

UCD Science

**UNDERGRADUATE STUDENT
HANDBOOK 2016-2017**

www.ucd.ie/science



**DN200 Science
DN230 Actuarial and Financial Studies
DN201 Computer Science**



University College Dublin
Ireland's Global University

Contents

Welcome to University Life	2
Science Office contacts	3
Staff with responsibility for Stage 1 students	4
Services Available to Help You	5
Peer Mentoring	5
Useful Advice	5
Stage 1 Academic Advisory meetings	7
Dates for Academic Session 2016/2017	7
Schools & Associated Subjects	7
Module Codes & Associated Schools	8
School contacts	8
Timetable Information	8
Email & Internet Usage	9
Jargon Buster (A – Z link)	9
Extenuating Circumstances	10
Policy on Late Submission of Course Work	11
Useful Web Addresses	12
Science Undergraduate Degree Programmes	13
Module Level Restrictions by Stage	14
Information on Module Grades; Late/Absent from Examination	15
Policy on Undergraduate student continuation	16
Degree GPA; Repeats/Resits in Undergraduate Science Programmes	17
Science Stage 1 Subject Streams	18
Table 1, Science Modules available in Stage 1	22
Table 2, Modules required for BSc Degrees in Science	23
Stage 1 Science	25
Stage 1 Repeats	26
Syllabus for Stage 1 Subjects in Science	27-32
Syllabus for Denominated Programmes Stage 1	33
Level 0 and Level 1 Module Descriptors	34-46
Level 1 Bachelor of Actuarial & Financial Studies Non Science Module Descriptors	47-48
Mathematics & Science Education	49
Stage 2 Science	50
Stage 2 Repeat	51
Incompatible Stage 2 Subject Combinations	52
Syllabus for Stage 2 Subjects in Science	53-65
Syllabus for Denominated Programmes Stage 2	66
Stage 3 Science	67
Stage 3 Repeat Students	68
Syllabus for Stage 3 Subjects in Science	69-83
Syllabus for Denominated Programmes Stage 3	83-84
Stage 4 Science	85-86
Syllabus for Stage 4 Subjects in Science	87-100
Syllabus for Denominated Programme Stage 4	101

WELCOME TO UNIVERSITY LIFE!

The UCD Science Office extends a warm welcome to all our Science students for the academic year 2016/2017. As a UCD Science student you are part of the largest University in Ireland and we hope that your time here is an enjoyable and rewarding one, both in academic achievement and personal development.

The Associate Dean of Science and the staff in the Science Office are always available to assist students with any problems they encounter, whether academic or personal. There are also Student Advisers along with many other support staff in Science whose function is to ensure that you settle into University life as quickly and easily as possible.

While the first year at University offers many exciting opportunities, some students may have difficulties in adapting to a new routine of education, especially students who are living away from home for the first time. A wide range of facilities are available within the Science Programme and the University to support you in the transition.

It is important to remember, however, the value of your University experience depends upon the effort and commitment that you make. You are here to be educated as a professional in whatever scientific discipline you choose to study. Your lecturers in Science will direct your academic programme, but it is up to you to make the most of the variety of opportunities that University will present. We wish you every success in your endeavours.

The Associate Dean of Science and staff in the Science Office are always available to offer advice and help to students whether it is an academic problem, a medical problem or in fact any problem at all!

Remember:

Don't hesitate to contact us – we're here to help!

This booklet is intended to assist students and all information is given in good faith. It is not an official publication of the University and does not bind the University in any way.

SCIENCE OFFICE STAFF

1st Floor, Room E1.09, O'Brien Centre for Science

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The Science Office operates an "open door" policy. The Science Office is open during term between 9.30am and 5.00pm and closes for lunch between 1.00pm and 2.00pm. These office hours are extended during peak registration times.

Any students seeking information can find out about available resources at the following places:

- Science Office website, www.ucd.ie/science
- Through your UCDconnect email account
- You can of course just drop into the Science Office, Room E1.09, 1st Floor, UCD O'Brien Centre for Science.

How We Contact You

- Science Office website – www.ucd.ie/science
- Through your UCDconnect email account

STAFF WITH SPECIAL RESPONSIBILITY FOR STAGE 1 STUDENTS

A member of the academic staff in each School in the Programme has been specifically designated to handle queries and problems that arise for new students

Biology and Environmental Science:

Dr John Finarelli, Room E4.11, Science East
T: 716 2347 Email: john.finarelli@ucd.ie

Chemistry:

Dr Mike Casey, Room S3.47, Science Centre-South
T: 716 2420 E-mail: mike.casey@ucd.ie

Geology:

Dr Julian Menuge, Room G05A, Science Centre-West
T: 716 2141 E-mail: j.f.menuge@ucd.ie

Mathematics:

Dr Kevin Hutchinson, Room 3.48, Belfield Office Park
T: 716 2577 E-mail: kevin.hutchinson@ucd.ie

Statistics:

Professor Nial Friel, Room 536 5th Floor, Library Building
T: 716 7370 E-mail: nial.friel@ucd.ie

Biomolecular & Biomedical Science:

Dr Patricia Maguire, Room F061, Conway Institute
T: 716 6957 Email: patricia.maguire@ucd.ie

Computer Science:

Professor Mohand Kechadi, Room E3.42, 3RD Floor, UCD O'Brien Centre for Science.
T: 716 2478 E-mail: tahar.kechadi@ucd.ie

Applied and Computational Mathematics:

Dr Lennon Ó Náraigh, Meet by appointment
T: 716 2546 E-mail: lennon.onaraigh@ucd.ie

Physics:

Dr Emma Sokell, Room 313, Science Centre, North.
T: 716 2514 E-mail: emma.sokell@ucd.ie

Actuarial Science

Dr Shane Whelan, Room 400, Library Building.
T: 716 7155 Email: shane.whelan@ucd.ie

SCIENCE SOCIETY

The UCD Science Society is made up of a bunch of fun loving, hard working and slightly insane Science students who spend most of the day thinking about how to make your college life more entertaining, and coming up with great ways of raising money for CMRF, Our Lady's Children's Hospital, Crumlin.

UCD SciSoc is now one of UCD's biggest societies and we are responsible for a range of events such as our famous "Cycle to Galway", our annual Science Day festival, the Science Ball and many more! Each year we bring great events, big and small, throughout both semesters. To top it off, all proceeds from our events go **DIRECTLY** to charity, so there's always that feel-good bonus too!

Interested? Get involved! Whether you're a Science student, science enthusiast, or just want to take part in some fantastic events, you can get in contact with us at science.society@ucd.ie or on facebook at <https://www.facebook.com/UCDSocietySoc>

SERVICES AVAILABLE TO HELP YOU

Computer Science Support Centre, Room B1.03, 1st Floor, Computer Science Building.

The Computer Science Support Centre is a free drop-in service offering extra help to any students taking Computer Science modules, who are worried or having problems with computer programming. This is in addition to the normal tutorials. The Centre is staffed by a team of helpful senior tutors and is located on the first floor of the School of Computer Science and Informatics. The Centre provides a friendly, relaxed environment where students can drop-in to discuss their difficulties and receive one-to-one support throughout the year. Further details are available from email: cssc@ucd.ie or <http://www.csi.ucd.ie/content/computer-science-support-centre>

Mathematics Support Centre, Ground Floor, James Joyce Library Building

Mathematics and Statistics are relevant to all areas of Science. The Mathematics Support Centre is a free drop-in service offering extra help to any students who are worried about their Mathematics background. This is in addition to the normal tutorials. The Centre is staffed by a team of helpful senior tutors who provide a friendly, relaxed environment where students can drop-in to discuss their difficulties and receive one-to-one support throughout the year. Further details are available from email: msc@ucd.ie or www.ucd.ie/msc

PEER MENTORING

Peer Mentors are Science students in Stage 2 or 3 who very generously give of their time to help welcome and support our Stage 1 students. The continued success of our Peer Mentoring programme is largely thanks to the energy, enthusiasm and commitment of our Peer Mentors every year. If you feel you would like to be a Peer Mentor please give your name and contact details to the Science Office or Student Adviser (paola.carrettoni@ucd.ie). You will hear more about the recruitment of Peer Mentors in Semester 2, but please feel free to give us your details any time before then.

SOME USEFUL ADVICE

Part-time employment: an advisory note

The experience of staff and of other students in recent years suggests that part-time employment exceeding 10 hours per week during term, can interfere with your attendance at lectures, tutorials or laboratory classes and can adversely affect your academic performance. You are strongly advised not to undertake any part-time employment during the study week and if possible, you should not work at all in the period immediately before exams. If financial circumstances oblige you to take a part-time job that requires you to work for significant numbers of hours per week, you should seek advice from a Student Adviser or the Office of the Vice-President for Students.

Continuous Assessment

In most modules, up to 50% of the marks available are awarded as part of the continuous assessment taken during the modules. Our experience over the years is clear: students who attend lectures, tutorials and laboratory classes and complete the in-course assignments achieve much higher grades in their modules; **students who have a poor record of attendance commonly fail their modules.**

Lectures

Lectures are generally held from 9.00 am to 6.00 pm. Lectures commence on the hour and each is of 50 minutes duration.

Practicals

Practical (or laboratory) classes generally take place in the afternoons and are held in the laboratories relating to the particular subject areas. They are of two or three hours duration and involve carrying out selected experiments, examining scientific material and getting hands-on experience of practical subjects.
N.B. Check your personal timetable online for information on practicals.

Tutorials

Tutorials are of particular benefit to students. Scientific discussion in a small group setting is an excellent method of instruction, encouraging questions and confirming understanding. It is vital that any problems with your subjects be discussed with the lecturers/tutors/demonstrators as soon as the problem arises. Do not wait until it is too late to seek help.

N.B. Check your personal timetable online for information on tutorials.

Deal with problems as they arise

If you don't understand – ASK!

Discipline

Good behaviour, especially in lectures, practicals and tutorials, is essential. This is especially true in science where classes may be large, safety may be an issue and where there is likely to be a mix of students, some with a basic grasp of the subject and others studying it for the first time. Mobile phones must be switched off during lectures, practicals and tutorials. Familiarise yourself with the 'Student Code' published in the *Student Information Handbook*. This can also be found on the website – www.ucd.ie/stu_codeandpolicy.htm.

SCIENCE STAGE 1 ACADEMIC ADVISORY MEETINGS

Stage 1 Science Students: 7th and 8th September 2016

This is a **compulsory meeting** for Stage 1 students. Incoming Stage 1 students will be split into two groups for the purpose of this meeting, students in Group 1 (DN200BBB, DN200CCS and DN230) should attend their Advisory Session on 7th September; Group 2 (DN200 and DN200MPG and DN201) should attend their Advisory Session on 8th September. The advisory meetings will commence with an address to students in the Moore Auditorium, UCD O'Brien Centre for Science. Following this, representatives from all the Science disciplines will be available on the Ground Floor concourse, UCD O'Brien Centre for Science, for consultation on the selection of modules. Advisory Sessions for denominated programme entry students (Computer Science DN201 & Actuarial & Financial Studies DN230) will be managed locally in the individual Schools.

Pre-Stage 2 and Pre-Stage 3 Advisory Meeting: February 2017, 1:00 pm (Date and Venue will be confirmed in early 2017)

This is a **compulsory meeting** for current Stage 1 and Stage 2 students in DN200. The advisory meeting commences with a talk to students. Information relating to Stage 2 and Stage 3 subject areas will be provided.

DATES FOR ACADEMIC SESSION 2016/2017

Semester 1

Teaching Term: 12th September 2016 – 2nd December 2016

Revision: 3rd December 2016 – 9th December 2016

Examinations: 10th December 2016 – 22nd December 2016

Semester 2

Teaching Term: 23rd January 2017 – 10th March 2017

Fieldwork/Study period 13th March 2017 – 26th March 2017

Teaching Term: 27th March 2017 – 28th April 2017

Revision: 29th April 2017 – 7th May 2017

Examinations: 8th May 2017 – 19th May 2017

Easter Sunday: 16th April 2017

May Bank Holiday: 1st May 2017

SCHOOLS AND ASSOCIATED SUBJECTS

SCHOOL NAME	SUBJECTS
Biology and Environmental Science	Cell & Molecular Biology, Environmental Biology, Plant Biology, Zoology, Mathematics, Biology & Education (Biology pathway).
Biomolecular and Biomedical Science	Biochemistry and Molecular Biology, Genetics, Microbiology, Neuroscience, Pharmacology, Mathematics, Biology & Education (Biology pathway).
Chemistry	Chemistry, Chemistry with Biophysical Chemistry, Chemistry with Environmental and Sustainable Chemistry, Medicinal Chemistry and Chemical Biology, Mathematics, Chemistry & Education (Chemistry pathway).
Computer Science	Computer Science
Earth Sciences	Geology
Mathematics & Statistics	Applied and Computational Mathematics, Mathematics, Mathematical Science, Financial Mathematics, Statistics, Theoretical Physics, Actuarial and Financial Studies, Mathematics, Applied Mathematics & Education – All four pathways.
Medicine	Physiology
Physics	Physics, Physics with Astronomy and Space Science, Theoretical Physics, Mathematics, Physics & Education (Physics pathway).
School of Education	Mathematics, Applied Mathematics & Education (All four pathways).

MODULE CODES AND ASSOCIATED SCHOOLS

Most module codes start with four letters and are associated with a particular School. To help you identify which module belongs to which School please see the list below.

ACM	School of Mathematics & Statistics
AESC	School of Agriculture, Food Science & Veterinary Medicine
ANAT	School of Medicine & Medical Science
BIOC	School of Biomolecular & Biomedical Science
BIOL	School of Biology & Environmental Science
BMOL	School of Biomolecular & Biomedical Science
BOTN	School of Biology & Environmental Science
CELB	School of Biology & Environmental Science
CHEM	School of Chemistry
COMP	School of Computer Science
ENVB	School of Biology & Environmental Science
FOR	School of Agriculture, Food Science & Veterinary Medicine
GENE	School of Biomolecular & Biomedical Science OR School of Biology and Environmental Science
GEOL	School of Earth Sciences
HORT	School of Agriculture, Food Science & Veterinary Medicine
MATH	School of Mathematics & Statistics
MDSA	School of Medicine & Medical Science
MEMI	School of Medicine & Medical Science
MICR	School of Biomolecular & Biomedical Science
MST	School of Mathematics & Statistics
NEUR	School of Biomolecular & Biomedical Science
PHAR	School of Biomolecular & Biomedical Science
PHYC	School of Physics
PHYS	School of Medicine & Medical Science
SCI	School of Biology & Environmental Science/School of Physics
STAT	School of Mathematics & Statistics
ZOOL	School of Biology & Environmental Science

SCHOOL CONTACTS

SCHOOL	ADMINISTRATOR (Undergraduate)	PHONE NUMBER
Biology and Environmental Science	Helen McCarthy	716 2385
Biomolecular and Biomedical Science	Mary O'Brien/ Heather Wood	716 2769/2768
Chemistry	Deirdre Murphy	716 2425
Computer Science	Clare Comerford	716 2483
	Ronan Nestor	716 2483
Earth Sciences	Sarah Procter	716 2331
Mathematics & Statistics	Nuria Garcia Ordiales	716 2560/2562
Medicine	Anthony Hyland	716 6635
Physics	Bairbre Fox	716 2210/2361

Timetable Information

Personalised timetables based on individual students' module selection are available through the SIS Student Web. In SIS you will be able to view your Semester 1 and Semester 2 Timetable and your Examination Timetable (when published).

