

Programme Specification

**Title of Course: BSc (Hons) Mathematics**

**Date Specification Produced: July 2017**

**Date Specification Last Revised: July 2018**

# SECTION 1: GENERAL INFORMATION

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| **Title:** | BSc (Hons) Mathematics |
| **Awarding Institution:** | Kingston University |
| **Teaching Institution:** | Kingston University |
| **Location:** | Penrhyn Road Campus |
| **Programme Accredited by:** | The Institute of Mathematics and its Applications |

# SECTION2: THE PROGRAMME

## Programme Introduction

Mathematics is an ancient subject but one whose applications are at the heart of the latest developments in virtually every aspect of our lives. For example, Google is continually updating the mathematics its search engine uses to identify and rank, sometimes hundreds of millions of, webpage hits in a fraction of a second – it now uses artificial intelligence (which may be studied in the final year of this programme). Google does not reveal details of precisely the methods that it employs – the mathematics is far too valuable for that – but they are based on the same underlying mathematical principles as are taught in this programme.

The course is an exciting applications-focussed Mathematics programme with the curriculum oriented towards potential career opportunities. Since the applications of mathematics permeate every aspect of the modern world, a mathematics degree offers a vast range of career opportunities. In the past our graduates have found employment in a wide range of areas including IT, pharmaceuticals, retail management, insurance, banking, accountancy, defence industry, the National Health Service, energy industry, education, transport, local and national government service as well as research, further study and teaching. These opportunities remain open but, with regard to specific areas of employment, the content of the programme is particularly directed towards the finance sector (currently the largest employment sector for mathematics graduates) and the data analysis field (the area that is expanding most rapidly at present) – ensuring that there should be strong demand for graduates from the programme.

The course constitutes a coherent, academically sound programme of study covering the fundamental modern mathematical and statistical methods required to solve scientific or business problems, together with the development of computing and analytical skills. A successful student will, by the very nature of the course, have acquired specialist knowledge useful for the investigation and solution of quantitative problems in commerce and industry and have developed highly valued logical and analytical thought processes. In addition there is a strong focus on setting the application of mathematics in context – providing students with relevant commercial and social awareness and appropriate professional skills for their future career development. Embedded throughout the provision are opportunities for the development of a range of key skills (in areas such as communication, teamwork, time and task management, and research) which are essential for future employment or further study.

The course is delivered by highly experienced and qualified expert staff, all with doctorates in their fields of expertise, and who also have a long-standing reputation for providing a supportive learning environment for students. The overarching ethos of the delivery is that students should be engaged in active learning wherever possible. A largely problem-centred learning approach is adopted, whereby students begin with the problems of interest and learn the necessary theory and techniques required to solve them. Within this environment traditional lectures are rare, the majority of class sessions being in workshop or tutorial format. Many of the problems considered, particularly those which are assessed, come from fascinating real-world applications. In order to facilitate the investigation of such problems, as well as mirror the situation in employment, extensive use is made of computational support. Students gain generic computing skills as well as experience of a variety of up to date professional, industry-standard software packages deployed on the university’s modern computing facilities. The format of assessments is varied - although there are some traditional tests and examinations, there is also an emphasis on more authentic assessments. For example, students investigate case-studies, individually and in groups, writing reports and giving oral presentations. Typically they produce simulations, posters, videos, schedules/quotations for customers, write articles, etc. In this way, as they progress through the course, students assemble a portfolio of tangible outputs which evidence, explicitly, the knowledge and skills they have gained and which may be used to demonstrate their capabilities to future employers.

Fundamental to the course curriculum is a theme developing, predominantly calculus based, techniques with applications modelling the real world. Also of key importance is a theme integrating mathematical and professional skills, culminating in students undertaking a substantial piece of independent study requiring research skills and drawing together strands from their earlier study, taking their communication skills to new levels and allowing them to design and create solution implementations or other appropriate artefacts. A distinctive feature of this theme is that students from this course work in groups together with students from other (IT-based) disciplines on real world case-studies, developing their own professional skills and awareness of their place in the wider professional world. Accompanying these is a data analysis strand with options to extend this or develop expertise in mathematics applied to finance – giving graduates a head start in these important employment markets.

The Mathematics degree course is accredited by the Institute of Mathematics and its Applications (IMA), the largest UK professional body representing mathematicians in academia, business and industry. Undergraduates may join the IMA as e-students for free or as full student members to receive publications including a journal which incorporates careers information and advertisements as well as news and articles. The IMA has also traditionally awarded annual prizes to the best graduates in the Mathematics programmes at Kingston. As a result of the IMA accreditation, when students graduate they receive a vocational qualification which enables graduates with appropriate work experience to apply for Chartered Mathematician (and Chartered Scientist) status.

## Aims of the Field/Course

The overarching aim of the Mathematics degree course is to offer opportunities to students from a wide range of backgrounds to realise their potential, enabling them to develop the mathematical knowledge and skills necessary to analyse and solve problems in the real world and preparing them to make a positive contribution to the society in which they live.

Specifically the aims of the Mathematics full field are to develop students’ abilities to:

a. attain a sound knowledge of the underlying concepts and practical skills in the mathematical sciences in order to understand and apply them to a range of problems in business, science or engineering;

b. identify, understand and exploit relationships between the various subject areas in the mathematical sciences they have studied;

c. seek, use and communicate relevant information effectively in oral, visual and written forms;

d. solve problems effectively both in groups and individually, and to work for and with non-mathematicians in situations requiring inter-disciplinary collaboration;

e. model real-world situations mathematically, identifying where assumptions and approximations may need to be made, evaluating solutions and refining or modifying the models when necessary;

f. develop and extend their knowledge in the mathematical sciences and their practical applications through guided and independent learning, in preparation for graduate employment and further professional and academic qualifications.

## Intended Learning Outcomes

The field/course provides opportunities for students to develop and demonstrate knowledge and understanding specific to the subject, key skills and graduate attributes in the following areas. The programme outcomes are referenced to the QAA subject benchmarks for Mathematics Statistics and Operational Research (2015) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student.

