

Programme Specification Leading to:
BEng/MEng (Hons) Civil Engineering with Sustainability
BEng/MEng (Hons) Civil Engineering with Sustainability and Placement

Applicable for all undergraduate students starting at FHEQ Level 4 in 2020

| <u>Version No.</u> | <u>Date</u> | <u>Notes – QUALITY ASSURANCE USE ONLY</u> | <u>QAM</u> |
|--------------------|-----------------|---|------------|
| 2020.21 v0.1 | 16 October 2020 | Programme updated for new entrants in September 2020. | JP |

| Undergraduate Programme | |
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| 1. Awarding institution | Brunel University London |
| 2. Teaching institution(s) | Brunel University London |
| 3. Home College / Department / Division | College of Engineering, Design and Physical Sciences |
| 4. Contributing College / Department | Department of Mathematics; Department of Computer Science, Department of Mechanical and Aerospace Engineering, Department of Electronic and Computer Engineering, Department of Chemical Engineering. BPC for Alternative Foundation Year (see section 25). |
| 5. Programme accredited by | To be submitted to the Joint Board of Moderators (JBM), on behalf of Institution of Civil Engineers, Institution of Structural Engineers, Chartered Institution of Highways and Transportation, and The Institute of Highway Engineers |
| 6. Final award(s) and FHEQ Level of Award | MEng (Hons) Civil Engineering with Sustainability (FHEQ level 7) MEng (Hons) Civil Engineering with Sustainability and Placement (FHEQ level 7)) BEng (Hons) Civil Engineering with Sustainability (FHEQ level 6) BEng (Hons) Civil Engineering with Sustainability and Placement (FHEQ level 6) |
| 7. Programme title | BEng/MEng Civil Engineering with Sustainability |
| 8. Programme type (Single honours/joint honours) | Single Honours |
| 9. Normal length of programme for each mode of study | BEng - 36 months FT, 48 months sandwich MEng - 48 months FT, 60 months sandwich |
| 10. Maximum period of registration for each mode of study | Normal or standard duration plus 3 years |
| 11. Variation(s) to September start | None |
| 12. Modes of study | Standard |

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| 13. Modes of delivery | Full Time and Thick Sandwich |
| 14. Other/Intermediate awards and titles and FHEQ Level of Award | CertHE Civil Engineering (FHEQ level 4) DipHE Civil Engineering (FHEQ level 5) DipHE Civil Engineering with Placement (FHEQ level 5) BEng (Ord) Civil Engineering with Sustainability (FHEQ level 6) BEng (Ord) Civil Engineering with Sustainability and Placement (FHEQ level 6) |
| 15. UCAS Code | MEng Civil Engineering with Sustainability (4 year FT) – H202 MEng Civil Engineering with Sustainability (5 year FSK – with placement) – H203 BEng Civil Engineering with Sustainability (3 year FT) – H200 BEng Civil Engineering with Sustainability (4 year FSK – with placement) – H201 |
| 16. JACS /HECoS Code | 100148 Civil Engineering |
| 17. Route Code | BEng H200UECIVESU MEng H200UMCIVESU |
| 18. Relevant subject benchmark statements and other external and internal reference points used to inform programme design UK Spec | <p>UK Quality Code for Higher Education QAA Subject Benchmark Statement Brunel 2030 Brunel Placement Learning Policy, as published under the 'Placements' section of the 'Managing Higher Education Provision with Others' page.</p> <p>Useful Pdf links:-</p> <p>the Engineering Benchmark Statement (http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering-.pdf)</p> <p>the Framework for Higher Education Qualifications (http://www.qaa.ac.uk/en/Publications/Documents/qualifications-frameworks.pdf)</p> <p>Engineering Council: UK-Spec (https://www.engc.org.uk/ukspec)</p> <p>the JBM's guidance for accreditation, which includes programme design (https://www.jbm.org.uk/Accreditation-guidance)</p> <p>Brunel's Programme Approval Policy (http://www.brunel.ac.uk/about/quality-assurance/documents/pdf/Programme-Approval-Policy.pdf),</p> |
| 19. Admission Requirements | For all current entry requirements, please click here . Levels of English for non-native speakers are outlined on the University's language requirements pages. |