To access SIS:-

- Click on SIS Student Web on the right side of the main UCD home page (www.ucd.ie)
- Enter your Student Number and PIN
- Click on Login

EMAIL AND INTERNET USAGE

UCD Email Accounts: You should use your UCD email account when communicating with Lecturers and Science Office staff. The Science Office communicates with you by email through your UCD email address.

All students have an obligation to regularly check their UCD email accounts and are bound by notices and information posted to these accounts.

Email Etiquette

Email communications should follow the same standards expected in written business communications.

- Lecturers should be addressed appropriately.
- Student name, student number, stage, class and group must be provided.
- Students must ensure that their reply email address is functional.
- The tone of any communication must be respectful.

Inappropriate Content: You must not present for I.T. Support or in class with inappropriate content on desktop wallpaper, screensavers, and homepage. Support Staff reserve the right to refuse to support a system with such content on display.

Network Usage: You should adhere to the general guidelines on computer and email usage detailed in the "Acceptable Usage Policy for UCD Computer and Network Systems" This document can be located at:

<http://www.ucd.ie/itservices/aboutus/acceptableusepolicy/>

Blackboard

Check announcements daily for important messages in your courses or from your programme.

Use distribution lists with caution; send emails only to recipients who need the information. Distribution lists available via Blackboard should only be used for academic purposes.

Blackboard discussion boards are only to be used for their intended purpose. Any postings with inappropriate or offensive content or postings made under false names will result in disciplinary action.

While most module course information will be available on Blackboard, it should be noted that not every Module Coordinator will choose to upload course notes, etc.

Jargon Buster

You may find that some of the terminology used in the literature and online is new to you and to help you with this you can access our online 'Jargon Buster' on the following link:
<http://www.ucd.ie/students/jargon.html>

EXTENUATING CIRCUMSTANCES

If you experience difficulties which have caused you to miss a substantial number of lectures, have significantly affected your ability to study or complete assessments (continuous assessment and/or examinations) or have adversely affected your performance in any assessments you have undertaken, your circumstances can be taken into account, for example by providing the opportunity to resit or repeat the module without academic or financial penalty. Typically such unforeseen circumstances could include events like an accident, a crime, family bereavement, serious illness or other serious personal or emotional circumstances.

Whatever the circumstances affecting you, you should seek advice from a member of academic staff, a student support professional, a Science Office staff member or the Students' Union support staff. From an academic perspective, if your circumstances are straightforward and easily documented with a medical certificate (e.g. short illness or minor injury), you should first contact the module coordinator and ask whether your circumstances can be taken into account by them. There are remedies for short absences that can be implemented quickly during the teaching term if the module coordinator is aware of the absence. If your circumstances are more personal or complex or if the module coordinator advises you to, you should submit an application for extenuating circumstances via the online system.

The online system can be accessed through your online registration under the '**Programme Services**' tab. When you complete the application form online you are required to submit hard copies of the appropriate original supporting evidence to the Science Office as close as possible to the time the circumstances occurred and **within 10 working days of the documented period affected**. The final deadline for submission of the online form and supporting documentation **in relation to end of semester examinations** is **5 working days** after the end of the relevant semester examination period and applications received after this deadline **will not normally be accepted**. It is the student's responsibility to ensure that an application and supporting documentation are submitted to the Science Office within the permitted timeframe. **Applications marked as 'Awaiting Evidence' are not considered to be submitted until the supporting documentation is presented to the Science Office.**

Please note that medical certificates, which must be on stamped headed notepaper, should state the dates that you were unfit/unable to attend university or that your performance or ability to perform may have been affected. It should also be noted that supporting documentation must be consistent with the application in terms of matters such as dates, circumstances, etc. The Science Taught Programme Board reserves the right to reject any application where there are discrepancies between the supporting documentation and the application.

For full details of the extenuating circumstances framework visit:

http://www.ucd.ie/science/current_students/extenuating_circumstances.html

UCD Policy on Extenuating Circumstances: <http://www.ucd.ie/registry/academicsecretariat/extc.htm>**

UCD Policy on Late Submission of Coursework:

<http://www.ucd.ie/registry/academicsecretariat/latesub.htm>

** See section on Student Code & Policy

Disability Support Services

Students who require ongoing support and accommodation on the grounds of a verifiable disability are encouraged to register with the Disability Support Service at their earliest convenience. For further information please refer to:

<http://www.ucd.ie/openingworlds/ucdaccesscentre/supportsforstudentswithadisability/>

Foreseen Absence from College

Circumstances that prevent a student from attending lectures, practicals, tutorials, in-semester assessments or examinations **that are known in advance** are **NOT** considered extenuating circumstances and students should ensure that arrangements have been put in place with module coordinators and/or Schools **in advance of the absence**. Retrospective claims for foreseen circumstances will not be accepted.

POLICY ON LATE SUBMISSION OF COURSE WORK

Coursework must be delivered by hand to the School Office (or other location designated by the School) or submitted electronically via an approved system, no later than 3 p.m. on the due date unless otherwise instructed by a module coordinator. Usually coursework received at any time within two weeks of the due date will be graded, but a penalty will apply.

University Policy states that coursework that is late by up to one week after the due date will have the grade awarded reduced by two grade points (e.g. from B- to C); coursework submitted up to two weeks after the due date will have the grade reduced by four grade points (e.g. B- to D+). Coursework received more than two weeks after the due date may not be accepted.

Submission dates may be extended in exceptional circumstances and students must apply for an extension in writing to the School and stating the reasons for seeking the extension.

See the following web address for the full policy details:

<http://www.ucd.ie/registry/academicsecretariat/latesub.htm>

USEFUL WEB ADDRESSES	
Science Programme Office	http://www.ucd.ie/science/
Assessment Unit	http://www.ucd.ie/registry/assessment
Fees & Grants Office	http://www.ucd.ie/students/fees/index.html
UCD Student Desk	http://www.ucd.ie/students/studentdesk/
UCD School of Computer Science	http://www.csi.ucd.ie/
UCD School of Earth Sciences	http://www.ucd.ie/geology
UCD School of Mathematics & Statistics	http://www.ucd.ie/mathstat/
UCD School of Physics	http://www.ucd.ie/physics/
UCD School of Biology & Environmental Science	http://www.ucd.ie/bioenvsci/index.html
UCD School of Biomolecular & Biomedical Science	http://www.ucd.ie/sbbs/index.html
UCD School of Chemistry	http://www.ucd.ie/chem/index.html
UCD School of Medicine & Medical Science	http://www.ucd.ie/medicine/index.html
UCD Student Health Service	http://www.ucd.ie/stuhealth/
Please Talk (Information on Student Support Services)	http://pleasetalk.ie/ucd/
IT Services	http://www.ucd.ie/itservices/itsupport/
UCD Library	http://www.ucd.ie/library/
UCD Student Advisers	http://www.ucd.ie/studentadvisers
UCD Conferring Unit	http://www.ucd.ie/confer/
UCD Current Student Website	http://www.ucd.ie/students/index.html

SCIENCE UNDERGRADUATE DEGREE PROGRAMMES

The primary degree awarded in Science is the Honours Bachelor of Science (BSc) following completion of 4 Stages in the programme. Generally this requires 4 years of study. A BSc (General Science) Honours degree may be awarded to students who exit after 3 Stages of study. Students who do not achieve a minimum stage GPA of 2.48 at the completion of Stage 3 will not be permitted to progress to Stage 4.

Your degree will be awarded on your performance in the final and penultimate stages of your programme. For a 4 year programme, this means that your final degree GPA will be calculated on Stages 3 and 4. For students who exit with a 3-year programme BSc (General Sciences) the degree will be calculated on Stages 2 and 3. The award will be based 70% on your final stage and 30% on your penultimate stage. For further details see section on Degree GPA on Page 16.

BACHELOR OF SCIENCE (BSc) DEGREE SUBJECTS

(i) BSc Single Major - The subject is chosen from the following:

- Applied and Computational Mathematics
- Biochemistry & Molecular Biology
- Cell & Molecular Biology
- Chemistry
- Chemistry with Biophysical Chemistry
(available to entrants from 2012)
- Chemistry with Environmental and Sustainable Chemistry (available to entrants from 2012)
- Computer Science
- Environmental Biology
- Financial Mathematics
- Genetics
- Geology
- Mathematical Science
- Mathematics
- Medicinal Chemistry & Chemical Biology
- Microbiology
- Neuroscience
- Pharmacology
- Physics
- Physics with Astronomy & Space Science
- Physiology
- Plant Biology
- Statistics
- Theoretical Physics
- Zoology

(ii) BSc Joint Majors

Joint Majors comprising a pairing of *some* subjects from the above list may be taken. The choice of subjects is contingent on the approval of the Schools concerned. Not all combinations may be available. For the academic year 2016-2017 Joint Majors **may be available** in the following subject areas and **must have the permission of the relevant Heads of Schools**

- Applied & Computational Mathematics
- Cell & Molecular Biology
- Physiology
- Mathematics
- Physics
- Plant Biology
- Statistics
- Zoology

(iii) Mathematics & Science Education

On completion of a four-year BSc in Mathematics & Science Education, followed by a one year MSc in Mathematics & Science Education you will be a fully qualified post-primary teacher of Mathematics and either Applied Mathematics, Biology, Chemistry or Physics.

BACHELOR OF SCIENCE (BSc) SINGLE MAJORS - DENOMINATED ENTRY

- BSc Computer Science (DN201)

BAFS (HONS) SINGLE MAJOR – DENOMINATED ENTRY

- Actuarial and Financial Studies (DN230)

MODULE LEVEL RESTRICTIONS BY STAGE**Module Level restrictions for Honours Bachelors Degree:**

To graduate with a 180 or 240 credit honours degree, the credits awarded must contain a maximum of 10 Level ECTS credits, a minimum of 100 ECTS credits at Level 2 or above, of which a minimum of 40 ECTS credits must be at Level 3 or above. In other words, students must take a minimum of 60 Level 2 and 40 Level 3 credits; this leaves them with the flexibility to take 80 or 140 credits of Level 0, 1, 2, 3 or 4 modules, subject to the restrictions below, to complete a 180 or 240 credit honours degree.

MODULE LEVEL RESTRICTIONS BY STAGE (for 240 credit Honours Degree)				
	Stage 1	Stage 2	Stage 3	Stage 4
Level 0	Max.10 non-elective credits	No non-elective credits	No non-elective credits	No non-elective credits
Level 1	No restrictions	Max 20 non-elective credits	No non-elective credits	No non-elective credits
Level 2	Max 10 non-elective credits or with Programme Board approval	No restrictions	Max 20 non-elective credits	No non-elective credits
Level 3	No non-elective credits	No restrictions. Up to individual Programmes.	No restrictions	No restrictions. Up to individual Programmes
Level 4	No non-elective credits	No non-elective credits	No restrictions	No restrictions. Up to individual Programmes
Electives	No restrictions	No restrictions	No restrictions	No restrictions

Further information on Module Level Restrictions can be found at: User's Guide to General Regulations. <http://www.ucd.ie/registry/academicsecretariat/asug/modulesandcredits/> and the particular FAQ that addresses this is 'What is a level?'

INFORMATION ON MODULES GRADES; LATE/ABSENT FROM EXAM; DEGREE CLASSIFICATION

MODULE GRADES AND GRADE POINT VALUES

GRADE	GRADE-POINT	DESCRIPTION
A+	4.2	Excellent
A	4	
A-	3.8	
B+	3.6	Very Good
B	3.4	
B-	3.2	
C+	3	Good
C	2.8	
C-	2.6	
D+	2.4	Pass
D	2.2	
D-	2	
E	1.6	Fail
F	1.0	Fail
G	0.4	Fail
NG	0	Fail

IMPORTANT: Significant changes to the policy for the potential compensation of E grades, and the phased removal of compensation, came into effect in 2013-2014. **From the 2015-16 academic year no modules are eligible for compensation.**

MODULE GRADE DESCRIPTORS

Further information on Module Grade Descriptors can be found at: User's Guide to General Regulations. <http://www.ucd.ie/registry/academicsecretariat/asug/modulesandcredits/> and the particular FAQ that addresses this is 'What is a Module Descriptor'?

Procedure if you are absent or late for an examination

If you are absent from an examination due to extenuating circumstances you should contact the Science Office as soon as possible for advice.

If for some reason you find that you may be late for an examination, it is advised that you should still attend the Examination Centre, where it may be possible that arrangements can be put in place to facilitate you.

DO NOT PANIC

ATTEND THE EXAMINATION CENTRE AS SOON AS POSSIBLE

OR

CONTACT THE SCIENCE OFFICE AS SOON AS POSSIBLE FOR ADVICE

POLICY ON UNDERGRADUATE CONTINUATION

The Undergraduate Continuation Policy will seek in the first instance to identify timely interventions to ensure that students complete their programme. Following a number of interventions and supports, it will be up to the Science Taught Programme Board to propose to UPB that a student's registration be cancelled. Students at risk will be identified using the following criteria:

- Poor attendance record
- Lack of engagement
- Failure to make sufficient and timely academic progress
- Repeated failure of examinations
- Failure to meet continuous assessment deadlines
- Failure to meet programme requirements
- Failure to fulfill academic obligations

Students who meet some or all of these criteria over four consecutive semesters, despite the interventions described above, will be referred to the University Programme Board for exclusion from their Programme. Interventions will be made after the Programme Examination Board for each of the four successive semesters in question.

Intervention 1

- Students at risk will be identified at the Programme Exam Board. These students will be formally notified of concern about their academic performance. This communication will be scheduled during the first four weeks of term. Students will be informed that their progress is being monitored and that continued dis-engagement could result in their removal from the programme should their engagement not improve over the subsequent three semesters. Students will be made aware of the range of academic support services available to them. Students will be advised that if they wish to make an appointment to meet with the Chair of the Science Programme Board (or his nominee) to discuss their performance this will be arranged.

Intervention 2

- Again students will be formally notified that the Programme Exam Board has considered their results and engagement and has found them in breach of the continuation policy. Students will be given the opportunity to explain their performance and will be given guidance on the repeat/resit process.

Intervention 3

- Students will be notified that their performance has been deemed non-satisfactory by the Programme Exam Board and that they are now in danger of removal from their programme. A meeting with the Chair of the Science Programme Board (or nominee) will be arranged where students will be asked to explain/consider their performance on their programme.

Intervention 4

- Students will be informed that the Programme Exam Board has approved the recommendation of their removal from the programme. Students will be given a period to appeal this outcome and to provide a reasonable explanation to the Board.

If students do not engage with, or respond to formal communications sent to them, the process will continue and the lack of response will be noted in the School's supporting evidence sent to UPB.

