Course Handbook
2019/20

BSc (Hons) Mathematics & MMath (Hons) Mathematics
(including foundation entry routes)

Date of publication: June 2018
Course Leader: Dr Christopher J Powles
School of Physical Sciences and Computing

Please read this Handbook in conjunction with the University's Student Handbook.

Contents

1. Welcome to the course

Welcome to the School of Physical Sciences and Computing (PSC) and congratulations on being accepted on the programme.

I am delighted that you have chosen to enrol on the Mathematics Programme. We will endeavour to provide you with an outstanding experience of higher education. We are aware that you have made a decision that affects your future career and we can assure you that we will work hard to meet your aspirations. However, we also expect that you will commit sufficient time and efforts to acquire and apply the knowledge and experience required to succeed in your field of study.

I trust that you will find your experience enjoyable and rewarding. In the meantime, if you have any queries or concerns, please do not hesitate to contact me

Dr Christopher Powles

Course Leader

1.1 Rationale, aims and learning outcomes of the course

The aims of the mathematics courses are as follows:

- To provide a good grounding in pure and applied mathematics and statistics.
- To provide a grounding in the applications of mathematical and statistical I.T.
- To provide sufficient in-depth subject knowledge to enable students to embark on further study or research either in an academic or industrial environment.
- To provide experience in a variety of working styles such as group, collaborative and independent working essential for the modern workplace.
- To provide training in both analytical and transferable skills and techniques found in mathematics which have wider applications.

Detailed learning outcomes are listed in the programme specifications given in appendix 1 of this document.

Both the BSc (Hons) and MMath (Hons) Mathematics degrees at UCLan are accredited by the Institute of Mathematics and Its Applications (IMA). The MMath (Hons) programme is accredited to meet the educational requirements of the Chartered Mathematician designation, while the BSc (Hons) programme is likewise accredited, when followed by subsequent training and experience in employment.

1.2 Course Team

The mathematics degrees at UCLan are delivered by a team of 13 academic staff, based in Leighton building.

Name	E-mail	Phone	Office
Dr Sylvy Anscombe	SAnscombe@uclan.ac.uk	3544	LE305
Dr Danielle Bewsher	DBewsher@uclan.ac.uk	3271	LE104
Dr Kevin Bowman	KBowman@uclan.ac.uk	3549	LE006A
Dr Daniel Brown	DSBrown@uclan.ac.uk	3305	LE208
Dr Timothy Cawthorne	TVCawthorne@uclan.ac.uk	3731	LE209
Dr Matthew Daws	MDaws@uclan.ac.uk	2680	LE305
Dr Paul Freeman	PGFreeman@uclan.ac.uk	3302	LE307
Dr Imran Khan	IKhan12@uclan.ac.uk	2376	LE006A
Dr Timo Laitinen	TLMLaitinen@uclan.ac.uk	3280	LE115
Dr Paul Marston	PMarston@uclan.ac.uk	3542	LE114
Dr Brett Patterson	BAPatterson@uclan.ac.uk	3567	LE208
Dr Davide Penazzi	DPenazzi@uclan.ac.uk	3827	LE116
Dr Chris Powles	CPowles@uclan.ac.uk	3572	LE116

The course leader for all mathematics courses is Dr Chris Powles. There are also year tutors for each year-group, who are assigned on an annual basis.

1.3 Expertise of staff

Staff in the mathematics teaching team are all qualified to postgraduate level, and have a wealth of teaching and research experience. In applied mathematics, staff in the course team have worked at NASA in the USA, and have developed industrial prediction tools in collaboration with Rolls-Royce and Airbus. In pure mathematics, members of the course team form an active model-theory research group.

Much of the research conducted within the department is reflected within the mathematics course. Particular areas of interest of the mathematics course team include:

- Cryptology
- Groups and Non Associative Algebras
- Logic and model theory
- Analytical and numerical solutions of differential equations
- Mathematical biology
- Electromagnetic and acoustic wave phenomena
- Fluid mechanics: from turbulence to galaxies
- Image processing

Further information about research activities in the mathematics group can be found at the following website: http://www.star.uclan.ac.uk/mathematics/

1.4 Academic Advisor

You will be assigned an Academic Advisor who will provide additional academic support during the year. They will be the first point of call for many of the questions that you might have during the year. Your Academic Advisor will be able to help you with personal development, including developing skills in self-awareness, reflection and action planning.

1.5 Administration details

Campus Admin Services provides academic administration support for students and staff and are located in hubs which open from 8.45am until 5.15pm Monday to Thursday and until 4.00pm on Fridays. Your hub can provide general assistance and advice regarding specific processes such as extenuating circumstances, extensions and appeals. The hub for mathematics students is:

Allen Building
Medicine
Dentistry
telephone: 01772 895566
email: AllenHub@uclan.ac.uk

Harris Building
Lancashire Law School
Humanities and the Social Sciences
Centre for Excellence in Learning and Teaching
telephone: 01772 891996/891997
email: HarrisHub@uclan.ac.uk

Foster Building
Forensic and Applied Sciences
Pharmacy and Biomedical Sciences
Psychology
Physical Sciences
telephone: 01772 891990/891991
email: FosterHub@uclan.ac.uk

Computing and Technology Building
Art, Design and Fashion
Computing
Journalism, Media and Performance
Engineering
telephone: 01772 891994/891995
email: CandTHub@uclan.ac.uk

Greenbank Building
Sport and Wellbeing
Management
Business
telephone: 01772 891992/891993
email: GreenbankHub@uclan.ac.uk

Brook Building
Community, Health and Midwifery
Nursing
Health Sciences

Social Work, Care and Community
telephone: 01772 891992/891993
email: BrookHub@uclan.ac.uk

1.6 Communication

The University expects you to use your UCLan email address and check regularly for messages from staff. If you send us email messages from other addresses they risk being filtered out as potential spam and discarded unread.

The administrative hub (see section 1.5 for contact details) will use both email and official letters to communicate.

The course team:

- Will normally communicate with you through Outlook using your UCLan email address. When emailing, you should include the module code in the subject field and/or any other relevant information to allow staff to help you. You should aim to check your email DAILY. (Staff will attempt to reply to your email within 48 hours).
- Will use eLearn to make module and course level information available to you.
- May contact you by telephone (land line or mobile) or text your mobile, when it has not been possible to communicate with you via other routes. It is therefore essential that you ensure that ALL your details are up to date. You can check and change this via MyUCLan (https://my.uclan.ac.uk/BANP/twbkwbis.P_WWWLogin)

Academic staff will have different office hours when they are available for face-to-face meetings. To check office hours, and to book appointments, you should use the Starfish system, which you will be shown during your course induction.

1.7 External Examiner

The University has appointed an External Examiner to your course who helps to ensure that the standards of your course are comparable to those provided at other higher education institutions in the UK. If for any reason you wish to make contact with your External Examiner, **you should do this through your Course Leader and not directly**.

The external examiner for mathematics degrees at UCLan is Prof Alan Hood, Professor of Mathematics at the University ofSt Andrews.

Electronic copies of the annual external examiner's reports are available on the mathematics eLearn site.

2. Structure of the course

2.1 Overall structure

The mathematics degrees are composed of a number of modules. A module is a coherent unit of subject material with its own learning outcomes and assessments. Each module in the mathematics course is worth 20 credits (with the exception of some modules in the foundation year, and the industrial placement module).

To complete the BSc (Hons) degree, you must accumulate a total of 360 credits, which is equivalent to 18 modules. To complete the MMath (Hons) degree, you must accumulate a

total of 480 credits, which is equivalent to 24 modules. To complete a degree with foundation entry, you need to accumulate an extra 120 credits during the foundation year. To complete a degree in Sandwich mode, with an Industrial placement, you need to complete the extra 120 credits in the Mathematics Industrial Placement Year module.

If you are studying full time, it is expected that you will complete 120 credits in each year of study, so the BSc (Hons) degree will normally take three years to complete, and the MMath (Hons) degree will normally take four years. Degrees with foundation entry require an extra year to complete, as do degrees with an industrial placement. Both BSc and MMath degrees are also available for study part-time, in which case the time required to complete a degree will vary.

