# University of Huddersfield

# Programme Specification

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| --- | --- | --- |
| 1 | Awarding Institution | University of Huddersfield |
| 2 | **Teaching Institution** | University of Huddersfield |
| 3 | **School and Department** | Computing and Engineering, Computer Science |
| 4 | **Course Accredited by:** |  |
| 5 | Mode of Delivery | Full Time (3 years) / Sandwich (4 years) |
| 6 | Final Award | BSc(Hons) |
| 7 | Course Title | Computer Science with Internet of Things |
| 8 | UCAS Code | n/a |
| 9 | **Subject Benchmark Statement** | QAA Computing 2019 |
| 10 | Date of Programme Approval | September 2019, June 2021, January 2022,  August 2022 |

**11 Educational aims of the Programme**

The Internet of Things (IoT) and Industrial Internet of Things (IIoT) refer to the use of a very wide range of devices that have internet connectivity. There is considerable coverage in news media of IoT currently, and while some of the applications discussed are, perhaps, somewhat frivolous, there is a very real industrial applications that are going to revolutionize manufacturing industry. This pathway will not focus on how a fridge may signal that provisions are running low, but will instead be focused around IIoT where machines are sensored and interconnected to facilitate preventative maintenance, to improve production scheduling efficiency, and to better manage logistics and supply chains.

Through our Centre for Industrial Analytics (CIndA) we have built significant links with a wide variety of local manufacturing businesses and have developed significant technical expertise in the use of IIoT to collect data, and in the subsequent processing of that data in order to extract business value. This IoT Pathway will draw heavily upon that expertise and will expose the students to real-world case studies and examples both in lecture material and in project work.

This course is designed to blend together core topics in computer science and IoT systems to provide students with a rich and diverse learning experience equipping them with the advanced skills and understanding needed to identify and solve a wide range of complex real-world problems. Within a supportive teaching environment, the program will develop analytical and problem-solving skills, individual and team-working skills and stimulate students’ interests in a wide range of modern applications of software engineering, computer science and IoT/IIoT

The Computer Science side of the course is designed to produce graduates capable of working either as computer scientists within the science and engineering community, exploiting their mathematical knowledge in the development of computer-based systems and products, or within the broad range of the computing profession, performing tasks that require software engineering expertise coupled with a sound understanding of IoT and IIoT systems.

The BSc (Hons) in IoT is designed to meet the demand for a new kind of computing specialist with skills - that can:

1. Engineer new interactive products – things

2. Interconnect and embed these things into larger diverse systems and architectures;

3: Intelligently sense multi-modal data in physical and human environments;

4. Intelligently fuse and analyse the data collected.

Programme graduates will be able to pursue careers in IoT positions in Industry, as well as initiate research in multiple scientific domains that rely on advanced IoT.

The course aims to enhance the technical effectiveness of graduates, thus increasing their immediate worth to industry in first-stage design/development roles. It seeks to do this by developing knowledge and understanding across a range computing and engineering systems disciplines and by developing skills in the use of computer-aided design/development methods, cloud computing, communication systems, cyber physical systems and security, but above all, it seeks to develop their ability to critically evaluate existing and emerging IoT technology, apply knowledge, understanding and analytical and design skills in support of technical design/development projects.

The main aims of the course are:

* To develop the technical knowledge and design skills of graduates.
* To prepare students for roles as design/development engineers in the area of IoT systems.
* To prepare graduates to apply IoT technology in areas such as smart cities, smart manufacturing, building automation and health care,
* To enable graduates to develop management knowledge and skills appropriate to technical management.
* To provide an opportunity for graduates to pursue a complementary discipline, knowledge of which may assist them in their chosen career path.
* To develop and enhance students’ ability in undertaking a major design project encompassing the knowledge and skills acquired from the taught modules.

**12** **Intended learning outcomes**

The courses provide opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities, and other attributes in the areas listed below. The British Computer Society specifies the generic learning outcomes expected for Computing and Information Systems courses leading to full or partial CEng and/or CITP status. Consequently, it is sensible to adopt these BCS outcomes directly, with limited re-phrasing to provide subject emphasis, to specify the learning outcomes expected of the courses within this programme. Tables mapping the core modules to these outcomes are provided in Appendix 2.