Degree GPA

For all students completing their degrees from 2014-15 onwards, the final degree GPA is based 70% on the final Stage and 30% on the penultimate Stage. For a four year degree it is 70:30 based on Stage 4: Stage 3. Students who graduate on completing Stage 3 with a BSc (General Sciences) Degree will have their degree GPA based 70% on Stage 3 and 30% on Stage 2. Students considering an international exchange for one or two semesters should visit:

http://www.ucd.ie/science/current_students/Degree_GPA_Calculation.html for further information.

This rule generally applies to students who entered the undergraduate Science programme from September 2011, but also applies to students who entered the programme prior to September 2011 but have had to complete repeats and resits requiring them to take one or more additional semester(s) to complete their degree. For students who commenced their degree before September 2011 but were unable to complete their degree prior to 2014-2015 due to Extenuating Circumstances, it **may** be possible to have their degree GPA calculated under the old regulation of their GPA being calculated on 100% Stage 4. Any student who believes they are eligible for this should contact the Science Office to discuss their case.

In the BAFS programme the final degree GPA is calculated on the unweighted GPAs of the final and penultimate stages of the programme and based on modules, including elective modules, that the student completes and passes to satisfy the credit requirements of those stages.

REPEATS AND RESITS IN UNDERGRADUATE SCIENCE PROGRAMMES

If you do not pass a module, what can you do?

Remediation: A School decides on the remediation opportunities for its modules, as it deems appropriate. The method of remediation for each module can be found online in the relevant module descriptor but will comprise some combination of the following:

- **Repeat** the module when it is next offered. A grade of D- or better awarded for a repeat attempt at a module carries a grade point of 2.0, irrespective of the actual grade awarded.
- **Resit the assessment** for that module, if a resit is offered. The resit assessment will be graded as pass (PR), fail (FR) or no grade (NG) with a grade point of 2.0 for a pass. The resit may be a single terminal examination and/or may require the submission of coursework or other assessment tasks during the semester. You should always seek advice from the Science Office and the School involved if you find yourself in this position.
- **Substitute another module** compatible with the credit requirements of the programme.

Students are permitted to substitute a new module for a failed option or elective module. When a student chooses this course of action, they are considered to be attempting this for the first time and the full grade point is awarded. This option will incur fees for the full cost of the new module. Information on Repeats and Resits is available on the Assessment website at: <http://www.ucd.ie/students/resitsrepeats.html>

Repeat Students: In a certain number of cases you may have earned insufficient credits (less than 50) to progress into the next Stage of your degree. In this situation you can return in the next academic year to complete the requirements for the Stage and potentially take some modules for the Stage that you plan to progress into. All students in a repeat Stage should meet with a member of staff in the Science Office at the start of the academic year for advice on their registration/enrolment and the options open to them for that year. More detailed information for students in a repeat attempt at a specific stage can be found in the relevant section in Stages 1-4 and on: http://www.ucd.ie/science/current_students (*See information on Assessment under Guidelines & Policies*)

SCIENCE STAGE 1 SUBJECT STREAMS (DN200)

You have chosen one of four streams within DN200 depending on your scientific interests. By choosing a stream, you can tailor your study plan to focus on a particular area or sample more widely to explore your interests. UCD Horizons enhances the subject choice available, so that of your 12 modules, two may be selected from other disciplines (e.g. languages) as electives. You may change your stream by informing the staff in the Science Office before the registration process closes at **5pm on 23rd September 2016**.

- UCD Science (DN200) is a single point of entry for **27 separate degree subjects**. The pathways, from the point of entry to graduation, for each of these subjects are described in the UCD Science prospectus which can be found at www.ucd.ie/science/ucdsience.pdf
- The course in **Stage 1 (first year)** is divided into 12 modules. Students choose their modules in order to fulfil the first year requirements for the subjects that interest them most. Students can either focus on a particular area, but must fulfil the requirements for at least 2 subjects, or choose to cover the core requirements for a wide range of subjects. There is no competition for places in Stage 1; students are guaranteed their subjects of choice.
- In **Stage 2 (second year)** students cover the requirements for **a minimum of 2 or 3 subjects**. Due to timetable and workload constraints not all combinations of subjects are possible in Stage 2 – but almost all combinations are possible within each of the BBB, CCS and MPG subject streams, and students can also combine Stage 2 subjects across subject streams. The choice of Stage 2 subjects that can be combined depends on the number of core modules shared between those subjects and the extent to which other requirements have been met in Stage 1. The details are contained in the Science Handbook. Students can study any subject in Stage 2 for which they have met the Stage 1 requirements; you are guaranteed any subject in Stage 2 that you are qualified to take.
- In **Stage 3 (third year) and Stage 4 (fourth year)** students study one of their Stage 2 subjects to degree level and this subject is their degree major. The selection of degree major may be competitive. In previous academic years 98% of students who completed Stage 2 got their first choice of degree major in Stage 3. There are a limited number of joint-major degrees available.

DN200 No preference

You have chosen to keep your options open. You are advised to use Science Programme literature to choose modules that will allow you to sample from areas that interest you, while ensuring that you fulfil the requirements for subjects you may wish to study in later Stages. Some modules that are required for a specific subject may be deferred to second year (Stage 2) to increase your range of options in first year (Stage 1) or to allow you to take introductory modules. Be aware that if you defer too many modules to Stage 2 (e.g. Programme Cores – see Table 2), you may restrict your choice of degree subjects.

The Mathematics modules have been designed to meet the needs of different subjects. Please ensure that you are taking the appropriate set of Mathematics modules. Further advice is contained within each subject area, DN200BBB, DN200CCS and DN200MPG.

DN200 BBB – Biological, Biomedical and Biomolecular Sciences

You have chosen to focus your studies on the Biological, Biomedical and Biomolecular disciplines. This will lead to a degree in one of the following subjects

- Biochemistry & Molecular Biology
- Cell and Molecular Biology
- Environmental Biology
- Genetics
- Microbiology
- Mathematics, Biology & Education
- Pharmacology
- Physiology
- Plant Biology
- Neuroscience
- Zoology

There are a number of modules you must take to continue studying in this area (Table 2). In addition to Biology, you must complete two modules of Mathematics and a module of Chemistry. You are not limited to these subjects. You may choose modules from other areas to widen the choices available to you.

If you are sure of your interest in Biological disciplines, we recommend that you take additional modules in first year (Stage 1) that are required for your degree (Programme Cores – see Table 2) or select modules that deepen your knowledge in this area. If you defer too many Programme Cores, this may limit some of your

options in Stage 2. If you are interested in keeping your options open regarding pursuing a degree in the Chemical, Mathematical, Physical or Geological Sciences you should carefully read the DN200 CCS and DN200 MPG sections and seek academic advice if necessary, e.g. by contacting asdean.science@ucd.ie.

DN200 CCS – Chemistry & Chemical Sciences

You have chosen to focus your studies on the Chemical Sciences. This will lead to a degree in one of the following subjects:

- Chemistry,
- Medicinal Chemistry and Chemical Biology
- Chemistry with Biophysical Chemistry
- Chemistry with Environmental & Sustainable Chemistry
- Mathematics, Chemistry and Education

There are a number of modules you must take to continue studying in these areas (Table 2). In addition to Chemistry, you must complete two modules of Mathematics and may be required to take a module in Biology. You are not limited to these subjects. You may choose modules from other areas to widen the choices available to you.

If you are sure of your interest in Chemistry and Chemical Sciences, we recommend you take additional modules in first year (Stage 1) that are required for your degree (Programme Cores – see Table 2) or select modules that deepen your knowledge in this area. If you defer too many Programme Cores, this may limit some of your options in Stage 2. If you are not required to take CHEM00010, seek academic advice as you could consider taking CHEM20080 in semester 1.

If you are interested in keeping your options open regarding pursuing a degree in the Biological, Mathematical, Physical or Geological Sciences you should carefully read the DN200 BBB and DN200 MPG sections and seek academic advice if necessary, e.g. by contacting asdean.science@ucd.ie.

DN200 MPG – Mathematical, Physical & Geological Sciences

You have chosen to focus your studies on the Mathematical and/or Physical and/or Geological Sciences. This will lead to a degree in one of the following subjects:

- Geology
- Physics
- Physics with Astronomy & Space Science
- Theoretical Physics
- Mathematics, Physics & Education
- Mathematics, Applied Mathematics & Education
- Applied & Computational Mathematics
- Statistics
- Mathematics
- Mathematical Sciences
- Financial Mathematics

Each subject has specific modules that you are required to take to progress in this area, although a number of modules are common to all subjects (Table 2). Some of these modules may be deferred to second year (Stage 2) if you wish to explore your interests in other subjects within this area or more broadly within Science or if you are required to take introductory modules. You are not limited to these subjects. You may choose modules from other areas to widen the choices available to you.

If you are sure of your interest in these subjects, we recommend you select additional modules in first year (Stage 1) that are required for your degree (Programme Cores – see Table 2) or select modules that deepen your knowledge in this area. If you defer too many Programme Cores, this may limit some of your options in Stage 2. If you have an interest in studying Geology beyond first year, you are recommended to take GEOL 10030.

You should note that the requirement for Mathematics within DN200 MPG varies and you should make sure that you are taking the correct set of Mathematics modules for your chosen subjects. Please seek academic advice to confirm your choices if you are in any doubt.

If you are interested in keeping your options open regarding pursuing a degree in the Biological or Chemical Sciences you should carefully read the DN200 BBB and DN200 CCS sections and seek academic advice if necessary, e.g. by contacting asdean.science@ucd.ie.

CHOOSING MODULES IN STAGE 1

- During Orientation Week, academic staff from the Science Office and disciplines will be available to assist you in choosing your modules and in completing your registration.
- All full-time students are required to study twelve modules in a year – it is recommended that you study six modules in each semester. The maximum number permitted in a semester is eight. At least ten of your Stage 1 modules must be from within Science (listed in Table 1). You may take up to two non-science elective modules in Stage 1. You are advised to consider your choice of elective modules carefully. You may also take your electives from within the Science Programme.
- Students are **guaranteed their subjects of choice in Stage 1** and, when in Stage 2, can study any subjects that they are qualified to take and for which the required modules can be combined and timetabled.
- You must take at least two Mathematics modules during Stage 1. Note that the requirements listed in Table 2 represent the minimum level of Mathematics required, but that alternative higher level modules may be available (see Mathematics information on page 24 for further information).
- The wide variety of Science modules available in Stage 1, shown in Table 1, allows you to sample and experience a number of subjects, while also studying the core modules required for your discipline. The choices you make in first year will have a bearing on your final degree subject(s). Make sure that you meet the core requirements for your subject of choice and consider taking Programme Cores (Table 2 Page 23) to reduce restrictions on your Stage 2 choices. The Level 0 and Level 1 modules required for entry to the degrees in the various subject areas are listed in Table 2.
- All Science laboratory and tutorial times will be automatically allocated at the start of term after you register online to your preferred area and your optional Science modules. Once the allocation to practicals and tutorials has been made, usually during the first week of term you will be able to see and print your individual timetable.
- It is possible to take a joint degree combining two subjects, subject to the agreement of the two disciplines concerned. The range of joint degrees available is limited and you should seek academic advice from the relevant subjects and further information from the Science Office if you wish to pursue this possibility.

INFORMATION RELATING TO PARTICULAR SUBJECTS IN STAGE 1

Mathematics

Students are required to take at least 2 modules in Mathematics, Linear Algebra and Calculus during their degree in UCD. Mathematics teaching has been tailored to meet the requirements of different programmes. However, Mathematics is fundamental to many disciplines of modern Biology and Chemistry and you should consider studying Mathematics to the level of your ability. You can sample the Mathematics for Physical or Mathematical Sciences modules and if you find them too challenging, you can move to Mathematics for the Sciences in the first weeks of the semester without affecting your ability to complete the modules. Students must take one Mathematics module in Semester 1. If a student is required to do MATH 00010 then their Linear Algebra module must be deferred until 2nd year (Stage 2). If you are interested in pursuing your studies in Mathematics to a higher level you should seek academic advice in relation to the Mathematics modules you should study.

Table. Mathematics Requirements

Subjects/Areas		Mathematics Topics		Comment (to substitute Mathematics modules, you must go to the Science Office)
		Linear Algebra	Calculus	
1	Biological Biomedical and Biomolecular (excluding Education), Chemistry and Chemical Sciences (excluding Education), Geology	MATH10290	MATH10310	MATH10340 can be taken instead of MATH10290 if students want to keep Mathematical and Physical Science subjects open. MATH10350 can be taken instead of MATH10310 if students want to keep the Education degrees or Mathematical and Physical Science subjects open.
2	Mathematics, Biology & Education, Mathematics, Chemistry & Education	MATH10290	MATH10350	MATH10340 can be taken instead of MATH10290 if students want to keep Mathematical and Physical Science subjects open. MATH10350 also fulfills the requirements for all BBB, CCS and Geology subjects (see above).
3	Physics, Theoretical Physics, Physics with Astronomy and Space Science, Mathematics, Physics & Education, Mathematics, Mathematical Sciences, Applied and Computational Mathematics, Financial Mathematics Statistics, Mathematics, Applied Mathematics & Education	MATH10340	MATH10350	Students who have not attained at least a HC3 in Leaving Certificate Mathematics (or equivalent) are strongly advised to consult with either the School of Physics or the School of Mathematical Sciences – depending on their main area of interest.

Mathematics and Science Education Degrees

The Mathematics and Science Education Programme is a five-year programme, consisting of a four-year BSc in Mathematics and Science Education, followed by a one-year MSc in Mathematics and Science Education. On successful completion of the five years of the programme, you are fully qualified to teach Mathematics and either Applied Mathematics, Biology, Chemistry or Physics to Higher Leaving Certificate Level in an Irish post-primary school. If your chosen Science specialisation is Biology, Chemistry or Physics you are also fully qualified to teach Science to Junior Certificate Level.

To meet Teaching Council approval to teach Applied Mathematics, Biology, Chemistry, Mathematics or Physics to Higher Leaving Certificate Level, you must study a minimum 60 ECTS credits of your chosen subject at third level. The Teaching Council places additional conditions on the areas of study for each subject, and the number of modules studied which must be at level 3 or above. The Teaching Council criteria also state that a prospective teacher of Biology, Chemistry or Physics must complete a minimum 10 ECTS credits in Biology, Chemistry and Physics in order to qualify to teach Science to Junior Certificate Level. The five-year Mathematics and Science Education Programme has received accreditation from the Teaching Council for each of its pathways and you are a fully qualified teacher on graduation from the five-year programme. More details can be found from the Science Handbook, the DN200 Pathways (www.ucd.ie/science/ucd_science_degrees.html) and from academic staff.

TABLE 1. SCIENCE MODULES AVAILABLE IN FIRST YEAR (STAGE 1).