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| 20. Other relevant information (e.g. study abroad, additional information on placements) | Optional work placement year is available after completion Level 5 BEng (thick sandwich mode), or after completion Level 6 MEng (thick sandwich mode) leading to the award of BEng/MEng Civil Engineering with Sustainability and Placement |
| 21. Programme regulations not specified in Senate Regulation 2. Any departure from regulations specified in Senate Regulation 2 must be stated here and approved by Senate. | Where a student has failed the module CE5006 Group Project (45 credits) an exception to Senate Regulation 2 regarding the maximum amount of reassessment at FHEQ Level 7 is allowed. The student will be permitted up to 45 credits of reassessment which will be applied to module CE5006 Group Project only. In all other cases the maximum amount of reassessment remains at 40 credits. However, reassessment in the Group project as a 2nd attempt does not satisfy the requirements for an accredited degree. |
| 22. Further information about the programme: | Link to programme information on the College website Course webpage: https://www.brunel.ac.uk/civil-engineering |

23. EDUCATIONAL AIMS OF THE PROGRAMME

The Civil Engineering programme at Brunel University London is part of the Brunel Engineering Curriculum portfolio. As such, its aim is to produce graduates that are creative, knowledgeable, have perspective and are professional in their approach.

The programme has been designed from the ground up in response to current industry needs and aims at equipping the students with a solid engineering background, combined with a variety of skills needed to excel in the workplace.

The programme is highly innovative with respect both to its content and its delivery strategy. The first two years will focus on providing the students with the necessary knowledge in fundamental disciplines (e.g. maths, structures, geotechnics, materials, fluid mechanics, engineering systems) and basic understanding of key topics at the basis of the profession (e.g. surveying, health and safety and professional skills). In the following two years, traditional topics (e.g. civil engineering design, construction management, transport infrastructure engineering) are complemented by specialist ones such as Water and Waste Water engineering, Sustainable transport Infrastructure and environment and structural dynamics which address pressing needs and opportunities in today's industry. Key pillars running throughout the programme are sustainability, creativity, system thinking, health and safety, risk management, problem solving and innovation. Specific focus is also on the practical aspects that form a well-rounded Engineer with the introduction of the novel Civil Engineer's Toolbox.

24. PROGRAMME AND INTERMEDIATE LEARNING OUTCOMES

The programme provides opportunities for students to develop and demonstrate knowledge and understanding (K) cognitive (thinking) skills (C) and other skills and attributes (S) in Engineering Analysis (EA), Design (D), Economic, legal, social, ethical and environmental context (EL), Engineering practice (P) and Additional transferable general skills (G). *Correlations with the Engineering Council's AHEP3 learning outcomes are given in the left-hand column.*

| Level | Category (K = knowledge & understanding, C = cognitive (thinking) skills, S = other skills and attributes) | Learning Outcome | Associated Assessment Blocks Code(s) | Associated Study Blocks Code(s) | Associated Modular Blocks Code(s) |
|---------------------|---|---|--------------------------------------|---------------------------------|--------------------------------------|
| FHEQ Level 4 | | | | | |
| SM1b SM1m | K | Knowledge, understanding, skills gathering and comprehension of the specific engineering disciplines relevant to engineering or Civil engineering, including systems, mechanics and materials. | | | BE1603 BE1604 BE1605 CE1620 |
| EA1b EA1m | K/C | Knowledge of the fundamental scientific principles that underpin an education relevant to engineering and demonstrating their application (e.g. basic energy and mass balance and fundamentals of thermodynamics and fluid mechanics) | | | BE1601 BE1603 CE1620 |
| EA1b EA1m | K/C | Knowledge and understanding of the fundamental mathematical and statistical principles that underpin basic calculations in engineering | | | BE1601 |
| EL1 | K/C | Apply a systems approach to identify the problems and apply core Civil engineering principles to their analysis | | | BE1602 CE1620 |
| P1 | C | Ability to formulate basic problems, apply and demonstrate mathematical methods together with computational tools (Matlab, Excel) in the analysis of engineering problems | | | BE1601 CE1620 BE1604 BE1605 |
| D1 | C | Ability to apply and demonstrate scientific principles to relevant engineering applications, collect, manipulate and interpret data (e.g. labs) | | | BE1602 CE1620 |
| EA1b Ea1m | K/S | Knowledge and understanding in the use of computer tools in solving basic engineering problems (e.g. Matlab, Excel, etc.) | | | BE1601 BE1602 CE1620 |
| P1 | S | Basic knowledge of management, entrepreneurship and safety culture | | | BE1602 CE1620 |

