Course Specification

A Course Information			
Final award title(s)	HND Building Services Engineering	**Course Code(s)**	541 FT 549 PT
Intermediate award title(s)	None		
Awarding Institution	London South Bank University		
School	☐ ASC ☐ ACI ☒ BEA ☐ BUS ☐ ENG ☐ HSC ☐ LSS		
Division	Civil and Building Services Engineering		
Delivery site(s) for course(s)	☒ Southwark ☐ Havering ☐ Other: please specify		
Mode(s) of delivery	☐Full-time ☐Part-time ☒ Both		
Length of course	**Mode** / **Length years** / **Start - month** / **Finish - month** Part time / 3 / September / July Full Time / 2 / September / July		
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		August 2018
	Course specification last updated and signed off		September 2019
	Version number		August 2018
Professional, Statutory & Regulatory Body accreditation	• Chartered Institution of Building Services Engineers (CIBSE) • Energy Institute (EI) Accredited to 2023 intake		
Reference points:	Internal	- LSBU Mission Statement and Strategic Plan; - LSBU Core Skills Policy; - LSBU Academic Regulations	
	External	- Engineering Council, Accreditation of Higher Education Programmes (Third Edition 2014);	

B Course Aims, Features and Outcomes	
Distinctive features of course	This course is intended for technician engineers who are looking to develop their skills. Graduates will be well equipped to enter the industry in areas such as design and build, consultancy and facilities management. A wide range of building services is taught, both mechanical and electrical, and the theme of energy conservation and environmental impact is present throughout. In keeping with the needs of modern engineering practice, management and communication skills also strongly feature in this course. The course is designed to deliver the following core skills that will enable students to work effectively in the field: • Mathematic and scientific skills and their application in building services • Technical skills and knowledge required to understand systems design • Communication skills. Students will also begin to develop team-working skills in preparation for further study should they wish to gain professional status.
Course Aims	The general aim of this course is to develop the students' technical and application skills in accordance with the requirements of an Incorporated Engineer; the emphasis being on developing skills appropriate to a multidisciplinary, integrated building services and energy engineering environment. Incorporated engineers will be expected to have good technical and project management competence, with critical self-awareness and confidence in applying appropriate design solutions. They will be expected to rise to positions of middle and top management. They will require good analytical and communication skills, to be able to lead design teams, while also being able to work independently. The course is specifically relevant to those wishing to join the Chartered Institution of Building Services Engineers (CIBSE) and/or the Energy Institute (EI). With regard to CIBSE the course provides the management, design and technical skills for those working within the building services industry. The interests of the Energy Institute are represented by the emphasis on energy management, low energy design and an awareness of the relationship of buildings to energy resource and supply issues. The HND Building Services Engineering aims to: 1. Produce diplomate Building Services/Energy Engineers satisfying the academic requirements at HND level for incorporated membership of the Chartered Institution of Building Services Engineers and the Energy Institute.

	2. Produce diplomats trained in the core discipline of Building Services/Energy Engineering with a strong emphasis on design and application. Such graduates typically find employment in the building services and energy industries, either with a consultant, end user, contractor, equipment manufacturer, energy specialist or facilities manager. 3. Develop students' knowledge of mathematics, applied sciences, engineering methods, safety, economics, finance, and sustainability in support of the central themes of the course. 4. Develop students' practical and problem-solving skills through the integration of a broad range of subject material. 5. Teach students to communicate clearly, to argue rationally and to draw conclusions based on a rigorous, analytical and critical approach to data and systems. 6. Develop the transferable skills expected of a diplomate who will work in multidisciplinary teams with technical, commercial and management staff in industrial and other occupations. 7. Produce diplomates capable of contributing to the profession of Energy/Building Services Engineering in the context of modern industrial practice and sustainable development.
Course Outcomes	The number and letter in brackets e.g. (SM2i) refer to the Learning Outcomes described in Engineering Council Documentation (Appendix C). The curriculum map showing the modules in which the material that each of the learning outcomes covers is taught, developed and assessed is in Appendix A. **a)** Students will have **knowledge and understanding** of: A1 Appropriate mathematical methods. A2 Science appropriate to the discipline. A3 Principles of IT and Communications (ITC) relevant to building services engineering. A4 Characteristics of engineering/ building materials and components. A5 General principles of design. A6 Design techniques specific to building services engineering. A7 Management and business practices (including finance, law, marketing, personnel and quality). A8 Professional and ethical responsibilities including the global and social context of engineering. A9 Operational practice. A10 Codes of practice and the regulatory framework requirements for safe operation. **b)** Students will develop their **intellectual skills** such that they are able to: B1 Use mathematical methods to support practical understanding and analysis of building services engineering problems.