Semester 1	Semester 2
Project Module (Core for all First Year Students in DN200)	
<i>SCI10010 Scientific Enquiry</i>	
Biological, Biomolecular & Biomedical Modules	
<i>BIOL00010 Fundamentals of Biology</i>	<i>BIOL10110 Cell Biology & Genetics</i>
BIOL10130 Biology in Action	BMOL10030 Biomedical Sciences
BIOL10140 Life on Earth	
Chemistry Modules	
<i>CHEM00010 Introductory Chemistry</i>	<i>CHEM10050 Organic Chemistry</i>
CHEM10040 The Molecular World	CHEM10100 Medicinal Chemistry
CHEM20080 Basis of Physical Chemistry	CHEM20020 Inorganic Chemistry
CHEM20100 Basis of Inorganic Chemistry	CHEM20120 Physical Chemistry (Level 2)
Geology Modules	
GEOL10050 Earth & Humanity ‡	GEOL10020 Earth Science & Materials
<i>GEOL10060 Introduction to Earth Sciences ‡</i>	GEOL10050 Earth & Humanity ‡
	GEOL10030 Field Geology (Level 1)
	GEOL10040 Earth, Env & Society
	<i>GEOL10060 Introduction to Earth Sciences ‡</i>
Mathematics Modules for Biological, Chemistry and Geological Sciences ‡	
<i>MATH00010 Introduction to Mathematics</i>	<i>MATH10310 Calculus for Science</i>
<i>MATH10290 Linear Algebra for Science ‡</i>	
Physics Modules	
<i>PHYC10070 Foundations of Physics</i>	<i>PHYC10080 Frontiers of Physics</i>
PHYC10050 Astronomy & Space Science	PHYC10210 Quanta, Particles and Relativity
PHYC20080 Fields, Waves & Light	PHYC20030 Thermal Physics
Applied & Computational Mathematics Modules	
<i>ACM10080 App Maths: Mechs & Methods</i>	<i>ACM10060 Appl of Differential Equations</i>
ACM10090 Climate Change: Causes & Consequences	ACM10070 Math Modelling in the Sciences
Mathematics Modules for Mathematical & Physical Sciences	
<i>MATH00010 Introduction to Mathematics</i>	<i>MATH10350 Calculus for Mathematical & Physical Sciences</i>
<i>MATH10340 Linear Algebra for Mathematical & Physical Sciences ‡</i>	MATH10320 Mathematical Analysis
MATH10040 Numbers and Functions	
Statistics Modules	
STAT10010 Introduction to Statistics	<i>STAT10060 Statistical Modelling</i>
STAT10050 Practical Statistics ‡	STAT10050 Practical Statistics ‡
STAT10140 Research Methods for Science	
Education Module	
	<i>EDUC10130 Teaching & Learning Maths</i>

‡ Students who also want to be eligible for a Mathematical or Physics subject in Stage 2, in addition to a Biological, Chemistry or Geological subject, must take the Mathematic modules for Mathematical and Physical Sciences instead.

‡ This module is offered in both Semester 1 and Semester 2.

‡ This module may be deferred until Stage 2 if student has to take MATH00010 in Stage 1 (see Table 3)

Bold Italics Core modules for a particular subject that must be taken in first year (unless otherwise stated)

Italics Conditional Cores. Modules that may need to be taken in Semester 1 of first year, depending on results of Leaving Certificate results or equivalent qualifications (see Table 3).

Table 2. Modules required for B.Sc. Degrees within Science (DN200)

Degrees	Conditional Core Modules that may be required (<i>Please see Table 3</i>)	Core Modules that must be taken in Stage 1 (see footnote)	Programme Cores: Compulsory Modules that students may choose to take in either Stage 1 or Stage 2
BIOLOGICAL, BIOMEDICAL & BIOMOLECULAR SCIENCES (BBB)			
Biochemistry & Molecular Biology, Cell & Molecular Biology Environmental Biology Genetics Microbiology Neuroscience Pharmacology Physiology Plant Biology Zoology	BIOL00010 CHEM00010 MATH00010 PHYC10070 (only a conditional core for Neuroscience and Physiology)	SCI10010 BIOL10110 CHEM10050 MATH 10290* , MATH10310*	At least two of : BIOL10130 BIOL10140 BMOL10030
Mathematics, Biology & Education	BIOL00010 CHEM00010 PHYC10070	SCI10010 BIOL10110 CHEM10050 MATH10290*, MATH10350 EDUC10130 STAT10060	BIOL10130 BIOL10140
CHEMISTRY & CHEMICAL SCIENCES (CCS)			
Chemistry, Chemistry with Biophysical Chemistry, Chemistry with Environmental and Sustainable Chemistry, Medicinal Chemistry and Chemical Biology	CHEM00010 MATH00010 BIOL00010 (only a conditional core for Medicinal Chemistry)	SCI10010 CHEM10050 MATH10290*, MATH10310* BIOL10110 (only a core for Medicinal Chemistry)	CHEM 20020 CHEM 20080 CHEM 20100 CHEM 20120
Mathematics, Chemistry & Education	BIOL00010 CHEM00010 PHYC10070	SCI10010 CHEM10050 MATH10290*, MATH10350 EDUC10130 STAT10060	CHEM 20020 CHEM 20080 CHEM 20100 CHEM 20120
MATHEMATICAL, PHYSICAL & GEOLOGICAL SCIENCES (MPG)			
Geology	MATH00010	SCI10010 <i>GEOL 10020, GEOL10060</i> MATH10290*, MATH10310*	
Physics, Physics with Astronomy & Space Science, Theoretical Physics	ACM10080 MATH00010 PHYC10070	SCI10010 <i>PHYC10080</i> MATH 10340, MATH10350	ACM10060** PHYC10050** PHYC20030, PHYC20080**
Mathematics, Physics & Education	ACM10080 BIOL00010 CHEM00010 PHYC10070	SCI10010 PHYC10080 MATH10340, MATH10350 EDUC10130 STAT10060	ACM10060 PHYC20030 PHYC20080**
Applied and Computational Mathematics, Mathematics, Financial Mathematics Mathematical Science, Statistics	<i>ACM10080 (only required for Applied and Computational Mathematics)</i>	<i>SCI10010</i> <i>ACM10060</i> <i>MATH10340*</i> , <i>MATH 10350</i> <i>STAT 10060</i>	MATH10040, MATH10320 (Mathematics, Math Sci. & Financial Maths only) ECON10720 (Financial Maths only)
Mathematics, Applied Mathematics & Education	ACM10080	SCI10010 ACM10060 MATH 10340, MATH10350, EDUC10130 STAT10060	MATH10040 MATH10320

Notes for Table 2 (* and **) given on next page:

Footnotes for Table 2:

The modules highlighted in **BOLD ITALICS** text constitute all of the compulsory modules for any subject in BBB and CCS except for the education pathways (note also conditional cores and programme cores).

The modules highlighted in *ITALICS* text constitute all of the compulsory modules for any subject in MPG except for the education pathways (note also conditional cores and programme cores).

* The following should be noted for the MATH10290 and MATH10310 modules :

Students required to take MATH10290 can take MATH10340 instead.

Students required to take MATH10310 can take MATH10350 instead.

Students required to take MATH00010 must defer MATH10290 or MATH10340 until Stage 2.

** The following should be noted for students following one of the Physics Degrees :

ACM10060 is core in Stage 1 for Theoretical Physics, but it may be taken in either Stage 1 or Stage 2 for Physics or Physics with Astronomy and Space Science.

PHYC10050 must be taken in either Stage 1 or Stage 2 for Physics with Astronomy and Space Science.

In order to take PHYC20080 in Stage 1, students must have attained a minimum grade of B3 in Higher Leaving Certificate Physics (A level; Grade B) AND a minimum grade of HB3 in Higher Leaving Certificate Mathematics (A level; Grade B).

Conditional Core Modules

Some students may not have a sufficiently strong background in a subject and may be required to take an introductory module in the subject before they can take more advanced modules. Table 3 outlines the specific “prior learning” requirements associated with these modules.

Table 3. Prior Learning requirements

Relevant Leaving Certificate Subject	Requirement (Conditional Core Module)	Rule
Applied Mathematics	ACM10080 Applied Mathematics, Methods & Applications	For the degrees where ACM10080 appears as a Conditional Core module in Table 2, students must take ACM10080 and/or have attained a minimum grade HC3 in Leaving Certificate Higher Applied Mathematics (A Level; Grade C).
Biology	BIOL00010 Fundamentals of Biology	To take BIOL10110 students must have taken BIOL00010 or attained a minimum grade C3 in Higher Leaving Certificate Biology (A Level; Grade C). BIOL00010 is also recommended for students taking BIOL10100 and BIOL10090 who haven’t achieved a HC3 in Leaving Certificate Biology.
Chemistry	CHEM00010 Introductory Chemistry	To take CHEM10050, students must have taken CHEM00010 or have attained a minimum grade C3 in Higher Leaving Certificate Chemistry (A Level; Grade C).
Mathematics	MATH00010 Introductory Mathematics	Students who did not achieve a minimum grade A2 Ordinary Level or HC3 in higher level Leaving Certificate Mathematics (GCSE; Grade A, A Level; Grade D) must take MATH00010 in addition to other required Mathematics modules.
Physics	PHYC10070 Foundations of Physics	To take PHYC10080 students must have taken PHYC10070 and/or attained a minimum grade of C3 in Higher Leaving Certificate Physics (A Level; Grade C). However, PHYC10070 is recommended for all students interested in pursuing further studies in Physics, Physics with Astronomy & Space Science and Theoretical Physics.

Geology

In order to take GEOL 10030 Field Geology, students must take or have taken GEOL 10020 and/or GEOL10060.

Science Stage 1

SCIENCE (DN200)

BIOLOGICAL, BIOMOLECULAR & BIOMEDICAL SCIENCE (DN200BBB)

CHEMISTRY & CHEMICAL SCIENCES (DN200CCS)

MATHEMATICAL, PHYSICAL & GEOLOGICAL SCIENCES (DN200MPG)

COMPUTER SCIENCE (DN201)

BACHELOR OF ACTUARIAL & FINANCIAL STUDIES (DN230)

STAGE 1 PROGRESSION FOR BSC SCIENCE STUDENTS

Students entering Stage 2 science must select a minimum of **two** subjects. If both subjects are selected from among Pharmacology, Neuroscience, Physiology and Genetics, however, students **must choose an additional subject** that is not in that list. Subject selection takes place online during July 2016.

The subjects available to you depend on the modules that you have attempted in Stage 1. When you select your subjects you will be pre-enrolled to the relevant core modules for Stage 2. You will be able to select your remaining modules when module registration opens in August 2015.

Students with 50 and 55 Stage 1 credits

Under University regulations, students are entitled to progress to the next Stage carrying up to 2 failed modules. Within the BSc programme, the following additional progression rules apply.

A student may progress to the next Stage of a subject if they have the possibility of meeting the core and optional requirements of the uncompleted Stage through repeating or selecting modules and with the approval of the School. Module prerequisites may be waived by a School if a student is taking the appropriate Stage modules as co-requisites. A student will be provisionally accepted into a Subject under the mechanism approved by the Programme Board.

STAGE 1 REPEAT STUDENTS

Students returning to a repeat attempt at Stage 1 will find information on how to register to resits and repeats, via the Resit/Repeat/Substitution tab on the Current Students website at: http://www.ucd.ie/students/resits_repeats/. Students considering a module substitution should note the pre-requisite requirements for their preferred subject areas in Stage 2. Details of the modules required in Stage 1, in order to progress to a subject area in Stage 2, can be found by consulting Table 2 on page 23.

Students should note the potentially substantial costs associated with the substitution of a module. Further information on these fees can be found at www.ucd.ie/fees

Students in a repeat attempt at Stage 1 have the opportunity to select modules from their next stage (via the 'Next Stage' tab in their SIS screen). The ability to take these modules can depend on a number of factors including whether these next stage modules will fit into the timetable for the modules required to complete their repeat stage. Other issues that need to be considered are pre-requisites and capacity.

SYLLABUS OF STAGE 1 SUBJECTS IN SCIENCE

The information given below, while final at the time of printing, **SHOULD ONLY BE USED AS A GUIDE** and not as an official statement of this curriculum. Further information on the programme curriculum, as well as detailed module information, can be found at www.ucd.ie/students/course_search.htm

Cores (C), Options (O), Conditional Cores (CC) and Programme Cores (PC)

The tables below list the Cores (C) and Options (O) for each subject in Stage 1 Science. There are also Conditional Cores (CC) modules that must be taken if a specified Leaving Certificate/A Level grade has not been achieved. In addition, the tables also list Programme Cores (PC) which are modules that must be taken but not necessarily in Stage 1; they may be taken in Stage 2. There are some Programme Cores that are common to more than one subject. Recommended or suggested modules are also listed for some subjects and may be taken by students interested in deepening their knowledge of a particular subject.

BIOLOGICAL, BIOMEDICAL AND BIOMOLECULAR SCIENCES (DN200 BBB)

Biological, Biomedical and Biomolecular Sciences

Students take at least 4 core modules in Stage 1. Students must also take a MATH module in Semester 1 of Stage 1. Students who did not achieve an OA2 or HD1 in Leaving Certificate Mathematics must take MATH00010. Students required to take MATH00010 in Stage 1 may defer MATH10290 until Stage 2. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. Students who did not achieve a HC3 or better in Leaving Certificate Biology must take BIOL00010. Students must take at least 2 of BIOL10130, BIOL10140 or BMOL10030 in either Stage 1 or Stage 2. Students intending to complete a degree in Physiology or Neuroscience must have achieved a minimum HC3 in Leaving Certificate Physics or complete PHYC10070 in Stage 1 or Stage 2. Students who wish to remain eligible for Mathematics, Biology & Education in Stage 2 must take EDUC10130 and STAT10060.

Core/Option	Code	Title	Credits	Semester
C	BIOL10110	Cell Biology & Genetics	5	2
C	CHEM10050	Organic Chemistry & Chemical Biology	5	2
C	MATH10310	Calculus for Science	5	2
C	SCI10010	Scientific Enquiry	5	1
CC	BIOL00010	Fundamentals of Biology	5	1
CC	CHEM00010	Introductory Chemistry	5	1
PC	PHYC10070	Foundations of Physics	5	1
Set A				
CC	MATH00010	Introduction to Mathematics	5	1
PC	MATH10290	Linear Algebra for Science	5	1
Set B				
PC	BIOL10130	Biology in Action	5	1
PC	BIOL10140	Life on Earth	5	1
PC	BMOL10030	Biomedical Science	5	2
O	EDUC10130	Teaching & Learning Maths	5	2
O	STAT10060	Statistical Modelling	5	2

Mathematics, Biology & Education

Students take at least 7 core modules in Stage 1. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. Students who did not achieve a HC3 or better in Leaving Certificate Biology must take BIOL00010. Students who intend to progress to Stage 2 Mathematics, Biology & Education **must take** at least two of BIOL10130, BIOL10140 or BMOL10030 in either Stage 1 or Stage 2. Students who did not achieve a HC3 or better in Leaving Certificate Physics, and who wish to remain eligible for Mathematics, Biology & Education, must take PHYC 10070 in Stage 1. Students **must take** either MATH10290 or MATH10350 in Stage 1.