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| G1 | S | Effective communication of technical material, ethics demonstration, in the form of written reports and oral presentations | | | BE1602 BE1604 CE1620 BE1605 |
| G1 | S | Working effectively as a member of a team; managing time and resources to given constraints | | | BE1602 CE1620 |
| FHEQ Level 5 | | | | | |
| SM2b SM2m | K/C | Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems | | | CE2606 CE2003 CE2605 |
| EA2 | K/C | Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques | | | CE2606 CE2604 CE2608 CE2003 CE2607 |
| D2 | K/S | Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards | | | CE2606 CE2604 CE2608 CE2605 |
| EL3b EL3m | K/S/C | Knowledge and understanding of management techniques, including project and change management, that may be used to achieve engineering objectives, their limitations, and how they may be applied appropriately | | | CE2606 CE2604 CE2608 |
| P2b P2m | K/S/C | Knowledge of characteristics of particular equipment, processes or products, with extensive knowledge and understanding of a wide range of engineering materials and components | | | CE2604 CE2608 CE2605 |
| EL2 | K/S | Knowledge and understanding of the commercial, economic and social context of engineering processes | | | CE2608 |
| G2 | K/S | Plan self-learning and improve performance, as the foundation for lifelong learning/CPD | | | CE2604 |

| FHEQ Level 6 | | | | | |
|--------------|-------|--|--|--|--------------------------------------|
| SM3b | K/S/C | Ability to apply and integrate knowledge and understanding of the other engineering disciplines to support study of their own engineering discipline | | | CE3099 CE3002 CE3613 |
| EA3b | S/C | Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action | | | CE3099 CE3610 CE3613 |
| EA4 | K/S | Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems | | | CE3099 CE3610 CE3613 CE3608 |
| D3b | K/S/C | Assess and work with information that may be incomplete or uncertain and quantify the effect of this on the design | | | CE3099 CE3610 CE3613 |
| D4 | K/S/C | Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal | | | CE3009 CE3610 CE3613 CE3608 |
| D5 | K/S | Plan and carry out a personal programme of work, adjusting where appropriate | | | CE3099 CE3610 CE3611 |
| D6 | K/C | Communicate their work to technical and non-technical audiences | | | CE3099 CE3610 CE3611 |
| EL5b | K/S/C | Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety and liability issues | | | CE3611 |
| EL6m & EL6b | K/S/C | Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques | | | CE3099 CE3611 |
| P6 | K/S/C | Understanding of appropriate codes of practice and industry standards | | | CE3099 CE3610 CE3608 CE3613 |
| P7 | K/C | Awareness of quality issues and their application to continuous improvement | | | CE3099 CE3611 |

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| P8 | K/C | Ability to plan and work with technical uncertainty | | | CE3099 CE3610 CE3002 CE3613 |
| P11b & P11m | K/S | Understanding of, and the ability to work in, different roles within an engineering team | | | CE3610 |
| D2 & EL4 | K/S/C | Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal | | | CE3613 CE3002 CE3099 CE3610 |
| D2 & EL4 | | Explain and understand the origins and multiple dimensions of sustainability | | | CE3608 CE3613 |
| D2 & EL4 | | Apply critical and creative thinking to sustainability problems and understand how complexity and uncertainty affect the sustainability of socio-ecological systems | | | CE3608 CE3613 |
| FHEQ Level 7 | | | | | |
| SM4m | | Critical awareness of developing technologies related to own specialisation | | | CE5006 CE5010 CE5014 CE5660 |
| SM6m | | Systematic understanding of concepts from a range of areas, including some outside engineering and the ability to evaluate them critically and apply them in engineering project | | | CE5006 CE5010 CE5014 CE5660 CE5008 |
| EA5m | | Ability to use fundamental knowledge to critically investigate new and emerging technologies. | | | CE5006 CE5010 CE5660 CE5608 |
| EA6M | | Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems | | | CE5006 CE5010 CE5014 CE5008 |
| D7m | | Demonstrate wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations | | | CE5006 CE5010 CE5660 CE5008 CE5014 |

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| D8m | | Demonstrate the ability to generate an innovative design for products, systems, components or processes to fulfil new needs | | | CE5006 CE5514 CE5014 |
| EL7m | K | Demonstrate critical awareness of the key drivers for business success, including innovation, calculated commercial risks and customer satisfaction | | | CE5006 CE5015 CE5660 |
| P9m | K/C/S | A thorough and critical understanding of current practice and its limitations, and some appreciation of likely new developments. | | | CE5006 CE5015 |
| P10m | k/C/S | Ability to critically apply engineering techniques taking account of a range of commercial and industrial constraints | | | CE5006 CE5519 CE5015 |
| P11m | K/C/S | Critical understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader. | | | CE5006 CE5519 CE5010 |
| | K/C | Systemic approach, extensive knowledge and understanding of a wide range of cutting-edge Civil engineering activities | | | CE5006 CE5010 CE5660 CE5014 CE5608 |
| | K/C | Conceptual understanding of key aspects and critical evaluation of state of art methodologies and practice in Civil Engineering | | | CE5006 CE5010 CE5660 CE5508 CE5014 |

Learning/teaching strategies and methods to enable learning outcomes to be achieved, including formative assessments

Modern teaching methodologies and technologies will be used to ensure maximum engagement from the students. Flipped classrooms approach will be incorporated into teaching where appropriate to allow for interaction and deeper learning through application. Team based learning and group exercises will provide students with training in communication skills and the ability to work in teams as well as the ability to hold a debate and justify the choice of their design or solution to a set problem. Formative work, including tests and practice work will allow students to experiment with their learning and communication skills.