	B2 Use scientific principles in the development of engineering solutions to practical problems. B3 Use scientific principles in the selection and analysis of engineering systems, processes and products. B4 Analyse systems, processes and components requiring engineering solutions. B5 Select and apply appropriate computer-based methods for calculation and selection of building services engineering solutions. B6 Create system designs through synthesis of ideas from a wide range of sources. B7 Produce solutions to building services engineering problems through the application of engineering. B8 Exploit knowledge and understanding to undertake technical risk evaluation. **c)** Students will acquire and develop **practical skills** such that they are able to: C1 Use appropriate mathematical methods for calculating and analysing problems in building services engineering. C2 Use computers and current software in quantitative and analytical work, as well as general information technology for communication and data handling. C3 Design a system, component, process, or practical testing of design ideas in laboratory or through simulation, with technical analysis and critical evaluation of results. C4 Research for information to develop ideas further. C5 Apply engineering techniques taking account of industrial and commercial constraints. C6 Manage projects. **d)** Students will acquire and develop **transferable skills** such that they are able to: D1 Manipulate, sort and present data in forms useful for understanding; select, interpret and validate data, identifying possible errors and inconsistencies. D2 Present data in a variety of ways. D3 Use scientific evidence-based methods in the solution of problems. D4 Use general IT tools. D5 Use creativity and innovation in problem solving and design. D6 Work with limited or contradictory information. D7 Communicate effectively. D8 Develop lifelong learning. D9 Develop the engineering approach to the solution of problems. D10 Demonstrate time and resource management. D11 Demonstrate teamwork and leadership.

C Teaching and Learning Strategy

A Knowledge and understanding

A1 is introduced in specific Level S and 1 classes and subsequently developed in classes at all levels. Lectures, tutorials and especially laboratory practicals (applications) at all levels cover A2 to A6. Project/Assignment work will develop these areas. Much of the understanding of A7 to A10 will be gained in specific modules, mainly at Levels 4 and 5. Statutory requirements, including safety, feature throughout the course, in practical work in particular.

Scientific principles underpinning electrical principle, thermo/fluid principle and building services technologies (SM1i) are taught at all levels. Teaching methods include lectures, tutorials, laboratory experiments, computing and online sources for self-study.

Understanding of mathematics (SM2i) is taught first at *Foundation Engineering Mathematics* module at level S and more in *Engineering Mathematics* module at level 4. This understanding and its application are developed in several level 4 and level 5 modules.

Students are taught professional and ethical conduct (EL1i) in *Construction Practice B* module at level 4. In addition, the commercial, economic and social context of engineering (EL2i) is introduced in *Introduction to Building Services* module at level 4.

Engineering activities relevant to sustainable development (EL4i) are taught in *Construction Practice B* module at level 4 and further taught and developed at level 5 in *Refrigeration, Air-Conditioning and Heat Pump Engineering* module.

Legal requirements of engineering activities (EL5i) and awareness of environmental risk (EL6i) are covered in *Construction Practice B* and *Introduction to Building Services* modules at level 4 and further developed in *Refrigeration, Air-Conditioning and Heat Pump Engineering* module at level 5. Case studies and examples from practice are combined with the presentation of theoretical principles. Teaching is through lectures, tutorials and laboratory experiments.

Throughout the course students have module guides relevant to each topic of study, giving additional reading material which students are encouraged to use for private study to consolidate the formal learning process, and both broaden and deepen their knowledge and understanding in the subject area. All students are encouraged to become student members of the professional institutions, use their libraries and resources, and attend meetings.

B Intellectual skills

Most of the curriculum supports B1 through B4: classroom time includes tutorial sessions, where students attempt problems. In private study, students develop skills by writing assignment and laboratory reports, and tackling problems set by the tutor or in past examinations. These are further tested in the solution of ‘real’ problems in Design Applications modules. B5 is of increasing importance as students progress from Level S up to 6. B6 is developed in Levels 4, 5 and 6 from underlying Level S/1 study. The principles of B7 are covered in the Engineering Systems and Design Applications modules in Level 4, 5 and 6. B8 is developed through all subjects.

Students are taught to interpret and apply the results of analysis and modelling (EA1i) in *Electrical Services in Buildings* module as well as in *Refrigeration, Air-Conditioning and Heat Pump Engineering and Design Applications* modules at level 5. Classroom time includes tutorial sessions, where students attempt problems. In private study, students develop their skills by writing assignments, laboratory reports and tackling problems set by the tutor or in past examinations. These are further tested in the solution of ‘real’ problems in *Design Applications* module.