Core/Option	Code	Title	Credits	Semester
C	BIOL10110	Biology-Cell Biology & Genetics	5	2
C	CHEM10050	Organic Chemistry & Chemical Biology	5	2
C	MATH10410	Introduction to Mathematics Pedagogy	5	2
C	MATH10350	Calculus for Mathematical & Physical Sciences	5	2
C	SCI10010	Scientific Enquiry	5	1
C	STAT10060	Statistical Modelling	5	2
CC	CHEM00010	Introductory Chemistry	5	1
CC	BIOL00010	Fundamentals of Biology	5	1
CC	PHYC10070	Foundations of Physics	5	1
Set B				
O	BIOL10130	Biology in Action	5	1
O	BIOL10140	Life on Earth	5	1
O	BMOL10030	Biomedical Sciences	5	2
Set C				
O	MATH10290	Linear Algebra for Science	5	1
O	MATH10340	Linear Algebra 1 (MPS)	5	1

CHEMISTRY AND CHEMICAL SCIENCES (DN200 CCS)

Chemistry

Chemistry with Biophysical Chemistry

Chemistry with Environmental & Sustainable Chemistry

Students take at least 3 core modules in Stage 1. Students must also take a MATH module in Semester 1 of Stage 1. Students who did not achieve an OA2 or HD1 in Leaving Certificate Mathematics must take MATH00010. Students who must take MATH00010 in Stage 1 may defer MATH10290 until Stage 2. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. It is recommended that students do not take both CHEM20080 and CHEM20100.

Core/Option	Code	Title	Credits	Semester
C	CHEM10050	Organic Chemistry & Chemical Biology	5	2
C	MATH10310	Calculus for Science	5	2
C	SCI10010	Scientific Enquiry	5	1
CC	CHEM00010	Introductory Chemistry	5	1
Set A				
PC	MATH10290	Linear Algebra for Science	5	1
CC	MATH00010	Introduction to Mathematics	5	1
Set B				

Students may take CHEM20080 &/or CHEM20120 and CHEM20100 &/or CHEM20020 in either Stage 1 or Stage 2 of their programme. However it is recommended that students who are sure that they wish to pursue this subject to degree level should take some Level 2 modules in Stage 1. Only students who have completed CHEM20080 may take CHEM20120 in Semester 2. Only students who have completed CHEM20100 may take CHEM20020 in Semester 2.

PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	The Basis of Physical Chemistry	5	1
PC	CHEM20100	The Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry (Level 2)	5	2
Set C				
Students who wish to take Chemistry with Biophysical Chemistry as a Stage 2 subject, must take BIOL10110 in Stage 1				
PC	BIOL10110	Biology-Cell Biology & Genetics	5	2
Recommended Modules				
	CHEM10040	The Molecular World	5	1
	CHEM10100	Aspects of Medicinal Chemistry & Chemical Biology	5	1
	PHYC10070	Foundations of Physics	5	1
	MATH10040	Numbers & Functions	5	1

Mathematics, Chemistry & Education

Students take at least 6 core modules in Stage 1. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. Students who did not achieve a HC3 or better in Leaving Certificate Biology must take BIOL00010. Students who did not achieve a HC3 or better in Leaving Certificate Physics, and wish to remain eligible for Mathematics, Chemistry & Education, must take PHYC 10070 in Stage 1.

Core/Option	Code	Title	Credits	Semester
C	CHEM10050	Organic Chemistry & Chemical Biology	5	2
C	MATH10290	Linear Algebra for Science	5	1
C	MATH10410	Introduction to Mathematics Pedagogy	5	2
C	MATH10350	Calculus for Mathematical & Physical Sciences	5	2
C	SCI10010	Scientific Enquiry	5	1
C	STAT10060	Statistical Modelling	5	2
CC	BIOL00010	Fundamentals of Biology	5	1
CC	CHEM00010	Introductory Chemistry	5	1
CC	PHYC10070	Foundations of Physics	5	1
Set A				
Students may take CHEM20080 &/or CHEM20120 and CHEM20100 &/or CHEM20020 in either Stage 1 or Stage 2 of their programme. However it is recommended that students who are sure that they wish to pursue this subject to degree level should take some Level 2 modules in Stage 1. Only students who have completed CHEM20080 may take CHEM20120 in Semester 2. Only students who have completed CHEM20100 may take CHEM20020 in Semester 2.				
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	The Basis of Physical Chemistry	5	1
PC	CHEM20100	The Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry (Level 2)	5	2

Medicinal Chemistry & Chemical Biology

Students must take at least 4 core modules in Stage 1. Students must also take a MATH module in Semester 1 of Stage 1. Students who did not achieve an OA2 or HD1 in Leaving Certificate Mathematics must take MATH00010. Students that must take MATH00010 may defer MATH10290 until Stage 2. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. Students who did not achieve a HC3 or better in Leaving Certificate Biology must take BIOL00010.

Core/Option	Code	Title	Credits	Semester
C	BIOL10110	Biology-Cell Biology & Genetics	5	2
C	CHEM10050	Organic Chemistry & Chemical Biology	5	2
C	MATH10310	Calculus for Science	5	2
C	SCI10010	Scientific Enquiry	5	1
CC	BIOL00010	Fundamentals of Biology	5	1
CC	CHEM00010	Introductory Chemistry	5	1
Set A				
PC	MATH10290	Linear Algebra for Science	5	1
CC	MATH00010	Introduction to Mathematics	5	1
Set B				
Students may take CHEM20080 &/or CHEM20120 and CHEM20100 &/or CHEM20020 in either Stage 1 or Stage 2 of their programme. However it is recommended that students who are sure that they wish to pursue this subject to degree level should take some Level 2 modules in Stage 1. Only students who have completed CHEM20080 may take CHEM20120 in Semester 2. Only students who have completed CHEM20100 may take CHEM20020 in Semester 2.				
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20120	Physical Chemistry (Level 2)	5	2
Recommended Modules				
	CHEM10040	The Molecular World	5	1
	CHEM10100	Aspects of Medicinal Chemistry & Chemical Biology	5	2

MATHEMATICAL, PHYSICAL AND GEOLOGICAL SCIENCES (DN200MPG)

Geology

Students take 2 core modules in Stage 1. Students must take at least one of either GEOL10020 or GEOL10060, but may take both if they wish. Students must also take a MATH module in Semester 1 of Stage 1. Students who did not achieve an OA2 or HD1 in Leaving Certificate Mathematics must take MATH00010. MATH10290 may be taken in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	SCI10010	Scientific Enquiry	5	1
C	MATH10310	Calculus for Science	5	2
Set A				
O	GEOL10020	Earth Science and Materials	5	2
O	GEOL10060	Introduction to Earth Sciences	5	1 & 2
Set B				
PC	MATH10290	Linear Algebra for Science	5	1
CC	MATH00010	Introduction to Mathematics	5	1
Recommended Modules				
	GEOL10020	Earth Science and Materials	5	2
	GEOL10030	Field Geology Level 1	5	2

Mathematics, Applied Mathematics & Education

Students take at least 6 core modules in Stage 1. Students wishing to complete a degree in Mathematics, Applied Mathematics and Education must take MATH10040 and MATH10320 in either Stage 1 or Stage 2. Students who did not achieve a HC3 or better in the Leaving Certificate Applied & Computational Mathematics, and who wish to remain eligible for Mathematics, Applied Mathematics & Education, must take ACM10080 in Stage 1.

Core/Option	Code	Title	Credits	Semester
C	ACM10060	Introduction to Applied & Computational Mathematics	5	2
C	MATH10410	Introduction to Mathematics Pedagogy	5	2
C	MATH10340	Linear Algebra in the Mathematical and Physical Sciences		
C	MATH10350	Calculus in the Mathematical and Physical Sciences	5	2
C	SCI10010	Scientific Enquiry	5	1
C	STAT10060	Statistical Modelling	5	2
CC	ACM10080	App Maths: Methods and Applic	5	1
PC	MATH10040	Numbers and Functions	5	1
PC	MATH10320	Mathematical Analysis	5	2

Applied & Computational Mathematics

Mathematics

Mathematical Science

Financial Mathematics

Statistics

Students take at least 5 core modules in Stage 1. To complete a degree in Mathematics, Mathematical Sciences or Financial Mathematics as a subject in Stage 2 students must take MATH10040 and MATH10320 in Stage 1 or Stage 2. To complete a degree in Applied & Computational Mathematics students must take MATH10320 in Stage 1 or Stage 2. Students who did not achieve a HC3 or better in the Leaving Certificate Applied & Computational Mathematics, and who wish to remain eligible for Applied & Computational Mathematics, must take ACM10080 in Stage 1. Students who wish to study Financial Mathematics as a subject must take ECON10720 in either Stage 1 or Stage 2.

Core/Option	Code	Title	Credits	Semester
C	ACM10060	Introduction to Applied & Computational Mathematics	5	2
C	MATH10340	Linear Algebra in the Mathematical and Physical Sciences	5	1
C	MATH10350	Calculus in the Mathematical and Physical Sciences	5	2
C	SCI10010	Scientific Enquiry	5	1
C	STAT10060	Statistical Modelling	5	2
CC	ACM10080	App Maths: Methods and Applic	5	1
PC	ECON10720	Business Economics	5	1 & 2
PC	MATH10040	Numbers and Functions	5	1
PC	MATH10320	Mathematical Analysis	5	2
Recommended Module				
	ACM10070	Maths Modelling in the Sciences	5	1
	STAT10140	Research Methods for Science	5	1

**Physics,
Physics with Astronomy & Space
Science Theoretical Physics**

Students take at	Code	Title	Credits	Semester
C	MATH10350	Calculus in the Math. and Phy. Sciences	5	2
C	PHYC10080	Frontiers of Physics	5	2
C	SCI10010	Scientific Enquiry	5	1
CC	ACM10080	Applied Mathematics: Mechanics & Methods	5	1
CC	PHYC10070	Foundations of Physics	5	1
PC	ACM10060	Applications of Different Equations	5	2
PC	PHYC10050	Astronomy & Space Science	5	1
PC	PHYC20030	Thermal Physics and Materials	5	2
PC	PHYC20080	Field, waves & light	5	1
Set A				
CC	MATH00010	Introduction to Mathematics	5	1
PC	MATH10340	Linear Algebra in Math. and Phy. Sci.	5	1
Recommended Module				
	STAT10140	Research Methods for Science	5	1
	PHYC10210	Quanta, Particles & Relativity	5	1

Mathematics, Physics & Education

Students take at least 6 core modules in Stage 1. Students who did not achieve a HC3 or better in Leaving Certificate Chemistry must take CHEM00010. Students who did not achieve a HC3 or better in Leaving Certificate Biology must take BIOL00010. Students who did not achieve a HC3 or better in Leaving Certificate Physics, and who wish to remain eligible for Mathematics, Physics and Education, must take PHYC 10070 in Stage 1. Students who did not receive a HC3 or better in the Leaving Certificate Applied & Computational Mathematics, and who wish to remain eligible for Mathematics, Physics and Education, must take ACM10080 in Stage 1. Students intending to progress to a degree in Mathematics, Physics and Education may take ACM10060, PHYC20030 and PHYC20080 in Stage 1 or Stage 2 (see page 23 for LC requirements for PHYC 20080 in Stage 1).

Core/Option	Code	Title	Credits	Semester
C	MATH10410	Introduction to Mathematics Pedagogy	5	2
C	MATH10340	Linear Algebra in Math. and Phy. Sci.	5	1
C	MATH10350	Calculus in the Math. and Phy. Sci.	5	2
C	PHYC10080	Frontiers of Physics	5	2
C	SCI10010	Scientific Enquiry	5	1
C	STAT10060	Statistical Modelling	5	2
CC	ACM10080	App Maths: Methods and Applic	5	1
CC	BIOL00010	Fundamentals of Biology	5	1
CC	CHEM00010	Introductory Chemistry	5	1
CC	PHYC10070	Foundations of Physics	5	1
PC	ACM10060	Intro. to App. & Comp. Mathematics	5	2
PC	PHYC20030	Thermal Physics and Materials	5	2
PC	PHYC20080	Field, waves & light	5	1

DENOMINATED PROGRAMMES STAGE 1

DN201 BSC IN COMPUTER SCIENCE

Students take 10 core modules and a further 2 modules as electives. Students who did not achieve a minimum grade A2 Ordinary Level or HC3 in Higher Level Certificate Mathematics (GCSE; grade A, A level; grade C) must take MATH00010, all other students take MATH10200.

Core/Option	Code	Title	Credits	Semester
C	COMP10030	Algorithmic Problem Solving	5	1
C	COMP10040	Introduction to Computer Architecture	5	2
C	COMP10050	Software Engineering Project I	5	2
C	COMP10070	Formal Foundations	5	1
C	COMP10110	Computer Programming I	5	1
C	COMP10120	Computer Programming II	5	2
C	COMP10130	Computer Science in Practice	5	1
C	MATH10210	Foundations of Mathematics for Computer Science I	5	1
C	MATH10220	Foundations of Mathematics for Computer Science II	5	2
CC	MATH10200	Matrix Algebra	5	1
CC	MATH00010	Introduction to Mathematics	5	1

DN230 BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES

Students take all 10 core modules and a further 2 elective modules.

Core/Option	Code	Title	Credits	Semester
C	ACM10070	Math Modelling in the Sciences	5	1
C	COMP10010	Introduction to Programming 1	5	1
C	FIN20010	Principles of Finance	5	1
C	MATH10130	Introduction to Analysis (E&F)	5	1
C	ECON10720	Business Economics	5	1&2
C	ACC10040	Financial Accounting 1	5	2
C	ECON10020	Principles of Macroeconomics	5	2
C	MATH10120	Linear Algebra Apps to Econ	5	2
C	MATH10140	Advanced Calculus (E&F)	5	2
C	STAT10060	Statistical Modelling	5	2

Level 0 and Level 1 Module Descriptors

ACM10060 Applications of Differential Equations

Semester 2

This course introduces students to the theory of differential equations and dynamical systems and to their many applications as mathematical models. The topics covered prepare the student for more advanced subjects in ordinary differential equations, dynamical systems theory, numerical methods and partial differential equations.

Module Coordinator: Miguel Bustamante

Level 1

Credits 5

ACM10070 Mathematical Modelling in the Sciences

Semester 1

This module is an introduction to the mathematical modeling of phenomena in many branches of the physical and biological science. The models are formulated in terms of difference and differential equations and the students are introduced to the basic properties of these equations and certain analytical (i.e. "pen and paper") techniques for solving them. [Mathematical background] Linear and non-linear ODEs, the order of a differential equation, separability of ODEs, homogeneity and inhomogeneity of ODEs, [Solution methods] substitution, separation of variables, integrating-factor technique, the exponential substitution for second-order linear homogeneous problems, the criterion for the existence and uniqueness of solutions, [Qualitative methods] Vector fields, simple vector fields for autonomous ODEs, fixed points and bifurcations, [Modelling techniques] Dimensional analysis, the scientific method, "theory" versus "model", [Applications] These include (but are not necessarily limited to) population models, fisheries models with harvesting, drug delivery, interest rates, epidemics, the fluid analogy of electrical circuits, RC and LRC circuits, [Discrete systems] discrete population dynamics, the Fibonacci sequence, properties of discrete maps (fixed points, orbits, stability), chaos in discrete maps, cellular automata

Module Coordinator: Edward Cox

Level 1

Credits 5

ACM10080 Applied Maths: Mechanics and Methods

Semester 1

This course introduces students to:

- A. The basic principles of Newtonian Mechanics. It focuses on applications of Newton's laws with an emphasis on problem solving. The topics covered include vectors, force, momentum and Newton's laws of motion.
- B. Solution techniques for differential and difference equations arising in Sciences. Topics include: Basic mathematical models, Separable equations, Exact equations and integrating factors, Slope Fields, First order difference equations

Module Coordinator: Lennon Ó'Náirigh

Level 1

Credits 5

ACM10090 Climate Change: Causes & Consequences

Semester 1

This module is for everyone with an interest in climate change!