|  |  |
| --- | --- |
| ***Knowledge and Understanding*** | |
| 2.1.1 Knowledge and understanding of facts, concepts, principles and theories.  2.1.7 Knowledge and understanding of commercial and economic issues  2.1.8 Knowledge of management techniques to achieve objectives  2.1.9 Knowledge of information security issues  3.1.2 Methods, techniques and tools for information modelling, management and security  3.1.3 Knowledge of systems architecture  4.1.1 Knowledge and understanding of scientific and engineering principles  4.1.2 Knowledge and understanding of mathematical principles  4.1.3 Knowledge and understanding of computational modelling  **Teaching/Learning Strategies:**  Lectures will be used to deliver core material; tutorials will allow discussion of ideas and work on small example exercises to support the learning process; and practicals will be used to reinforce the material through hands-on laboratory-based sessions.  **Assessment Strategies:**  Many modules are assessed by coursework and/or examination. Others often involve on-going phased assessment or combination of presentation and dissertation. Courseworks assess learning outcomes through practical and creative work either individually or in groups. Students are typically required to submit evaluative and reflective reports and/or evidence of planning and design as well as any finished product.  **Alignment to Subject Benchmark Statement:**  The learning outcomes above align with the following derived from the benchmark statement for Computing: programming language concepts; computing hardware and networks; modelling formalisms relevant to information systems analysis and design; object oriented approaches to analysis, design and programming; internet and web-based systems; database management; organisational and professional issues; human aspects of computer systems; mathematics applicable to software engineering; computer science; design approaches and their role in systems design and development; common architectures and platforms; operating systems; artificial intelligence and knowledge representation formalisms. | |
| ***Professional, Practical and Subject Specific Skills*** |
| 2.1.2 Effective modelling and design  2.1.4 Analyse if/how a system meets current and future requirements  2.1.5 Deploy theory in design, implementation and evaluation of systems  2.1.6 Recognise legal, social, ethical & professional issues  2.2.1 Specify, design or construct computer-based systems  2.2.2 Evaluate systems in terms of quality and trade-offs  2.2.3 Recognise risk/safety for safe operation of computing equipment  2.2.4 Deploy tools effectively  3.1.1 Deploy systems to meet business goals  3.2.1 Specify, deploy, verify and maintain information systems  3.2.3 System design  4.2.1 Specify, deploy, verify and maintain computer-based systems  4.2.2 Defining problems, managing design process and evaluating outcomes  4.2.3 Principles of appropriate supporting engineering and scientific disciplines  5.1 Application of practical and analytical skills  5.4 Awareness of wider customer contexts.  **Teaching/Learning Strategies:**  Lectures will be used to deliver core material and to demonstrate, where appropriate, use of tools and best practice; tutorials may be used either to facilitate a theoretical treatment of a topic or as reparation for practicals; the practicals themselves give students the opportunity to apply and hone their skills via the application of material to a given problem scenario and/or through practice with particular tools, languages, environments, etc.  Professional skills are taught in a number of modules including the final year project and in the supervised work experience year.  **Assessment Strategies:**  Many modules, including the final year project, involve these issues in their assessment. This may include, for example, a reflective critique of work undertaken or an evaluation/application of these skills as part of an assignment.  **Alignment to Subject Benchmark Statement:**  The learning outcomes above align with the following derived from the benchmark statement for Computing: object-oriented and procedural programming; object-oriented systems modelling and prototyping; use and management of operating systems and networks; programming language translation and compilation; formal and rigorous specification and contract obligations; project and software lifecycle management; enforcement of formally-agreed and de facto standards; artificial intelligence techniques; developing neural networks for machine learning. |

| ***Transferrable/Key Skills*** |
| --- |
| 2.1.3 Problem solving strategies  2.3.1 Work as a member of a development team  2.3.2 Development of general transferable skills  3.2.2 Defining problems, managing design process and evaluating outcomes  4.1.1 Knowledge and understanding of scientific and engineering principles  4.1.2 Knowledge and understanding of mathematical principles  **Teaching / learning strategies and methods:**  Key skills are developed throughout the programme through a combination of lectures, tutorials, practical, laboratory work, projects/studio work, guided study, and case studies.  **Assessment Strategies:**  Key skills are assessed as part of coursework, projects, written examinations, and presentations.  **Alignment to Subject Benchmark Statement:**  The learning outcomes above align with the following derived from the benchmark statement for Computing: professional ethics; workplace practice; application of data protection legislation; copyright and intellectual property rights; information retrieval skills (including web browsing, search engines, and library skills). |
|  |

###### 13 Programme structures and requirements, levels, modules, credits and awards

**Course Structure**

The course has been designed to meet the QAA Benchmark Statement for Computing. Appendix D provides a table showing how the course learning outcomes map to the Benchmark Statement areas.

