University of the West of England
BRISTOL

ACADEMIC SERVICES

PROGRAMME SPECIFICATION

Part 1: Basic Data			
Awarding Institution	UWE.		
Teaching Institution	UWE SHAPE Hong Kong / VTC		
Delivery Location	UWE – Frenchay Campus – Full Programme SHAPE Hong Kong / TMC – Final year Top-Up		
Study abroad / Exchange / Credit recognition	None		
Faculty responsible for programme	Faculty of Environment and Technology		
Department responsible for programme	Architecture and the Built Environment		
Modular Scheme Title	Undergraduate Modular Scheme		
Professional Statutory or Regulatory Body Links	Chartered Institution of Building Services Engineers (CIBSE)		
Highest Award Title	BEng (Hons) Building Services Engineering		
Default Award Title	BEng Building Services Engineering		
Fall-back Award Title			
Interim Award Titles	DipHE Building Services Engineering CertHE Building Services Engineering		
UWE Progression Route			
Mode(s) of Delivery	FT / PT / BL		
Codes	**UCAS:**	**JACS:**	
	ISIS2:K29D K29D (FT/PT); K29E (Shape)	**HESA:**	
Relevant QAA Subject Benchmark Statements	Building and Surveying, Engineering		
First CAP Approval Date	14th January 2014	Valid from	September 2014
Revision CAP Approval Date	March 2015 v1.2; April 2015 v1.3 Feb 2016 V2; *June 2016 v2.1*	Valid from	September 2016 v2.1
Version	*2.1*		
Review Date	January 2020		

Part 2: Educational Aims of the Programme

Engineers who pursue a professional career in building services can expect to become involved in a broad range of activities demanding not only a progressive approach to technical innovation, but also a clear understanding of the operational and commercial aspects of the construction industry and the contextual responsibilities to society and the environment.

The aim of the programme is to provide an outstanding educational experience that will prepare graduates for related careers in the field of building services engineering, giving them the requisite knowledge, skills, creativity and enthusiasm to make a meaningful contribution to their profession.

Graduates can expect to have a choice of established career alternatives (mechanical building services engineer, electrical building services engineer, construction manager, facility manager), as well as a range of emerging and specialist career opportunities. (sustainability engineer, renewable energy design consultant, engineer specialising in lighting, acoustics, fire, security or public health.) This programme has been devised to incorporate elements from across the field, providing students with an excellent foundation on which to found continuing professional development (CPD) and career progression within an employment market that values multi-skilled personnel capable of working in, and managing, diverse engineering environments.

The educational aims of the programme are as follows:

1. Develop the requisite science based knowledge and analytical skills for the formulation of appropriate, effective and sustainable solutions to engineering problems.
2. Equip graduate engineers with the management skills and personal attributes needed to provide leadership in the work environment, to meet the challenges, and recognise opportunities presented in a Building Information Modelling context.
3. Give students the self-confidence and judgment needed to take leading roles in decision making.
4. Provide opportunities to enable engineering students to advance their creative instinct, and apply multi-dimensional thinking in design and problem solving.
5. Engender in students a sense of enquiry in all aspects of the subject, and provide tools to enable personal research to be undertaken in pursuit of answers to questions, and as a foundation to life-long learning.
6. Develop such practical competences as are necessary to participate in activity undertaken in the laboratory, the engineering workshop, and the workplace generally.
7. Enable students to demonstrate competent application of computer based skills, such as engineering simulations and encourage multi-perspective exploration and experimentation with related new technologies.
8. Provide an understanding of the role played by the building services engineering professions within the context of economic, social and environmental concerns.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

This programme is a modular Bachelor of Engineering with Honours as recognised by the Engineering Council for accredited engineering programmes. Programme learning outcomes are broadly aligned with UK-SPEC and expressed in terms of knowledge and skills encompassing engineering analysis and design, social and economic context, and engineering practice.