We know that the Earth's climate is changing. However, there are often conflicting stories about how and why this is happening. What is right? How do we know? In this module, we aim to clear up this confusion by asking critical questions about the different theories to discover the science behind each one. This module will provide an accessible introduction to the science of climate change, allowing students to understand this vital topic, and to appreciate the challenges and consequences for our future.

Module Coordinator: Xuefeng Cui

Level 1

Credits 5

BIOL00010 Fundamentals of Biology**Semester 1**

This course provides an introduction to the general principles of biology and is intended primarily for students who have not previously studied the subject. A wide range of biological concepts will be covered, including cells, organisms and ecology. These areas will be studied through addressing the question of how water availability affects life from cellular, physiological and ecological perspectives. For example, it will show how water availability determines where organisms live and how it affects their form and function (i.e. their appearance, physiology and cellular structure). The overall aim of this module is to provide a basic understanding of biology and put this in the context of the many diverse and developing research areas that exist in biology today. Upon completion of this course, students will have an understanding of the basic concepts of biology. They will understand the importance of accurate formulation of questions and the roles of observation, experimentation and use of existing knowledge in answering these questions. By studying specific topics, such as the effects of water availability, students will comprehend and be able to discuss the following:

(i) How environmental factors affect animal and plant populations; (ii) The factors which shape evolutionary development of animal and plant physiology; (iii) The interactions between cells and their environment and the structures within cells which are involved in these interactions; (iv) The diversity of form which exists in the living world.

Module Coordinator: Sean Storey**Level 0****Credits 5****BIOL10110 Cell Biology & Genetics****Semester 2**

This module will provide an introduction to the cell, its structure and functioning. Also the basis of genetics and inheritance will be explored. The following topics will be covered: (1) An overview of cell structure, content and the macromolecules within them; (2) An introduction into cell communication, signalling and messaging; (3) How cells work- cellular respiration, fermentation and photosynthesis; (4) The cell cycle and the key roles of cell division; (5) How meiosis and sexual life cycles provide biological variation; (6) Introduction into genes and inheritance from a Mendelian perspective; (6) The link between chromosomes, genes and inheritance; (7) DNA and the molecular basis of inheritance; (8) How proteins are made from genes; (9) How genomes can inform our understanding of life's diversity; (10) Brief introduction into basic genetic molecular techniques. The student is required to attend 22 lectures, five three-hour practicals and complete online continuous assessments. Students will be expected to purchase on-line access to course material for this module (in common with BIOL10130 and BIOL10140). On successful completion of this module, students should be able to demonstrate knowledge of: how to use a microscope to study cells; the basic structure, function and mechanism of cellular compartmentalization and macromolecules contained within; why and how cells communicate; an understanding of basic cellular respiration, fermentation and photosynthesis; mitosis and meiosis; Mendelian genetics; The chromosomes' role in inheritance; DNA, its structure, function and replication; DNA transcription and translation; Genetics and inheritance and its role in evolution; Genome structure and genome diversity in life; Basic molecular biological techniques, PCR, Electrophoresis, Genome sequencing, fingerprinting. The student should be able to work safely in a Biology laboratory, carry out a range of routine laboratory procedures and gain experience in using scientific equipment. The student should also be able to record observations, collate and analyse data, and write scientific reports.

Module Coordinator: Carl Ng**Level 1****Credits 5****BIOL10130 Biology in Action****Semester 1**

Biology is all around us, is happening from the microscopic to the global scale, and encompasses all organisms on Earth. To fully understand the biology of any organism requires an appreciation of how it interacts with both its environment and the myriad of other organisms it may encounter. This module will explore 'biology in action' using real life examples from the research of academics in the School of Biology and Environmental Science to demonstrate the relevance and importance of biology in our everyday lives. Parallel practical sessions will explore a biological question of your choice through a small group project. Students will be expected to

purchase on-line access to course material for this module in common with BIOL10140 and BIOL10110.

Module Coordinator: Tom Wilkinson

Level 1

Credits 5

BIOL10140 Life on Earth

Semester 1

Life is the defining feature of our planet. In this module, we will consider how it has arisen and evolved into the myriad of forms it takes today. We will introduce the principles of evolution and explore the tree of life, highlighting the major evolutionary advances that have enabled organisms to exploit every habitat on earth. The major groups of microbes, plants and animals will be presented and the key features of their biology will be discussed and illustrated. A wide range of examples will be given, spanning microbial parasites, jellyfish and corals, worms, insects, crustaceans, fish, birds, mammals and prehistoric to present day plants. We will examine how they feed, survive and reproduce and how they affect our lives. Students will be expected to purchase on-line access to course material (in common with BIOL10130 and BIOL10110).

Module Coordinator: John Finarelli

Level 1

Credits 5

BMOL10030 Biomedical Sciences: Understanding Human Disease.

Semester 2

This module will introduce students to Biomedical Science and the molecular basis of neuronal, cardiovascular, infectious, hormonal and immune diseases. Students will learn about fundamental metabolism, the structure and function of each affected organ or biological system, and how these may be disrupted to manifest into disease and clinical symptoms. The risk factors associated with each disease (e.g. genetic, environmental, diet/lifestyle) will be investigated, and current therapies and research efforts to prevent and cure the diseases will be discussed. The module provides a foundation for further studies in Biochemistry, Genetics, Microbiology, Neuroscience, Pharmacology and Physiology.

Module Coordinator: Patricia Maguire

Level 1

Credits 5

CHEM00010 Introductory Chemistry

Semester 1

The module is intended for students without a strong background in Chemistry. It will provide an overview of the subject, with an emphasis on fundamental principles. Topics will include: atomic structure and the periodic table; ionic and covalent bonding; shapes of covalent compounds; Lewis structures; chemical reactions, including balancing chemical equations, calculating chemical amounts as moles; oxidation and reduction reactions and the acid base reaction; the properties and structures of carbon compounds. The principles will be illustrated by examples of the chemistry of different elements including nitrogen, carbon, hydrogen, the alkali metals and alkaline earth metals and the halogens.

Module Coordinator: Michael Casey

Level 0

Credits 5

CHEM10040 The Molecular World

Semester 1

This is an optional module intended for students with a background in Chemistry at Leaving Certificate or equivalent. The purposes of the module are to reinforce key basic concepts, and to introduce students to the central role that molecular science now plays in understanding our environment, in understanding life processes, and in the design of new materials and medicines. The first section of the course introduces basic atomic theory and chemical bonding, and chemical energetics. These concepts are used to study various environmental problems, including pollution, the greenhouse effect and several methods of energy generation. The second half consists of a series of case studies of important drugs, including aspirin, the beta-lactam antibiotics and cimetidine. The case studies are used to revise fundamental concepts of structure and reactivity of organic compounds, and to illustrate the development of medicinal chemistry and the key role that it plays in alleviating human suffering. There are five laboratory

sessions associated with the module and these will involve student preparation (using an online assessment), a practical component and a laboratory report.

Module Coordinator: Francesca Paradisi

Level 1

Credits 5

CHEM10050 Basis of Organic and Biological Chemistry

Semester 2

The module is an introduction to organic chemistry, the chemistry of carbon. It covers the common organic molecules (alkenes, alcohols, amines, carbonyls etc.) and emphasises their recognition, naming, reactions and relevance to everyday life and health. Specific topics include 3D aspects of chemistry, what exactly happens in a chemical reaction and how it is done in practice. A significant proportion of the module is devoted to the larger molecules of life (proteins, carbohydrates, fats) and shows how these can be understood in terms of the simpler molecules.

Module Coordinator: Michael Casey

Level 1

Credits 5

CHEM10100 Aspects of Medicinal Chemistry and Chemical Biology

Semester 2

This is a module that will discuss aspects of Medicinal Chemistry and Chemical Biology. Case studies will be used throughout the module to exemplify chemical and biological aspects of drugs, natural products and vaccines. The aim of this module is to introduce students to the concepts that are at the bases of interdisciplinary subjects such as chemistry and biology, pharmacology and drug development. Workshops on scientific language and scientific presentation, paper analysis and critical thinking will be held throughout the semester. Students will also work on a project aiming at conveying a scientific message to a lay audience. A basic chemistry knowledge is strongly recommended.

Module Coordinator: Karl Oscarson

Level 1

Credits 5

COMP10010 Introduction to Programming I

Semester 1

This is a module for all students interested in using and understanding computers. In this module students will learn the practical skill of how to program a computer to make it do what they want it to do. Students will learn how to write simple computer programs that can solve problems; how to write simple programs that can process different sorts of information; and how to write programs that can respond differently to different situations. Students will find these skills very useful in all areas of study, not just computer science.

Module Coordinator: Gianluca Pollastri

Level 1

Credits 5

COMP10020 Introduction to Programming II

Semester 2

This is a module for all students interested in learning more about programming a computer to make it do what they want it to do. In this module students will learn two important techniques that make writing computer programs easier and more successful. First, students will learn to take a 'divide and conquer' approach to programming, in which a complex programming task is split into a set of simple procedures: pieces of program that are easy to write. These procedures are then combined to produce a completed program. Second, students will learn to take an 'object oriented' approach to programming, in which they see their computer programs as manipulating objects similar to those they encounter in the real world. The programming examples presented in this module will focus on data science, one of the most interesting contemporary areas of modern computer science.

Module Coordinator: Brian MacNamee

Level 1

Credits 5

COMP10030 Algorithmic Problem Solving**Semester 1**

Aims and Objectives : Over the last 40 years Computing Scientists have learned a lot about Problem Solving. What we will do in this module is to introduce you to some of the techniques and strategies which we have learned. For anyone intending to read for a degree in Computer Science, this module will introduce you to a number of the fundamental concepts which you will use again and again throughout your studies and subsequent career. If you intend to read for a degree in another subject you will still benefit from taking the module because the problem solving techniques can be applied in most other areas. The material will be presented using puzzles and games and does not require any computer skills.

Module Coordinator: Henry McLoughlin**Level 1****Credits 5****COMP10040 Introduction to Computer Architecture****Semester 2**

This course provides an introduction and practical overview to computer architecture and organisation. There is a brief historical review of the evolution of computers leading to today's design. The digital electronic circuits underlying computer systems are explained with an introduction to the basic concepts of the transistor and integrated circuits. The emphasis of the course is to present an understanding of the operation of a typical modern computer from the conceptual instruction level down to the electronic implementation level. The main components of the module are

1. A review of the historical evolution of modern computer systems and the emergence of the Von Neumann architecture.
2. Data and number representation in digital computer systems.
3. Instruction format and execution.
4. The basics of integrated circuits: the transistor and logic gates.
5. Boolean algebra.
6. Computer architecture.
7. The Memory hierarchy: Primary and secondary memory.
8. Cache memory systems.
9. Techniques for improving computing performance: Pipelining and super-scaler processing.
10. Input/Output techniques.

Module Coordinator: Damian Dalton**Level 1****Credits 5****COMP10050 Software Engineering Project 1****Semester 2**

This module focuses on developing a student's ability to program and is designed to supplement the Introduction to Programming modules COMP10110 and COMP10120. The main goal is to give the student experience in developing software programs that are significantly larger than those encountered in COMP10110 and COMP10120. On completion of the module the student will have developed at least three software programmes comprising more than 100 lines of code. This module also provides an introduction to some ideas and methods in professional software development. Students are encouraged to use a professional Integrated Development Environment such as Eclipse for project work. The important role of software testing in software development is also emphasised throughout the module. Students are also introduced to the complexities of large scale software development through seminars by external speakers from industry..

Module Coordinator: Pádraig Cunningham**Level 1****Credits 5****COMP10060 Computer Science for Engineers I****Semester 2**

This course provides students with an introduction to computer programming. Major topics include algorithm development, programming fundamentals, control flow, and data structures. By the end of the course, students will be able to write simple programs to solve small-scale problems. The module is introductory in nature and assumes no previous programming knowledge, and so is suitable for first

year students, who require a formal and structured introduction. This module will include weekly two-hour computing practicals. It is a requirement that you have access to your own laptop to undertake the practical elements and to learn how to code.

Module Coordinator: John Murphy

Level 1

Credits 5

COMP10070 Formal Foundations

Semester 1

In addition to becoming skilled in Programming and Problem Solving, Computer Scientists need to be aware of the limitations of particular techniques and be able to test for correctness of programs they produce. This course introduces students to the logical fundamentals underlying proof of correctness (propositional and predicate logic, proof techniques) and to the concept of a finite state machine, a restricted computational model used in many application domains. This course is very practical in nature and students will be required to apply the techniques they have learned to a particular set of problems.

Module Coordinator: John Dunnion

Level 1

Credits 5

COMP10110 Computer Programming I

Semester 1

In this module students will learn how to program a computer using a simple programming language (e.g. C). Students will learn how to make many simple things happen and how to solve simple problems by programming. After taking the course the students should be able to: understand the basic ideas of programming and be familiar with variables, arrays, strings, conditionals, loops, terminal and file I/O, functions, etc.; confidently write computer programs in the language they have learned during the course; run programs, to produce results. After taking the course the students should be able to: understand the basic ideas of programming and write small programs that demonstrate their knowledge of variables, loops, I/O, etc.; confidently write computer programs in the language they have learned during the course (e.g. C); run programs, to produce results.

Module Coordinator: Neil Hurley

Level 1

Credits 5

COMP10120 Computer Programming II

Semester 2

This module constitutes the second part of the Computer Programming and it is a continuation of what it was covered in COMP 10110 (Computer Programming I). Some concepts which were already covered in the first semester will be studied here in details. In addition we will look at some other concepts which were not introduced so far, such as pointers, arrays, structures and unions, structures and list processing, functions, the C pre-processor, advanced Input/Output functions, etc. We will see also the standard libraries, their content, and how they are defined and built. A strong emphasis is placed on the development of practical programming skills, for building software applications. The course is designed to give a sound understanding of the programming techniques, and how to get your application programs from the design phase to its implementation.

Module Coordinator: Gavin McArdle

Level 1

Credits 5

COMP10130 Computer Science in Practice

Semester 1

This module will introduce students to the breadth and depth of Computer Science. The course will cover major areas of current activity in the School with different guest lecturers giving weekly talks on the topics covered; for example, social networking, graph theory, evolutionary computing, databases, and natural language processing. The module has a significant practical component running parallel to the lectures that will involve group presentations, additional topic research and the development of related skills.

Module Coordinator: Ivana Dusparic

Level 1

Credits 5

ECON10720 Business Economics**Semester 1 or 2**

The aim of this module is to introduce students to the core microeconomic principles and how this can be used in a business environment to help decision making and behaviour. The module explains how markets operate and focuses on both the customer and firm side of markets. Models of consumer demand are explained as well as how firms make price and output decisions under perfect and imperfect competition. The role and rationale of government intervention into markets is also explored.

