develop and apply new technologies	PA	TDA	TDA	DA	TDA	TDA	TDA	TDA	TDA	DA
e	• Show originality and innovation in the application of knowledge and techniques for developing systems	PA	TDA	TDA	DA	TDA	TDA	TDA	TDA	TDA	DA
f	• Make general evaluations of commercial risk through some understanding of the basis of such risks	PA	TDA	TDA	TDA	TD	TDA	TDA	TDA	TDA	DA
2.5 Projects											
2.5.1 General project requirements											
a	An individual project is an expectation within undergraduate, integrated masters, and postgraduate masters programmes. Students must be provided with written guidance on all aspects of the project, including selection, conduct, supervision, milestones, format of the report and the criteria for assessment.	PR	D	D	TDA	D	D	D	D	TDA
b	All projects should reflect the aims and learning outcomes which characterise the programme to which they contribute as set out in the programme specification.	PR	D	D	TDA	D	D	D	D	TDA
Project reports (Projects must involve the production of a report which should include:)											
c	• Elucidation of the problem and the objectives of the project	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
d	• An in-depth investigation of the context and literature, and where appropriate, other similar products (this section is likely to be emphasised less for an IEng project)	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
e	• Where appropriate, a clear description of the stages of the life cycle undertaken	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
f	• Where appropriate, a description of how verification and validation were applied at these stages	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
g	• Where appropriate, a description of the use of tools to support the development process	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
h	• A critical appraisal of the project, indicating the rationale for any design/implementation decisions, lessons learnt during the course of the project, and evaluation (with hindsight) of the project outcome and the process of its production (including a review of the plan and any deviations from it)	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
i	• A description of any research hypothesis	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
j	• In the event that the individual work is part of a group enterprise, a clear indication of the part played by the author in achieving the goals of the project and its effectiveness	PR	TDA	TD	TDA	DA	DA	DA	DA	DA	DA
k	• References	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
2.5.2 Postgraduate project requirements											
a	Projects at postgraduate level may be similar in scope to undergraduate projects but should reflect the ethos of advanced study and scholarship appropriate to a masters degree (whether generalist or specialist).	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
b	• A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the specialist academic discipline	PR	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
c	• A comprehensive understanding of techniques applicable to their own research or advanced scholarship	PR	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
d	• Originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline	PR	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
e	• Deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences	PR	TDA	TDA	TDA	TDA	TDA	TDA	TDA	TDA	DA
f	• Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level	PR	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
g	• Critical self-evaluation of the process	PR	TDA	DA	TDA	DA	DA	DA	DA	DA	DA
h	Generalist masters programme projects should be worth at least 30 credit points and be at least at undergraduate honours level. It is recognised that in practice a project on a masters programme is usually worth at least 60 credits at Level 7. The project must be passed without compensation.	PR			TD						TDA

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 development of 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	Outcomes focus and professional/employer links 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..	The course design has been informed by discussion with industry representatives. It is intended that all taught modules should include at least one external speaker. Each module was designed to provide experience and knowledge of relevant professional issues and will incorporate presentations by external professionals and/or LSBU alumni.
Embedded learning development	Support for transition and academic preparedness Several modules 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. Some modules should reference and reinforce the learning development to aid in the transfer of learning.	The Research Methods module is the key provider of learning development and disciplinary thinking in conjunction with the Statistical Analysis, Data Management and Future Internet Technologies modules.
High impact pedagogies	Individual and Group-based learning experiences 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**. Consideration should be given to how students are allocated to groups to foster experience of diverse perspectives and values.	Project Management and Professional Practice issues are delivered as part of several modules during the course. Developing both independent learning skills and a more sophisticated / in-depth team-working exercise.
Inclusive teaching, learning and assessment	Accessible materials, resources and activities 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	All course materials and resources will be provided in a variety of formats making them accessible to students with different needs.

	and the availability of alternative formats for reading lists.	
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. Assessment and feedback communicates high expectations and develops a commitment to **excellence**.	All taught modules have formative assessment strategies explicitly described in their descriptors.
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 the dissertation 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.	Research Methods and also Statistical Analysis and Modelling include the development of research skills and critical writing. They also are given an opportunity to engage with open-ended problems and are guided throughout the activity. The students also present their findings and receive peer feedback.
Curricula informed by employer and industry need / Assessment *for* learning	<u>Authentic learning and assessment tasks</u> Live briefs, projects or equivalent authentic workplace 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.	Research Methods explicitly addresses the use of authentic workplace learning experiences, while other modules are intended to make use of case studies and examples derived from current events, industry and ongoing developments in the relevant fields.
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.	The course team will be encouraged to explore a wide variety of teaching approaches to offer all students as exciting a learning experience as possible and hopefully to allow all to find aspects of the course that allow them to make use of their individual strengths and characters. Non-technical content such as examples and case studies shall be drawn from a global context.
Curricula informed by	<u>Work-based learning</u> Opportunities for learning that is relevant to future	Future Internet Technologies is built around real world case

