Degree Programme Specifications

Updates for Informatics UG degrees

6 Aug 2021

Background and overview for Board of Studies members

What is a DPS and why are we updating them?

The UK Quality Assurance Agency expects all higher education institutions to maintain a programme specification for all UG and PG degrees, which provides the **definitive record of a programme, providing its intended aims and learning outcomes, and how students will achieve them.**

The DPS is a public document, available in DRPS and to prospective students and employers.

Our UG programme specifications have not been updated since 2012, so it was high time for a review. The immediate impetus for these updates is the BCS accreditation visit for the BEng Computer Science degree (the only degree for which the School is now pursuing accreditation). BCS requires us to provide a DPS, and the DPS from 2012 was significantly out of date.

Which DPSs are being updated?

Since the DPSs for most of our degrees are very similar, we have taken the opportunity to review and update the DPSs not just for the BEng in CS, but for all UG degrees that are not joint with other Schools, i.e.,

- BSc and BEng degrees in Computer Science
- BSc Artificial Intelligence
- BSc Artificial Intelligence and Computer Science
- BSc Software Engineering
- MInf Informatics

The BSc in AI&SE will close in 22/23 after graduating its final students, so does not require updates.

We have not reviewed the DPSs for our joint degrees (including Cognitive Science); this may be done as part of the Internal Programme Review in the coming year.

What is in the rest of this document?

This document provides the updated text of the DPSs, drafted by the DDoLT(curriculum) with assistance from other members of Teaching Exec, and **already approved by convenor action.** The updated DPSs reflect what we are doing already in our degrees, so they should not be controversial.

However, we encourage members of teaching staff to review this document as a reminder of the aims and outcomes of our programmes. Aside from the External Summary, the text for all degrees is nearly identical.

We use the UoE templates for degree programme specifications.

Updates to administrative information

Most of the administrative information at the top of the DPS for all six degrees will remain the same: in particular, the Awarding institution, Teaching institution, Final award, Programme title, UCAS code, QAA subject, and Further Information.

The following fields will be updated:

- **Programme accredited by**
  - For BEng Computer Science, update to "BCS, the Chartered Institute for IT"
  - For the other five degrees, update to "not applicable"
- **Postholder with overall responsibility for QA**
  - For all six degrees, update from "John Longley" to "School of Informatics Quality Assurance Officer".

External summary

For CS degrees (BEng and BSc)

Computer Science as a discipline is concerned with understanding, designing, implementing and using computational systems. Its practitioners are at the heart of developing and maintaining computer systems and applications that we use daily. Computer scientists also collaborate with scientists and innovators in other fields, providing technical contributions to support the modelling and management of complex data and to solve difficult problems.

Like all programmes offered by the School of Informatics at Edinburgh, this programme aims to educate the next generation of leaders in industry and research by providing a solid foundation of theoretical principles as well as a breadth of practical experience developing both user-centred applications and more technical code for computer systems and specialist applications. We expect our graduates to have well-developed academic and professional skills and values, which will prepare them for a range of computing-related careers.

For SE degree

Software Engineering as a discipline is concerned with understanding, designing, implementing and using software systems. Its practitioners are involved in developing and maintaining software systems and applications that we use daily. Software Engineers also collaborate with scientists and innovators in other fields, providing support for the modelling and management of complex data and software to help solve difficult problems.

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For AI degree

Artificial Intelligence as a discipline is concerned with understanding, designing, implementing and using computational systems to perform tasks that simulate intelligent behaviour, such as decision-making, prediction, natural language communication, or sensing and acting in the world. Its practitioners are involved in developing and maintaining applications we use daily; they also collaborate with scientists and innovators in other fields, providing technical contributions to support the modelling and analysis of complex data and to solve difficult problems.

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For AI&CS degree

Computer Science as a discipline is concerned with understanding, designing, implementing and using computational systems. Artificial Intelligence focuses specifically on computational systems intended to perform tasks that simulate intelligent behaviour, such as decision-making, prediction, natural language communication, or sensing and acting in the world. Practitioners of both fields are involved in developing and maintaining applications we use daily; they also collaborate with scientists and innovators in other fields, providing technical contributions to support the modelling and analysis of complex data and to solve difficult problems. Graduates of the Artificial Intelligence and Computer Science programme gain specialist knowledge in AI as well as other areas of Computer Science.

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For MInf degree

Informatics is the study of the structure, behaviour, and interactions of natural and engineered computational systems, focussing on the representation, processing, and communication of information. In natural and artificial systems, information is carried at many levels, ranging, for example, from biological molecules and electronic devices through nervous systems and computers and on to societies and large-scale distributed systems. As a discipline, Informatics combines the science of information and the engineering of information systems.