Year 3 of the programme comprises a monitored Professional Placement with a minimum duration of 48 weeks.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module Code** | **Module Name** | **Level** | **Credits** | **Term** | **Type** |
| **CFM2175** | Computing Science and Mathematics | F (FHEQ 4) | 20 | Term 1 | Core |
| **CFS2101** | Computer Organisation and Architecture | F (FHEQ 4) | 20 | Term 1 | Core |
| **CFP2125** | Project 1 | F (FHEQ 4) | 20 | Term 2 | Core |
| **CFS2102** | Computer Network Fundamentals | F (FHEQ 4) | 20 | Term 2 | Core |
| **CFS2160** | Software Design and Development | F (FHEQ 4) | 40 | Yearlong | Core |
| **CIS2205** | Introduction to Artificial Intelligence | I (FHEQ 5) | 20 | Term 1 | Core |
| **CIS2206** | Algorithms and Data Structures | I (FHEQ 5) | 20 | Term 1 | Core |
| **CIS2360** | Relational Databases and Web Integration | I (FHEQ 5) | 20 | Term 1 | Core |
| **CII2350** | Team Project | I (FHEQ 5) | 20 | Term 2 | Core |
| **NIE2206** | Embedded Systems | I (FHEQ 5) | 20 | Term 2 | Core |
| **CIM2130** | Computational Mathematics 1 | I (FHEQ 5) | 20 | Term 2 | Option-A\* |
| **CIS2201** | Cyber Security | I (FHEQ 5) | 20 | Term 2 | Option-A\* |
| **CIS2207** | Language Translators | I (FHEQ 5) | 20 | Term 2 | Option-A\* |
| **CIS2208** | Operating Systems | I (FHEQ 5) | 20 | Term 2 | Option-A\* |
| **CIS2343** | Object-Oriented Systems Development | I (FHEQ 5) | 20 | Term 2 | Option-A\* |
| **CSP2010** | Personal Social and Technical Skills | S | 60 | Yearlong | Optional |
| **CSP2020** | Self-Assessment Skills | S | 60 | Yearlong | Optional |
| **CSP2025** | Enterprise in Action | S | 120 | Yearlong | Optional |
| **CHI2550** | Modern Database Applications | H (FHEQ 6) | 20 | Term 1 | Option-B\* |
| **CHM2130** | Computational Mathematics 2 | H (FHEQ 6) | 20 | Term 1 | Option-B\* |
| **CHS2406** | Data-driven Artificial Intelligence | H (FHEQ 6) | 20 | Term 1 | Option-B\* |
| **CHT2520** | Advanced Web Programming | H (FHEQ 6) | 20 | Term 1 | Option-B\* |
| **CHS2403** | Internet of Things and Cyber Physical Systems | H (FHEQ 6) | 20 | Term 2 | Core |
| **CHS2546** | Distributed and Client Server Systems | H (FHEQ 6) | 20 | Term 2 | Core |
| **CHP2524** | Individual Project | H (FHEQ 6) | 40 | Yearlong | Core |

\*Students take 1 from OPTION-A, 2 from OPTION-B. Sandwich Year (Level S) is optional.

**Programme Level and Awards**

BSc (Hons) will be awarded upon successful completion of modules which give the student 360 academic credits at foundation and post-foundation level. These credits must include 120 at honours level, including the credits from the relevant Year 4 Individual Project module.

BSc will be awarded upon successful completion of modules totalling 300 academic credits at foundation and post-foundation level. These credits must include 60 at honours level.

DipHE (Diploma of Higher Education in Computer Science) will be awarded to students gaining 240 credits of which at least 120 must be I and/or H level.

CertHE (Certificate of Higher Education in Computer Science) will be awarded to students gaining 120 foundation level credits

The class of award is determined at the Course Assessment Board in accordance with the guidelines outlined in the “Regulations for Awards” on the Registry website as follows: <https://www.hud.ac.uk/policies/registry/awards-taught/>

###### 14 Teaching, Learning and Assessment

A variety of teaching and learning strategies are used appropriate to the nature of the material being delivered. The nominal mean workload on students is 10 hours per credit.

Typically, lectures are used as a mechanism to deliver key facts, concepts, theories and methodologies. These may be backed up by tutorial and/or practical sessions. These sessions allow students to develop their skills, to receive feedback on their progress and to take ownership of their own learning.