Part 3: Learning Outcomes of the Programme

The award route provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:

A Knowledge and Understanding

On successful completion of the programme, students will demonstrate knowledge and understanding of:

1. The underlying principles of mathematics, physics and engineering sciences appropriate to the analysis and solution of problems of a specialised nature.
2. Characteristics of materials, plant and systems relevant to the field.
3. The concepts and principles of sustainable development and environmental performance of buildings.
4. The needs and behaviour of occupants, clients, and facilities managers in creating and maintaining usable sustainable environments.
5. The procedures, parties and relationships involved in design, procurement and management in the built environment with regard to finance, law, quality control, and business practice.
6. The social and ethical responsibilities of engineers working in the construction industry, and in the wider society.
7. The framework of statutory regulation and codes of practice governing buildings and their engineering systems.
8. The role of IT in supporting engineers and other construction professionals.

Teaching/learning methods and strategies: The acquisition of knowledge and understanding is largely through formal lectures, with supporting tutorials and associated formative assignments. Individual and co-operative project work, an element in several modules, encourages the development of specialist knowledge, within closely defined parameters, relevant to a range of industrial specialisms. Modules consolidate students' knowledge and prepare students for assessment via formative work and feedback. A significant proportion of assignment work in several of the technical modules is laboratory-based.

Assessment: Testing of knowledge and understanding is through appropriate forms of assessed coursework and examinations. Assessed coursework includes essays, development projects, technical reports, design portfolios with software outputs, and presentations. Examinations are normally written, both seen and unseen. Some modules include controlled assessment by oral presentation and viva. Computer based tests are used to examine engineering principles in certain modules at level 1.

B Intellectual Skills

In successful completion of the programme, students will be able to:

1. Apply reflective, critical, analytical and imaginative reasoning in the solution of non-routine technical problems.
2. Appraise engineering plant and systems in terms of performance criteria, commercial value, life-cycle, O&M consideration, and end-user acceptability.
3. Select and apply a range of analytical methods to define parameters and model physical phenomena.
4. Evaluate commercial potential and limitations in a range of engineering activities to determine optimum solutions.
5. Formulate persuasive arguments in support of concepts, results, ideas and beliefs
6. Communicate, and respond to, critical judgment of the student's and others ideas and perspectives.

Teaching/learning methods and strategies: Lectures and tutorials provide the basic framework within which the intellectual skills are defined, with directed learning by formative assignments providing opportunities for their application. In the early modules, intellectual skills are founded on study of engineering principles. Tutorials provide the opportunity to reinforce routine problem solving abilities. At the higher levels, case studies and exemplar projects are used to examine engineering applications, with carefully chosen project assignments and practical investigations to encourage the creative, structured and analytical approach to novel, non-routine problems. In some higher level

Part 3: Learning Outcomes of the Programme

modules, site visits are used to give students experience of real engineering systems and problems, and interactions with external personnel who hold responsibility for delivering practical objectives. Research-focused activities in the final year project module also requires students to develop higher level intellectual skills.

Assessment: By a combination of formal examinations, mostly unseen, technical and laboratory reports, presentations with viva, poster papers, design portfolios, Computer based tests are used to examine mathematical skills at level 1.

C Subject, Professional and Practical Skills

On successful completion of the programme, students will be able to:

1. Select and use scientific and technical equipment to undertake practical experimental investigations into building envelope and system characteristics.
2. Select and use specialist applications software and analytical tools in the solution of problems and the production of designs.
3. Perform all stages of the preparation of design proposals, including feasibility analysis, sketch and detailed design studies, financial evaluation, installation management, commissioning, and design realisation feedback appraisal.
4. Plan, appraise and schedule work to be undertaken in the design, development and construction of buildings and services.
5. Maintain a professional approach in matters relating to self-appraisal, personal development, relationships with clients and colleagues, and be able to work effectively at all levels in a team to achieve collective goals.
6. Demonstrate accepted standards of conduct and ethics with regard to the environmental, health and safety responsibilities of a professional engineer working in industry.

Teaching/learning methods and strategies: Laboratory work will involve the planning and execution of investigative projects. Site visits will require the application of fundamentals to practical engineering issues, and necessitate the formulation of reflectively considered and commercially feasible proposals. The demonstration of specialist skills will form a significant part of the set tasks. Other project work, spread across the programme and culminating in the final year Design Projects module, will develop and provide feedback guidance on the performance of many of the subject specific aspects.