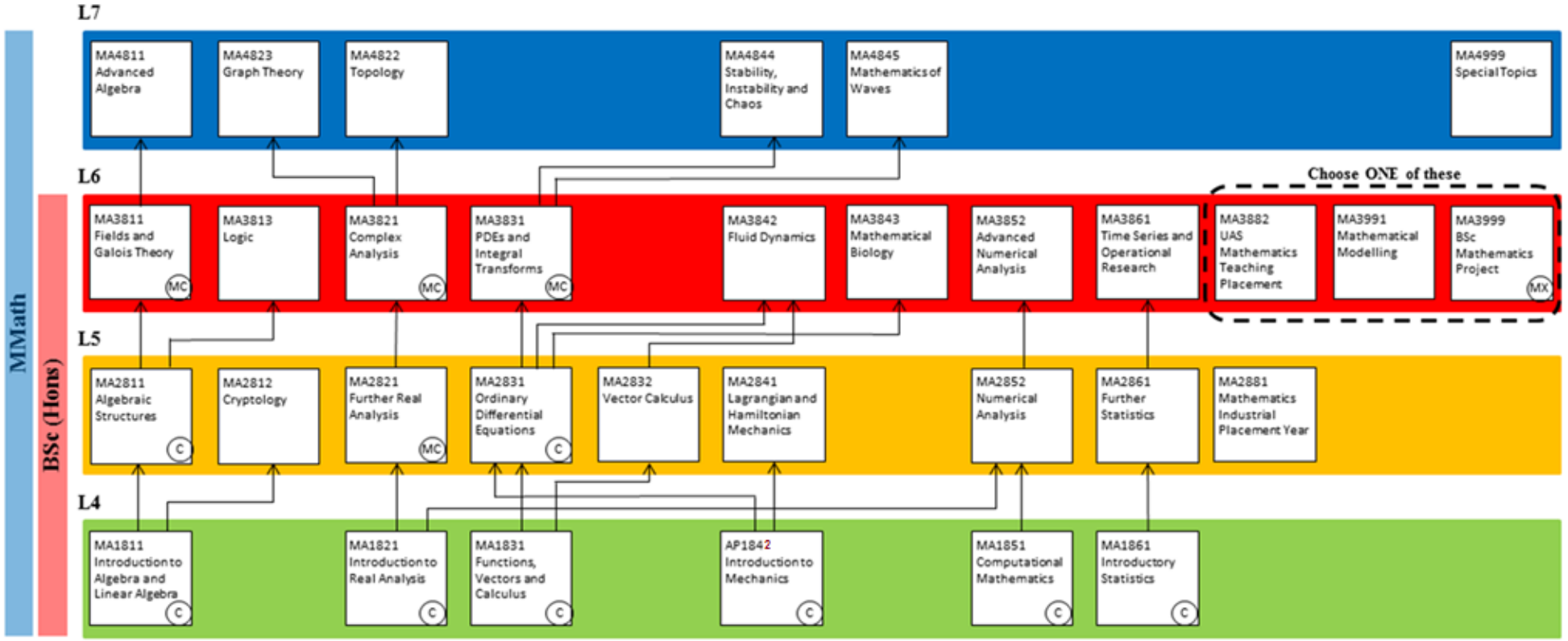
Each module has a level which reflects the depth of material covered. Level 4 corresponds to the usual academic level of first-year modules on a three-year honours degree, while level 5 corresponds to the usual modules on the second year of such a course, and level 6 corresponds to the usual modules on the third year of such a course. Level 7 modules correspond to the academic level of fourth-year modules on a four-year undergraduate master's degree (these are sometimes called the "MMath modules", as they are only available to students studying the MMath (Hons) degree). For students on the foundation entry routes, Level 3 corresponds to A-level study, and to modules studied during the foundation year.

Some modules within the degrees are compulsory, while others are optional. Compulsory modules contain fundamental material which is essential for understanding a wide range of mathematical ideas, while optional modules are more specialised. Students must complete ALL of the compulsory modules for their chosen degree (details in section 2.2), and can then choose from the optional modules to make up the required number of modules each year. Note that there are some level 5 and level 6 modules which are compulsory for students studying towards the MMath (Hons) degree, but are optional for students studying towards the BSc (Hons) degree.

A 20-credit module, at any level, corresponds to 200 hours of study. This includes all the time you spend in class and also your private study time. A breakdown of what is expected for each module can be found in the module descriptor for the module.

A flow-chart of all the modules offered on the mathematics degrees (excluding the foundation year) is given overleaf. Arrows on the chart indicate pre-requisites. As an example, the arrow from the box labelled MA1821 (Introduction to Real Analysis) to the box labelled MA2821 (Further Real Analysis) means that you must complete MA1821 before you will be allowed to study MA2821.

MMath (Hons) and BSc (Hons) Mathematics degree schemes



(C) - compulsory module

(MC) - compulsory for MMath

(MX) - disallowed for MMath

All information in this document is provisional, and subject to staffing resources.

2.2 Modules available

In the mathematics degrees, there are six compulsory modules at level 4: these provide you with a common set of mathematical tools that you will use throughout the rest of your course. Further compulsory modules at higher levels develop key mathematical skills and techniques in the important fields of algebra, calculus, and (for MMath students) analysis.

Compulsory level 4 modules (year 1 for full-time students):

MA1811 Introduction to Algebra and Linear Algebra
: Algebra concerns the study of number systems and their properties; linear algebra concerns matrices, eigenvalues and eigenvectors.

MA1821 Introduction to Real Analysis
: Analysis starts with the study of proof, and then rigorously treats sequences and series of numbers, and continuous functions.

MA1831 Introduction to Calculus
: This module builds on A-level calculus knowledge, and extends this to consider functions of several independent variables.

AP1842 Mechanics
: In this module physical ideas concerning force and energy motivate the study of differential equations.

MA1851 Computational Mathematics
: Here you will learn to use a mathematical software package, and apply this to mathematical modelling problems.

MA1861 Introduction to Probability and Statistics
: Statistics concerns the proper uses of data, and the study of probability.

Compulsory level 5 modules (year 2 for full-time students):

MA2811 Algebraic Structures (Compulsory for BSc and MMath)
MA2821 Further Real Analysis (Compulsory for MMath only)
MA2831 Ordinary Differential Equations (Compulsory for BSc and MMath)

Compulsory level 6 modules (year 3 for full-time students):

MA3811 Galois Theory (Compulsory for MMath only)
MA3831 Partial Differential Equations and Integral Transforms (Compulsory for MMath only)

BSc students must choose ONE of the following modules:

MA3882 UAS Mathematics Teaching Placement
MA3991 Mathematical Modelling
MA3999 Mathematics Project

MMath students must choose one module from either MA3882 or MA3991.

A range of optional modules are available at levels 5 and 6. These allow you to develop your own particular interests, and to prepare for specific careers. The Industrial placement module allows you to gain work experience in a mathematically-relevant industry: this optional module is studied after completing 120 credits of study at level 5.

Optional level 5 modules (year 2 for full-time students):

MA2812 Cryptology
MA2821 Further Real Analysis (optional for BSc)
MA2832 Vector Calculus
MA2841 Lagrangian and Hamiltonian Mechanics
MA2852 Numerical Analysis
MA2861 Further Statistics
MA2881 Mathematics Industrial Placement Year (120 credits - requires extra year)

Optional level 6 modules (year 3 for full-time students):

MA3811 Galois Theory (optional for BSc)
MA3813 Logic
MA3821 Complex Analysis
MA3831 Partial Differential Equations and Integral Transforms (optional for BSc)
MA3842 Fluid Dynamics
MA3843 Mathematical Biology
MA3852 Advanced Numerical Analysis
MA3861 Time Series and O.R

Usually all of these options are run every year, but if demand for a particular option is very low in any given year, that option may be withdrawn. You should be careful to check the pre-requisites for any modules you particularly wish to study, especially at level 6. Students wishing to study a project at level 6 (MA3999) will be offered a range of different topics. Projects at level 6 will only be offered to students who achieve a sufficiently high average percentage mark at level 5 (65%).

At level 7 in the MMath degree, there are six modules. These modules are not available to students on the BSc (Hons) degree.