In some subject areas, particularly the group-based module, teaching may be studio-based and/or delivered using group seminars.

Use is made of IT resources in teaching across the full range of subjects. This may be in the form of materials made available via the VLE, electronic forums, simulations and examples. Students are introduced to the University and Departmental systems for C&IT during induction

Formative assessment will be provided in a variety of ways. Whenever practical, students will be given individual feedback on their progress prior to formal assessment. This may be in the form of oral feedback on work reviewed in a tutorial, seminar or studio session or written feedback on a piece of work submitted prior to assessment. Formative assessment is a student driven process.

Assessment is used to determine if students have achieved the learning outcomes of individual modules and hence, the learning outcomes of the programme. A number of forms of assessment are used. These may include portfolios of work, essays, reports on group work, software, audio-visual presentations (both individually and as a member of a group), computer-based tests, short tests and formal examinations. In all cases, assessment is governed the University’s Regulations for Awards as reproduced in the [Students’ Handbook of Regulations](http://www2.hud.ac.uk/registry/students_handbook.php).

The assessment to be used in individual modules is indicated in appendix 3.

The University complies fully with the Special Educational Needs and Disabilities Act (2001). The wide variety of delivery and assessment methods used makes the course accessible to students with a range of special educational needs and/or disabilities.

###### 15 Support for students and their learning

All students are assigned a personal tutor. The role of the year personal tutor in supporting students is seen as of primary importance. Students are encouraged to see their personal tutor about any problems they have which do or may affect their ability to study and learn. The tutor will keep track of any serious on-going issues, but respects student confidentiality. Students may see other staff about an issue if they feel more comfortable doing so; further information will be supplied in the Course Handbook. Students are encouraged to see academic tutors if they have difficulty understanding material or with coursework. Additional support includes:

**University Level**

A range of central facilities are provided to support students:

* Student Services provide specialist advice in the areas of counselling, disability, pastoral care and chaplaincy, accommodation, finance and careers; it also supports a day-care nursery and job shop for part-time work.
* The Learning Centre (library and computing facilities) provides induction and on-going support for students.
* The International Office provides help and support for overseas students.

**Programme Level**

* All students undertake an induction programme in year 1.
* All students have a Personal Tutor, with whom they can discuss personal and academic difficulties and develop their PDP.
* Year Tutors are available to provide guidance on academic progress.
* Module Tutors are available to help with academic problems specific to the modules they deliver.
* An Academic Skills Tutor is available to provide assistance with generic study, and other, skills.
* A central computer-based attendance monitoring scheme is operated and students with poor attendance are contacted and advised.
* Student Guidance and Support Officers are available to help students who are experiencing difficulties with attendance and/or other aspects of their studies.
* Supporting documentation is provided in the form of student handbooks, module handbooks, programme specifications and module specifications.
* The virtual-learning environment is used to support all modules and year groups.
* Lecture Capture is available for a large number of taught classes to aid student learning.

###### 16 Criteria for admission

The recruitment and admissions process endeavours to ensure a good match between the abilities and aptitudes of the applicants and the demands of the programme. The aim is to facilitate widening participation whilst ensuring that students can reasonably expect to succeed on their chosen course.

Candidates must be able to satisfy the general admissions requirements of the University of Huddersfield. Indicative admissions requirements are: A-level BBB or DMM in BTEC Level 3 Extended Diploma. Since these may be subject to change, definitive admissions requirements, including UCAS points equivalence, will be as given on the University web site (<http://www.hud.ac.uk/courses>).

Candidates with non-standard qualifications and/or experience will be considered on a case-by-case basis. For candidates with supplementary qualifications and/or experience it may be possible to take this into account and offer these candidates exemption from specific modules, or entry onto a later year of the course.

The overriding consideration in admitting a student to any of these courses is evidence that the student is likely to be able to complete the course satisfactorily.

###### 17 Methods for evaluating and improving the quality and standards of teaching and learning

**Quality and Standards**

* The University’s Teaching and Learning Committee has ultimate responsibility for quality and standards of teaching and learning in the University.
* The School Board, via the School Teaching and Learning Committee has responsibility for implementing University policy through School-defined procedures.
* Periodic School and subject reviews take place on a rolling quinquennial programme and focus inter alia on the arrangements for quality management and enhancement, teaching, learning and assessment, C&IT strategies, the articulation and assurances of standards, external examiner reports and evaluation and links with professional bodies, employers and other external organisations.