The ability to apply quantitative methods to understand the performance of systems and components (EA2i) is taught in *Heating and Ventilation Systems* module at level 4 and is developed later in several modules at level 5 including *Thermo/fluids Engineering* and *Electrical Services in Buildings*.

Students are taught how to solve engineering problems and recommend appropriate actions (EA3i) in *Electrical Services in Buildings* and *Design Applications* modules of level 5.

At level 5 in *Design Applications*, *Heating and Ventilation Systems* and *Refrigeration, Air-Conditioning and Heat Pump Engineering* modules, students are taught to apply an integrated or systems approach to engineering problems (EA4i).

Students are taught the awareness to understand customer needs (D1i) in *Design Applications* module and this skill is develop through the group design projects in the same module.

The skill of defining the problem and its various constraints (D2i) is taught in *Construction Practice B* and *Introduction to Building Services* module at level 4 and is developed later in *Refrigeration, Air-Conditioning and Heat Pump Engineering* module at level 5.

The students learn how to deal with uncertainty and incomplete information (D3i) in *Internal Environment and Comfort* module at level 4. This is further developed in *Design Applications* module at levels 5.

The ability to apply problem-solving skills (D4i) is taught to students in *Heating and Ventilation Systems* module at level 4 and later it is developed in *Refrigeration, Air-Conditioning and Heat Pump Engineering* and *Design Applications* modules at level 5.

In design projects at each level, students learn how to manage the design process (D5i) and also to communicate their work (D6i). The communication skills are taught in *Construction Practice B* (writing, AutoCAD) and at level 5 in *Design Applications* module.

C Practical Skills

Lectures and tutorials at all levels cover C1 with the later applications and analysis modules developing these skills in relevant fields. Basic IT skills of C2 for engineering and science are developed in Design Applications modules at Level S and 4, as are experimental methods. Students also learn the principles and study the application of specialist engineering packages in most taught modules. C3 is acquired in practical workshop, laboratory and applications sessions. Projects, especially the final design projects, will be open-ended, developing C4 to C6. The wider aspects of C6 will be covered using assignments/tutorials within the Management lectures.

Students appreciate the context of engineering (P1i) in *Introduction to Building Services* module at level 4 in lectures and group projects.

The ability to use relevant materials and equipment (P2i) is taught in *Internal Environment & Comfort* module at level 4 and the understanding of laboratory practice (P3i) are largely taught and developed at level 5, in *Electrical Services in Buildings* and *Refrigeration, Air-Conditioning and Heat Pump Engineering* modules.

Lectures and tutorials in *Internal Environment and Comfort* and *Heating and Ventilation Systems* modules of level 4 equip students with the ability to apply information from technical literature (P4i). This skill further developed at level 5 in *Refrigeration, Air-Conditioning and Heat Pump Engineering* module.

In their study, students are taught to use appropriate codes of practice (P6i) at level 4 module of *Heating and Ventilation Systems* as well as the level 5 modules of *Electrical Services in Buildings* and *Design Applications*.

Awareness of team roles (P11i) are taught at level 4 in lectures, tutorial and group projects of *Construction Practice*, *Introduction to Building Services* and *Heating and Ventilation System*s modules.

D Practical Skills

D1 and D2 are covered in assignment, tutorial, project and laboratory practical work: students for example obtain data from handbooks and computer databases and use it in calculations, graphical solutions and computer applications. The principles of D3 and D4 are covered in lectures with development in all areas of coursework. D5, D6, D7 and D9 are developed with all applications modules. D8 is encouraged throughout the course through exposure to continuing professional development such as the CIBSE ASHRAE group. D10 to D11: time/resource management, teamwork and leadership are developed in laboratory and project-orientated modules throughout the course.

In most level 4 modules, students acquire their related skills (G1i) of problem-solving in *Heating and Ventilation Systems and effective use of IT facilities in Design Applications.* These are covered in assignments, tutorials, projects and laboratory practical work: students for example obtain data from handbooks and computer databases and use it in calculations, graphical solutions and computer applications.

Self-learning and personal development (G2i) are taught in Construction *Practice B* and lifelong learning is encouraged throughout the course through exposure to continuing professional development such as the CIBSE ASHRAE group.
Students learn how to carry out a personal programme of work (G3i) in *Construction Practice B* module at level 4 and later in *Design Applications* module at level 5.

Exercising personal responsibility (G4i) is part of *Construction Practice B, Introduction to Building Services* and *Heating and Ventilation Systems* modules at level 4.