Assessment: Testing of subject, professional and practical skills is through appropriate forms of assessed coursework and written examinations. Assessed coursework includes development projects, reports, portfolios, presentations and the production of documentation to professional standards.

D Transferable Skills and other attributes

On successful completion of the programme, students will be able to:

1. Identify, access, research, manipulate and interpret data and information.
2. Communicate information and ideas orally and using written documents, demonstrating competence with graphical techniques, and electronic media.
3. Plan and execute appropriate research methods to illuminate answers and resolve questions.
4. Engage effectively in inter-personal activity, demonstrate leadership and team-working qualities, chair meetings, record, review, summarise and evaluate arguments, recognise conflict and negotiate to reach optimal outcomes.
5. Be adaptable to work productively, independently and in unfamiliar environments, and gain maximum benefit from available resources.

Teaching/learning methods and strategies: Key transferable skills are introduced in a programme of skills development in level 1 modules including time management, report and essay writing, presentation skills. Projects and coursework of a formative nature, with feedback from academic staff and peer group, are the principal means by which these transferable skills are developed. Typical activities can be identified in each stage of the programme.

Assessment: Assessment is predominantly by written technical, management and design reports, presentation of case-studies and assessment of group-working activities, both in design studios and laboratories.

Part 3: Learning Outcomes of the Programme Structure (Mapping of Module to Programme Learning Outcomes)

Intended Learning Outcomes (abbreviated) / Module No:	UBLMSB-30-1	UBPLWH-30-1	UBLMPC-30-1	UFMFYG-15-1	UBLLWQ-15-1	UBLMTB-30-2	UFMFF7-15-2	UBLMH8-15-2	UBLLYF-15-2	UBLMRT-30-2		UBLMGP-15-3	UBLMPB-30-3	UBLLXE-30-3	UBLMHP-15-3
A) knowledge and understanding:															
1. principles of mathematics, physics and engineering sciences appropriate to the analysis and solution of problems	x	x		x	x		x								
2. the characteristics of materials, plant and systems relevant to the field.	x	x				x						x	x		
3. the concepts and principles of sustainable development and environmental performance of buildings.	x					x			x			x			
4. the needs and behaviour of stakeholders in creating and maintaining usable sustainable environments.			x							x					x
5. the procedures, parties and relationships involved in design, procurement and management etc.			x							x				x	
6. the social and ethical responsibilities of engineers working in the construction industry, and in the wider society.			x							x				x	
7. the framework of statutory regulation and codes of practice governing buildings and their engineering systems.			x					x	x	x		x			
8. the role of IT in supporting engineers and other construction professionals.									x					x	
B) Intellectual Skills															
1. apply reflective, critical, analytical and imaginative reasoning in the solution of non-routine technical problems.												x	x	x	
2. appraise engineering plant and systems in terms of performance criteria, commercial value etc.												x	x		
3. select and apply a range of analytical methods to define parameters and model physical phenomena.									x				x		
4. evaluate commercial potential and limitations in a range of engineering activities to determine optimum solutions.												x		x	
5. formulate persuasive arguments in support of concepts, results, ideas and beliefs												x		x	
6. communicate, and respond to, critical judgment of the student's and others ideas and perspectives.												x	x	x	x
C) Subject/Professional/Practical Skills:															
1. select and use scientific and technical equipment to undertake practical experimental investigations etc.	x					x							x		
2. select and use specialist applications software and analytical tools in design and problem solving.						x			x					x	
3. perform all stages of the preparation of design proposals etc.														x	
4. plan, appraise and schedule work to be undertaken in the design, development and construction of buildings etc.										x				x	
5. maintain a professional approach in matters relating to self-appraisal, personal development, relationships with clients and colleagues, and be able to work effectively at all levels in a team to achieve collective goals.												x		x	
6. demonstrate accepted standards of conduct and ethics with regard to the environmental, health and safety responsibilities of a professional engineer working in industry.			x							x				x	
D) Transferable skills and other attributes:															
1. identify, access, research, manipulate and interpret data and information.	x					x		x				x	x		
2. communicate information and ideas orally and using written documents, demonstrating competence with graphical techniques, and electronic media.												x	x	x	x
3. plan and execute appropriate research methods to illuminate answers and resolve questions.														x	
4. engage effectively in inter-personal activity, demonstrate leadership and team-working qualities, etc.												x			
5. be adaptable to work productively, independently and in unfamiliar environments etc.														x	