**Monitoring, Development and Evaluation**

The Course Committee is responsible for the monitoring and development of the course or programme, taking account of feedback from staff, students and external examiners. Feedback is sought as follows:

* From students through annual course and module evaluation questionnaires, termly Student Panel meetings, input from student members of the Course Committee and the National Student Survey.
* From external examiners through annual reports, course assessment board minutes, assessment moderation reports and informal communication during the year.
* From Professional Standards and Review Bodies through quinquennial reaccreditation visits.

Annual evaluation of the programme is the responsibility of the School Board. The Course Committee prepares an annual evaluation report comprising reporting and evaluation, informed by feedback from staff, students and external examiners and by statistical data.

**Validation of Courses, Modules and Changes**

Course validation takes place under the University's [Quality Assurance Procedures for Taught Programmes](http://www2.hud.ac.uk/registry/quality_assurance_regulations.php). Amendments to programme and module documents are validated by the School Accreditation and Validation Panel.

**Teaching and Learning**

The School Teaching and Learning Panel, a sub-committee of the School Teaching and Learning Committee, is tasked with implementing the University's teaching and learning strategy and with fostering innovation in teaching and learning and the dissemination of good practice.

**Staff Development Priorities Include**

Staff Annual Appraisal and institutional staff development courses

Fellowship of the Higher Education Academy

Updating professional developments

Regular course meetings and annual review and planning for subsequent academic year

Engagement in subject specific research conferences, including pedagogical research.

###### 18 Regulation of assessment

Assessment regulations are as detailed in the University of Huddersfield [Regulations for Awards](http://www.hud.ac.uk/registry/regulationsandpolicies/awards/), relevant sections of which are repeated in the [Students’ Handbook of Regulations](http://www.hud.ac.uk/registry/regulationsandpolicies/studentregs/).

The following course regulation will be applicable from academic year 2022-2023 for those students wanting to partially or fully meet the requirements for Chartered Engineer (CEng). The regulation is not applicable nor required for meeting requirements for Chartered IT Professional (CITP).

A maximum of 20 credits in a Bachelor’s degree can be condoned (termed Compensation by the Engineering Council). If a module is available for Condonement, an opportunity will be given to undertake the appropriate referral assessment/s – if however the respective module is not subsequently assessed as an overall pass, then the condoned pass credits will be awarded, with no further module condonement available in subsequent levels of the course.

###### 19 Indicators of quality and standards

Reports of validation panels

Annual course reviews

Annual evaluation report

External examiners’ reports

Qualifications and experience of staff

Report on University Review

The programme will be offered for accreditation by the British Computer Society for graduates to enter BCS’s professional entry examinations (CITP) and to obtain the (partial or full) status of Chartered Engineer (CEng) / Chartered Scientist (CSci). Accreditation will normally constitute quinquennial external audit/review.

In the periods between professional institution accreditation visits, quality will be monitored and maintained via the external examining system. The teaching quality of staff responsible for delivering course modules will be assured by a mandatory FHEA requirement. An additional quality indicator will be the significant involvement in the delivery of the programme of staff contributing to Research Excellence Framework submissions.

**Please note: 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 each module can be found in the study module guide(s) and course handbook. The accuracy of the information contained in this document is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.**

**Key sources of information about the course can be found in:**

* Student Handbook (Issued yearly)
* University of Huddersfield Student Handbook of Regulations (issued yearly)
* University of Huddersfield Prospectus (issued yearly)
* University website ([http://www.hud.ac.uk](http://www.hud.ac.uk/))
* School of Computing and Engineering external web site (<http://www.hud.ac.uk/ce/>)
* School of Computing and Engineering intranet (<http://intranet.hud.ac.uk/ce-student/>), containing Year Handbooks and Module Specifications.

###### APPENDIX A Staffing and Management

**Management of Programmes**

The management structure for the BSc (Hons) Computer Science with IoT course operates within the Department of Informatics within the School of Computing and Engineering.

**Course Committee**

The Course will be under the overall management of the Course Committee which meets at least once per term and is responsible for any decisions concerning the suitability of modules for inclusion on the Course. The chair of that Committee is normally the Subject Area Leader (SAL). The SAL will implement policies and decisions of that committee and be responsible for overseeing the day to day running of the course in collaboration with the Course Leader. Feedback from student representatives is a standing item on the agenda.