D Assessments

A Knowledge and understanding

Most of the assessment for A1, A2 and A4 will be through written examinations, and classroom tests. Students will demonstrate their grasp of A3 in project/assignment reports. A5 and A6 will be principally evidenced in assignment work as will A7 to A10 that will also be assessed through particular Management and Design Applications presentations and examinations.

The understanding of the knowledge base of scientific principles (SM1i) is assessed through *unseen written examinations* and *in-class tests* at levels 4 and 5, in the disciplines of electrical principles, thermos/fluid principle and building services technologies. *Coursework* is also used, comprising: *laboratory, computing and design reports.*

Understanding of mathematics (SM2i) is assessed at levels S and 4 through *phase tests* and *unseen written examinations.*

Professional and ethical conduct (EL1i) is assessed in *Construction Practice B* at level 4. In addition, the commercial, economic and social context of engineering (EL2i) is assessed in *Introduction to Building Services* module at level 4.

Legal requirements of engineering activities (EL5i) and awareness of environmental risk (EL6i) are assessed in *Construction Practice B* and *Introduction to Building Services* modules at level 4 and further in *Refrigeration, Air-Conditioning and Heat Pump Engineering* module at level 5, through both *coursework* and *unseen written examinations.*

B Intellectual skills

Written examinations are the main means of assessment for B1 through B4, although these are also tested in laboratory and application assignments, which also contribute particularly to B5. For B2 and B3, project assignments set students increasingly open-ended problems to which they are expected to apply basic concepts. Project work provides an open-ended method for the assessment of B5 to B8 with Level 5 and 6 projects allowing the student to evidence further knowledge and understanding within B8.

The interpretation and application of results (EA1i) is assessed in laboratory reports and application assignments in *Electrical Services in Buildings* module as well as in *Refrigeration, Air-Conditioning and Heat Pump Engineering and Design Applications* modules.

The ability to apply quantitative methods to understand the performance of systems and components (EA2i) is assessed through tests and reports in *Heating and Ventilation Systems* module at level 4 and later in several modules at level 5 including *Thermo/fluids Engineering* and *Electrical Services in Buildings*.

The ability to solve engineering problems and recommending appropriate actions (EA3i) is assessed in *Electrical Services in Buildings* and *Design Applications* modules in the form of coursework and unseen written examinations. Group Design Project in *Design Applications* module assesses a variety of skills and knowledge combined to solve a complex engineering problem in an integrated and systematic approach (EA4i).

Identifying customer needs (D1i) is assessed in project work of *Design Applications* module through group design project. The skill of defining the problem (D2i) is assessed in most modules, starting from level 4.

In general dealing with uncertainty (D3i) is assessed through coursework and tests at levels 4 and 5. Problem-solving skills (D4i) and their application to multi-disciplinary problems are assessed through group design project. The management of the design process (D5i) is assessed in coursework in level 4 and 5 modules.

The communication skills (D6i) are assessed in *Construction Practice B* (academic report writing, AutoCAD tests), at level 5 in *Design Applications* module.

C Practical Skills

All aspects are assessed through assignment and design project work. The projects will evidence the appropriate level of attainment in these areas and will be assessed for a critical approach to problem-solving and project management.

Introduction to Building Services module assesses the knowledge of students in the context of engineering (P1i) through coursework and group projects.

The ability to use relevant materials and equipment (P2i) and the laboratory practice (P3i) are assessed at levels 4 and 5, in technical laboratory reports. The use of technical literature related to a specific discipline (P4i) is assessed in coursework and design exercises in *Internal Environment and Comfort* and *Heating and Ventilation Systems* and *Refrigeration, Air-Conditioning and Heat Pump Engineering* modules.

The ability to use appropriate codes of practice (P6i) and awareness of team roles (P11i) are assessed in design projects of *Design Applications* and *Heating and Ventilation Systems* modules.

All aspects are assessed through assignment and design project work. The projects will evidence the appropriate level of attainment in these areas and will be assessed for a critical approach to problem-solving and project management.

D Practical Skills

D1 to D3 are assessed in many written examination papers. The application modules will also provide the focus for the assessment of these as well as the majority of other areas (D3, D4, D5, D6, D7, D9, D10 and D11). All projects will be marked for a critical approach to problem solving and time/resource management. D10 and D11: time/resource management, teamwork and leadership are assessed directly through application modules which are carried out on a both individual and team basis.

Problem solving and effective use of IT facilities (G1i) are assessed *in Heating and Ventilation Systems and Design Applications* through *project report, tests* and *exams.*

Self-learning and personal development (G2i) is assessed in *Construction Practice B* through *coursework* and lifelong learning is encourages through exposure to the professional accreditation bodies.