Module Coordinator: David Madden**Level 1****Credits 5****GEOL10020 Earth Science and Materials****Semester 2**

Through closely related lectures, laboratory and field classes, this module outlines the physical and chemical processes leading to the formation of Earth materials and introduces the economic uses and environmental significance of rocks. Topics include: minerals as the building blocks of rocks; melting, crystallization and the formation of igneous rocks; weathering, erosion, sedimentary processes and the formation of sedimentary rocks; stress, strain and the formation of geological structures; solid state recrystallization and the formation of metamorphic rocks; minerals, rocks, groundwater and hydrocarbons in industry and the environment.

Module Coordinator: Julian Menuge**Level 1****Credits 5****GEOL10030 Field Geology, Level 1****Semester 2**

This is an intensive, mainly field-based and residential, course, which will take place mainly in one week within the Spring Break covering the following topics: Topographic and geological maps, basic principles of navigation; plate tectonics and the geological history of Ireland; sedimentary, igneous and metamorphic processes; Irish mineral, hydrocarbon and coal resources; Geology and landscape features; building materials and quarrying.

Module Coordinator: Stephen Daly**Level 1****Credits 5****GEOL10040 Earth, Environment and Society****Semester 2**

Planet Earth is a complex interconnected system in which human activities can have disproportionate and unintended impacts. The effect of human activities on the 'health' of our planet is now a major concern globally, not only to scientists, but also to economists, policymakers and governments. This open elective module explores the causes and consequences of human induced changes and how they interact with Earth's natural processes. Key topics include climate change and geohazards, the carbon economy, the global energy landscape, the role of sustainable and renewable energy, as well as the provision of metal, non-metal and water resources for a rapidly expanding human population in the 21st century. The module also deals with possible approaches for the mitigation of climate change and environmental degradation, the effects of societal decisions on greenhouse gas emissions and the possible role of geo-engineered solutions. The concept of sustainable development and the near and long-term future of Planet Earth are also discussed. This module complements GEOL10050 Earth and Humanity. GEOL10040 focusses on how humans affect the environment, whereas GEOL10050 deals with how the Earth has affected and continues to influence humanity.

Module Coordinator: Frank McDermott**Level 1****Credits 5****GEOL10050 Earth and Humanity****Semester 1 or 2**

This open elective module considers how geological agents have shaped the pattern of human evolution, the development of agricultural and early industrial civilisations, and impact on the general health of these and today's societies. The lectures are supplemented by a comprehensive on-line learning resource. The first part investigates how environmental conditions (e.g. fluctuating

climatic conditions, natural resource availability, geohazards and catastrophic natural events) influenced the evolution, migration and settlement patterns of hominid and early-modern human populations in the recent geological past. The second part of the module examines how, over the past ten thousand years, geology has influenced the development of agriculture, cities and an increasingly sophisticated use of metals, water and other earth resources up to the Industrial Revolution. The increasing effect of humans on the environment over time will be explored, including examples of civilisations ended by their own environmental impact; the collapse of civilisations as the result of external geological forces is also considered. The third part of the module focuses on how geological and related environmental factors continue to exert strong effects on the health and wellbeing of billions of people in the 21st century. Medical Geology, an emerging discipline in environmental and human health, is introduced. Case studies will be used to illustrate the beneficial and harmful effects of metals, metalloids and mineral dust on human health and their links with geological environments. The module complements GEOL10040, in which the current and future impact of humans on the global system is considered.

Module Coordinator: Patrick Orr

Level 1

Credits 5

GEOL10060 Introduction to Earth Sciences

Semester 1 or 2

This module introduces students to Earth Science, the multi-disciplinary study of the past, present and future of planet Earth and other planets in our solar system. No previous knowledge of the subject is assumed. The course is in 4 parts, each comprising 4-6 lectures, one laboratory class and an independent on-line exercise. The first of these topics considers the origin of the solid Earth, its atmosphere and oceans and how these have evolved over the past 4,600 million years. It emphasises how plate tectonics explains not just the global distribution of earthquakes and volcanoes, but impacts on other important processes that shape the Earth, including oceanic circulation, and climatic patterns. The second part examines how surface processes and burial generate the sedimentary rocks that detail Earth's history. The third part considers how this geological record is an archive of environmental change over time. Can the geological record be used to predict the result of the dramatic environmental changes occurring on Earth today as a result of human activities? Emphasis is also placed on detailing the broad scale geological evolution of Ireland via analysis of sedimentary rocks of different age. The final part reviews the history of life on Earth as recorded in the fossil record, and emphasises the coupled evolution of the geosphere and biosphere. The key events in the evolution of life through time are documented. Particular emphasis is placed on the role mass extinction events have played, and whether the global scale biotic changes the Earth is currently experiencing warrants the descriptor 'the sixth mass extinction event'.

Module Coordinator: Patrick Orr

Level 1

Credits 5

MATH00010 Introduction to Mathematics

Semester 1

This is an introductory module that is intended to help incoming students to understand and master those topics from Leaving Certificate mathematics that are necessary for successful engagement with the School's level 1 modules in mathematics. Topics include: fractions, exponents, manipulating and simplifying algebraic expressions, roots of simple polynomials, scientific notation, metric prefixes, units, percentages, ratios, proportions, solving quadratic equations, graphs and functions, exp and log, probability, examples and applications in the Sciences.

Module Coordinator: Thomas Unger

Level 0

Credits 5

MATH10040 Numbers & Functions

Semester 1

This module is an introduction to the joys and challenges of mathematical reasoning and mathematical problem-solving, organised primarily around the theme of properties of the whole numbers. It begins with an introduction to some basic notions of mathematics and logic such as proof by contradiction and mathematical induction. It introduces the language of sets and functions, including injective surjective and bijective maps and the related notions of left-, right- and 2-sided inverses. Equivalence relations, equivalence classes. It covers basic important principles in combinatorics such as the Principle of Inclusion-Exclusion and the Pigeonhole Principle. The greater part of the module is devoted to number theory: integers, greatest common divisors, prime

numbers, Euclid's algorithm, the Fundamental Theorem of Arithmetic, congruences, Fermat's theorem, Euler's theorem, and arithmetic modulo a prime and applications. The module concludes with some topics from elementary coding theory / cryptography such as the RSA encryption system.

Module Coordinator: Robert Osburn

Level 1

Credits 5

MATH10200 Matrix Algebra

Semester 1

This is an introductory module in matrix algebra designed for computer science students. A course outline is as follows: Systems of linear equations (solving systems of linear equations, in/consistent solutions, solution sets), Matrix Operations (addition and multiplication of matrices, properties of matrix operations (assoc., dist. Laws etc), transpose, trace, inverse, determinant, partitioned matrices), Linear Transformations (matrix transformations), Applications (network flow, input-output models, difference equations, computer graphics). Students will be introduced to the MAPLE package, which has many pre-defined functions to deal with matrix computations. This will allow students to handle more complicated problems, closer to real-world applications.

Module Coordinator: Helena Smigoc

Level 1

Credits 5

MATH10200 Matrix Algebra

Semester 1

This is an introductory module in matrix algebra designed for computer science students. A course outline is as follows: Systems of linear equations (solving systems of linear equations, in/consistent solutions, solution sets), Matrix Operations (addition and multiplication of matrices, properties of matrix operations (assoc., dist. Laws etc), transpose, trace, inverse, determinant, partitioned matrices), Linear Transformations (matrix transformations), Applications (network flow, input-output models, difference equations, computer graphics). Students will be introduced to the MAPLE package, which has many pre-defined functions to deal with matrix computations. This will allow students to handle more complicated problems, closer to real-world applications.

Module Coordinator: Helena Smigoc

Level 1

Credits 5

MATH10210 Foundations of Mathematics for Computer Science I

Semester 1

This module offers a first introduction to principles of discrete mathematics, with a presentation for students of computer science. A brief course outline can be read below.

Basic Algebra: algebraic manipulations, substitutions, inequalities, summations, operations

Principles of Proof: predicates and quantifiers, direct argument, contrapositive, constructive proofs, proof by contradiction, proof by induction

Sets: operations and constructions on sets, properties of sets, De Morgan's laws

Functions: domain and range, injectivity, surjectivity, invertibility, floor and ceiling, max and min, binomial coefficients.

Module Coordinator: Eimear Byrne

Level 1

Credits 5

MATH10220 Foundations of Mathematics for Computer Science II

Semester 2

This module continues with topics in discrete mathematics, building on ideas presented in MATH10210. 1. Modular arithmetic. 2. Permutations: Cycles, Disjoint Cycle Representations, Order, Sign. 3. Basic Counting Principles: Pigeonhole Principle, Inclusion Exclusion, Ordered and Unordered Selections with or without Repetition, Binomial and Multinomial Theorem. 4. Advanced Counting Principles: Generating Functions, Linear Recurrences, Counting Equivalent Colourings, Symmetry Groups and Cycle Index. Upon successful completion of this module, students will have a good understanding of important mathematical concepts such as permutations, urn models, and advanced counting principles. Applications of these ideas that are prevalent in mathematical computer science include ordered and unordered selections of objects out of a set. Students will have a concrete

understanding of important counting principles and standard techniques including the use of generating functions and cycle indices of symmetry groups.

Module Coordinator: John Sheekey

Level 1

Credits 5

MATH10290 Linear Algebra for Science

Semester 1

This module is offered to first year science students. It is a comprehensive introduction into basic linear-algebraic structures and methods. It covers the algebra of matrices and analytic geometry in up to three dimensions. A main emphasis is put on methodological aspects as opposed to theoretical aspects and rigid theorem proving. Applications to science will be part of the discussion. On completion of this module students should be able to: Solve linear systems and Perform standard calculations with matrices.

Module Coordinator: Helena Smigoc

Level 1

Credits 5

MATH10310 Calculus for Science

Semester 2

This module is an introduction to differential calculus and its applications, assuming no prior knowledge of the topic. Introduction to functions and their graphs: linear functions, quadratics, higher degree polynomials, rational functions. The algebra of powers and roots. Limits of functions. The average rate of change of a function. The derivative as the instantaneous rate of change and the slope of a tangent line. Rules for computing derivatives. The exponential function and the natural logarithm. Using the derivative to sketch graphs and solve max/min problems. A preview of integration and areas. Applications in the sciences.

Module Coordinator: Michael Mackey

Level 1

Credits 5

MATH10320 Mathematical Analysis

Semester 2

This module is designed to introduce students to the fundamental concepts of Real Analysis. Topics investigated will include, The Completeness Axiom, Sequences, Series, Absolutely and Conditional Convergence of Series, Power series, Cardinality of sets, Continuity and properties of continuous functions. Boundedness Theorem and Intermediate Value Theorem. On completion of this module the student should be able to 1) Compute the supremum and Infimum of sets of real numbers, 2) Prove or disprove elementary statements concerning the supremum and Infimum of sets of real numbers, 3) Show that certain sequences converge or diverge and determine its limit when it converges, 4) Use the Monotone Convergence Theorem to establish various properties of sequences and subsequences, 5) Test for convergence a wide range of series, 6) Be able to distinguish between the concepts of absolute and conditional convergence, 7) Determine the radius of convergence and interval of convergence of a power series, 8) Be able to distinguish between countable and uncountable sets, 9) Prove or disprove elementary statements concerning continuous functions.

Module Coordinator: Christopher Boyd

Level 1

Credits 5

MATH10340 Linear Algebra in the Mathematical and Physical Sciences

Semester 1

Students will cover mathematical topics and concepts essential to the study of the Mathematical and Physical Sciences. Topics covered include: (1) a review of complex numbers - their fundamental arithmetic, Euler's formula and roots of unity; (2) matrices - sums, products and transposes, determinants of $(n \times n)$ -matrices, their computation for small n , and the adjugate method of finding inverses; (3) solutions of systems of linear equations by Gaussian elimination, connections between matrices and linear systems, and elementary matrices and their effects on determinants; (4) vectors in n -dimensional real and complex space, scalar products, angles between vectors, the Cauchy-Schwarz inequality, orthogonal projections, vector products and lines and planes in 3-space; (5) eigenvalues and eigenvectors of $(n \times n)$ -matrices, and their computation for small n ; (6) linear spaces and bases - examples of linear spaces from previous chapters, linearly independent and spanning sets, bases and dimension, eigenspaces and orthonormal bases. Examples and applications of these topics in the

Mathematical and Physical Sciences will be presented throughout the module.

Module Coordinator: Richard Smith

Level 1

Credits 5

MATH10350 Calculus in the Mathematical and Physical Sciences

Semester 2

Following an initial discussion of the notions of the limit of a function and continuity, the module focuses on derivatives and tangent lines, various rules for differentiation, and the differentiation of trigonometric functions and inverse functions. Attention is given to an important result, the mean value theorem and its consequences, as well as optimization problems. The second main emphasis concerns the notions of area and the definite integral, which are related to differentiation by the Fundamental Theorem of Calculus. There will be a study of the logarithmic and exponential functions and various techniques of integration. Applications of calculus to the physical sciences will be provided throughout the module. On completion of this module students should be able to: 1. Compute limits of functions, derivatives and integrals, solve optimization problems, establish key properties of a given function, and exploit important properties of trigonometric and exponential functions and their inverses; 2. Describe the concepts introduced in the course, explain why certain key facts about calculus are true, and be able to apply these facts to the solutions of mathematical problems; 3. Apply the methods of calculus to a variety of problems arising in the physical sciences.

Module Coordinator: Stephen Gardiner

Level 1

Credits 5

MATH10410 Introduction to Mathematics Pedagogy

Semester 2

This module is a core Stage 1 module for anyone wishing to pursue one of the Science and Mathematics Education pathways in DN200 or as an option for those interested in learning more about mathematics education and developing their communication skills. As this is the first “education step” of a five-year programme, in this module we will focus mainly on learning - in particular we will encourage you to examine your own learning of mathematics at primary and post-primary school and your concurrent learning of mathematics at university. We will introduce you to theories and ideas of how people learn and approach learning of mathematics, and then focus on research carried out in mathematics classrooms that illustrate the impact that specific teaching approaches have on learning. Interaction with your peers and engagement are both strongly encouraged in class and throughout the module we will ask you to use the theories and ideas introduced as lens to examine your own mathematics learning. Although you will not be asked to teach students in this module, we do want to gradually introduce you to some of the complexities of teaching mathematics. As part of the module you will participate in an observation placement in a primary school, specifically focusing on the teaching of mathematics and science. This observation placement will form the basis of a report structured around the theories you will be introduced to in class. In addition we will encourage you to develop your communication and presentation skills. To that end we ask you to engage in a Public Communication of Mathematics Project as part of a team. You will be required to read a research article in mathematics education and to communicate the message to the general public via a suitable means. You will present the outline of your communication strategy to the class. Finally you will be asked to keep a journal and engage in critical reflection - an essential skill of the professional teacher. Even if you do not wish to be a teacher, this module will enable you to reflect on your learning and provide you with an opportunity to improve your communication skills. Although you will not be asked to teach students in this module, we do want to gradually introduce you to some of the complexities of teaching mathematics at post-primary school. To that end we ask you to engage, as part of a team, in a semester long project to design a one-hour, interactive workshop aimed at transition year students, to be delivered during Maths Week. In the design of the workshop we will look for evidence of how you have incorporated the theories and ideas of learning discussed throughout the semester. Throughout the module we will ask you to keep a journal. We will be asking you to engage in critical reflection – which is an essential skill of the professional teacher. Even if you do not wish to be a teacher, this module will enable you to reflect on your learning, and provide you with an opportunity to improve your communication skills.