Practical sessions, including hands-on experiments, computer practicals and surveying will enable students to develop applied skills, and link theory to practice. Students will also take part in off-campus activities, including a residential field course at FHEQ Level 5.

The MEng group project is designed in such a way as to enable multidisciplinary teams including students from a range of engineering disciplines to work together on a shared, design-centred challenge.

Experienced engineers working in the Civil Engineering sector will deliver selected parts of the programme, ensuring students are exposed to the practicalities of the industry and understand more of the world of work. A group poster conference (part of BE1602) will take place towards the end of FHEQ L4, with a range of industrial specialists invited

to examine the posters and talk with the students. Students will also have the opportunity to work on industry-related projects at FHEQ Level 6 and Level 7.

The opportunity to think creatively, including producing novel designs, will be given at all levels, particularly:

FHEQ L4: BE1602 Engineering Practice; CE1620 Introduction to Contemporary Civil Engineering

FHEQ L5: CE2604 Civil Engineering Toolbox and Professional Skills; CE2606 Structural design

FHEQ L6: CE3099 Final Year Project

FHEQ L7: CE5006 Major Group Project; CE 5010 Structural Design and FEA

Summative assessment strategies and methods to enable learning outcomes to be demonstrated.

The assessment strategy is developed in mind to cover all needs and abilities of students and to help them to achieve the programme learning outcomes, to make studying more interactive for the students and to help them to benefit from continued professional development. Some assessment will focus on knowledge and understanding. From FHEQ L4, there will also be open and 'authentic' assessments based on 'real world' type challenges to allow students to develop deeper understanding and creative judgement.

Students will be tested by a combination of exams and assignments (in the form of coursework, laboratory reports, in-class tests and presentations at all levels). This will allow the students to demonstrate the knowledge, skills and systems thinking they have acquired in each module and to better prepare them for the workplace.

Each learning outcome is covered by more than one assessment.

25. Programme Structure, progression and award requirements

Programme structures and features: levels, assessment blocks, credit and progression and award requirements

- **Compulsory block:** one which all students registered for the award are required to take as part of their programme of study. These will be listed in the left hand column;
- **Optional block:** one which students choose from an 'option range'. These will be listed in the right hand column;
- A **core assessment** is an assessment identified within an assessment block or modular block (either compulsory or optional) which must be passed (at grade D- or better) in order to be eligible to progress and to be eligible for the final award. All core assessments must be specified on the programme specification next to the appropriate assessment or modular block:

Where students are expected to pass the block at D- or better, but not necessarily all elements, then the block itself is core.

e.g. AB3000 Project (40)

Core: Block

Where only some elements of assessments are required to be passed at D- or better, these will be identified by listing each element that is core

e.g. AB3001 Title (20 credits)

Core: 1 & 4

Where students are expected to pass all assessments in a block then this will be identified. By setting the assessment this way, students are also required to pass the block by default. This will be identified thus:

e.g. AB3002 Title (20 credits)

Core: All, Block

- A **non-core assessment** does not have to be passed at grade D- or better, but must be better than a grade F, in order to progress and to be eligible for the final award.

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| Foundation Year |
| The Foundation Year available to international students is specified in document “Validated Programme Element Specification for LBIC Alternative Foundation in Engineering”. This document also specifies the admission and progression requirements. |

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| Level 4 | |
| Compulsory assessment block codes, titles and credits | Optional assessment block codes, titles and credits |
| Compulsory study block codes, titles and credit volume | Optional Study block codes, titles and credit volume |
| Compulsory modular block codes, titles and credits BE1601 Engineering Mathematics & Programming (Core Block) – (20 credits) BE1602 Engineering Practice (Core Block) – (20 credits) BE1603 Engineering Systems and Energy – (30 credits) BE1604 Engineering Mechanics and Materials I – (15 credits) BE1605 Engineering Mechanics and Materials II – (15 credits) CE1620 Introduction to Contemporary Civil Engineering (20 credits) | Optional modular block codes, titles and credits |
| Level 4 Progression and Award Requirements | |
| As per Senate Regulation 2 | |