Part 4: Student Learning and Student Support

Teaching and learning strategies to enable learning outcomes to be achieved and demonstrated

At UWE, Bristol there is a policy for a minimum average requirement of 12 hours/week contact time over the course of the full undergraduate programme. This contact time encompasses a range of face:face activities as described below. In addition a range of other learning activities will be embedded within the programme which, together with the contact time, will enable learning outcomes to be achieved and demonstrated.

On the BEng(Hons) Building services Engineering programme teaching is a mix of classroom based activities, support activities on a virtual learning environment, practical activities in workshops and real world case studies using the University's extensive industry network.

Scheduled learning includes lectures, seminars, tutorials, project supervision, demonstration, practical classes and workshops; fieldwork; external visits; work based learning; supervised time in studio/workshop. Scheduled sessions may vary slightly depending on the module choices made.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc. Scheduled sessions may vary slightly depending on the module choices made.

Description of any Distinctive Features

1. Professional recognition
   Accreditation will be sought from CIBSE as part-fulfilment of the academic requirement of the Engineering Council towards recognition of a graduate's Chartered Engineer (CEng) status.
2. Inter-professional ethos
   A particular feature of the undergraduate programme at UWE is the interprofessional ethos that runs throughout the modular scheme. Many of the modules on this programme are shared with other UG programmes for Architecture & Environmental Engineering, Architectural Technology and Design, and Construction Management. This is seen as a major strength in curricular terms, as it enables project and group activity to have an inter-professional dimension. The shared modules enable students to pool their distinctive multi-disciplinary knowledge and skills to deliver interprofessional team-driven solutions to live projects, to consider sustainable development issues within the broader built environment. It will also encourage mutual respect for related professions; particularly important in shaping interactions between nascent Architects and Engineers, whose roles have traditionally been seen as distinctive, but with the current challenge of creating sustainable built environments have seen some very significant convergence of professional activity and technical interest.
3. Supported by staff with strong links to professional practice
   The award team include staff who are very active in the CIBSE, CIOB, RICS and the Engineering Council member institutions generally, at local and national level. Most undertake professional consultancy work and are active in both professional practice and pedagogic research. Many staff are active researchers in their field of expertise.
4. Integration of Engineering with Management
   The programme exploits Departmental strengths by integrating a rigorous core of engineering principles and applications with a complementary and parallel strand of management subjects, with emphasis on the management of projects and the deployment of innovative new technology. The importance of graduates being able to progress to higher levels within organisations, and understand the critical imperatives of the commercial environment in the construction industry is clear.

Part 5: Assessment

Approved to University Regulations and Procedures

Part 6: Programme Structure

This structure diagram demonstrates the student journey from Entry through to Graduation for a typical **full time student**,

ENTRY

	Compulsory Modules	Optional Modules	Interim Awards
Year 1	**UFMFYG-15-1** Mathematics for Civil and Environmental Engineering **UBLLWQ-15-1** Engineering Principles (Building Engineering) **UBPLWH-30-1** Investigating Structures **UBLMPC-30-1** Law, Economics and Management **UBLMSB-30-1** Building Physics and Services	None	**CertHE** Building Services Engineering 120 credits with at least 100 credits at level 1 or above
Year 2	**UBLMTB-30-2** Building Services Applications **UBLMH8-15-2** Energy Transformations **UFMFQ3-15-2** Application of Mathematics in Civil and Environmental Engineering **UBLMRT-30-2** Procurement and Contract Practice **UBLLYF-15-2** Sustainability and Energy Simulations	**UBLMNE-15-3** Collaborative Practice **UFMF89-15-3** Industrial Placement **UFMF8C-15-2** Project Management (Work Based Learning)	**DipHE** Building Services Engineering 240 credits with at least 100 credits at level 2 and a further 120 credits at level 1 or above
Year 3	**UBLMHP-15-3** Interactive Systems and Comfort Control **UBLMGP-15-3** Energy Management and Performance Evaluation **UBLMPB-30-3** Mechanical Services **UBLLXE-30-3** Design Project	**UBLLYV-30-3** Dissertation **UBLMN7-30-3** Low Carbon Building Services	**BEng** Building Services Engineering 300 credits with at least 60 credits at level 3, a further 100 credits at level 2 or above, and a further 120 credits at level 1 or above