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| **Programme Learning Outcomes** |
|  | **Knowledge and Understanding**On completion of the course students will be able to: |  | **Intellectual Skills**On completion of the course students will be able to: |  | **Subject Practical Skills**On completion of the course students will be able to: |
| A1 | identify the required mathematical techniques relevant to addressing a variety of problems | B1 | display mastery of a range of analytical and numerical mathematical techniques including the appropriate underpinning theory | C1 | use appropriate software effectively to assist with the solution of mathematical problems. |
| A2 | show understanding of the need to make assumptions and approximations when formulating real-world problems in forms suitable for mathematical treatment  | B2 | apply a modelling cycle methodology to a range of real-world problems | C2 | present mathematics in a clear form using a variety of formats. |
| A3 | identify the range of applicability of their mathematical models to real-world problems | B3 | display the ability to work collaboratively with specialists from other disciplinary fields  | C3 | convey mathematical solutions and logical arguments in a comprehensible manner to diverse audiences |
| A4 | demonstrate awareness and understanding of key issues (ethical, legal, social, professional) relating to employment in the modern world. | B4 | identify relevant computer applications, to assist in the solution of problems. | C4 | work independently on projects, demonstrating effective mathematical, research and reporting skills. |
|  |  | B5 | construct logically coherent arguments and distinguish such from fallacious ones, both in mathematical reasoning and in everyday life. |  |  |

In addition to the programme learning outcomes identified overleaf, the programme of study defined in this programme specification will allow

students to develop a range of Key Skills as follows:

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| **Key Skills** |
| **Self Awareness Skills** | **Communication Skills** | **Interpersonal Skills** | **Research and information Literacy Skills** | **Numeracy Skills** | **Management & Leadership Skills** | **Creativity and Problem Solving Skills** |
| Take responsibility for own learning and plan for and record own personal development | Express ideas clearly and unambiguously in writing and the spoken work | Work well with others in a group or team | Search for and select relevant sources of information | Collect data from primary and secondary sources and use appropriate methods to manipulate and analyse this data | Determine the scope of a task (or project) | Apply scientific and other knowledge to analyse and evaluate information and data and to find solutions to problems |
| Recognise own academic strengths and weaknesses, reflect on performance and progress and respond to feedback | Present, challenge and defend ideas and results effectively orally and in writing | Work flexibly and respond to change | Critically evaluate information and use it appropriately | Present and record data in appropriate formats | Identify resources needed to undertake the task (or project) and to schedule and manage the resources | Work with complex ideas and justify judgements made through effective use of evidence |
| Organise self effectively, agreeing and setting realistic targets, accessing support where appropriate and managing time to achieve targets | Actively listen and respond appropriately to ideas of others | Discuss and debate with others and make concession to reach agreement | Apply the ethical and legal requirements in both the access and use of information | Interpret and evaluate data to inform and justify arguments | Evidence ability to successfully complete and evaluate a task (or project), revising the plan where necessary | Work independently with patience and persistence, pursuing the solution of a problem to its conclusion |
| Work effectively with limited supervision in unfamiliar contexts |  | Give, accept and respond to constructive feedback | Accurately cite and reference information sources | Be aware of issues of selection, accuracy and uncertainty in the collection and analysis of data | Motivate and direct others to enable an effective contribution from all participants | Transfer knowledge and skills appropriately from one context to another |
|  |  | Show sensitivity and respect for diverse values and beliefs | Use software and IT technology as appropriate |  |  |  |

## Entry Requirements

The minimum entry qualifications for the programme are:

From A levels: 112 UCAS points including at least grade C in Mathematics A2

BTEC National: Normally only appropriate if accompanied by Mathematics A2 GCE

Access Diploma: Pass in Access to HE Diploma containing at least 40% credit in Mathematics at level 3

Plus: GCSE (A\*–C): minimum of five subjects including English Language and Mathematics.

A minimum 6.0 (with at least 5.5 in each component), in Academic IELTS, or equivalent is required for those for whom English is not their first language.

## Field/Course Structure

This programme is offered in full-time and part-time modes and leads to the award of BSc (Hons) Mathematics. Entry is normally at Level 4 with A-level or equivalent qualifications (See section D). Transfer from a similar course is possible at Level 5 with passes in comparable Level 4 modules and at Level 6 with passes in comparable modules at Levels 4 and 5 but is at the discretion of the Course Director. Intake is normally in September.

### E1. Professional and Statutory Regulatory Bodies

The Institute of Mathematics and its Applications

### E2. Work-based learning, including sandwich courses

KU Talent; the University’s career service, has a specific team for the faculty that helps source industrial placements. Placement specialists within the KU Talent team help students throughout the application process, with support interviews and throughout the transition to work, for example, with mock interview sessions, CV workshops, careers fairs and industry speakers on employers’ needs. The team monitors the student whilst in industry. Placement students are visited whilst in industry by a network of academics who act as individual placement tutors.

Work placements are actively encouraged – although it is the responsibility of individual students to source and secure such placements. This allows students to reflect upon their own personal experience of working in an applied setting, to focus on aspects of this experience that they can clearly relate to theoretical concepts and to evaluate the relationship between theory and practice.

### E3. Outline Programme Structure

*BSc (Hons) Mathematics*

 **LEVEL 4 LEVEL 5 LEVEL 6**

MA5500 Applications of Calculus and Linear Systems

**INDUSTRIAL PLACEMENT**

MA6500 Advanced Mathematical Methods and Models

MA4500 Mathematical Methods and Modelling of Applications

MA4550 Practical Data Analyst Skills

Level 6 option

MA5550 Modelling Real-World Data with Statistics

Level 6 option

MA5510 Mathematics of Finance and Investment

MA4510 Problem Solving and Computational Mathematics

MA6910 Individual Project

CI5450 Professional Environments 2

CI4450 Professional Environments 1

**Level 6 options;**

MA6510 Financial Portfolios and Derivatives

MA6520 Insurance Risk Mathematics

MA6530 Optimisation Techniques and Applications

MA6550 Practical Applications of Advanced Statistics

MA6600 Artificial Intelligence and Machine Learning

Each level is made up of four modules each worth 30 credit points. Typically a student must complete 120 credits at each level. All students will be provided with the University regulations. Full details of each module will be provided in module descriptors and student module guides.