**Course Leaders** are responsible to the Course Committee for the proper management and monitoring of each year of the Course. They will be responsible for advising students of their choice of modules and for support, guidance and counseling when appropriate. The Individual Project tutor is responsible for the co-ordination and administration of the final year project. They will be responsible for allocating project supervisors to each student and will co-ordinate and oversee the assessment of the project.

**Module Leaders** will arrange and co-ordinate the teaching programme for the module(s) for which they are responsible, and maintain appropriate records. Module leaders meet on a regular basis with the teaching team involved in the delivery of the module and with the Course Leader. The Module Leader also seeks feedback from student representatives regarding the module. Module Leaders prepare annual reports for the modules for which they are responsible and which subsequently feeds into the Annual Evaluation process.

**Personal Tutors** are allocated to all first year students by the Course Leader and are retained in Years 1, 2 and 3. In the final year it is the project supervisor.

**Admissions Officer** is responsible, through the Course Leader, to the Course Committee for the proper processing of all applications for admission to the Course.

###### APPENDIX B Mapping of Learning Outcomes to Modules

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **BSc (Hons)/BSc Computer Science with Internet of Things** | **Year 1** | CFS2160 | CFM2175 | CFS2101 | CFS2102 | CFP2125 | **Year 2** | CIS2360 | CIS2206 | NIE2206 | CIS2205 | CII2350 | **Year 3** | CSP2010 | CSP2020 | **Year 4** | CHS2546 | CHP2524 | CHS2403 |
| 2.1.1 Knowledge and understanding of facts, concepts, principles & theories |  | \* | \* | \* | \* | \* |  | \* | \* | \* | \* |  |  |  |  |  | \* | \* | \* |
| 2.1.2 Use of such knowledge in modelling and design |  | \* |  |  |  | \* |  | \* | \* | \* | \* | \* |  |  |  |  | \* | \* | \* |
| 2.1.3 Problem solving strategies |  | \* | \* |  |  |  |  |  | \* | \* | \* |  |  |  |  |  | \* |  | \* |
| 2.1.4 Analyse if/how a system meets current and future requirements |  |  |  |  | \* | \* |  | \* | \* | \* | \* | \* |  |  |  |  | \* | \* | \* |
| 2.1.5 Deploy theory in design, implementation and evaluation of systems |  | \* |  |  |  | \* |  | \* |  |  |  | \* |  |  |  |  | \* | \* |  |
| 2.1.6 Recognise legal, social, ethical & professional issues |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 2.1.7 Knowledge and understanding of commercial and economic issues |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 2.1.8 Knowledge of management techniques to achieve objectives |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 2.1.9 Knowledge of information security issues |  |  |  |  | \* |  |  | \* |  |  |  |  |  |  |  |  | \* |  | \* |
| 2.2.1 Specify, design or construct computer-based systems |  | \* |  | \* | \* | \* |  | \* | \* |  | \* | \* |  |  |  |  | \* | \* | \* |
| 2.2.2 Evaluate systems in terms of quality and trade-offs |  |  |  |  |  | \* |  |  |  | \* | \* | \* |  |  |  |  |  | \* | \* |
| 2.2.3 Recognise risk/safety for safe operation of computing equipment |  |  |  |  | \* |  |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 2.2.4 Deploy tools effectively |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  | \* | \* |  |
| 2.3.1 Work as a member of a development team |  |  |  |  |  | \* |  |  |  |  |  | \* |  | \* | \* |  |  |  |  |
| 2.3.2 Development of general transferable skills |  | \* | \* | \* | \* | \* |  | \* | \* |  | \* | \* |  | \* | \* |  | \* | \* | \* |
| 3.1.1 Deploy systems to meet business goals |  |  |  |  |  | \* |  | \* |  |  |  |  |  |  |  |  |  | \* | \* |
| 3.1.2 Methods, techniques and tools for information modelling, management and security |  |  |  |  | \* | \* |  | \* |  |  | \* |  |  |  |  |  | \* |  | \* |
| 3.1.3 Knowledge of systems architecture |  | \* |  | \* | \* |  |  | \* |  | \* | \* |  |  |  |  |  | \* | \* | \* |
| 3.2.1 Specify, deploy, verify and maintain information systems |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  | \* | \* |  |
| 3.2.2 Defining problems, managing design process and evaluating outcomes |  |  |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 3.2.3 System Design |  |  |  |  |  | \* |  | \* |  |  |  |  |  |  |  |  |  | \* | \* |
| 4.1.1 Knowledge and understanding of scientific and engineering principles |  | \* | \* | \* | \* | \* |  | \* | \* | \* | \* | \* |  |  |  |  | \* | \* | \* |
| 4.1.2 Knowledge and understanding of mathematical principles |  |  | \* |  |  |  |  |  | \* |  | \* |  |  |  |  |  |  | \* |  |
| 4.1.3 Knowledge and understanding of computational modelling |  |  |  |  |  |  |  |  | \* |  | \* |  |  |  |  |  |  |  |  |
| 4.2.1 Specify, deploy, verify and maintain computer-based systems |  | \* |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  | \* | \* |  |
| 4.2.2 Defining problems, managing design process and evaluating outcomes |  | \* |  |  |  | \* |  |  |  |  |  | \* |  |  |  |  |  | \* |  |
| 4.2.3 Principles of appropriate supporting engineering and scientific disciplines |  |  |  |  |  |  |  |  | \* |  | \* |  |  |  |  |  |  |  |  |
| 5.1 Application of practical and analytical skills |  | \* |  |  |  | \* |  | \* | \* |  | \* | \* |  | \* | \* |  | \* | \* | \* |
| 5.4 Awareness of wider customer contexts |  |  |  |  |  | \* |  |  |  |  |  | \* |  | \* | \* |  |  | \* |  |