Level 7 modules (year 4 for full-time MMath students):

MA4811 Advanced Algebra
MA4822 Topology
MA4823 Graph Theory
MA4844 Stability, Instability and Chaos
MA4845 Mathematics of Waves
MA4999 Special Mathematics Topics

Foundation Entry

For students on the foundation entry route, the foundation year consists of seven modules: four compulsory mathematics modules, each worth 15 credits, and three optional modules, each worth 20 credits. For your optional modules, you choose one of two groups: either the Physics group or the Computing group (modules from these two groups cannot be mixed: you choose one group and do all of the associated modules). These groups allow you to progress onto other degrees at the end of the foundation year, if you decide that mathematics is not the right choice for you (subject to progression requirements laid out in the programme specification – see appendices).

Compulsory level 3 modules (foundation year for foundation entry students)

MAC801 Foundation Mathematics 1
MAC802 Foundation Mathematics 2
MAC803 Foundation Mathematics 3
MAC804 Foundation Mathematics 4

Optional level 3 modules (foundation year for foundation entry students)

Either

APC801 Foundations of Applied Physics
APC802 Motion, Forces and Force Fields
APC803 The Road to Quantum Mechanics

Or

COC001 Introduction to Software Development
COC002 Investigating I.T.
COC005 Study Skills: Developing Academic Skills

2.3 Course requirements

For students on the foundation entry routes, automatic progression from Foundation Year on to the BSc (Hons) or MMath (Hons) Mathematics degrees usually requires that you pass 120 credits in the foundation year (so you must pass all your chosen modules) and at least a 70% average mark in the four mathematics modules. Students who achieve between 60 and 70% in those modules may progress at the discretion of the Course Assessment Board. Students who achieve 120 credits and at least a 40% average mark will gain a transcript of the modules and marks achieved if they decide to leave or are able to progress onto an Engineering or Computing degree.

Please note that the Foundation Year award determines whether you progress on to the full degree scheme, but does not itself count towards the final degree scheme award.

2.4 Module Registration Options

Discussions about your progression through the course normally take place in February each year. It is an opportunity for you to make plans for your study over the next academic year. The course team will tell you about the various modules / combinations available and you will both agree on the most appropriate (and legal) course of study for you.

At the end of the second year of full-time study (or part-time equivalent), students studying towards the BSc (Hons) degree will have the option of transferring to the MMath degree providing that they satisfy two conditions:

(i) they must have passed the optional module MA2821 (Further Real Analysis) as well as the compulsory second-year modules, and

(ii) they must achieve an average percentage mark (APM) in their second year modules of at least 65%.

Students may transfer from the MMath degree to the BSc (Hons) degree at any time. If at the end of the second year of full-time study, students studying towards the MMath degree do not achieve an APM in their second-year modules of at least 65%, they will automatically transfer to the BSc (Hons) degree.

2.5 Study Time

2.5.1 Weekly timetable

A timetable will be available once you have enrolled on the programme, through the student portal.

2.5.2 Expected hours of study

The expected amount of work involved in achieving a successful outcome to your studies is to study for 10 hours per each credit you need to achieve – this includes attendance at UCLan and time spent in private study.

You are therefore expected to spend a total of 200 hours on each 20-credit module. It is important that you allocate time reasonably equally to all modules constantly throughout the academic year if you want to gain a good honours degree.

Each week you will have a range of timetabled classes, but you will also be expected to spend a large amount of time studying outside the timetabled hours. On most level four modules you will have three timetabled hours a week, which may be used as lectures, examples classes, computer labs, etc., depending on the requirements of the individual

module. At level five and above, each module will have two timetabled hours per week (except projects, for which you have a 30 minute meeting with your supervisor each week). Outside of timetabled hours, you should spend time studying your lecture notes, working on tutorial problems and assignments, reading books form the supplied reading lists, and so on.

Broadly, you should spend six to seven hours each week on each module that you are studying. We know that students who spend more time studying generally do better.

2.5.3 Attendance Requirements

You are required to attend all timetabled learning activities for each module. Notification of illness or exceptional requests for leave of absence must be made to your year tutor.

You are required to attend all timetabled learning activities for each module. We use an electronic system called SAM (Student Attendance Monitoring) to monitor your attendance, and you will be contacted if your attendance falls below our expectation. Class registers are taken (using ID-card scanners or using registers), and it is your responsibility to make sure that you bring your ID card and that you are marked as present. All register marks are entered into SAM and checked by staff regularly. You are able to access your attendance record through myUCLan.

Each time you are asked to enter your details on SAM you must remember that the University has a responsibility to keep information up to date and that you must only enter your own details on the system. To enter any other names would result in inaccurate records and be dishonest. Any student who is found to make false entries can be disciplined under the student regulations.

International students have attendance responsibilities under the Visas and Immigration (UKVI) Points Based System (PBS) - you MUST attend your course of study regularly; under PBS, UCLan is obliged to tell UKVI if you withdraw from a course, defer or suspend your studies, or if you fail to attend the course regularly.

3. Approaches to teaching and learning

3.1 Learning and teaching methods

Throughout the mathematics course you will encounter a range of teaching methods. This may include:

- Lectures: used to deliver information and knowledge. You may be asked to read around the subject in readiness for a particular class. Mathematics lectures are often delivered in a traditional “chalk and talk” style.
- Tutorials/Problem Classes: used to allow you to test out your knowledge and understanding, and your application of that knowledge.
- Computer Laboratories: used to allow you to develop computational skills and consolidate the theory you have learned in lectures with practical experience.

The mixture of lesson types will vary, depending on the particular module being studied. For some modules, you will be expected to use the university’s online learning environment (eLearn) to access course materials. In many modules, problem sheets will be given out, which you are expected to work through in order to reinforce your knowledge of the material taught in lectures. In some modules, you may be asked to present information or findings to your peers and staff in a variety of formats.

It is expected that as you progress through the course, your independent learning skills should develop, so that you can study with less intervention from module tutors.

3.2 Study skills

General study skills are taught early in the degree: you will be taught how to take advantage of the resources available through the library, including a huge array of online materials.

Specific study skills relevant to mathematics are taught throughout the degrees. For example, training in how to write formal reports and give oral presentations is given in the compulsory first-year module MA1851. Further study skills are taught and developed within the context of relevant individual modules.

For general study skills, there are a variety of services to support students; these include:

WISER http://www.uclan.ac.uk/students/study/wiser/index.php

LIS https://portal.uclan.ac.uk/webapps/portal/frameset.jsp?tab_tab_group_id=_25_1

3.3 Learning resources

3.3.1 Learning Information Services (LIS)

Extensive resources are available to support your studies, provided by LIS, which runs the library and IT services. Take advantage of the free training sessions designed to enable you to gain all the skills you need for your research and study.

An introduction to LIS facilities is provided during induction week. There are also library tours running throughout induction week. Seminars will be provided from time to time on subject-specific resources. The library provide a guide to online resources available for mathematics students; this can be accessed through the following link:

http://www.uclan.ac.uk/students/study/library/Mathematics_guide.php

3.3.2 Electronic Resources

For mathematics students, LIS provides access to the mathematical software package MAPLE. This is freely available on the university campuses, and a version for use on student's home computers will be provided by LIS. Students are taught to use this package in the compulsory level 4 module MA1851 – Computational Mathematics.

3.4 Personal development planning

Personal Development Planning (PDP) is 'a structured and supported process undertaken by an individual to reflect upon their own learning, performance and/or achievement and to plan for their personal, educational and career development'.

By 'structured' we mean designed and intended. By 'supported' we mean that it is valued and facilitated by tutors and other professionals who promote and support your learning. By 'personal, educational and career development' we mean the development of the whole person.

The primary object of PDP is to help you learn more effectively. By this we mean being able to:

- Be more effective in planning your work and time

- Meet deadlines for completing work
- Consider your strengths and needs in relation to your work
- Review your own progress and take responsibility for your own learning
- Access support
- Prepare for employment.

PDP is intended to support the development of your skills, allow you to plan the development of your own learning and to encourage the development of employability skills.

PDP is embedded within the mathematics programme and also in the academic advisor system. We will help you develop a range of skills that will be of use when seeking employment. In various modules students are required to participate in group work, develop report writing skills and are assessed on oral presentations and poster presentations. The BSc project is an extended research/project module, which further develops students' report writing and independent working skills. In addition, separate short courses are available in basic IT skills, for example in using Microsoft Office products. Additional support is available through the academic advisor system.

Your academic advisor will offer you the opportunity to discuss personal development at various stages in your course. However it is your responsibility to undertake the PDP, and not the tutor's.