GRADUATION

Part 7: Entry Requirements

Level 1: University Standard Entry Requirements including grade C or above in GCSE Mathematics and English

Level 2: in addition to the University's Standard Entry requirements, students should hold a qualification for which a minimum of 120 credits of BEng (hons) standard Accredited Learning at Level 1 can be granted, eg HNC/HND (additional module credits may be granted depending upon performance in the underpinning qualification)

Level 3: in addition to the University's Standard Entry requirements, students should hold a qualification for which a minimum of 240 credits of BEng (hons) Accredited Learning at Level 1 or 2 may be granted, of which at least 100 credits must be at Level 2.

Students entering with advanced standing must satisfy all the pre-requisite requirements for their intended programme of study.

Part 8: Reference Points and Benchmarks

The programme draws on the:

CIBSE Guidance Notes to the Academic Content Requirements for Degree in Building Services Engineering. Stated requirements regarding academic content and skills development have been rigorously implemented. The future accreditation of the programme is seen as a critical requirement, and the team are confident that this objective will be satisfied by the programme as proposed.

QAA Engineering/Building and Surveying benchmark statements. The generic statements expressed in QAA subject benchmarks for engineering are largely derived from the Engineering Council's statements of output standards for competence in the engineering professions, and to this extent need not be considered in isolation. Reference to the QAA benchmark statements for construction, property and surveying has been made to confirm that no significant omissions or contradictions have been made in compiling the generic or programme specific learning outcomes, or in the strategies adopted for teaching, learning and assessment across programmes.

Engineering Council UK Standard for Professional Engineering Competence. The output statements, as interpreted by the professional body to be approached for accreditation, the Chartered Institution of Building Services Engineers, have been the critical driver for both generic and programme specific learning outcomes. Skills matrices have been compiled to demonstrate comprehensive inclusion of the broad range of outcomes over the modular structure are based on these statements.

UWE Bristol, Strategy 2020 Through its constituent teaching and learning elements, assessment strategies, practical focus and learning outcomes, the programme intends to support the achievement of the workstreams defined in the UWE Bristol Strategy 2020. Specifically, the programme will contribute to the strategic ambitions of outstanding learning (Work-stream 1) and developing ready and able graduates (Work-stream 2).

UWE Bristol, Sustainability Plan 2013-2020 The principles of sustainable design and development are core principles of the programme and embedded in most modules as specific learning outcomes, meeting or exceeding the requirements of the USE Sustainability Plan.

Faculty Technology Enhanced Learning (TEL) Strategy (2012-2017) The delivery of the programme has been informed by the Faculty's TEL policy on teaching, learning and assessment including a strong emphasis on formative work, skills development and innovative approaches to teaching and learning.

'Informal' Benchmarking The programme is underpinned by staff consultancy, professional practice and research. The course team have excellent links with local employers who advise the course team on the content and structure of the programme through the Construction Consortium that meets three times a year.

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of individual modules can be found in module specifications, available on the University's website.

Appendix 1: Mapping of Knowledge, Skills and Behaviours from BEng (Hons) Building Services Engineering to the Building Services Design Engineer Degree Apprenticeship Standard

BEng (Hons) Building Services Engineering also acts as the knowledge qualification in UWE's Building Services Design Engineer Degree Apprenticeship. The below table shows how the module learning outcomes map to the knowledge, skills and behaviours defined in the apprenticeship standard.