The MInf Informatics is a five-year programme that shares with the School's other programmes the mathematical and computational foundations necessary to understand, implement, or simulate all types of computational systems. In later years, it allows students flexibility to study, and specialize in, a range of topics within Informatics, such as theoretical computer science, computer systems, artificial

intelligence, computational approaches to natural cognition, and biological and social computation. This combination of depth and breadth means that students educated in Informatics are well-placed for careers in designing, implementing, maintaining, and evaluating the computational systems and applications that we use daily. Practitioners may also collaborate with scientists and innovators in other fields, providing technical contributions to support the modelling and analysis of complex data and to solve difficult problems.

Like all programmes offered by the School of Informatics at Edinburgh, this programme aims to educate the next generation of leaders in industry and research by providing a solid foundation of theoretical principles as well as a breadth of practical experience developing both user-centred applications and more technical code for computer systems and specialist applications. We expect our graduates to have well-developed academic and professional skills and values, which will prepare them for a range of computing-related careers.

Educational aims of the programme

For all six degrees

This degree programme aims to:

- provide students with a solid foundation in the core knowledge and skills of a computer scientist, including mathematics, algorithms and theory of computing, programming and software engineering, and data modelling and analysis.
- give students the opportunity to study a broad range of topics in their degree area, and encourage them to explore connections between those topics.
- give students the opportunity to study chosen topics in considerable depth, to provide the knowledge and skills needed for specialized industry positions or to enter research programmes.
- develop students' practical problem-solving skills in a range of application areas.
- develop students' skills in independent learning and research, to prepare them for an ever-changing technical landscape, while emphasizing core unchanging principles of computing.
- develop students' ability to critically evaluate computing systems along multiple dimensions (e.g., technical, ethical, social).
- provide students with additional transferable skills, such as the ability to communicate technical information in a variety of modalities, and to work in teams.

Programme outcomes: Knowledge and understanding

For CS, SE, and MInf degrees

Graduates of the programme will have knowledge and understanding of:

- the concept of abstraction and its importance in the design of computational systems.
- the nature of algorithms and their complexity, and a variety of standard algorithms and data structures.

- a variety of programming languages, and the ways that languages can differ from each other.
- the software development process, and common tools used as part of it.
- how data is used in computational systems, including predictive and analytic systems.
- the underlying mathematical concepts which allow computer scientists to reason about computers and computer-based systems.
- the principles of how computers operate, from application programs down through system software to hardware.
- the principles of computer security and risk mitigation.
- social, professional, ethical and legal issues involved in the use of computational systems.
- a range of specialized topics related to computer systems, software, theory, and/or applications.

For AI degree. Replace the final four bullets in the CS version (above) with:

- a range of approaches to, and applications of, intelligent systems, including some specialized topics.
- social, professional, ethical and legal issues involved in the use of computational (and especially intelligent) systems.

For AI&CS degree. Add one more bullet to the end of the CS version:

- a range of approaches to, and applications of, intelligent systems, including some specialized topics.

Programme outcomes: Graduate attributes - Skills and abilities in research and enquiry

For all six degrees

Completing this degree programme will enable students to:

- research topics using appropriate sources of information.
- critically analyse data and evaluate claims based on data.
- synthesize multiple sources of information to identify key points.
- analyse and solve problems in a variety of ways, such as by reducing them to essential characteristics or by developing data-driven models.
- identify trade-offs in different solutions to a problem.
- use and develop software to collect, analyse, and synthesise information.
- carry out a sustained project requiring background research and/or requirements gathering, followed by analysis, design, development, and evaluation.

Programme outcomes: Graduate attributes - Skills and abilities in personal and intellectual autonomy

For all six degrees

Completing this degree programme will enable students to:

- solve problems independently and as part of a group.

- learn independently from a variety of information sources and identify appropriate sources as needed.
- identify social, legal, and ethical issues and risks associated with a particular system or solution.
- weigh trade-offs in the design or implementation of a system and decide or advise on the best approach.

Programme outcomes: Graduate attributes - Skills and abilities in communication

For all six degrees

Completing this degree programme will enable students to:

- work effectively as part of a development team.
- communicate effectively through a variety of media including oral, visual, written, diagrammatic and on-line.
- justify choices made in the design or implementation of a computational system.

Programme outcomes: Graduate attributes - Skills and abilities in personal effectiveness

For all six degrees

Completing this degree programme will enable students to:

- organize their workload and manage their time when working independently, and complete complex tasks under deadline pressure.
- plan and complete a substantial project.
- manage uncertainty (e.g., by identifying risk mitigation strategies).
- take creative and innovative approaches to solve problems.