The UCLan Skills web site is a good starting point for help with developing many PDP skills.

- For study skills, visit the following UClan web site: http://www.uclan.ac.uk/wiser . WISER offers an in-sessional programme to all students covering things like essay, report and thesis writing.
- For on-line help with specific study skills visit http://www.uclan.ac.uk/skills . Access from outside the university network will need you to use the username and password skill and inspire respectively.
- For IT skills, visit the following UClan web site: http://www.uclan.ac.uk/LIS
- For general skills, visit the Students' Union - http://www.uclansu.co.uk/ . The union offers courses throughout the year to help students develop a range of skills. **Project** is the Unions' personal and professional development programme for its members. Essentially it is short, fun and interactive bite sized chunks of information presented by students for students.

3.5 Preparing for your career

Your future is important to us, so to make sure that you achieve your full potential whilst at university and beyond, your course has been designed with employability learning integrated into it. This is not extra to your degree, but an important part of it which will help you to show future employers just how valuable your degree is. These "Employability Essentials" take you on a journey of development that will help you to write your own personal story of your time at university:

- To begin with, you will explore your identity, your likes and dislikes, the things that are important to you and what you want to get out of life.
- Later, you will investigate a range of options including jobs and work experience, postgraduate study and self- employment,
- You will then be ready to learn how to successfully tackle the recruitment process.

It's your future: take charge of it!

The UCLan Careers service offers a range of support for you including:-

- career and employability advice and guidance appointments
- support to find work placements, internships, voluntary opportunities, part-time employment and live projects
- workshops, seminars, modules, certificates and events to develop your skills

A daily drop in service is available from 09:00-17:00 for CV checks and initial careers information. For more information come along and visit the team (in Foster building near the main entrance) or access our careers and employability resources via the Student Portal.

The top three professions for maths graduates in the UK are:

- Finance and investment analysts and advisers
- Chartered and certified accountants
- Programmers and software developers

In addition to the above, graduates from the UCLan mathematics degrees have gone on to a range of destinations, including: Masters degrees, PhDs, PGCE teacher training, actuarial work, acquisition analysis, and NHS management.

The mathematics courses will help you to develop a range of important skills that will make you attractive to employers. These include:

- Analytical Skills
- Communication Skills
- Investigative Skills
- Learning Skills
- Problem-solving skills
- Self-Management
- Team work

4. Student Support

Your primary contact for advice on general academic matters is your academic advisor. They will advise you on matters like progression, choosing modules, and so on. They also have a role in pastoral care, and can advise you on who to talk to in the university about a range of problems. In addition, there is the general advice desk for students called ‘The I’ – this is located in the library, and can help with a wide range of issues, including student finance.

4.1 Academic Advisors

Your academic advisor is there to offer pastoral care and general academic advice. You will meet your academic advisor in the first week of your studies, and then will have other meetings as often as you and the tutor feel they are needed. When your academic advisor asks for a meeting with you, you should prepare by thinking about how things are going – are there any problems you want to talk about or any questions you need to ask?

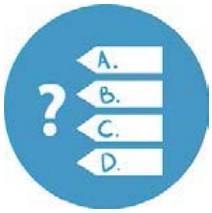
4.2 Students with disabilities

If you have a disability that may affect your studies, please either contact the Disability Advisory Service - disability@uclan.ac.uk - or let one of the course team know as soon as possible. With your agreement information will be passed on to the Disability Advisory Service. The University will make reasonable adjustments to accommodate your needs and to provide appropriate support for you to complete your study successfully. Where necessary, you will be asked for evidence to help identify appropriate adjustments.

4.3 Students' Union

The Students' Union offers thousands of volunteering opportunities ranging from representative to other leadership roles. We also advertise paid work and employ student staff on a variety of roles. You can find out more information on our website: http://www.uclansu.co.uk/

5. Assessment



5.1 Assessment Strategy

Assessment is inescapable in formal education, but we don't want it to be a nightmare for you.

Assessment can be used not only to grade your understanding of a topic, but also to give you and us feedback about how you're doing. Part of that process requires you to develop your skills at self-assessment. You will always be in a position to judge how much you know and have achieved, and it's important that you accept that responsibility. During the course, you must be able to judge how you're doing in order to know when you've done enough work, and when you're having difficulty. Learning doesn't stop once you leave a classroom.

Don't be 'afraid' to reveal your difficulties. We're here to help, and nobody gets it right all the time. The only person who never makes mistakes is the person who never tries anything. You will learn by overcoming mistakes and misunderstandings, not by avoiding or ignoring them.

In fact, reflecting on why you can't solve a problem may lead you to identify misunderstandings that you're not aware of. Don't worry about making mistakes, because we all do. It's an essential part of learning and trying something new.

Each module on which you enrol will have a number of learning outcomes. These are the things that you will be capable of doing when you have successfully completed the module. In order to determine whether or not you have achieved these outcomes we devise an assessment strategy. Because some outcomes are more easily assessed by coursework and others are more easily assessed by examination you will meet a wide variety of assessment methods throughout your programme in mathematics. This is because we always try to select the most appropriate assessment method for the particular learning outcome(s) that we are trying to assess at each stage.

5.2 Notification of assignments and examination arrangements

You will be provided with an assessment schedule at the beginning of the academic year to allow you to manage your time. The assessment schedule is made available through eLearn and on the mathematics noticeboard on the ground floor of Leighton Building. An examination timetable will be made available to you prior to the examination periods on the University website.

Because different modules will be assessed in different ways, there is no central rule for when or how assessments should be submitted. Some may be short pieces of handwritten work to be completed in class, some may be short projects to be typed up as formal reports and submitted online, and so on. For each module, when there is an assessed piece of work to be done the module tutor will give you a problem specification which tells you what, when and how to submit the resulting work. The tutor should also give you some indication of how the work will be marked

5.3 Referencing

When you have to refer to textbooks or other written materials in your assignments, you must include proper references to the materials. Guidance will be given in the module MA1851, where you will be issued with a guide to writing formal reports, which discusses proper referencing.

5.4 Confidential material

Within your course you are unlikely to have access to confidential information during the course. However, if you do, it is important to respect confidentiality. Any students who have to deal with confidential material will be briefed on this by their tutor at the time.

5.5 Cheating, plagiarism, collusion or re-presentation

Please refer to the information included in section 6.6 of the University Student Handbook for full definitions. The University uses an online Assessment Tool called Turnitin. A pseudo-Turnitin assignment will be set up using the School space on Blackboard to allow students to check as many drafts as the system allows before their final submission to the 'official' Turnitin assignment. Students are required to self-submit their own assignment on Turnitin and will be given access to the Originality Reports arising from each submission. In operating Turnitin, Schools must take steps to ensure that the University's requirement for all summative assessment to be marked anonymously is not undermined and therefore Turnitin reports should either be anonymised or considered separately from marking. Turnitin may also be used to assist with plagiarism detection and collusion, where there is suspicion about individual piece(s) of work.

6. Classification of Awards

The University publishes the principles underpinning the way in which awards and results are decided in Academic Regulations. Decisions about the overall classification of awards are made by Assessment Boards through the application of the academic and relevant course regulations.

7. Student Feedback

You can play an important part in the process of improving the quality of this course through the feedback you give.

Students are welcome to voice their opinion on matters relevant to the mathematics degrees throughout their studies. Twice per year there are meetings of the Student-Staff Liaison Committee (SSLC), as discussed below. Also, if and when any problems arise with specific modules, the module tutor will be happy to discuss the issues with individual students, and if problems arise which affect multiple modules, this can be raised by students with their year tutor or the course leader.

7.1 Student Staff Liaison Committee meetings (SSLCs)

Details of the Protocol for the operation of SSLCs is included in section 8.2 of the University Student Handbook.

The purpose of an SSLC meeting is to provide the opportunity for course representatives to feedback to staff about the course, the overall student experience and to inform

developments which will improve future courses. These meetings are normally scheduled once per semester.

Meetings will be facilitated using guidelines and a record of the meeting will be provided with any decisions and / or responses made and / or actions taken as a result of the discussions held. The meetings include discussion of items forwarded by course representatives, normally related to the following agenda items (dependent on time of year).