###### APPENDIX C Assessment Strategy and Schedule

**YEAR ONE – FOUNDATION LEVEL MODULES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module**  **Code** | **Module Title** | **Assessment Weighting** | | | **Assessment Strategy and Indicative Schedule** |
| **Exam** | **C/W** | |
| **practical** | **other** |
| CFS2160 | Software Design & Development | 40 | 60 |  | In-class test in guidance week of every term  Portfolio of work in Weeks 12 and 24 |
| CFM2175 | Computing Science and Mathematics | 10  90 |  |  | Four online quizzes, in Weeks 3, 6, 9 and 12  End of term 2-hour exam |
| CFS2102 | Computer Network Fundamentals | 50 | 50 |  | Week 18: 1 hour in-class test  Week 24: Coursework |
| CFP2125 | Project 1 |  |  | 100 | Portfolio comprised of three components: group artefact conceptualisation (30%, Week 18), individual time-boxed activities (20%, Week 18), and group application development (50%, Week 24) |
| CFS2101 | Computer Organisation and Architecture | 50 | 50 |  | Week 6: 1 hour in-class test  Week 12: Coursework |

**YEAR TWO – INTERMEDIATE LEVEL MODULES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module**  **Code** | **Module Title** | **Assessment Weighting** | | | **Assessment Strategy** |
| **Exam** | **C/W** | |
| **practical** | **other** |
| CIS2206 | Algorithms and Data Structures | 40 | 60 |  | In-class test in week 6  Portfolio of programming and theoretical exercises (week 12) |
| NIE2206 | Embedded Systems | 30 |  | 70 | Week 12: In-class test  Week 24: Lab log book  Week 24: Project portfolio |
| CIS2360 | Relational Databases and Web Integration |  | 50  50 |  | Week 6: Relational Database  Week 12: Web Front-end |
| CII2350 | Team Project |  |  | 20/20/  60 | Week 12: Team proposal which outlines aims and objectives, team roles, time planning projections, project management, and deliverables  Week 13: Showcase - small intensive team project based on an industrial brief  Week 24: Final product supported with team management documentation and peer assessment forms |
| CIS2205 | Introduction to Artificial Intelligence |  | 50  50 |  | Week 6: Coursework on basic symbolic AI  Week 12: Coursework on basic sub-symbolic/statistical AI |

**YEAR 4 – HONOURS LEVEL MODULES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module**  **Code** | **Module Title** | **Assessment Weighting** | | | **Assessment Strategy** |
| **Exam** | **C/W** | |
| **practical** | **other** |
| CHS2546 | Distributed and Client Server Systems |  | 50  50 |  | Week 6: Analysis, design, implementation and testing of a secure distributed information system  Week 12: Design, development and evaluation of a client-server system |
| CHP2524 | Individual Project |  | 100 |  | Week 24: Project report and presentation/demo |
| CHS2403 | IoT and Cyber Physical Systems |  | 50  50 |  | Week 18: In-class test  Week 24: Written assignment |