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| **Level 4** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Mathematical Methods and Modelling of Applications | MA4500 | 30 | 4 | 1&2 |
| Problem Solving and Computational Mathematics | MA4510 | 30 | 4 | 1&2 |
| Practical Data Analyst Skills | MA4550 | 30 | 4 | 1&2 |
| Professional Environments 1 | CI4450 | 30 | 4 | 1&2 |

Progression to Level 5 requires 120 credits at Level 4.

Students exiting the field/course at this point who have successfully completed 120 credits are eligible for the award of Certificate of Higher Education in Mathematics.

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| **Level 5** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |  |
| Applications of Calculus and Linear Systems | MA5500 | 30 | 5 | 1&2 |  |
| Mathematics of Finance and Investment | MA5510 | 30 | 5 | 1&2 |  |
| Modelling Real-World Data with Statistics | MA5550 | 30 | 5 | 1&2 |  |
| Professional Environments 2 | CI5450 | 30 | 5 | 1&2 |  |

Progression to level 6 requires 120 credits at level 5.

Students exiting the programme at this point who have successfully completed 240 credits are eligible for the award of Diploma of Higher Education in Mathematics.

Students who are on the sandwich course take the placement module CI5999 Industrial Placement

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| **Industrial Placement** (60 credit) for students on sandwich course |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |  |
| Industrial Placement | CI5999 | 60 | 5 | 1 and 2 |  |

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| **Level 6** (60 credits = core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |  |
| Advanced Mathematical Methods and Models | MA6500 | 30 | 6 | 1&2 |  |
| Individual Project | MA6910 | 30 | 6 | 1&2 |  |
| **Option modules** |  |  |  |  | **Pre-requisites** |
| Financial Portfolios and Derivatives | MA6510 | 30 | 6 | 1&2 | MA5510 |
| Insurance Risk Mathematics | MA6520 | 30 | 6 | 1&2 | MA5510 |
| Optimisation Techniques and Applications | MA6530 | 30 | 6 | 1&2 | MA5500 |
| Practical Applications of Advanced Statistics | MA6550 | 30 | 6 | 1&2 | MA5550 |
| Artificial Intelligence and Machine Learning | MA6600 | 30 | 6 | 1&2 | MA5550 |

Level 6 requires the completion of the compulsory modules MA6500 Advanced Mathematical Methods and Models and MA6910 Individual Project and two option modules. The complete list of option modules available will be determined annually and is subject to resourcing.

### Student “learning journey” – the development of knowledge and skills

The core knowledge and skills required for Mathematicians in employment, together with those skills that contribute to their ability to develop as undergraduates as well as post-graduation are developed in this course as follows.

(Bold arrows 🡺 indicate growth or development; thin arrows 🡪 suggest a link or supporting activity and colours represent intensity or significance. Typically only the core modules are represented – option modules will link to other modules that develop knowledge/skills as per their pre-requisites and are included only where the relationship is pivotal on a guided student journey *e.g.* towards a particular “guided route” or chosen, career-focused final year project.)

#### Calculus-based techniques with applications in the real world (mathematical modelling theory and practice)

The development of students’ knowledge and practical understanding of calculus starts in MA4500 where classes incorporate software, which gives students opportunities to practice at their own pace on randomized problems, and a computer algebra system introduced in MA4510 helps students to focus on conceptual knowledge by assisting with calculations. Assessment in MA4500 is individually for the concepts and in group work for modelling applications. MA5500 and MA6500 complete the undergraduate calculus journey, developing increasingly sophisticated concepts and models that are applied in more authentic, exciting and real-world applications. In parallel, calculus is used in statistics modules (MA4550, MA5550) to explain underlying principles and is extended to different contexts in the finance module (MA5510), which reinforces students’ understanding and introduces opportunities for assessments using software for data analysis and its presentation. Finally in MA6910, the capstone project, students choose a project, guided by staff to tie-in with their interests and career choices, which may utilize or develop their calculus knowledge further (*e.g.* investigating multistage rockets, traffic flow, biological or financial models) but could also be statistical or computational in nature.

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| MA4550(uses calculus) | 🡪 | MA5510, MA5550(uses and develops calculus in context) | 🡪 | (option modules) |
| 🡩 |  | 🡹 |  | 🡩 |
| MA4500(calculus fundamentals and simple mathematical models) | 🡺 | MA5500(linear systems, vector calculus, 3D models) | 🡺 | MA6500(partial differential equations, nonlinear systems) |
| 🡩 |  | 🡩 |  | 🡻 |
| MA4510(supporting software) | 🡪 | CI5450(introducing Python & NumPy) | 🡪 | MA6910(informs dissertation) |

#### Statistics and data analysis (theory and practice of data analytics supported by software)

The development of experience in statistics and data analysis/interpretation draws heavily on subject- and employment-specific software (MA4550, MA5550 and options like MA6550). There is also a supplementary parallel data manipulation data thread using software and scripting (programming) to transform data for analysis. Programming starts with MA4510, which uses a state-of-the-art programming environment and pedagogy to introduce all students, regardless of prior experience, to programming, which is extended in CI5450 to the mathematical and statistical context through Python (the “glue language” widely-used in industry) in preparation for a possible capstone application in MA6910, where, guided by a member of staff, students choose a project showcasing the gamut of skills and knowledge acquired in a “product” suited for publication in the student’s portfolio (which in itself was introduced and curated through CI4450 and CI5450).

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| --- | --- | --- | --- | --- |
| MA4550(descriptive statistics) | 🡺 | MA5550(model and evaluate) | 🡺 | option MA6550(model and predict) |
| 🡩 |  | 🡩 |  | 🡻 |
| MA4510(supporting software and code) | 🡺 | CI5450(data transformation) | 🡪 | MA6910(informs dissertation) |

#### Communication skills (presenting work; giving, receiving and acting on feedback)

Presentations, reports, data analyses, mathematical models, visualizations and posters feature across the programme. The use of presentation and document-writing software to create these artefacts is guided through workshops in MA4510, CI4450 and CI5450. The information being presented increases in sophistication from MA4500 (simple models) and MA4550 (small datasets and summary statistics) through MA5500 (more sophisticated models) and MA5550 (larger datasets, modelled and interpreted) to MA6500 (presentation and discussion of models and problem case studies) and the final year project which culminates in written presentation (with feedback from the supervisor), poster and oral presentation (with feedback from peers and others informally, and formally from the supervisor and 2nd marker).