- Update on actions completed since the last meeting
- Feedback about the previous year – discussion of external examiner's report; outcomes of National /UCLan student surveys.
- Review of enrolment / induction experience;
- Course organisation and management (from each individual year group, and the course overall);
- Experience of modules - teaching, assessment, feedback;
- Experience of academic support which may include e.g. Personal Development Planning, academic advisor arrangements;
- Other aspects of University life relevant to student experience e.g. learning resources, IT, library;
- Any other issues raised by students or staff.

The course team encourage student feedback in all areas and recognise that additional items for discussion may also be raised at the meeting

8. Appendices

8.1 Programme Specification(s)

Programme specifications are provided below for the following programmes of study:

1. BSc (Hons) Mathematics

UNIVERSITY OF CENTRAL LANCASHIRE

Programme Specification

This Programme 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.

Sources of information on the programme can be found in Section 17

1. Awarding Institution / Body	University of Central Lancashire
2. Teaching Institution and Location of Delivery	University of Central Lancashire, Preston Campus
3. University School/Centre	Physical Sciences and Computing
4. External Accreditation	Accredited by the Institute of Mathematics and Its Applications (IMA) to meet the educational requirements of the chartered mathematician designation when followed by subsequent training and experience in employment to obtain equivalent competences to those specified by the Quality Assurance Agency (QAA) for taught masters degrees.

5. Title of Final Award	BSc (Hons) Mathematics
6. Modes of Attendance offered	Full time Part time Sandwich
7a) UCAS Code	G100
7b) JACS Code	G100
8. Relevant Subject Benchmarking Group(s)	Mathematics
9. Other external influences	None
10. Date of production/revision of this form	April 2017

11. Aims of the Programme

- **To provide a good grounding in pure and applied mathematics and statistics.**
- **To provide a good grounding in the applications of mathematical and statistical I.T.**
- **To provide sufficient in-depth subject knowledge to enable students to embark on further study or research either in an academic or industrial environment.**
- **To provide experience in a range of working styles such as group, collaborative and independent working essential for the modern workplace.**
- **To provide training in both analytical and transferable skills and techniques found in mathematics which have wider applications.**

12. Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

By the end of this course of study, a student should be able to:

A1. Use appropriate mathematical techniques in pure mathematics.

A2. Use mathematical methods to solve problems in applied mathematics.

A3. Use mathematics to describe a system/situation.

A4. Use a range of numerical methods and algorithms to find solutions to mathematical problems.

Teaching and Learning Methods

Mathematical methods and techniques will be developed and demonstrated to students in lectures. Students will develop their skills in applying these techniques by completing regular worksheets, and will receive regular feedback on this work in tutorials/workshops. Numerical techniques will be developed and demonstrated in lectures and computer laboratory classes, and students will practice these skills regularly: numerical tools will be used throughout the degree course to support and complement analytical methods.

Assessment methods

Students' skills with mathematical and numerical methods will be assessed by a variety of means, including portfolios of short exercises, closed-book examinations, extended computer programming tasks, project reports, and presentations. In many modules the primary assessment will be a closed-book exam (the dominant form of assessment in UK mathematics degrees), but some modules will place more emphasis on computer-based and project-based skills, so may have no exam component.

B. Subject-specific skills

By the end of this course of study, a student should be able to:

B1. Provide a coherent logical mathematical argument (e.g. proof).

B2. Use mathematics to model systems.

B3. Recognise the limitations and scope of particular mathematical techniques.

B4. Generalise and extend areas of mathematics.

Teaching and Learning Methods

Students will see a wide range of mathematical proofs and models developed in lectures. To develop their own skills in logical argument and model development, they will complete regular worksheets, which will require a greater degree of independent thought perseverance at higher levels. Regular feedback on their attempts at proof and modelling will be a key component of the learning process.

Assessment methods

Closed-book examinations will be used to assess these skills across a range of modules. Given the importance of regular practice and feedback to the development of these skills (as recognised in subject benchmark statements), portfolios of small regular exercises will

also be used in a range of modules. The ability to generalise areas of mathematics will also be assessed through project reports and presentations, and programming tasks.

C. Thinking Skills

By the end of this course of study, a student should be able to:

C1. Analyse a given (mathematical) problem and apply appropriate techniques to find a solution.

C2. Use mathematics to model a process or series of events.

C3. Analyse a mathematical problem and find alternative representations.

Teaching and Learning Methods

Students will develop their thinking skills by seeing a wide range of mathematical arguments presented in lectures, and then practicing the application and generalisation of these ideas in regular exercises. In addition, thinking skills will be developed through project work in which students will be required to treat particular mathematical problems in depth, using a wide range of methods and tools.

Small-group and one-to-one supervisory sessions for these projects will present a key opportunity to develop student's thinking skills in a safe and structured environment, and will present students a chance to practice their skills at discussing and describing mathematical ideas.

Assessment methods

Students' mathematical thinking skills will be assessed by a variety of means, including short portfolios of exercises, closed-book examinations, extended computer programming tasks, project reports and vivas, and assessed presentations. Extended project reports, project vivas, and assessed presentations will be particularly important for assessing the students' thinking skills.

D. Other skills relevant to employability and personal development

By the end of this course of study, a student should be able to:

D1. Manage their own learning, making optimum use of appropriate texts and learning materials.

D2. Work in small groups towards a common aim.

D3. Use appropriate ICT and mathematical software tools.

D4. Develop and deliver a presentation for peers and/or general consumption.

Teaching and Learning Methods

Students will be explicitly taught employability skills in a number of modules, though they will feature implicitly throughout the degree scheme. These skills will be taught in lectures and computer lab classes, and students will have many opportunities to hone these skills. Self-management skills and ICT skills are developed and assessed throughout the students' course of study, while teaching and assessment of group working and presentation skills is focussed in a number of key (compulsory) modules.

Assessment methods

The employability-skills will be assessed by a variety of means, including short portfolios of exercises, project reports and vivas, and assessed presentations. Many coursework assessments will require the use of ICT, both for mathematical purposes and for document creation (formal reports, etc.). Group working, self-management, and presentation skills will be explicitly assessed by group project work, individual project work, project vivas, and presentations.

13. Programme Structures				14. Awards and Credits
Level	**Module Code**	**Module Title**	**Credit rating**	
Level 6		**Compulsory modules:**		**Bachelor Honours Degree**
		Exactly one from:		**BSc (Hons) Mathematics**
	MA3999	Mathematics Project	20	Requires 360 credits including a minimum of 220 at Level 5 or above and 100 at Level 6
	MA3991	Mathematical Modelling	20	
	MA3882	UAS Mathematics Teaching Placement	20	**Bachelor Degree**
		Optional modules:		**BSc Mathematics**
	MA3811	Galois Theory	20	Requires 320 credits including a minimum of 180 at Level 5 or above and 60 at Level 6
	MA3813	Logic	20	
	MA3821	Complex Analysis	20	
	MA3831	PDEs and Integral Transforms	20	Students who successfully complete MA2882, Mathematics Industrial Placement Year, will have the award “in sandwich mode.”
	MA3842	Fluid Dynamics	20	
	MA3843	Mathematical Biology	20	
	MA3852	Advanced Numerical Analysis	20	
	MA3861	Time Series and O.R.	20	
Level 5		**Compulsory modules:**		**Diploma of Higher Education**
	MA2811	Algebraic Structures	20	**DipHE Mathematics**
	MA2831	Ordinary Differential Equations	20	Requires 240 credits including a minimum of 100 at Level 5 or above
		Optional modules:		
	MA2812	Cryptology	20	
	MA2821	Further Real Analysis	20	
	MA2832	Vector Calculus	20	
	MA2841			

	MA2852 MA2861 MA2881	Lagrangian and Hamiltonian Mechanics Numerical Analysis Further Statistics **For sandwich award:** Mathematics Industrial Placement Year	20 20 20 120	
Level 4	MA1811 MA1821 MA1831 AP1842 MA1851 MA1861	**Compulsory modules:** Introduction to Algebra and Linear Algebra Introduction to Real Analysis Introduction to Calculus Mechanics Computational Mathematics Introduction to Probability and Statistics	 20 20 20 20 20 20	**Certificate of Higher Education** **CertHE** Requires 120 credits at Level 4 or above
Level 3 (FE)	MAC801 MAC802 MAC803 MAC804 APC801 APC802 APC803	**Compulsory modules:** Foundation Mathematics 1 Foundation Mathematics 2 Foundation Mathematics 3 Foundation Mathematics 4 **Optional modules:** *Either three AP modules:* Foundations of Applied Physics Motion, Forces and Force Fields The Road to Quantum Mechanics *Or three CO modules:*	 15 15 15 15 20 20 20	**Progression Information:** For progression to: **Mathematics:** average mark of 70% in the maths modules, and pass the other modules. **Physics:** average mark of 60% in the maths modules and in the physics modules. **Various Engineering titles:** pass all of the maths and all of the physics modules, and interview with course leader for specific engineering title. **Various Computing titles:** pass all of the maths and all of the computing modules.