###### APPENDIX D Mapping of Learning Outcomes to Computing Benchmark Outcomes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nature and extent of Computing** | **Subject-specific and generic skills** | **Teaching, learning and assessment** | **Professional practice** |
| 2.1.1 Knowledge and understanding of facts, concepts, principles & theories | \* | \* |  |  |
| 2.1.2 Use of such knowledge in modelling and design |  | \* |  |  |
| 2.1.3 Problem solving strategies | \* |  | \* |  |
| 2.1.4 Analyse if/how a system meets current and future requirements |  | \* | \* |  |
| 2.1.5 Deploy theory in design, implementation and evaluation of systems |  | \* |  |  |
| 2.1.6 Recognise legal, social, ethical & professional issues | \* | \* | \* | \* |
| 2.1.7 Knowledge and understanding of commercial and economic issues | \* |  | \* | \* |
| 2.1.8 Knowledge of management techniques to achieve objectives |  | \* |  |  |
| 2.1.9 Knowledge of information security issues |  | \* |  | \* |
| 2.2.1 Specify, design or construct computer-based systems |  | \* | \* |  |
| 2.2.2 Evaluate systems in terms of quality and trade-offs |  |  | \* |  |
| 2.2.3 Recognise risk/safety for safe operation of computing equipment |  | \* |  | \* |
| 2.2.4 Deploy tools effectively |  | \* |  |  |
| 2.3.1 Work as a member of a development team | \* | \* |  | \* |
| 2.3.2 Development of general transferable skills | \* |  | \* |  |
| 3.1.1 Deploy systems to meet business goals | \* |  | \* |  |
| 3.1.2 Methods, techniques and tools for info modelling, management and security | \* | \* |  | \* |
| 3.1.3 Knowledge of systems architecture | \* | \* | \* |  |
| 3.2.1 Specify, deploy, verify and maintain information systems | \* | \* |  |  |
| 3.2.2 Defining problems, managing design process and evaluating outcomes | \* | \* |  |  |
| 3.2.3 System Design | \* | \* |  |  |
| 4.1.1 Knowledge and understanding of scientific and engineering principles | \* | \* |  |  |
| 4.1.2 Knowledge and understanding of mathematical principles | \* | \* |  |  |
| 4.1.3 Knowledge and understanding of computational modelling | \* | \* |  |  |
| 4.2.1 Specify, deploy, verify and maintain computer-based systems |  | \* |  |  |
| 4.2.2 Defining problems, managing design process and evaluating outcomes |  | \* | \* |  |
| 4.2.3 Principles of appropriate supporting engineering and scientific disciplines | \* | \* | \* |  |
| 5.1 Application of practical and analytical skills |  |  | \* |  |
| 5.4 Awareness of wider customer contexts | \* |  |  | \* |

###### APPENDIX E Personal Development Planning (PDP)

|  |  |  |  |
| --- | --- | --- | --- |
| Competencies | Course Year | Areas where addressed | Evidence |
| Personal (including Communication Skills, Time Management and Self Organisation, Independent Learner and Group Working) | Year 1 | * CFP2125 Project 1 * CFS2160 Software Design & Development * Personal Academic Tutor (PAT) PDP process | * Group assignment and poster for CFP2125 * Individual time-boxed activities for CFP2125 * Portfolio for CFS2160 * Completed notes from PAT PDP process |
|  | Year 2 | * CII2350 Team Project * CIS2206 Algorithms and Data Structures * PAT PDP process | * Team proposal, showcase and product for CII2350 * Portfolio for CIS2206 * Completed notes from PAT PDP process |
|  | Year 3 | * Professional Placement (CSP2010/CSP2020) * PAT PDP process | * Experience gained through placement work * Formal reports for CSP2010/CSP2020 * Completed notes from PAT PDP process |
|  | Year 4 | * CHP2524 Individual Project * PAT PDP process | * CHP2524 poster, demo and report * Completed notes from PAT PDP process |
| Career Planning | Year 2 | * CII2350 Team Project * PAT PDP process | * Experience gained through working on a real-world industry brief for CII2350 showcase * Completed notes from PAT PDP process |
| Year 3 | * Professional Placement (CSP2010/CSP2020) | * Formal reports for CSP2010/CSP2020 |
| Year 4 | * Personal session with careers guidance officer – recommended * PAT PDP process | * Personal research into professional competencies required for chosen career area. * Completed notes from PAT PDP process. |
| Professional (Analytical, Practical, Technical & Managerial Skills) | All Years | * All modules * PAT PDP process – further competence areas to be selected by the students as part of the PDP process throughout the studies | * Formal reports, portfolios, grades and feedback * Examination results * Completed notes from PAT PDP process |