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| MA4500, MA4550(simple outputs) | 🡺 | MA5500, MA5550(sophisticated/technical presentation) | 🡺 | MA6500(increased technical detail and scale) |
| 🡩 |  | 🡩 |  | 🡻 |
| CI4450, MA4510(posters and portfolio) | 🡺 | CI5450(supported *via* portfolio) |  | MA6910(informs dissertation) |

#### Group work (the ability to work in teams)

The course strategy is to carefully introduce and teach the practice of group work in Level 4 and use it quite intensively whilst the assessment stakes are low to establish good habits and models of group working, and then to use it, typically within two summative assessments at Level 5 and one at Level 6 where the assessment stakes are higher but the contribution to the final degree classification still relatively small:

* CI4450 introduces the practice and process of group work; team working skills are demonstrated, taught and assessed in collaboration with colleagues from the Directorate for Student Achievement (KU Talent *etc.*) with assessed coursework in cross-disciplinary groups, timetabled group workshops (simulating a workplace environment) where attendance is expected and absence must be accounted for, and, typically, using project topics related to industry or research – this model is then adapted at later stages, timed to minimise overlap, in the other three Level 4 modules
* MA4500 summatively assesses group work in a mathematical modelling or interpretation exercise (which results in a portfolio artefact, such as a newspaper article, poster or short video)
* MA4510 summatively assesses group work in a mathematical modelling exercise solved with the aid of software (which results in a report, or simulated article accompanied by a very brief oral presentation)
* MA4550 summatively assesses group work as part of a survey design and data collection coursework, which leads to a group presentation where students give and receive formative peer feedback
* CI5450 continues the professional emphasis with cross-discipline, industry-driven projects, with summatively assessed project management skills being developed to build on the group experience in CI4450
* MA5500 and MA6500 both simulate the workplace within workshops, monitoring attendance and giving regular feedback on progress, to give students space and encouragement to continue the good practice in group assessment developed and modelled in CI4450
* MA6910 (the capstone project) give opportunities to celebrate student’s work and to receive feedback from peers and employers in poster or conference settings (feedback from peers is formative).

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| --- | --- | --- | --- | --- |
| MA4500, MA4510, MA4550(uses & assesses by model) | 🡺 | MA5500(uses & assesses by model) | 🡺 | MA6500(uses and assesses by model) |
| 🡹 |  | 🡩 |  | 🡫 |
| CI4450(teaches, supports & establishes model)  | 🡪 | CI5450(revisits model) |  | MA6910(receive/give peer & other feedback) |

## Principles of Teaching, Learning and Assessment

**Introduction**

The overall ethos of teaching on this course is one of *active learning* – all teaching sessions will involve students as active participants and not passive listeners. Moreover, where possible classes will be structured around the investigation, analysis and/or solution of *problems* (so-called “problem-centred learning”) where students take an active role in discovering and building their own knowledge, and the lecturer supports this process with a hands-on approach in the classroom; any lecturing that’s necessary in this mode of teaching will always be short and active, for example making use of a classroom response system.

The School’s underpinning assessment strategy is based on ideas of learning through doing and making, that is to support students’ learning through the tackling of problems leading to the construction of various artefacts intended to form part of a professional portfolio.

In Mathematics these artefacts will support students in applying for placements and future work by evidencing skills, knowledge and experience. Typical examples include

* scripting software solutions to problems (production of typically platform-based code (e.g. Matlab and SAS) through level 4 and 5 modules),
* data collection, cleaning and interpretation (with a survey-based assignment in level 4 and a student-contributed dataset in level 5),
* data modelling (building and testing models with SAS in level 5, and creating a poster in level 6),
* mathematical modelling case studies investigated in groups at all levels (lead to professionally produced reports, articles, videos).

Students will be guided by their Project Supervisor, Personal Tutor or Course Director to develop a final year project that showcases their skills and application of knowledge, as a capstone entry in the Personal Portfolio that is introduced and curated through the level 4 and level 5 *Professional Environments* modules.

In common with modern educational principles, authentic assessment that promotes learning will be widely used. The development of mathematical and statistical knowledge and expertise will be aligned with software-based skills, since mathematicians and statisticians rarely work unsupported by technology, and this is assured through the use of coursework developing outputs suitable for inclusion in the student’s professional portfolio and, where necessary, exams that are often supported by software, utilise case studies or open book. . Emphasis is on workshop & real-life problem solving, often with the creation of “products” at the heart of assessed work which will be demonstrated through the production of artefacts utilising industry-standard software and authentic datasets. The use of industry-relevant software is particularly important supporting students’ analytical work and also preparing them for future employment.

**Further Details**

The learning and teaching strategies reflect the field aims and learning outcomes, student background, potential employer requirements and the need to develop a broad range of technical and professional skills, with the ability to apply them appropriately. The strategies ensure that students have a sound understanding of some areas in mathematics and statistics which are important in applications and have acquired the transferable skills expected of modern-day graduates.

Learning mathematics is often most readily undertaken in the context of the search for solutions to real-life problems. This is reflected in the approach adopted throughout this programme which is problem-centred wherever appropriate. The strategy is to start with a relevant problem then to move forward from there to explore the theory and techniques necessary to investigate that problem. This ‘top down’ approach contrasts with the more traditional one adopted in mathematics, whereby theory is developed (built up) often entirely abstractly, and then eventually applied to solve problems. The ‘top down’ approach provides more motivation for students to engage with material/concepts and opportunities for relatable (concrete), inclusive example problems to be used. Students frequently work in groups to tackle these problems both in timetabled sessions and outside, thereby creating a learning community in which the students collaborate with each other and staff. As the students work together in groups, both formatively and summatively, this community supports them - automatically allowing for different learning styles and varied backgrounds.