The ability to carry out a personal programme of work (G3i) is a part of coursework of *Construction Practice B* assessment. In addition, Exercising personal responsibility (G4i) is assessed in *Construction Practice B*, *Introduction to Building Services* and *Heating and Ventilation Systems* modules at level 4.

E Academic Regulations

The University's Academic Regulations apply for this course. Any course specific protocols will be identified here.

http://www.lsbu.ac.uk/ data/assets/pdf file/0008/84347/academic-regulations.pdf

F Entry Requirements

Applicants for admission to the course should normally possess one of the following qualifications:

GCSE passes in six subjects (grade C or above), including English Language and Physics. The University will accept a pass in the Key Skills qualification at Level 2 in place of GCSE English Language. Additionally, applicants must possess one of the following:

- A Level EEE or;
- BTEC National Diploma MPP or;
- Access to Engineering qualifications with 45 Passes or;
- Equivalent level 3 qualifications worth 64 UCAS points
- Level 3 qualifications must include Maths and Physics
- Applicants must hold 5 GCSEs A-C including Maths and English or equivalent (reformed GCSEs grade 4 or above).

For advanced entry:
• BTEC HNC/D - six Merit passes at Level H. Must include passes in Mathematics and should preferably include Introduction to Building Services, Electrical Principles, Thermofluids Principles; or
• A qualification deemed to be the equivalent of the above.

For Mature Candidates:
Mature candidates without the normal academic qualifications will be considered if they have a Level 3 vocational qualification (NVQ or C and G) in a relevant discipline and have significant relevant industrial experience. Initially, they may be considered for entry to our Extended Degree course – this will provide one year of preparatory study before the HND.

AP(E)L {Accreditation of Prior (Experiential) Learning}

- Applicants may use their experience (in work and life) to demonstrate:
  - They have the necessary skills and knowledge for entry to the course;
  - They have met the of the learning outcomes of one or more of the course modules and can claim credits without participating in those modules;
  - Examples of APEL being a portfolio of prior written work;
  - References

G Course Structure

Course Overview

The Course is delivered on a semester pattern; each semester is 15 weeks in duration.
Students study one module at level S, seven modules at level 4 and four modules at level 5.

Full Time:

Year 1		**Year 2**	
Foundation Engineering Mathematics	(LS)	Internal Environment & Comfort	(L4)
Introduction To Building Services	(L4)	Heating & Ventilation Systems	(L4)
Electrical Principles	(L4)	Design Applications	(L5)
Thermofluids Principles	(L4)	Electrical Services in Buildings	(L5)
Construction Practice B	(L4)	Refrigeration, Air-Conditioning and Heat Pump Engineering	(L5)
Engineering Mathematics	(L4)	Thermofluids Engineering	(L5)

Part Time:

Year 1		**Year 2**	
Foundation Engineering Mathematics	(LS)	Construction Practice B	(L4)
Introduction To Building Services	(L4)	Engineering Mathematics	(L4)
Electrical Principles	(L4)	Internal Environment & Comfort	(L4)
Thermofluids Principles	(L4)	Heating & Ventilation Systems	(L4)
Year 3			
Design Applications	(L5)		
Electrical Services in Buildings	(L5)		
Refrigeration, Air-Conditioning and Heat Pump Engineering	(L5)		
Thermofluids Engineering	(L5)		

Full Time						
Year	**Semester 1**	**Credits**	**Level**	**Semester 2**	**Credits**	**Level**
1	Foundation Engineering Mathematics	20	S	Electrical Principles	20	4
	Introduction to Building Services	20	4	Thermofluids Principles	20	4
	Construction Practice B			Construction Practice B	20	4
	Engineering Mathematics			Engineering Mathematics	20	4
2	Internal Environment & Comfort	20	4	Heating & Ventilation Systems	20	4

	Design Applications	20	5	Refrigeration, Air-Conditioning and Heat Pump Engineering	20	5
	Electrical Services in Buildings	20	5	Thermofluids Engineering	20	5

Part Time

Year	Semester 1	Credits	Level	Semester 2	Credits	Level
1	Foundation Engineering Mathematics	20	S	Electrical Principles	20	4
	Introduction to Building Services	20	4	Thermofluids Principles	20	4
2	Construction Practice B			Construction Practice B	20	4
	Engineering Mathematics			Engineering Mathematics	20	4
	Internal Environment & Comfort	20	4	Heating & Ventilation Systems	20	4
3	Design Applications	20	5	Refrigeration, Air-Conditioning and Heat Pump Engineering	20	5
	Electrical Services in Buildings	20	5	Thermofluids Engineering	20	5