employer and industry need	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 relevant to the course. Work-based learning can be linked to assessment if appropriate.	studies, practice and implementation of relevant contemporary emerging technologies. The module is based in a bespoke specialist lab where students develop skills hosting Cloud/Cyber security/ Data Science and a range of alternate specialist practice based skills.
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.	Discipline specific writing techniques are assessed in all modules. Formal reports and presentations are part of coursework assessments for most of the modules. The students receive feedback on their formative and summative assessments.
High impact pedagogies	<u>Multi-disciplinary, interdisciplinary or interprofessional group-based learning experiences</u> 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 including **inclusivity**, communication and networking.	Research Methods has been designed in collaboration with the PhD Research groups and involves the active participation of academics from separate disciplines.
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. BSc or equivalent) an advantage or disadvantage. An holistic assessment strategy should provide opportunities for all students to be able to demonstrate achievement of learning outcomes in	A wide range of diverse assessment types is used throughout the course taking into account that students might have their preferred and less preferred styles of assessments. This approach ensures fairness and enables students to perform to their full abilities.

	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.	
Curricula informed by employer and industry need	Career management skills 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 process. This should be designed to inform the development of **excellence** and **professionalism**.	Research Methods allows reflection is an assessed component. Reflection is also an assessed feature of many modules throughout the course and is an integral component of the dissertation.
Curricula informed by employer and industry need / Assessment *for* learning / High impact pedagogies	Capstone project/dissertation The 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**.	The dissertation has been designed as a capstone module that allows students to synthesise and apply all they have learnt in the module. The project has been designed with the recognition of the British Computer Society explicitly in mind and thus represents an undertaking relevant to future employment prospects (for example as something students can describe to potential employers in depth to illustrate their expertise).

Appendix C: Personal Development Planning

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

Approach to PDP	**Level 7**
1 Supporting the development and recognition of skills through the personal tutor system.	The course director as the student's Personal Tutor meets the student in the first few weeks of the course to identify the skill set needed for development and provide guidance throughout the course of studies.
2 Supporting the development and recognition of skills in academic modules/units.	All modules support the development and recognition of skills, in particular transferrable skills, through seminar/tutorials and assessments.
3 Supporting the development and recognition of skills through purpose designed modules/units.	All modules are designed to support the development and recognition of both practical and transferrable skills and address employability. These are stated in the individual module descriptors/guides.

4 Supporting the development and recognition of skills through research projects and dissertations work.	The Research Methods module will equip students with research methods and skills to undertake the L7 project. Having progressed to the dissertation, students will be supported and guided by their project supervisor in developing and recognising the skill sets in the areas of their projects and future career development.
5 Supporting the development and recognition of career management skills.	The Career Management Talks each semester provide students with information of the Informatics labour market and systematic support on skill development such as CV writing skills and job interviews.
6 Supporting the development and recognition of career management skills through work placements or work experience.	The Programme has dedicated Moodle site where job and placement opportunities will be posted. Further, staff at the Employability and Skills office located within the Student Centre offer information, advice and guidance on job search and career management skills. Students are encouraged to use various employability facilities such as the Job Shop and Career Gym to look for job opportunities and to enhance their employability skills.
7 Supporting the development of skills by recognising that they can be developed through extra curricula activities.	Students are encouraged to attend seminar and workshops provided by the Employability Services. Various events have recently been provided such as Career Capital Clubs, Mock Interview week and Volunteering drop-in session. Students are also encouraged to join the British Computer Society to keep abreast of current development and practices.
8 Supporting the development of the skills and attitudes as a basis for continuing professional development.	This will be covered in the Research Methods module. Support will also be given by the course director and the project supervisor. The Division also provide a series of master's classes as part of students' professional development.
9 Other approaches to personal development planning.	The Orientation Programme normally includes a session on employability and learning resources offered by the Learning Resources Centre (LRC). An integrative assignment may be designed to address teamwork, project and other skills through a case study that reflects current practices.
10 The means by which self-reflection, evaluation and planned development is supported e.g. electronic or paper-based learning log or diary.	Students are also encouraged to keep a learning journal, both on paper and electronically, to reflect on their learning experience. In many modules this forms part of the assessment regime.

The course director will act as personal tutor to all students. In the full-time degree course, project supervisors provide this, but the top-up students carry out their projects over the summer so the same arrangement is not applicable here.

Student Support

Personal Tutoring Scheme

Students will be allocated a personal tutor, usually the Course Director (CD). This arrangement allows tutors and tutees to establish a relationship through regular contact with their assigned tutees. Personal tutors arrange regular meetings with their tutees to check that there are no problems and they are making progress. They also contact and arrange ad hoc meetings if students' attendance/engagement is not at a good level to identify the issues and provide necessary support if possible or give advice. Course directors also monitor students' attendance and achievement and contact /meet students to support and encourage their engagement.

While undertaking their dissertation/project student choose a supervisor from among the academic staff. As the supervisors are intrinsically involved in the development of their work it is most appropriate for the supervisor to fulfil the PDP functions of the personal tutor role at the dissertation stage.

Academic Support

At the school level we also have 'academic-clinic' sessions every week run by a member of the academic staff. The students receive academic help and feedback during these sessions.

At the university level we provide English and Maths as well as other support sessions which are freely available to all the students.

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