Teaching and learning sessions adopt a hybrid approach based on modern pedagogical principles, with use of appropriate Technology Enhanced Learning (TEL) such as clickers.. Contact time with students predominantly consists of tutorials, problem classes, practicals and, in the first year particularly, Mentoring sessions, with active delivery of material contents dependent on individual module requirements. For any topic where a more formal didactic approach is deemed the most appropriate, the ‘lecture’ delivery still involves active participation by students, for example, working through exercises and/or using classroom response systems throughout the session. Subject material and corresponding techniques are typically introduced via problem-centred learning often with a tutorial/seminar, flipped or ‘partially flipped’ classroom approach to replace traditional lectures.

Canvas, the university’s virtual learning environment, is used extensively in all modules as a communication tool and means of dissemination of learning and reference materials, formative worksheets, assignments, links, videos and lecturer-annotated slides. In this way it acts as a dynamic study guide in each module and, going further, it provides a structured learning space to support students for independent study, facilitate discussion, and in addition in some modules, for formative and summative tests and surveys. Canvas is also used to facilitate group work, both formatively and summatively. For example in the Professional Practice modules students are introduced to the group collaboration features of Canvas and are encouraged to use the Canvas app to mediate discussion and to collaborate on coursework “artefacts” which can be formatively assessed in the group workshops while the record of collaboration contributes, summatively, to the module’s assessment outcomes.

Study materials, including examples and exercises, are published on Canvas in advance of the time-tabled sessions, to allow students to prepare and fully benefit from classroom time – further, many sessions adopt a flipped or partially flipped approach for which the pre-published materials are essential. The availability of this material assists students from various backgrounds to achieve a common level at the start of the session or to highlight any deficiencies which they can then address with the lecturer. Typically during the session students then work on similar problems to the pre-published examples, facilitated by the lecturer, expanding on concepts and exploring misconceptions, which feed-forward to the eventual assessment tasks.

Typically there are more timetabled contact hours at level 4 to provide initial academic support, leaving the remainder for self-directed or guided study time. Students are encouraged to develop as independent learners as they progress through their degree course, this is supported explicitly through, for example, the strand of professional skills modules culminating in the individual project in the final year.

The teaching practice is guided by the Higher Education Academy (HEA) considerations for effective practice across subject areas together with Kingston University’s “Excellence in Inclusive Curriculum” initiative. In particular, a collaborative approach is taken which creates a partnership between staff, students, employers and other stakeholders (through the Industrial Advisory Board and by taking advantage of the networks of staff involved in research and enterprise activities, including Knowledge Transfer Partnerships (KTPs) with industry). Opportunities to insure that the curriculum is inclusive occur in such forums as the Staff Student Consultative Committees and Boards of Study together with discussions at module and course level. Meetings take place between subject teams to consider subject specific issues. The variety of teaching activities also takes account of the students’ different learning preferences and experiences and there is a careful balance of individual and group based activities, which is assured at the programme level by Boards of Study. The assessment schemes in some modules permit an element of student choice, including selection of a real-world problem for a group case study in MA5500, a review topic in MA6550 and the dissertation topic in MA6910, allowing the students to customise the assessment to suit their own interests and background, enhancing inclusivity and giving the students a greater sense of ownership of their study.

The assessment is regarded as an integral part of our learning and teaching strategy, and incorporates both assessment of, and for, learning. Ample opportunities are given to students for formative assessment with rapid feedback. This can be achieved using electronic support packages which generate a large pool of appropriate problems and give immediate feedback on performance or constructive hints if necessary. Students may repeat these as many times as they feel necessary until they are satisfied that they have mastered the skills and developed the confidence to perform well in summative assessments. This mode of study is introduced at the outset, for example through a package which is associated with the core text for the calculus-based modelling modules. Other examples include formative exercises designed to develop logical reasoning and rigorous analysis.

Marking criteria are provided for all assessments as part of the assessment booklet at the beginning of the year for each module and care is taken to ensure that the language used in the assessment brief is jargon free, which is checked by the moderator, to ensure that the assessments are accessible. The case studies used are designed to be inclusive. Examples from the past include “Diversity in Gaming” which is available as a resource on the KU Equality Diversity and Inclusion (EDI) website, and the ice-breaker “history of mathematics” poster assignment where the topics set by Personal Tutors reflect the diversity of the cohort.

A wide range of assessment mechanisms is used to ensure that students with diverse backgrounds and different strengths and abilities are not disadvantaged and to ensure that our students are capable of tackling many different types of problems. The methods of assessment have been selected so as to be most appropriate for the nature of the subject material, teaching style and learning outcomes in each module and the balance between the various assessment methods for each module reflects the specified learning outcomes. Emphasis is given to authentic assessments based on real-world problems. This allows the students to produce “artefacts” as outcomes of the assessment process, forming a portfolio which provides tangible evidence of their developing skills and knowledge thus enhancing their employment prospects.

A feature of this programme is that in comparison with many mathematics courses there are relatively few formal unseen, unsupported examinations. While examinations do have a role to play in testing an individual’s technical subject knowledge and ability to apply it to solve problems independently, there are other assessment methods which have possibly greater applicability to the work that graduates will subsequently undertake and which may be more appropriate tools for particular students. To assist students as they manage the transition to higher education there are no formal examinations at level 4. When examinations or tests are used many are ‘seen’, with students able to undertake relevant preparation in advance, and in some others students are allowed access to notes and/or to software packages to support them in the assessment.

Feedback, in a variety of formats, provides students with guidance in developing skills which are both beneficial for future assessments and highly valued by employers. In some modules, where appropriate, coursework (formative and summative) involves students’ Personal Tutors (PTs), either following the successful model already used in mathematics where the PT sets the “topic” of a specific assignment or by utilising the PT as a conduit through which feedback is given.

In the final year every student undertakes a 30 credit research project, which draws on and enhances the skills and knowledge developed throughout the programme. This consolidates independent learning skills and typically provides an opportunity for practical application of their academic knowledge to the implementation of a solution or construction of a suitable artefact.