Knowledge A Building Services Design Engineer will require a comprehensive and in-depth knowledge of:-	**UFMFYG-15-1**	**UBLLWQ-15-1**	**UBLLWH-30-1**	**UBLMPC-30-1**	**UBLMSB-30-1**	**UBLMTB-30-2**	**UBLMH8-15-2**	**UFMFQ3-15-2**	**UBLMRT-30-2**	**UBLLYF-15-2**	**UBLMNE-15-3***	**UFMF89-15-3***	**UBLMHP-15-3**	**UBLMGP-15-3**	**UBLMPB-30-3**	**UBLLXE-30-3**	**UBLLYV-30-3***	**UBLMN7-30-3***
The mathematical, scientific and engineering principles, methods and modelling that underpin the design of complex building services systems including the quantitative methods used to understand the performance of systems and components and current and emerging technologies. Examples include: comfort criteria, heat transfer calculations, building management systems, fluid dynamics theory for ventilation and water flow, electrical power theory, lighting engineering theory. Using psychrometric charts to determine cooling and humidification Using fan/pump characteristics to determine operating capability	X	X	X		X	X	X	X		X			X	X	X	X		X
The digital solutions used to model, design, analyse and evaluate building services systems Examples include: Using building information modelling to design heating, ventilation and air-conditioning systems, and integrate system components with architectural and structural Using computer programs for heating load assessments. Using										X				X		X		X

dynamic thermal modelling programs to calculate carbon emissions and demonstrate compliance with Building Regulations Part L criteria. Using spreadsheet techniques for calculating and summating electric power loads.																		
The research techniques used to improve the performance of building services systems and components with particular reference to sustainability and reduced carbon emissions and including the use of market intelligence and evidence from best practice. Examples include: Using post-occupancy evaluation outcomes indicating the specific occupancy patterns, space usage and behavioural characteristics and their impacts on energy consumption and carbon emissions, so that future designs can be improved														X		X	X	
The quality standards, codes of practice, legal and regulatory frameworks such as building regulations and construction and design management regulations that govern the design of building services systems with particular reference to health, safety and welfare and environmental impact. Examples include: Building Regulations Part L Conservation of Fuel and Power and Part F Ventilation; Electricity at Work Regulations, air quality				X					X	X						X		X
The principles and techniques of whole life evaluation in the design of building engineering services systems taking account of critical constraints, including														X				

due concern for safety and sustainability. Examples include: Running costs for mechanical and electrical systems, including fuel costs and operation and maintenance costs; carbon usage assessments including both operational carbon from energy usage and embodied carbon from materials usage, including replacements and upgrades; mechanical and electrical equipment replacement strategies																		
The principles and techniques of effective project management including resources, cost management and risk assessment. Examples include: project programmes for the building services design activities; resources planning against project stages and 'deliverables' schedules for producing mechanical and electrical drawings and specifications. Using stage-by-stage cost allocation and expenditure profiles and cumulative schedules of risks				X					X							X		
How to manage teams and develop staff to meet changing technical and managerial needs. Examples include: building teams, briefing and providing direction, reviewing and appraising performance in relation to delivery of building services projects. Using change-management techniques to address client/architect changes and impacts on building services design loads, layouts and plant											X	X				X		
How to communicate effectively through reports, drawings, specifications,										X			X			X		X

presentations and discussions with both technical and non-technical people. Examples include: Contributions to proposals reports for building services solutions to meet the client brief; concept diagrams for explaining the design principles of complex mechanical and electrical systems in layman's terms; specifications for mechanical and electrical installations																		
The professional and ethical codes of conduct and associated responsibilities as set out by the relevant professional engineering institution. Examples include: Dealing in a fair and honest way in activities such as selection of suppliers/contractors for tender lists for building services contracts; and in reviewing tenders and making recommendations for award of contracts				X					X									
Skills A Building Services Design Engineer will be able to:	**UFMFYG-15-1**	**UBLLWQ-15-1**	**UBLLWH-30-1**	**UBLMPC-30-1**	**UBLMSB-30-1**	**UBLMTB-30-2**	**UBLMH8-15-2**	**UFMFQ3-15-2**	**UBLMRT-30-2**	**UBLLYF-15-2**	**UBLMNE-15-3***	**UFMF89-15-3***	**UBLMHP-15-3**	**UBLMGP-15-3**	**UBLMPB-30-3**	**UBLLXE-30-3**	**UBLLYV-30-3***	**UBLMN7-30-3***
Use a sound, evidence-based approach to problem solving to develop building services engineering design solutions which maintain and enhance the quality of the environment and community and meet client, financial and safety objectives. Examples included: Use feedback from previous projects, and in-use data from operational buildings, and incorporate lessons learnt into building services designs and														X		X		