H Course Modules

M. Code	Module Title	Level	Semester	Credit value	Assessment Ex/Cw
BEA_S_459	Foundation Engineering Mathematics	S	1	20	100/0
BEA_4_455	Introduction to Building Services	4	1	20	0/100
BEA_4_452	Electrical Principles	4	2	20	100/0
BEA_4_453	Thermofluids Principles	4	2	20	100/0
BEA_4_511	Construction Practice B	4	1 – 2	20	0/100
BEA_4_450	Engineering Mathematics	4	1 – 2	20	50/50
BEA_4_456	Internal Environment & Comfort	4	1	20	70/30
BEA_4_457	Heating & Ventilation Systems	4	2	20	50/50
BEA_5_463	Design Applications	5	1	20	100/0
BEA_5_466	Electrical Services in Buildings	5	1	20	70/30
BEA_5_462	Refrigeration, Air-Conditioning and Heat Pump Engineering	5	2	20	70/30
BEA_5_461	Thermofluids Engineering	5	2	20	100/0

J Costs and financial Support

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: Learning outcomes – AHEP3 Curriculum Mapping
Appendix C: Educational Framework
Appendix D: Terminology

Appendix A: Curriculum Map

This map provides a design aid to help course teams identify where course outcomes are being taught (T), developed (D), assessed (A) 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.

Units			Programme outcomes LSBU									
Level	**Title**	**Code**	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**
S,4	Foundation Engineering Mathematics	BEA_S_459	TA									
	Engineering Mathematics	BEA_4_450	TDA									
	Electrical Principle	BEA_4_452	TA	TA								
	Thermofluids Principle	BEA_4_453	TA	TA								
	Construction Practice B	BEA_4_511					TDA	TDA		TD	TDA	TDA
	Introduction to Building Services	BEA_4_455		T		TA	T	T				TA
	Internal Environment and Comfort	BEA_4_456		TDA	DA				TD	TD		
	Heating and Ventilation Systems	BEA_4_457		DA	DA	DA	TDA					
5	Thermofluids Engineering	BEA_5_461		TDA								
	Refrigeration, Air Conditioning and Heat Pumps Engineering	BEA_5_462		DA					TDA	TD		DA
	Design Applications	BEA_5_463			DA	DA		TDA				
	Electrical Services in Buildings	BEA_5_466		DA		TDA	TDA					

T: taught, D: developed and A: assessed

Units			Programme outcomes LSBU							
Level	**Title**	**Code**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**
S,4	Foundation Engineering Mathematics	BEA_S_459	TA							
	Engineering Mathematics	BEA_4_450	TDA	TD						
	Electrical Principle	BEA_4_452	TA	TA	T					
	Thermofluids Principle	BEA_4_453	TA	TA	T					
	Construction Practice B	BEA_4_511				TD	TA		TD	TA
	Introduction to Building Services	BEA_4_455		T						
	Internal Environment and Comfort	BEA_4_456		TDA	TDA					
	Heating and Ventilation Systems	BEA_4_457	TD		TDA	TD	TD			
5	Thermofluids Engineering	BEA_5_461		D	TD		TDA			
	Refrigeration, Air Conditioning and Heat Pumps Engineering	BEA_5_462	TDA		TDA	DA				
	Design Applications	BEA_5_463		DA	TDA		TDA	DA		
	Electrical Services in Buildings	BEA_5_466			TDA	TDA	TDA			

T: taught, D: developed and A: assessed

Units			Programme Outcomes LSBU					
Level	**Title**	**Code**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
S,4	Foundation Engineering Mathematics	BEA_S_459	TA					
	Engineering Mathematics	BEA_4_450						
	Electrical Principle	BEA_4_452	TA					
	Thermofluids Principle	BEA_4_453	TA					
	Construction Practice B	BEA_4_511			TDA	D	TDA	
	Introduction to Building Services	BEA_4_455				TA		
	Internal Environment and Comfort	BEA_4_456			DA			
	Heating and Ventilation Systems	BEA_4_457			D			
5	Thermofluids Engineering	BEA_5_461						
	Refrigeration, Air Conditioning and Heat Pumps Engineering	BEA_5_462	TDA	TDA				TDA
	Design Applications	BEA_5_463		TA		DA	DA	DA
	Electrical Services in Buildings	BEA_5_466	TDA	TDA				