	COC001 COC002 COC005	Introduction to Software Development Investigating I.T. Study Skills: Developing Academic Skills	 20 20 20	

15. Personal Development Planning

Personal Development Planning (PDP) is the process of reflecting on learning, performance, and achievement, and thereby planning for personal, educational, and career development. The PDP process involves academic study, extra-curricular activities and career planning.

Students will be introduced to PDP early in their first year, which gives them an opportunity to develop a plan for the whole of their time at University. A range of the PDP activities are delivered as part of the "employability essentials" scheme, which extends through the three years of the degree. To begin with, students explore their identity, the things that are important to them, and what they want to get out of life. Later, they investigate a range of options including jobs and work experience, postgraduate study and self- employment. They are then ready to learn how to successfully tackle the recruitment process. PDP is also embedded as part of the personal tutor system throughout the duration of the student's studies.

16. Admissions criteria *

(including agreed tariffs for entry with advanced standing)

**Correct as at date of approval. For latest information, please consult the University's website.*

UCAS: 128 UCAS points from three A-levels, including Mathematics A-level (A2) at grade A.

IELTS: grade 6 with no subscore lower than 5.5

Foundation Entry: 80 UCAS points, plus Mathematics GCSE at grade A.

17. Key sources of information about the programme
• **Course webpage**
• **Student handbook**

18. Curriculum Skills Map

Please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed

Level	Module Code	Module Title	Core (C), Compulsory (COMP) or Option (O)	Programme Learning Outcomes															
				Knowledge and understanding				Subject-specific Skills				Thinking Skills				Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	D1	D2	D3	D4	
LEVEL 6	MA3811	Fields and Galois Theory	O	X				X			X	X		X	X				
	MA3813	Logic	O	X				X			X	X		X	X				
	MA3821	Complex Analysis	O	X	X			X		X	X	X		X	X				
	MA3831	Partial Differential Equations and Integral Transforms	O		X	X	X		X	X	X	X	X	X	X		X		
	MA3842	Fluid Dynamics	O		X	X	X		X			X	X		X				
	MA3843	Mathematical Biology	O		X	X	X		X				X	X	X		X		

	MA3852	Advanced Numerical Analysis	O		x	x	x		x	x	x	x	x		x		x	
	MA3861	Time Series and O.R.	O		x	x	x		x			x	x		x		x	
	MA3882	Undergraduate Ambassadors Scheme	COMP: choose one from these three	?	?	?	?	?	?	?	?	?	?	?	x		x	x
	MA3991	Mathematical Modelling			x	x	x		x			x	x		x	x	x	x
	MA3999	Mathematics Project		?	?	?	?	?	?	x	x	x	x	x	x		x	x
LEVEL 5	MA2811	Algebraic Structures	COMP	x				x				x		x	x			
	MA2812	Cryptology	O	x		x	x	x				x		x	x	x	x	
	MA2821	Further Real Analysis	O	x				x		x	x	x		x	x			
	MA2831	Ordinary Differential Equations	COMP		x	x	x	x	x	x		x	x	x	x		x	
	MA2832	Vector Calculus	O		x	x		x				x			x			

	MA2841	Lagrangian and Hamiltonian Mechanics	O		X	X	X		X			X	X	X	X		X		
	MA2852	Numerical Analysis	O			X	X	X	X	X	X	X	X		X		X		
	MA2861	Further Statistics	O		X	X			X			X	X		X				
	MA2882	Mathematics Industrial Placement Year	O		?	?	?	?	?	?	?	?	?	?	X	X	X	X	

Continued overleaf

				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	D1	D2	D3	D4
LEVEL 4	MA1811	Introduction to Algebra and Linear Algebra	COMP	X				X			X	X		X	X			
	MA1821	Introduction to Real Analysis	COMP	X				X			X	X		X	X			
	MA1831	Functions, Vectors and Calculus	COMP		X	X			X	X		X	X		X			

	AP1842	Mechanics	COMP		x	x			x	x		x	x		x			
	MA1851	Computational Mathematics	COMP			x	x		x	x		x			x	x	x	x
	MA1861	Introduction to Probability and Statistics	COMP		x	x	x		x			x	x		x		x	

Note: ***For some project-based or placement modules, some learning outcomes will depend on the topic of the project/placement, which must be agreed individually with the module tutor. These are indicated by a question mark.***

Note: *Mapping to other external frameworks, e.g. professional/statutory bodies, will be included within Student Course Handbooks*

19. LEARNING OUTCOMES FOR EXIT AWARDS:

Learning outcomes for the award of: CertHE

By the end of this course of study, a student should be able to:

A1/2. Recognize and apply basic mathematical techniques.

A3. Interpret a mathematical description of a system/situation.

A4. Use given numerical methods to find solutions to mathematical problems.

B1. Recognize fundamental structures of mathematical argument (e.g. proof).

B2. Apply a given model system.

B3. Recognise that particular mathematical techniques have limitations.

B4. Describe particular areas of mathematics.

C1/2/3. Recognize mathematical problems and models, and alternative representations of these.

D1. Take responsibility for their own learning.

D2. Work in small groups towards a common aim.

D3. Use given ICT and mathematical software tools.

D4. Develop and deliver a short presentation for peers.

Learning outcomes for the award of: DipHE Mathematics

By the end of this course of study, a student should be able to:

A1. Use specified mathematical techniques in pure mathematics.

A2. Use specified mathematical methods to solve problems in applied mathematics.

A3. Interpret and refine a mathematical description of a system/situation.

A4. Use given numerical methods and algorithms to find solutions to mathematical problems.

B1. Incrementally adapt a given logical mathematical argument (e.g. proof).

B2. Apply and generalise a given model system.

B3. Recognise and investigate the limitations of simple mathematical techniques.

B4. Describe relations between areas of mathematics.

C1. Analyse a given (mathematical) problem and apply specified techniques to find a solution.

C2. Use mathematics to model a simplified process or series of events.

C3. Analyse a mathematical problem and use alternative representations.

D1. Manage their own learning, making use of learning materials.

D2. Work in small groups towards a common aim.

D3. Use given ICT and mathematical software tools.

D4. Develop and deliver a presentation for peers.

Learning outcomes for the award of: BSc Mathematics

By the end of this course of study, a student should be able to:

A1. Use mathematical techniques in pure mathematics.

A2. Use mathematical methods to solve problems in applied mathematics.

A3. Use mathematics to describe a system/situation.

A4. Use some numerical methods and algorithms to find solutions to mathematical problems.

B1. Provide a coherent logical mathematical argument (e.g. proof).

B2. Use mathematics to model systems.

B3. Recognise the limitations and scope of particular mathematical techniques.

B4. Generalise and extend areas of mathematics.

C1. Analyse a given (mathematical) problem and apply appropriate techniques to find a solution.

C2. Use mathematics to model a process or series of events.

C3. Analyse a mathematical problem and find alternative representations.

D1. Manage their own learning, making use of appropriate texts and learning materials.

D2. Work in small groups towards a common aim.

D3. Use appropriate ICT and mathematical software tools.

D4. Develop and deliver a presentation for peers and/or general consumption.

2. MMath (Hons) Mathematics

UNIVERSITY OF CENTRAL LANCASHIRE

Programme Specification

This Programme 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.