Programme outcomes: Technical/practical skills

For CS, SE, and MInf degrees

Completing this degree programme will enable students to:

- develop and implement computer systems, including programs in a range of programming languages (e.g. Java, Haskell, Python) and paradigms (e.g. procedural, functional, object-oriented).
- make well-informed and sensible decisions when designing and implementing computer systems.
- make effective use of a wide range of state-of-the-art tools and techniques for the specification, design, implementation and evaluation of computer-based systems.
- apply appropriate tools and techniques to manage and model information.
- master new programming languages and technologies quickly as the need arises.
- Identify and explain issues and tradeoffs related to security, privacy, and/or bias in the design and use of computer systems.

For AI degrees

Replace this bullet in the list above:

- make well-informed and sensible decisions when designing and implementing computer systems.

with:

- make well-informed and sensible decisions when designing and implementing AI systems.

For AI&CS degree

Replace this bullet in the list above:

- make well-informed and sensible decisions when designing and implementing computer systems.

with:

- make well-informed and sensible decisions when designing and implementing computer-based (including AI) systems.

Programme structure and features

For all six degrees

All single honours degree programmes in the School of Informatics follow a similar structure:

First year: Students on all programmes take the same set of Informatics and Mathematics courses in their first year, which introduce foundational concepts of mathematics, computation, and programming. In addition, first year students fulfil one third of their credit points by taking outside courses (options from across the University).

Second year: Courses build on the first year foundation, covering additional mathematics as well as data modelling and analysis, reasoning, algorithms and data structures, computer architecture, and software engineering. Most of these courses are compulsory for all degree programmes. On programmes where not all the courses are compulsory, students may take the remaining credits from Informatics courses or choose courses from other Schools.

Third year: Students take a mixture of compulsory and optional courses, and complete both an individual and a team-based project. Optional courses within Informatics include topics from computer systems, theory, software engineering, and artificial intelligence; students must take most of their credits from within their own degree programme area, but some optional courses can be chosen from other Informatics areas or from courses in other Schools.

Fourth year: Students complete an honours project supervised by a member of staff. The project extends over the whole year and typically involves elements of research or original thinking. Students choose their remaining credits from a large pool of optional courses. As in the third year, some of the optional course credits can be filled using Informatics courses outside the degree area, or from courses in other Schools.

Social and professional issues are discussed in several of the compulsory courses throughout the degree, as well as in many optional courses.

For formal definitions, including details of compulsory and optional course choices, consult the Degree Programme Table.

Teaching and learning methods and strategies

For all six degrees

Teaching is delivered through a variety of timetabled activities (lectures, tutorials, workshops, and practical laboratory sessions). Additional support for learning is available from drop-in help sessions for some courses, and (especially in the early years) from School-supported peer learning groups and drop-in tutor hours.

Most courses provide learning materials online. Materials typically include lecture notes and formative exercises. Theoretical exercises are typically reviewed or discussed in tutorial sessions, while practical exercises may be done independently or during scheduled labs. In-class or online quizzes may be used to provide students with the opportunity to assess their own understanding, and lecture recordings may be provided either as the primary delivery method for that material or for revision purposes.

Practical skills in programming are developed via extensive coursework exercises in the early years using a range of programming languages, and through courses that focus on software engineering skills, working both individually and in groups. Many courses in the later years further develop these skills through practical work focused on particular topics within the degree.

Students are expected to spend a significant amount of time on independent study outside of scheduled activities, and to supplement the materials provided with their own notes. Independent study activities include working on formative or summative coursework and exercises, reading textbooks or lecture notes, participation in online class forums, watching lecture recordings, identifying and reading supplementary materials, and (especially in the later years) undertaking research.

Assessment methods and strategies

For all six degrees

Methods of assessment of intended learning outcomes include written examinations, online programming examinations and summative course work assignments. Students complete individual and group projects as part of their degree programme, culminating in the honours project in the final year.

The final honours degree classification of the programme is based equally on performance in third and fourth years. Degrees are classified according to the University's standard marking scale with boundaries at 70%, 60%, 50% and 40%. Students can be awarded an ordinary degree on the basis of their third year marks.

Career opportunities

For all six degrees

Employers across many fields place a high premium on graduates with knowledge of computer science and skills in programming, software engineering, and data science. Our graduates can choose from a wide range of opportunities in industry, government, or non-profit organisations, with positions such as software engineer, data scientist, or project manager. Those with entrepreneurial interests may join or found a start-up or do consulting work, while others choose to pursue work in education or civil service. Our graduates are also well-prepared for postgraduate study, to advance a career in research or academia.