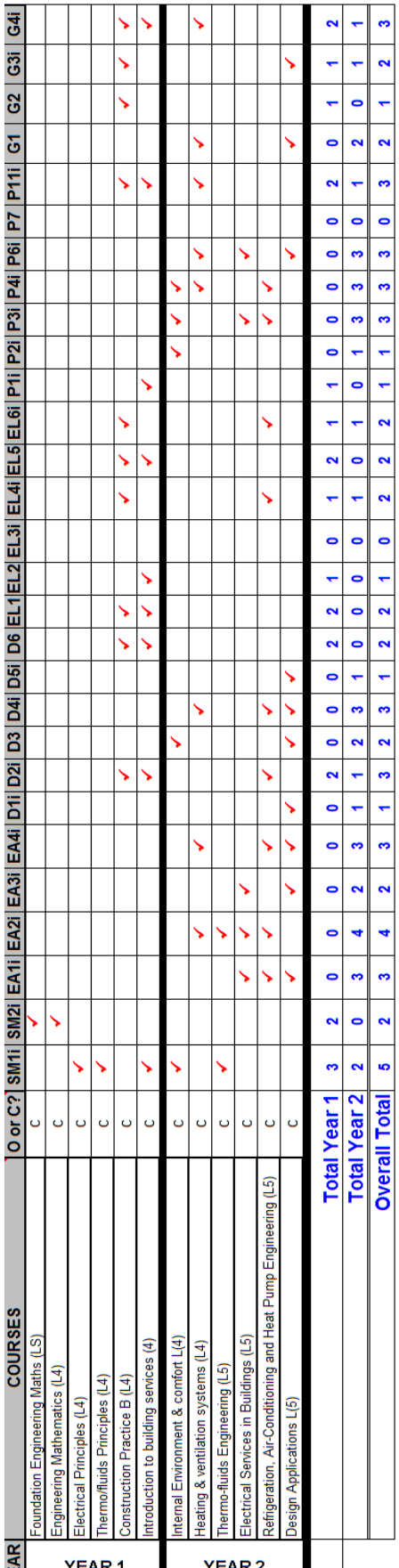
T: taught, D: developed and A: assessed

Units			Programme Outcomes LSBU									
Level	**Title**	**Code**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
S,4	Foundation Engineering Mathematics	BEA_S_459		DA						TDA		
	Engineering Mathematics	BEA_4_450	TDA	TDA						TD		
	Electrical Principle	BEA_4_452		TA						TDA		
	Thermofluids Principle	BEA_4_453		TA						TDA		
	Construction Practice B	BEA_4_511	TDA			TDA					DA	TDA
	Introduction to Building Services	BEA_4_455		TA						DA		
	Internal Environment and Comfort	BEA_4_456	DA						DA		D	
	Heating and Ventilation Systems	BEA_4_457	TDA	TDA	TD					TD	TDA	TDA
5	Thermofluids Engineering	BEA_5_461										
	Refrigeration, Air Conditioning and Heat Pumps Engineering	BEA_5_462	DA		TDA			TDA			D	
	Design Applications	BEA_5_463				DA	TDA	DA	DA			DA
	Electrical Services in Buildings	BEA_5_466			TDA			TDA				

T: taught, D: developed and A: assessed

Appendix B: Learning Outcomes – AHEP3 Curriculum Mapping

Engineering Council AHEP3 Curriculum Map- HND Building Services FT



YEAR	COURSES	O or C?	SM1i	SM2i	EA1i	EA2i	EA3i	EA4i	D1i	D2i	D3	D4i	D5i	D6	EL1	EL2	EL3i	EL4i	EL5	EL6i	P1i	P2i	P3i	P4i	P6i	P7	P11i	G1	G2	G3i	G4i
YEAR 1	Foundation Engineering Maths (LS)	C		✓																											
	Engineering Mathematics (L4)	C		✓																											
	Electrical Principles (L4)	C	✓																												
	Thermo/fluids Principles (L4)	C	✓																												
	Construction Practice B (L4)	C								✓				✓	✓			✓	✓	✓							✓		✓	✓	
	Introduction to building services (4)	C	✓							✓				✓	✓	✓			✓		✓						✓				✓
YEAR 2	Internal Environment & comfort L(4)	C	✓								✓											✓	✓	✓							
	Heating & ventilation systems (L4)	C				✓		✓				✓												✓	✓		✓	✓			✓
	Thermo-fluids Engineering (L5)	C	✓			✓																									
	Electrical Services in Buildings (L5)	C			✓	✓	✓																✓		✓						
	Refrigeration, Air-Conditioning and Heat Pump Engineering (L5)	C			✓	✓		✓		✓		✓						✓		✓			✓								
	Design Applications L(5)	C			✓		✓	✓	✓		✓	✓	✓												✓			✓			
	Total Year 1		**3**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**2**	**1**	**0**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**1**	**2**
	Total Year 2		**2**	**0**	**3**	**4**	**2**	**3**	**1**	**1**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**3**	**3**	**3**	**0**	**3**	**2**	**0**	**1**	**1**
	Overall Total		**5**	**2**	**3**	**4**	**2**	**3**	**1**	**3**	**2**	**3**	**1**	**2**	**2**	**1**	**0**	**2**	**2**	**2**	**1**	**1**	**3**	**3**	**3**	**0**	**3**	**2**	**1**	**2**	**3**