Sources of information on the programme can be found in Section 17

7. Awarding Institution / Body	University of Central Lancashire
8. Teaching Institution and Location of Delivery	University of Central Lancashire, Preston Campus
9. University School/Centre	Physical Sciences and Computing
10. External Accreditation	IMA approval
11. Title of Final Award	MMath (Hons) Mathematics
12. Modes of Attendance offered	Full time Part time Sandwich
7a) UCAS Code	G100
7b) JACS Code	G100
8. Relevant Subject Benchmarking Group(s)	Mathematics
13. Other external influences	None
14. Date of production/revision of this form	Date of validation: April 2017
15. Aims of the Programme	
• **To provide a good grounding in pure and applied mathematics and statistics.**	
• **To provide a good grounding in the applications of mathematical and statistical I.T.**	
• **To provide sufficient in-depth subject knowledge to enable students to embark on further study or research either in an academic or industrial environment.**	
• **To provide experience in a range of working styles such as group, collaborative and independent working essential for the modern workplace.**	

• **To provide training in analytical and transferable skills and techniques found in mathematics which have wider applications.**
• **To develop student's independent learning and research skills.**

16. Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

By the end of this course of study, a student should be able to:

A1. Use appropriate mathematical techniques in pure mathematics.
A2. Use mathematical methods to solve problems in applied mathematics.
A3. Use mathematics to describe a system/situation.
A4. Use a range of numerical methods and algorithms to find solutions to mathematical problems.

Teaching and Learning Methods

Mathematical methods and techniques will be developed and demonstrated to students in lectures. Students will develop their skills in applying these techniques by completing regular worksheets, and will receive regular feedback on this work in tutorials/workshops. Numerical techniques will be developed and demonstrated in lectures and computer laboratory classes, and students will practice these skills regularly: numerical tools will be used throughout the degree course to support and complement analytical methods.

Assessment methods

Students' skills with mathematical and numerical methods will be assessed by a variety of means, including portfolios of short exercises, closed-book examinations, extended computer programming tasks, project reports, and presentations. In many modules the primary assessment will be a closed-book exam (the dominant form of assessment in UK mathematics degrees), but some modules will place more emphasis on computer-based and project-based skills, so may have no exam component.

B. Subject-specific skills

By the end of this course of study, a student should be able to:

B1. Provide a coherent logical mathematical argument (e.g. proof).
B2. Use mathematics to model systems.
B3. Recognise the limitations and scope of particular mathematical techniques.
B4. Generalise and extend areas of mathematics.

Teaching and Learning Methods

Students will see a wide range of mathematical proofs and models developed in lectures. To develop their own skills in logical argument and model development, they will complete regular worksheets, which will require a greater degree of independent thought perseverance at higher levels. Regular feedback on their attempts at proof and modelling will be a key component of the learning process.

Assessment methods

Closed-book examinations will be used to assess these skills across a range of modules. Given the importance of regular practice and feedback to the development of these skills (as recognised in subject benchmark statements), portfolios of small regular exercises will also be used in a range of modules. The ability to generalise areas of mathematics will also be assessed through project reports and presentations, and programming tasks.

C. Thinking Skills

By the end of this course of study, a student should be able to:

C1. Analyse a given (mathematical) problem and apply appropriate techniques to find a solution.
C2. Use mathematics to model a process or series of events.
C3. Analyse a mathematical problem and find alternative representations.
C4. Execute an in-depth mathematical study, applying a range of research skills.

Teaching and Learning Methods

Students will develop their thinking skills by seeing a wide range of mathematical arguments presented in lectures, and then practicing the application and generalisation of these ideas in regular exercises. In addition, thinking skills will be developed through project work in which students will be required to treat particular mathematical problems in depth, using a wide range of methods and tools.

Small-group and one-to-one supervisory sessions for these projects will present a key opportunity to develop student's thinking skills in a safe and structured environment, and will present students a chance to practice their skills at discussing and describing mathematical ideas.

Assessment methods

Students' mathematical thinking skills will be assessed by a variety of means, including short portfolios of exercises, closed-book examinations, extended computer programming tasks, project reports and vivas, and assessed presentations. Extended project reports, project vivas, and assessed presentations will be particularly important for assessing the students' thinking skills.

D. Other skills relevant to employability and personal development

By the end of this course of study, a student should be able to:

D1. Manage their own learning, making optimum use of appropriate texts and learning materials.
D2. Work in small groups towards a common aim.
D3. Use appropriate ICT and mathematical software tools.
D4. Develop and deliver a presentation for peers and/or general consumption.

Teaching and Learning Methods

Students will be explicitly taught employability skills in a number of modules, though they will feature implicitly throughout the degree scheme. These skills will be taught in lectures and computer lab classes, and students will have many opportunities to hone these skills. Self-management skills and ICT skills are developed and assessed throughout the students' course of study, while teaching and assessment of group working and presentation skills is focussed in a number of key (compulsory) modules.

Assessment methods

The employability-skills will be assessed by a variety of means, including short portfolios of exercises, project reports and vivas, and assessed presentations. Many coursework assessments will require the use of ICT, both for mathematical purposes and for document creation (formal reports, etc.). Group working, self-management, and presentation skills will be explicitly assessed by group project work, individual project work, project vivas, and presentations.

13. Programme Structures				14. Awards and Credits
Level	**Module Code**	**Module Title**	**Credit rating**	
Level 7	MA4811	Advanced Algebra	20	**Master of Mathematics Degree**
	MA4822	Topology	20	**MMath Mathematics**
	MA4823	Graph Theory	20	Requires 480 credits including a
	MA4844	Stability, Instability and Chaos	20	minimum of 340 at level 5 or
	MA4845	Mathematics of Waves	20	above, 220 at level 6 or above,
	MA4999	Special Mathematics Topics	20	and 120 at level 7.
Level 6		**Compulsory modules:**		**Bachelor Honours Degree**
	MA3811	Galois Theory	20	**BSc (Hons) Mathematics**
	MA3821	Complex Analysis	20	Requires 360 credits including a
	MA3831	PDEs and Integral Transforms	20	minimum of 220 at Level 5 or
		Plus exactly one from:		above and 100 at Level 6
	MA3991	Mathematical Modelling	20	
	MA3882	UAS Mathematics Teaching		**Bachelor Degree**
		Placement	20	**BSc Mathematics**
		Optional modules:		Requires 320 credits including a
	MA3813	Logic	20	minimum of 180 at Level 5 or
	MA3842	Fluid Dynamics	20	above and 60 at Level 6
	MA3843	Mathematical Biology	20	
	MA3852	Advanced Numerical Analysis	20	Students who successfully
	MA3861	Time Series and O.R.	20	complete MA2882, Mathematics Industrial Placement Year, will have the annotation on their Certificate “in sandwich mode.”
Level 5		**Compulsory modules:**		**Diploma of Higher Education**
	MA2811	Algebraic Structures	20	**DipHE Mathematics**
	MA2821	Further Real Analysis	20	Requires 240 credits including a
	MA2831	Ordinary Differential Equations	20	minimum of 100 at Level 5 or
		Optional modules:		above
	MA2812	Cryptology	20	
	MA2832	Vector Calculus	20	
	MA2841	Lagrangian and Hamiltonian		
		Mechanics	20	
	MA2852	Numerical Analysis	20	
	MA2861	Further Statistics	20	
		For sandwich award:		
	MA2881	Mathematics Industrial		
		Placement Year	120	
Level 4	MA1811	Introduction to Algebra and		**Certificate of Higher Education**
		Linear Algebra	20	**CertHE**
	MA1821	Introduction to Real Analysis	20	Requires 120 credits at Level 4 or
	MA1831	Introduction to Calculus	20	above
	AP1842	Mechanics	20	
	MA1851	Computational Mathematics	20	
	MA1861	Introduction to Probability and		
		Statistics	20	
Level 3		**Compulsory modules:**		**Progression Information:**
(FE)	MAC801	Foundation Mathematics 1	15	For progression to:
	MAC802	Foundation Mathematics 2	15	**Mathematics:** average mark of
	MAC803	Foundation Mathematics 3	15	70% in the maths modules, and
	MAC804	Foundation Mathematics 4	15	pass the other modules.
		Optional modules:		**Physics:** average mark of 60% in
		Either three AP modules:		the maths modules and in the
	APC801	Foundations of Applied		physics modules.
		Physics	20	**Various Engineering titles:** pass
	APC802	Motion, Forces and Force		all of the maths and all of the
		Fields	20	physics modules, and interview

	APC803 COC001 COC002 COC005	The Road to Quantum Mechanics *Or three CO modules:* Introduction to Software Development Investigating I.T. Study Skills: Developing Academic Skills	20 20 20 20	with course leader for specific engineering title. **Various Computing titles:** pass all of the maths and all of the computing modules.