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| Level 5 | |
| Compulsory assessment block codes, titles and credits | Optional assessment block codes, titles and credits |
| Compulsory study block codes, titles and credit volume | Optional Study block codes, titles and credit volume |
| Compulsory modular block codes, titles and credits CE 2604 Civil Engineering Toolbox and Professional Skills (20) CE 2605 Geotechnical Engineering (20) CE 2003 Structural Mechanics (20) CE 2606 Structural Design (20) CE 2607 Hydraulics (20) CE 2608 Construction Material and Sustainability(20) | Optional modular block codes, titles and credits |
| Level 5 Progression and Award Requirements | |
| As per Senate Regulation 2 | |

| Level 5 – Placement | |
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| Compulsory assessment block codes, titles and credits | Optional assessment block codes, titles and credits |
| Compulsory study block codes, titles and credit volume | Optional study block codes, titles and credit volume |
| Compulsory modular block codes, titles and credits CE2555 Placement (120) Core: Block | Optional modular block codes, titles and credits |
| <p>Level 5 Placement Progression and Award Requirements</p> <p>As per Senate Regulation 2</p> <p>For BEng Civil Engineering with Sustainability and Placement, CE2555 will contribute 25% of the Level 2 profile and 8.3% of the overall degree calculation. Module CE2555 must be undertaken between Levels 4 & 5.</p> <p>For MEng Civil Engineering with Sustainability and Placement, CE2555 will contribute 25% of the Level 2 profile and 5% of the overall degree calculation. Module CE2555 must be undertaken between Levels 5 & 6 or 6 & 7.</p> <p>If registered on BEng Civil Engineering with Sustainability and Professional Development, and the placement module (CE2555) is not passed at D- or above, a DipHE Civil Engineering may be awarded by the Board of Examiners.</p> | |

| Level 6 | |
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| Compulsory assessment block codes, titles and credits | Optional assessment block codes, titles and credits |
| Compulsory study block codes, titles and credit volume | Optional study block codes, titles and credit volume |
| Compulsory modular block codes, titles and credits CE 3009 Final Year Project (BEng students only) Core: Block (40) CE3099 Final Year Project (MEng students only) Core: Block (40) CE3610 Civil Engineering Design (20) CE3611 Contract Management, Procurement and Risk (20) CE3608 Water and Waste Water Engineering (20) CE3613 Sustainable Transport Infrastructure Engineering (20) | Optional modular block codes, titles and credits |

Level 6 Progression and Award Requirements

As per [Senate Regulation 2](#)

BEng (Honours) Civil Engineering with Sustainability: 360 Credits

BEng (Honours) Civil Engineering with Sustainability and Placement: 480 Credits

For BEng Civil Engineering with Sustainability and Placement, CE2555 will contribute 25% of the FHEQ Level 5 profile and 8.3% of the overall degree calculation.

Module CH2T must be undertaken between Levels 2 & 3.

For MEng Civil Engineering with Sustainability and Placement, CE2555 will contribute 25% of the FHEQ Level 5 and 5% of the overall degree calculation.

Module CE2555 must be undertaken between FHEQ Levels 5 & 6 or 6 & 7.

If registered on BEng Civil Engineering with Sustainability and Placement, and CE2555 is not passed at D- or above, the degree of BEng Civil Engineering may be awarded by the Board of Examiners.

Level 7

Compulsory modular block codes, titles and credits

CE5006 Major Group Project (45 credits) Core: Block
The student's input to the major group project topic must be directly relevant to sustainable civil engineering

CE5015 Project Management (15 credits)
CE5010 Structural Design and FEA (15 credits)
CE5660 Infrastructure Management (15 credits)
CE5008 Geo-Environmental Engineering (15 credits)
CE5014 Water Process Engineering (15 credits)

Optional modular block codes, titles and credits

Level 7 Progression and Award Requirements

As per [Appendix B of Senate Regulation 2](#)

MEng (Honours) Civil Engineering with Sustainability: 480 Credits

MEng (Honours) Civil Engineering with Sustainability and Placement: 600 Credits

For MEng Civil Engineering with Sustainability and Placement, CE2555 will contribute 25% of the FHEQ Level 5 profile and 5% of the overall degree calculation

If registered on MEng Civil Engineering with Sustainability and Placement, and CE2555 is not passed at D- or above, the degree of MEng Civil Engineering with Sustainability may be awarded by the Board of Examiners.

Please note: this specification provides a concise summary of the main features of the programme and the learning outcomes that a 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 can be found in the modular block, assessment and study block outlines and other programme and block information. The accuracy of the information contained in this document is reviewed by the University from time to time and whenever a modification occurs.