In the programme as a whole, the following components are used in the assessment of the various modules:

* Practical exercises: to assess students’ understanding and technical competence
* Individual and group-based case studies: to assess ability to understand requirements, to provide solutions to realistic problems and to interact and work effectively with others as a contributing member of a team. The outcomes can be:
	+ Written report, where the ability to communicate the relevant concepts, methods, results and conclusions effectively will be assessed.
	+ Oral presentation, where the ability to summarise accurately and communicate clearly the key points from the work in a brief presentation will be assessed.
	+ Poster presentation where information and results must be succinct and eye-catching.
	+ Video, which may replicate features of oral presentations but allows advance preparation away from the audience (which may suit some students better).
	+ Article emphasising the ability to communicate with different audiences.
	+ Simulated client interactions: letters, quotations, etc.
* Multiple choice or short answer questions: to assess competence in basic techniques and understanding of concepts.
* Long answer structured questions in coursework assignments: to assess ability to apply learned techniques to solve simple to medium difficulty problems and which may include a limited investigative component
* Long answer structured questions in end-of-module examinations: to assess overall breadth of knowledge and technical competence to provide concise and accurate solutions within restricted time
* Project: The individual project module represents an opportunity for students to draw together different aspects of their learning on the course and to apply the techniques learned in an extended study. As such the assessment here will place a greater emphasis on ability to plan work, manage time effectively, and research background information, culminating in a written report and interview or presentation.

At the beginning of each academic year there is a course team meeting at which the delivery of material and assessments is planned with a full calendar being constructed. This ensures:

* that care is taken to avoid summative assessment bunching and thus student workloads are managed;
* synchronized and coherent delivery of material across the programme in a way that is visible both to staff and students, thus enabling assessments to draw on skills and knowledge from an appropriate variety of modules.

Students are expected to develop their skills, knowledge, confidence and understanding through independent and group learning, in the form of guided and self-directed study, and the exploration of the application of mathematics in the real world, throughout their course. For example basic team-working, investigative, researching and (informal) communication skills are introduced, developed and facilitated through group work, particularly in the Professional Practice modules, tackling formative exercises together. Students are also introduced to the professional environment surrounding their area of study alongside considerations of ethical behaviour and responsibility. These themes are reinforced with professional development opportunities tailored for each programme level and delivered by colleagues from Student Achievement and KU Talent. Furthermore, all students explore group case studies for mathematical and statistical modelling, requiring the collaborative investigation/solution of some real world problems as well as the production of written reports and oral or poster presentations. These foster the development of team-working, research and (formal) communication skills. In the final year all students will carry out research and present the background to and findings of their projects as indicated above. This will enhance their research and investigative skills to explore and master complex new ideas, learn and apply advanced techniques and further develop their independent working and communication skills.

Staff members also engage with research into teaching and learning in Higher Education which feeds through to support learning in lectures and other forms of student engagement during contact time. These activities regularly develop investigative partnerships with students, formally within University projects like “SADRAS” or Faculty “Internships” and also informally, which lead to publications at pedagogical research conferences.

## Support for Students and their Learning

Students are at the heart of everything we do and supporting their well-being and success is a top priority. The staff team has a long-standing reputation for providing a supportive learning environment for students as confirmed by current and former students in a recent review. To ensure access for all students to staff members the Department adopts effectively an ‘open-door’ policy in addition to published office hours when lecturers are guaranteed to be available. Furthermore, some of the staff ‘office hours’ are offered in the MathsAid centre to remove the potential ‘barrier of the office door’ which may represent a particular obstacle to students from some backgrounds.

In terms of formal mechanisms students are supported by a highly qualified team of academic staff which includes individuals with the following roles:

* A Course Director to help students understand the programme structure
* A Module Leader for each module
* A Personal Tutor to provide academic and personal support

In Level 4 students are supported by a Level 5 student as an Academic Mentor.

Additional support is provided by the following:

* Placement specialists within the KU Talent team to give general advice on placements (and a placement tutor to support students during the placement)
* Technical support to advise students on IT and the use of software
* Library (learning Resource Centres are available on each campus)
* A designated programme administrator.
* English language support for international students.

Matters outside the academic arena are supported by:

* Student support facilities that provide advice on issues such as finance, regulations, legal matters, accommodation, international student support etc.
* Disability and dyslexia student support
* A substantial Study Skills Centre that provides academic skills support
* KU Talent (Careers and Employability Service)
* The Union of Kingston Students
* An induction week at the beginning of each new academic session
* Staff Student Consultative Committee
* A virtual learning environment (VLE) available on the university’s intranet called Canvas
* And the University provides a facility whereby students can email, or phone a designated number to get instant help on a variety of issues.

Support for students begins before enrolment through the Welcome environment on the Kingston University website and in particular Head Start events for Compact students to aid their orientation before the start of the academic year. The students are introduced to all the above mechanisms during induction sessions at the beginning of each new academic year. It is here that the level 4 students first encounter the computer network, which includes their personal access to the Canvas system and how to use it as a learning environment. They are also encouraged to make use of the substantial SEC Academic Study Skills Centre (SASC), an important resource that provides additional help across a range of academic skills (including writing and study strategies) and the MathsAid support facility.

Students are expected to be involved in the development of their programme. On an individual level they have meetings with their personal tutors at which they can discuss their academic progress, personal development and can seek advice on course and module choices in the light of their career aspirations. As a cohort, students can contribute to many aspects of programme evolution, for example by student representation on committees including Staff Student Consultative Committees, as well as by their formal and informal feedback. At a higher level students can enhance many aspects of the curriculum and its delivery (as well as their own personal development) by participating in SADRAS (Student Academic Development Research Associate Scheme) projects.

In addition, at Level 4, the School works with the Mentoring Team in the Directorate for Student Achievement to run weekly, timetabled Academic Mentor sessions. Here trained Level 5 student Mentors provide academic advice and support to Level 4 students, easing their transition into Higher Education and disseminating the Level 5 students’ experience from their Level 4 studies, as well as enhancing the skills of the Mentors themselves.

Students are assigned a member of the mathematics academic staff as Personal Tutor (PT) who they first meet in Welcome Week for an introductory meeting where the PT contact is initiated and the following procedure introduced.

### Level 4 [settling in and building confidence]

In the first year (Level 4) PTs follow-up the Induction Week contact with a 1-to-1 meeting between weeks 1 and 3 in order to discuss any academic or pastoral issues that might have arisen during this important settling-in period. Employability topics such as the value of industrial placements and internships are introduced; they are encouraged to think about compiling a CV in preparation for their future applications (this is followed up in the professional environments module).