15. Personal Development Planning

Personal Development Planning (PDP) is the process of reflecting on learning, performance, and achievement, and thereby planning for personal, educational, and career development. The PDP process involves academic study, extra-curricular activities and career planning.

Students will be introduced to PDP early in their first year, which gives them an opportunity to develop a plan for the whole of their time at University. A range of the PDP activities are delivered as part of the "employability essentials" scheme, which extends through the first three years of the degree. To begin with, students explore their identity, the things that are important to them, and what they want to get out of life. Later, they investigate a range of options including jobs and work experience, postgraduate study and self- employment. They are then ready to learn how to successfully tackle the recruitment process. PDP is also embedded as part of the personal tutor system throughout the duration of the student's studies.

16. Admissions criteria *
(including agreed tariffs for entry with advanced standing)
**Correct as at date of approval. For latest information, please consult the University's website.*

UCAS: 128 UCAS points from three A-levels, including Mathematics A-level (A2) at grade A.

IELTS: grade 6 with no subscore lower than 5.5

Foundation Entry: 80 UCAS points, plus Mathematics GCSE at grade A.

17. Key sources of information about the programme

- **Course webpage**
- **Student handbook**

18. Curriculum Skills Map

Please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed

Level	Module Code	Module Title	Core (C), Compulsory (COMP) or Option (O)	Programme Learning Outcomes															
				Knowledge and understanding				Subject-specific Skills				Thinking Skills				Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
LEVEL 7	MA4811	Advanced Algebra	COMP	X				X			X	X		X		X			
	MA4822	Topology	COMP	X				X			X	X		X		X			
	MA4823	Graph Theory	COMP	X		X		X	X		X	X		X		X			X
	MA4844	Stability, Instability and Chaos	COMP		X		X		X	X	X	X	X		X	X		X	
	MA4845	Mathematics of Waves	COMP		X	X	X		X	X	X	X	X		X	X		X	
	MA4999	Special Mathematics Topics	COMP	?	?	?	?	?	?	?	X	X	?	?	X	X		X	X
LEVEL 6	MA3811	Fields and Galois Theory	O	X				X			X	X		X		X			
	MA3813	Logic	O	X				X			X	X		X		X			
	MA3821	Complex Analysis	O	X	X			X		X	X	X		X		X			
	MA3831	Partial Differential Equations and Integral Transforms	O		X	X	X		X	X	X	X	X	X		X		X	
	MA3842	Fluid Dynamics	O		X	X	X		X			X	X			X			
	MA3843	Mathematical Biology	O		X	X	X		X				X	X		X		X	
	MA3852	Advanced Numerical Analysis	O		X	X	X		X	X	X	X	X			X		X	
	MA3861	Time Series and O.R.	O		X	X	X		X			X	X			X		X	
	MA3882	Undergraduate Ambassadors Scheme	COMP: choose one from these two	?	?	?	?	?	?	?	?	?	?	?		X		X	X
	MA3991	Mathematical Modelling			X	X	X		X			X	X			X	X	X	X

CONTINUED OVERLEAF

				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
LEVEL 5	MA2811	Algebraic Structures	COMP	X				X				X		X		X			
	MA2812	Cryptology	O	X		X	X	X				X		X		X	X	X	
	MA2821	Further Real Analysis	O	X				X		X	X	X		X		X			
	MA2831	Ordinary Differential Equations	COMP		X	X	X	X	X	X		X	X	X		X		X	
	MA2832	Vector Calculus	O		X	X		X				X				X			
	MA2841	Lagrangian and Hamiltonian Mechanics	O		X	X	X		X			X	X	X		X		X	
	MA2852	Numerical Analysis	O			X	X	X	X	X	X	X	X			X		X	
	MA2861	Further Statistics	O		X	X			X			X	X			X			
	MA2882	Mathematics Industrial Placement Year	O		?	?	?	?	?	?	?	?	?	?		X	X	X	X
LEVEL 4	MA1811	Introduction to Algebra and Linear Algebra	COMP	X				X			X	X		X		X			
	MA1821	Introduction to Real Analysis	COMP	X				X			X	X		X		X			
	MA1831	Functions, Vectors and Calculus	COMP		X	X			X	X		X	X			X			
	AP1842	Mechanics	COMP		X	X			X	X		X	X			X			
	MA1851	Computational Mathematics	COMP			X	X		X	X		X				X	X	X	X
	MA1861	Introduction to Probability and Statistics	COMP		X	X	X		X			X	X			X		X	

Note: ***For some project-based or placement modules, some learning outcomes will depend on the topic of the project/placement, which must be agreed individually with the module tutor. These are indicated by a question mark.***

Note: *Mapping to other external frameworks, e.g. professional/statutory bodies, will be included within Student Course Handbooks.*

19. LEARNING OUTCOMES FOR EXIT AWARDS:

Learning outcomes for the award of: CertHE

By the end of this course of study, a student should be able to:

A1/2. Recognize and apply basic mathematical techniques.
A3. Interpret a mathematical description of a system/situation.
A4. Use given numerical methods to find solutions to mathematical problems.
B1. Recognize fundamental structures of mathematical argument (e.g. proof).
B2. Apply a given model system.
B3. Recognise that particular mathematical techniques have limitations.
B4. Describe particular areas of mathematics.
C1/2/3. Recognize mathematical problems and models, and alternative representations of these.
D1. Take responsibility for their own learning.
D2. Work in small groups towards a common aim.
D3. Use given ICT and mathematical software tools.
D4. Develop and deliver a short presentation for peers.

Learning outcomes for the award of: DipHE Mathematics

By the end of this course of study, a student should be able to:

A1. Use specified mathematical techniques in pure mathematics.
A2. Use specified mathematical methods to solve problems in applied mathematics.
A3. Interpret and refine a mathematical description of a system/situation.
A4. Use given numerical methods and algorithms to find solutions to mathematical problems.
B1. Incrementally adapt a given logical mathematical argument (e.g. proof).
B2. Apply and generalise a given model system.
B3. Recognise and investigate the limitations of simple mathematical techniques.
B4. Describe relations between areas of mathematics.
C1. Analyse a given (mathematical) problem and apply specified techniques to find a solution.
C2. Use mathematics to model a simplified process or series of events.
C3. Analyse a mathematical problem and use alternative representations.
D1. Manage their own learning, making use of learning materials.
D2. Work in small groups towards a common aim.
D3. Use given ICT and mathematical software tools.
D4. Develop and deliver a presentation for peers.

Learning outcomes for the award of: BSc Mathematics

By the end of this course of study, a student should be able to:

A1. Use mathematical techniques in pure mathematics.
A2. Use mathematical methods to solve problems in applied mathematics.
A3. Use mathematics to describe a system/situation.
A4. Use some numerical methods and algorithms to find solutions to mathematical problems.
B1. Provide a coherent logical mathematical argument (e.g. proof).
B2. Use mathematics to model systems.
B3. Recognise the limitations and scope of particular mathematical techniques.
B4. Generalise and extend areas of mathematics.
C1. Analyse a given (mathematical) problem and apply appropriate techniques to find a solution.
C2. Use mathematics to model a process or series of events.
C3. Analyse a mathematical problem and find alternative representations.
D1. Manage their own learning, making use of appropriate texts and learning materials.
D2. Work in small groups towards a common aim.
D3. Use appropriate ICT and mathematical software tools.
D4. Develop and deliver a presentation for peers and/or general consumption.

Learning outcomes for the award of: BSc (Hons) Mathematics

By the end of this course of study, a student should be able to:

A1. Use appropriate mathematical techniques in pure mathematics.

A2. Use mathematical methods to solve problems in applied mathematics.
A3. Use mathematics to describe a system/situation.
A4. Use a range of numerical methods and algorithms to find solutions to mathematical problems.
B1. Provide a coherent logical mathematical argument (e.g. proof).
B2. Use mathematics to model systems.
B3. Recognise the limitations and scope of particular mathematical techniques.
B4. Generalise and extend areas of mathematics.
C1. Analyse a given (mathematical) problem and apply appropriate techniques to find a solution.
C2. Use mathematics to model a process or series of events.
C3. Analyse a mathematical problem and find alternative representations.
D1. Manage their own learning, making use of appropriate texts and learning materials.
D2. Work in small groups towards a common aim.
D3. Use appropriate ICT and mathematical software tools.
D4. Develop and deliver a presentation for peers and/or general consumption.