management systems with cost-benefit analysis																		
Identify, review and select techniques, procedures and methods best suited to undertake the design of complex building services systems and components. Examples included: comparison and selection of methods for equipment sizing for power systems; assessing the suitability of computational fluid dynamics for understanding thermal and ventilation dynamic characteristics in complex scenarios			X		X	X	X								X	X		X
Promote the continuous improvement of the design of building services systems and components. This includes using market intelligence and best practice and participating in design reviews and evaluation. Examples include: maintaining awareness of technical developments in equipment such as chillers, boilers and generators; and good practice methods for system configurations and control. Participating in design critiques for the building services strategy at the concept design stage										X			X	X		X		X
Manage and apply safe systems of work including taking responsibility for own obligations for health, safety and welfare issues, assessing and controlling risk, working with health, safety and welfare legislation and best practice. Examples include: Undertaking hazard identification and risk assessment for building services systems involving electricity, gas, rotating plant, refrigerants, hot				X					X							X		

surfaces, testing and commissioning. Planning suitable access and facilities for operation and maintenance of mechanical and electrical equipment																		
Manage the planning, budgeting and organisation of tasks, people and resources through the use of appropriate management systems, working to agreed quality standards, project programme and budget, within legal, contractual and statutory requirements. Examples include: Use employer's quality management system for stage-by-stage project delivery; assessing required person-hours for design, site visits, inspections and witnessing in relation to fees											X	X				X		
Manage teams and develop staff to meet changing technical and managerial needs. Examples include: Provide team briefings and guidance on interpretation and application of new energy regulations or employer/institutional design guidance on lighting design											X	X		X				
Communicate effectively through reports, drawings, specifications, presentations and discussions with both technical and non-technical people. Examples include: Presenting building services design concepts and proposals to a client using diagrams, data in context and interactive discussions on the intended operational performance and user benefits			X		X	X	X			X			X	X	X	X	X	X
Carry out and record the continuing professional						X	X			X					X	X		X

development necessary to maintain and enhance knowledge and competence as a building services design engineer, Examples include: Learning and evidence records from project activities, such as mechanical/electrical systems design calculations; heating, cooling and power load assessments; lighting calculations; equipment capacities and selection; schematic and layout drawings for mechanical and electrical services; witness reports from commissioning; writing reports; and attendance at seminars, lectures and workshops																		
Behaviours A Building Services Design Engineer will:	**UFMFYG-15-1**	**UBLLWQ-15-1**	**UBLLWH-30-1**	**UBLMPC-30-1**	**UBLMSB-30-1**	**UBLMTB-30-2**	**UBLMH8-15-2**	**UFMFQ3-15-2**	**UBLMRT-30-2**	**UBLLYF-15-2**	**UBLMNE-15-3***	**UFMF89-15-3***	**UBLMHP-15-3**	**UBLMGP-15-3**	**UBLMPB-30-3**	**UBLLXE-30-3**	**UBLLYV-30-3***	**UBLMN7-30-3***
Be aware of the needs and concerns of others, especially in relation to diversity and equality											X	X	X			X		
Demonstrate reliability, integrity and respect for confidentiality				X					X					X				
Demonstrate confidence and flexibility in dealing with new and changing interpersonal				X					X		X	X						
Create maintain, and enhance productive working relationships				X					X		X	X						
Demonstrate a strong commitment to health, safety and				X					X		X	X				X		
Demonstrate a personal commitment to professional and ethical standards, recognising one's obligations to society, the profession and the environment				X					X		X	X				X		
Take responsibility for personal development, demonstrating commitment to learning and self-improvement and be open to feedback													X	X	X	X	X	X