Throughout the first teaching block, some academic sessions based around problem centred learning encourage the students to work together in their tutor groups in formative assessments to facilitate the bonding of these individuals into self-supporting study teams which are intended to endure. In addition selected second year students are recruited as mentors in the Level 4 programme to encourage the community spirit of their course and foster engagement.

One of the core modules (MA4500) sets a tutor group assignment on a mathematical topic, providing a further opportunity for student collaboration and interaction of the PT staff member with the students when discussing feedback on the assessment. This will enhance engagement and cooperation as the students will already know one another and have experience working together from the first week.

Student attendance is closely monitored from the first teaching week. In the Professional Practice module this includes monitoring attendance and participation in group (team-based) workshops where students are developing their group working skills. Those absent from classes are contacted by their tutor to determine whether they need additional support. This is to address the danger of poor attendance at the beginning of the course which can be associated with poor academic outcomes.

Subsequent PT meetings are motivated by continued monitoring of formative assessment in core modules and helping students to begin preparing for summative assessments by providing support and signposting appropriate sessions in study skills centres. Where problems exist, both PTs and the module team(s) will direct students to MathsAid and/or SASC as appropriate.

### Level 5 [‘stepping it up’ and broadening horizons]

In the second year the focus of the PT system is to encourage students to begin looking forwards, toward some form of academically-relevant placement activity, perhaps as a full-scale Industrial Placement in year 3, or as some form of identifiable engagement with industry, such as a relevant short-term placement, summer work or a subject-relevant internship. All students receive information from the KU Talent team on the process and opportunities before the winter vacation.

The PT highlights the importance of students engaging with this in their “welcome back” induction meeting in week 1, together with an explanation of how Level 5 modules contribute to degree classification and any other differences in course structure and assessment procedures between Level 4 and Level 5.

### Level 6 [maximising success and moving on]

In the final year the focus shifts to graduation and employability and the PT scheme uses the capstone project module to promote PT-style discussions alongside regular project meetings (the supervisor is appointed as a second tutor and typically takes on the bulk of the PT role).

In the first weeks of term the PT’s role is to welcome students back, encourage them to reflect on their progress and module feedback, and plan to make the most of their final year, exemplified by early deliverables in the project module. Throughout Level 6, the KU Talent team provides activities which the PT signposts for students, some of which are delivered within and linked explicitly to sessions and assignments in core modules.

After the winter vacation the PT meets with their tutees to discuss the opportunities for graduate study and employment and provide contact details for employers’ reference requests. The final project (dissertation, presentation, and mathematical, statistical or data-based product) is a key employability “artefact”. As the PT is involved with the project from the start they are best placed to include details from the project (as well as other modules) in any reference and also, in collaboration with KU Talent, to encourage students how best to present their project on their *cv* and at interview.

## Ensuring and Enhancing the Quality of the Course

The University has several methods for evaluating and improving the quality and standards of its provision. These include:

* External examiners
* Boards of study with student representation
* Annual review and development
* Periodic review undertaken at subject level which links to periodic re-accreditation by the IMA
* Student evaluation
* Moderation policies

## Employability Statement

Mathematics degrees are among the most versatile, and enable graduates to find employment in a globally wide spectrum of careers ranging from banking and insurance through modelling large scale industrial problems to education and cutting edge research at the forefront of science and technology. Mathematics provides students with skills that would help them to find variety of high paid jobs. Recent graduates from our mathematics based courses have found employment with large organisations such as GlaxoSmithKline, Allianz Insurance, Axa Investments, Barclays, BUPA, Ernst & Young, Goldman Sachs, IBM, Office for National Statistics, Oracle, Statistics Canada and in teaching as well as with a host of smaller companies. Of course many graduates have pursued postgraduate study at institutions including LSE, UCL, Manchester, Southampton and Cambridge as well as at Kingston.

Our curriculum is largely applied in nature with many case studies chosen for their topicality and relevance to industry, such as the spread of a contagious disease, measuring air quality, and stock market volatility. Working on such case studies, typically in teams, gives students experience of applying their mathematical techniques to analyse open ended problems with complex solutions and presenting their findings, including any limitations or uncertainty, in a professional manner. This mirrors the experience of mathematicians working in industry and commerce. In preparation for their future employment, we make extensive use of industry standard software such as Matlab, Maple and SAS throughout the course. To further set the course material in context, as well as to inspire our students, practitioners from industry are invited to give guest lectures. Throughout the course students develop communication and interpersonal skills, learn time management and the value of prioritising and planning by involvement in the learning activities outlined in section F.

Our programme is designed to embed employability skills within the curriculum at all levels and develop students’ ability to recognise their personal and academic achievements and career aspirations. This is fostered through the strand of professional environments modules built into the programme from the start. During these modules, students experience a transition from guided learning towards independent learning, and career planning and development, through a series of sessions, offered under the auspices of KU Talent, including; Professional Communication, Time and Self-Management and Identifying and Articulating Skills. There are also opportunities to perfect skills required to gain employment such as; CV writing, Psychometric Test and Using LinkedIn. These modules are shared with other courses in the School and students study and work in a multidisciplinary environment, developing their ability to communicate with non-mathematicians. In this way students gain insight into the true nature of commercial teamwork, harnessing a range of different talents and skills to tackle complex problems, preparing them for the workplace. As they progress, students enhance their planning, teamwork and communication skills, (in the professional environments modules and throughout the programme) and show evidence of these though oral and poster presentations and both individual and group written reports. Outputs from these (written reports, posters and records, e.g. as videos and/or slideshows), plus products such as computer programs or results from modelling exercises on real-world problems, can be collated into a portfolio which may be presented to potential employers. Furthermore, their personal development and career options and plans are discussed with their personal tutors at regular intervals throughout their studies, and guidance given as appropriate. This is in liaison with the KU Talent team, the University’s Careers Service.