Engineering Council AHEP3 Curriculum Map- HND Building Services PT

YEAR	COURSES	O or C?	SM1i	SM2i	EA1i	EA2i	EA3i	EA4i	D1i	D2i	D3	D4i	D5i	D6	EL1	EL2	EL3i	EL4i	EL5	EL6i	P1i	P2i	P3i	P4i	P6i	P7	P11i	G1	G2	G3i	G4i
YEAR 1	Foundation Engineering Maths (LS)	c		✓																											
	Electrical Principles (L4)	c	✓																												
	Thermo/fluids Principles (L4)	c	✓																												
	Introduction to building services (4)	c	✓							✓				✓	✓	✓			✓		✓						✓				✓
YEAR 2	Engineering Mathematics (L4)	c		✓																											
	Construction Practice B (L4)	c								✓				✓	✓			✓	✓	✓							✓		✓	✓	✓
	Internal Environment & comfort L(4)	c	✓								✓											✓	✓	✓							
	Heating & ventilation systems (L4)	c				✓		✓				✓												✓	✓		✓	✓			✓
YEAR 3	Thermo-fluids Engineering (L5)	c	✓			✓																									
	Electrical Services in Buildings (L5)	c			✓	✓	✓																✓		✓						
	Refrigeration, Air-Conditioning and Heat Pump Engineering (L5)	c			✓	✓		✓		✓		✓						✓		✓			✓	✓							
	Design Applications L(5)	c			✓		✓	✓	✓		✓	✓	✓												✓			✓		✓	
	Total Year 1		3	1	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1
	Total Year 2		1	1	0	1	0	1	0	1	1	1	0	1	1	0	0	1	1	1	0	1	1	2	1	0	2	1	1	1	2
	Total Year 3		1	0	3	3	2	2	1	1	1	2	1	0	0	0	0	1	0	1	0	0	2	1	2	0	0	1	0	1	0
	Overall Total		5	2	3	4	2	3	1	3	2	3	1	2	2	1	0	2	2	2	1	1	3	3	3	0	3	2	1	2	3

Appendix C: Educational Framework

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. Students should have access to employers and/or alumni in at least one module at level 4.	The curriculum design is informed by the JBM and the Industrial Advisory Panel at LSBU. Teaching staff on the course are LSBU staff.
Embedded learning development	Support for transition and academic preparedness 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.	These expectations are achieved in the Construction Practice B module in which academic writing is introduced and in the Introduction to Building Services module, which can be seen as an introduction to analytical thinking.
High impact pedagogies	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**. 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.	There is a Group Project in Construction Practice B. Due to the nature of the scheme, group-based learning is also encouraged in topics such as Engineering Mathematics. All modules at all level concerning labs and projects are positively impacting on the experience

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.	Students work in diverse groups in labs and project and field trips. Inclusion is guaranteed with the mix of different cohorts during the lectures
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 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**.	Short in class formative tests are used to check the progress of the students.
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.	At all levels there are opportunities for the learners to get ready to undertake their individual research project at the end of the degree.
Curricula informed by employer and industry need /	<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	The group project introduces the students to working on a live brief.

Assessment *for* learning	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.	
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.	This diversity is guaranteed with a successful mix of full-time, part-time and apprenticeship students where the lecturers encourage the learners to share their knowledge.
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 relevant to the course. Work-based learning can be linked to assessment if appropriate.	As noted above students on the course are part-time and working in the construction industry where they will have many opportunities to network and undertake work based learning.
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	Student writing skills are taught and assessed at all levels. These skills are needed to produce the lab reports, field trip reports and group project report that form part of the modules assessments.

	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.	
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 including **inclusivity**, communication and networking.	Apprentices are introduced to these expectations at all levels and mainly in the Group Projects.
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. A 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.	There are a range of assessments on the course including as follows: Examinations and in class tests. Laboratory Reports. Presentations. Field Trip Quiz. Field Trip Report. Group Project and Group Surveying Project.
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 process. This should be designed to inform the development of **excellence** and **professionalism**.	As noted above the course is informed by the JBM and the Industrial Advisory Panel at LSBU.

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**.	As per Individual Research Project A

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