This theme culminates in the Level 6 capstone project module, which draws together the academic strands of the course. It also enhances students’ employability skills in different ways, giving them an insight into what mathematicians do in graduate careers. Typically, the project involves the application of mathematics to explore some real-world problem, often stemming from the supervisor’s research interests; for example modelling of traffic flow, renewable energy generation, weather prediction, impact of comets on the Earth, or sport strategies and technologies. Undertaking this type of activity gives students a taste of independent research, albeit supported by the supervisor, as they familiarise themselves with the real world situation and the mathematical techniques required to investigate it. In the project, students are encouraged to develop their critical thinking, creative and analytical skills, and gain experience and proficiency in technical writing. When choosing their Level 6 option choices and project topic, students are guided by their Course Director and Personal Tutor regarding what possible choices best suit their career aspirations.

The experiences gained during, and their reports and presentations on, students’ projects can provide a valuable case study to be cited in job applications and, if shortlisted, a focus for discussion and demonstration of professional skills in interviews. This has proved to be vitally important for several recent graduates, for whom giving an account of their project and the skills developed therein was crucial in securing a position of graduate employment during their interviews.

All of our students are encouraged to make use of the opportunity to enhance their learning and personal development by undertaking a Summer Internship between years of study and/or an industrial placement in the third year of their programme. All placements are vetted to ensure that they provide a relevant experience in which students can apply their learning in a practical situation. All placement students on the course receive comprehensive support from the placement specialists (Talent Preparation Officers) within the KU Talent team in securing a position and while in the workplace, although ultimately the responsibility for the placement remains with the student. A small number of students take advantage of the opportunity for an overseas educational exchange visit, in which part of the course is studied at a university in another country, typically the USA or in Europe. This broadens their cultural experience and enhances their personal development in ways that are particularly valuable in today’s multinational employment market. Students also gain employability and transferrable skills through participation in the School’s annual monitoring process (*e.g.* as student representatives on the Staff Student Consultative Committee, Faculty Forum, and Board of Study); through volunteering, which the University and Union of Kingston Students facilitates, as Student Ambassadors, where mathematics students have been excellent ambassadors for our courses at Open Days, Enrolment and Induction events; and through the University’s Talent Academy programme which offers a range of different on-campus employment opportunities to students. Large numbers of suitable employers and alumni come to the University to take part in Careers Fairs, deliver talks and to recruit students for specific opportunities.

The Department maintains close links with the Institute of Mathematics and its Applications and the Royal Statistical Society (RSS), and encourages our students to become members of these bodies to assist with their continuing professional development throughout their careers. We host annually the RSS “Schools Lecture” (now called “William Guy Lecture”), with help from the School’s Student Ambassadors. This brings A-Level students from local schools into the faculty for a taste of the university environment and an academic lecture on a popular and accessible statistics topic that is designed by the RSS to highlight the wide range of careers open to statisticians.

## Approved Variants from the Undergraduate or Postgraduate Regulations

None.

## Other sources of information that you may wish to consult

The subject benchmark statement for Mathematics Statistics and Operational Research may be found at: <http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Mathematics-statistics-and-operational-research.aspx> . (This explains the core competencies required for graduates from honours degree courses in mathematical subjects.)

The Unistats website summarises the results of an annual survey of final students giving feedback on their courses:

<http://unistats.direct.gov.uk/>

The latest details on this course (and links to supporting information on the university) may be found at: <http://www.kingston.ac.uk/undergraduate-course/mathematics/>

Professional or statutory body information:

The Institute of Mathematics and its Applications <https://ima.org.uk/>

The Royal Statistical Society <https://www.rss.org.uk/>

**Development of Field/Course Learning Outcomes in Modules**

This map identifies where the field/course learning outcomes are summatively assessed across the modules for this field/course. It provides an aid to academic staff in understanding how individual modules contribute to the field/course aims, a means to help students monitor their own learning, personal and professional development as the field/course progresses and a checklist for quality assurance purposes.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Level 4** | **Level 5** | **Level 6** |
| **Module code** | MA4500 Mathematical Methods and Modelling of Applications | MA4510 Problem Solving and Computational Mathematics | MA4550 Practical Data Analyst Skills | CI4450 Professional Environments 1 | MA5500 Applications of Calculus and Linear Systems | MA5510 Mathematics of Finance and Investment | MA5550 Modelling Real-World Data with Statistics | CI5450 Professional Environments 2 | MA6500 Advanced Mathematical Methods and Models | MA6510 Financial Portfolios and Derivatives | MA6520 Insurance Risk Mathematics | MA6530 Optimisation Techniques and Applications | MA6550 Practical Applications of Advanced Statistics | MA6600 Artificial Intelligence and Machine Learning | MA6910 Individual Project |
| **Knowledge & Understanding** | A1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| A2 | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| A3 | ✓ |  | ✓ |  | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ |  | ✓ |
| A4 |  |  |  | ✓ |  |  |  | ✓ |  |  |  |  |  |  | ✓ |
| **Intellectual Skills** | B1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| B2 | ✓ |  | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| B3 | ✓ | ✓ | ✓ | ✓ | ✓ |  |  |  | ✓ |  |  |  |  |  |  |
| B4 | ✓ | ✓ | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ |
| B5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Practical Skills** | C1 | ✓ | ✓ | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ |
| C2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| C3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| C4 |  |  |  |  |  |  | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Students will be provided with formative assessment opportunities throughout the course to practice and develop their proficiency in the range of assessment methods utilised.

# Technical Annex

|  |  |
| --- | --- |
| **Final Award(s):** | BSc (Hons) Mathematics |
| **Intermediate Award(s):** | Cert HE, Dip HE |
| **Minimum period of registration:** | 3 years for full-time award, 4 years for sandwich award, 6 years for part-time award |
| **Maximum period of registration:** | 6 years for full-time award, 8 years for sandwich award, 12 years for part-time award |
| **FHEQ Level for the Final Award:** | 6 |
| **QAA Subject Benchmark:** | Mathematics Statistics and Operational Research (2015) |
| **Modes of Delivery:** | Full-time, part-time |
| **Language of Delivery:** | English |
| **Faculty:** | Science Engineering and Computing |
| **School:** | Computer Science and Mathematics |
| **Department:** | Mathematics |
| **JACS code:** | G100 |
| **UCAS Code:** | G100, G102 |
| **Course/Route Code:** |  |
|  |  |