Module Coordinator: Maria Meehan

Level 1

Credits 5

PHYC10050 Astronomy & Space Science

Semester 1

We live in a golden age of astronomy. This module provides an introduction to astronomy, from the earliest theories through to the most current scientific knowledge of the universe. Topics include the solar system, extrasolar planets, the sun, stars and their evolution, black holes and the Big Bang. There

is an emphasis on the role of space-based technology in our understanding of the formation and evolution of the universe and its contents. This module is not highly mathematical or quantitative and is probably not appealing to students seeking a rigorous mathematical introduction to the subject..

Module Coordinator: Antonio Martin-Carrillo **Level 1** **Credits 5**

PHYC10070 Foundations of Physics

Semester 1

This module provides an introduction to fundamental concepts in physics. It is intended both for students who have studied physics in school, and those who are new to the subject. This module introduces classical mechanics, Newton's laws, momentum, work and energy. The physics of waves is introduced and applied to sound and the propagation of light. Topics also include thermal physics, electricity and magnetism. Through in-class problems and weekly homework assignments, students master the core concepts of physics and develop physics problem-solving skills. Reading assignments and self-directed learning allow the student to gain an understanding of the relevance of physics to everyday life. Laboratory practicals ensure that students develop experimental skills, becoming familiar with data analysis methods and the role of uncertainty in measurement.

Module Coordinator: Deirdre Coffey **Level 1** **Credits 5**

PHYC10080 Frontiers of Physics

Semester 2

This module introduces Einstein's theory of Special Relativity and the basis for the theory of Quantum Mechanics, with applications in atomic, nuclear and particle physics. The Lorentz Transformations are derived and used to explain length contraction and time dilation. $E=mc^2$ is derived and simple particle kinematics are investigated. The nature of light is probed through the two-slit experiment and the photoelectric effect. Wave particle duality is discussed. The quantisation of energy and momentum is proposed and illustrated through Compton scattering and atomic spectra. Bohr's model of the atom is described. The fundamental particles, quarks and leptons, and the fundamental forces are described using the language of Feynman diagrams. α - β - and γ -radiation are explained from the perspective of the weak and strong forces. Radioactivity, including radioisotopic dating, is described. A model for the nucleus is discussed leading to an understanding of fission and fusion.

Module Coordinator: Ronan McNulty **Level 1** **Credits 5**

PHYC10210 Quanta, Particles & Relativity

Semester 2

This module provides a thorough introduction to the Theory of Special Relativity and its application to laboratory and astrophysical problems. Galilean invariance and inertial frames of reference are introduced. The challenges posed by Maxwell's work on electromagnetic radiation and the Michelson-Morley experiment are discussed. Einstein's postulates are described and the Lorentz transformations derived. The kinematic consequences are derived including length contraction, time dilation, velocity transformation and the relativistic Doppler effect. Proper time and spacetime diagrams are introduced and used to analyse the twin "paradox". The dynamical results of special relativity are described including mass-energy equivalence, force, acceleration and conservation laws. These are applied to particles and quanta in laboratory and astrophysical problems.

Module Coordinator: Peter Duffy **Level 1** **Credits 5**

SCI10010 Principles of Scientific Enquiry

Semester 1

This module introduces students to the principles of scientific enquiry through lectures and group work. Working in small groups, students in conjunction with their academic mentor will identify a scientific problem, research the literature and produce a review. The work will develop students independent study skills. This module involves staff from all disciplines within the Science Programme and students are encouraged to undertake their project work in a discipline that is of particular interest to them. Using a project based approach; students will learn communication and presentation skills, methods of sourcing scientific information, scientific writing and analysis. Formal direction on teamwork, communication, presenting, sourcing and appraising information, scientific reading and writing, and critical thinking will be central to this module.

Module Coordinator: Mary Kelly-Quinn **Level 1** **Credits 5**

STAT10010 Research Methods for the Social Science, Business and the Humanities Semester 1

This module is aimed at students majoring in Social Science, Science, Business, Medicine or any other degree programme. These students may not intend to major in Statistics but would like to get some exposure to the basic concepts of data collection and analysis. Pre-requisites: Ability to perform arithmetic computations (addition, subtraction, multiplication and division), understand and be able to manipulate fractions. Topics covered:1. Statistics: The Science of data. 2. Data Sources: Sampling and Opinion Polls, Experiments and Observational Studies 3. Descriptive Statistics: Summarising data, Relationships between variables.4. Inferential Statistics: The Normal Distribution, Simple Linear Regression with applications, How to interpret Hypothesis Tests and Confidence Intervals.

Module Coordinator: Patrick Murphy

Level 1

Credits 5

STAT10050 Practical Statistics

Semester 1 or 2

This module focusses on practical statistics and computation in real-world scenarios. Students will cover:

How statistics are used, How to turn data into information, How to create statistical graphics, How to obtain data from surveys and designed experiments, Probability theory and random variables. The module is run through short, video-based lectures, which students are expected to watch every week. Contact with the lecturer and tutors is through the two computer labs run every week from week 3. In the computer labs, students will learn how to use both the Minitab and R statistics packages.

Module Coordinator: Andrew Parnell

Level 1

Credits 5

STAT10060 Statistical Modelling

Semester 2

Hypothesis Tests and Confidence Intervals for the difference between two population means or proportions using independent samples and using paired data. Hypothesis testing for proportions and independence. Testing the fit for a population model. The simple linear regression model. Inferences based on the estimated regression line. Inferences on the population correlation. Checking model adequacy. Single factor ANOVA. Multiple comparisons. Randomised block experiment. Two-factor ANOVA. Distribution free procedures. One and two way frequency tables.

Module Coordinator: Thomas Murphy

Level 1

Credits 5

STAT10140 Research Methods for Science

Semester 1

This module is aimed at students majoring in Science, Medicine, Nursing, Agricultural Sciences and Veterinary. These students may not intend to major in Statistics but would like to get some exposure to the basic concepts of data collection and analysis. Students need to be proficient at basic arithmetic prior to taking this course. Topics covered:1. Statistics: The Science of data. 2. Data Sources: Sampling and Opinion Polls, Experiments and Observational Studies 3. Descriptive Statistics: Summarising data, Relationships between variables.4. Inferential Statistics: The Normal Distribution, Simple Linear Regression with applications, How to interpret Hypothesis Tests and Confidence Intervals.

Module Coordinator: Patrick Murphy

Level 1

Credits 5

BACHELOR OF ACTUARIAL & FINANCIAL STUDIES: NON SCIENCE MODULES

ACC10040 Financial Accounting 1

Semester 2

This module provides an introduction to financial accounting practices, usage and regulation. In particular, it introduces students to the preparation and interpretation of company financial statements. On completion of this module, students should be able to:

1. Describe the role of financial accounting in providing information to a variety of user groups.
2. Define assets, liabilities and equity.
3. Explain the accounting equation and describe the statement of financial position (balance sheet).
4. Explain the accruals principle and describe the income statement (profit and loss account).
5. Record basic transactions using the double-entry accounting system.
6. Calculate depreciation and describe the treatment of non-current assets in the accounting system; record additions and disposals of non-current assets and the depreciation charge.
7. Describe the treatment of impaired receivables, accruals and prepayments in the accounting system. Record accruals, prepayments, impairments and changes in the allowance for credit losses.
8. Explain the sources of finance available to a limited company and their accounting treatment. Record issues of share capital, issues and repayments of loans and dividend payments. Record corporation tax liabilities and payments, and transactions involving VAT and PAYE.
9. Prepare a trial balance, and present the income statement and statement of financial position for a small company under International Financial Reporting Standards (IFRS) regulation.
10. Analyse a statement of financial position and an income statement. Calculate basic accounting ratios and interpret the ratios in the context of a particular business. Evaluate the profitability, liquidity and gearing of a company.
11. Prepare and interpret a statement of cash flows.
12. Identify and discuss accounting aspects of current business news and events.

Module Coordinator : Mary Canning

Level 1

Credits 5

ECON10020 Principles of Macroeconomics

Semester 2

Macroeconomics is “big picture” economics. It looks at the economy as a whole and examines how it is performing. In this module, we introduce students to measuring the key macroeconomic variables such as GDP, inflation and unemployment. We explore what determines whether economies experience booms and recessions and the factors that influence unemployment and inflation. We also examine how the government should influence the economy via fiscal policy (decisions about public spending and taxation) and monetary policy (decisions about money creation and interest rates made by a central bank). We also look at longer term trends in living standards and the factors that drive these trends. Note that no assumption is made that students have previously studied economics. This module is a prerequisite for all students planning to take economics as a major at level 2 (second year). This includes (a) economics as a single subject major (b) economics as one of two subjects in a joint major programme (c) economics as a major in a major/minor combination. It is also a prerequisite for ECON 20020 (Intermediate Macroeconomics). On completion of this module students should be able to: ·Develop their analytical skills through the application of macroeconomic theory to problems and case studies. ·Understand of the determinants of aggregate economic activity and the role of macroeconomic policy in stabilising the economy.

Module Coordinator Frank Walsh

Level 1

Credits 5

ECON10720 Business Economics

Semester 1, 2

The aim of this module is to introduce students to the core microeconomic principles and how this can be used in a business environment to help decision making and behaviour. The module explains how markets operate and focuses on both the customer and firm side of markets. Models of consumer demand are explained as well as how firms make price and output decisions under perfect and imperfect competition.

The role and rationale of government intervention into markets is also explored. On completion of this module, students will be able to:

1. understand how markets operates; discuss how markets reacts to changes in demand and supply; calculate price and income elasticities.
2. understand consumer demand and behaviour
3. explain firm's decision on product selection, marketing and advertizing
4. gain a knowledge of production functions, costs, revenues and profits.
5. describe profit maximization and price/ouput decision under conditions of perfect and imperfect competition
6. understand how and when markets can fail and how government intervention may correct such failures.

Module Coordinator David Madden

Level 1

Credits 5

FIN20010

Semester 1

This subject is an an introduction to modern finance. As domesic and international companies became more sophisticated, it was realised that every executive required an understanding of corporate finance. Topics covered include financial analysis and planning, asset valuation, capital investment decisions, the concept of risk and return, capital structure, and dividend policy. Upon completion of this module, students should be able to value stocks and bonds, apply the techniques of capital budgeting, and identify capital investment projects that maximize shareholder wealth. Students will also have an understanding of how firms raise capital, and how they choose their capital structure and dividend policy. Students will be introduced to the basic principles of portfolio theory. This course will also introduce the concept of ethics in finance.

Module Coordinator: Julie Byrne

Level 2

Credits 5

MATHEMATICS AND SCIENCE EDUCATION

The Mathematics and Science Education Programme is a five-year programme, consisting of a four-year BSc in Mathematics, Science (Applied Mathematics, Biology, Chemistry or Physics), and Education followed by a one-year MSc in Mathematics and Science Education. On successful completion of the five years of the programme, you are fully qualified to teach Mathematics and either Applied Mathematics, Biology, Chemistry or Physics to Higher Leaving Certificate Level in an Irish post-primary school. If your chosen Science specialisation is Biology, Chemistry or Physics you are also fully qualified to teach Science to Junior Certificate Level. The five-year programme has been approved by the Irish Teaching Council.

The aim behind this programme is that you will not only become a scientist or mathematician, but also a teacher, and throughout the five years of study you will be encouraged to develop this dual identity. To this end, the programme offers you the opportunity to study Science and Mathematics along with Education in an integrated manner. Another key feature of the programme is that in keeping with the flexible structure of DN200 Science, it has been also been designed to enable you to explore and “taste” some Education modules in Stages 1 and 2, allowing you to make an informed decision about whether to pursue a teaching career. Therefore in Stages 1 and 2 while the focus of your studies will be Science and Mathematics, you will have the opportunity to take one Education module in Stage 1 (with a short primary-school placement) and two Education modules in Stage 2 (with a short post-primary school placement). If your aim is to become a Biology, Chemistry or Physics teacher, then to ensure a well-rounded Science education, you must take at least 10 ECTS credits in all three of these subjects during the first three years of the programme.

Should you choose to study Mathematics and Science Education in Stage 3 you will take four Education modules, two of which involve teaching placements - one in a post-primary school and one as a university tutor. At the end of Stage 4, subject to receiving a grade point average (GPA) of 3.08 (equivalent to a 2nd Class Honours degree “a 2:1”) you will have direct entry to the one-year MSc in Mathematics and Science Education.

While you will continue some study of Mathematics and Science in Stages 4, Education will be the primary focus of Stages 4 and 5, with a significant placement component. Specifically you will be assigned two year-long placements at two different post-primary schools. These placements are designed so that you will not only obtain teaching experience, but also gain a whole-of-school experience through participating in parent-teacher meetings, timetabling and other school matters. Over the course of the two years you will also develop a Professional Practice Portfolio, and in Stage 5, you will undertake a professional dissertation.

SCIENCE STAGE 2

SCIENCE (DN200)

BIOLOGICAL, BIOMOLECULAR & BIOMEDICAL SCIENCE (DN200BBB)

CHEMISTRY & CHEMICAL SCIENCES (DN200CCS)

MATHEMATICAL, PHYSICAL & GEOLOGICAL SCIENCES (DN200MPG)

COMPUTER SCIENCE (DN201)

BACHELOR OF ACTUARIAL & FINANCIAL STUDIES (DN230)

Programme Core – All Biological Subject Streams: (*excluding Biology & Mathematics Education – see note below*)

If not previously taken in Stage 1, Students enrolled to a Biological subject stream must take:

- MATH10290 Linear Algebra for Science in Semester 1 in Stage 2. **(This rule also applies to Geology and Chemistry subjects).**
- At least two of BIOL10130 Biology in Action; BIOL10140 Life on Earth or BMOL10030 in either Stage 1 or Stage 2

NOTE: For Biology & Mathematics Education students must take BIOL10130 and BIOL10140 in either Stage 1 or Stage 2.

Programme Core – Physiology and Neuroscience only

If Physics has not been taken in the Leaving Certificate, and if not previously taken in Stage 1, students enrolled to Stage 2 Physiology or Stage 2 Neuroscience must take PHYC10070 Foundations in Physics in Semester 1 in Stage 2.

Allowed Substitution and CHEM20090

All BBB subjects in Stage 2 require the module Chemistry for Biologists (CHEM20090) unless a student is also taking a CCS subject in Stage 2 (e.g. Biochemistry and Chemistry). In this case the modules taken as part of the Chemistry syllabus are an allowed substitution for CHEM20090. For this reason, in the tables below, CHEM20090 is marked as C* - core for all BBB subjects unless a student is also taking a CCS subject.

DN200 SCIENCE STAGE 2

Students entering Stage 2 Science must select a minimum of **two** subjects. If both subjects are selected from among Pharmacology, Neuroscience, Physiology and Genetics, however, students **must choose an additional subject** that is not in that list. Subject selection will take place online during July 2016.

The subjects available to you depend on the modules that you have attempted in Stage 1.

When you select your subjects you will be pre-registered to the relevant core modules for Stage 2. You will be able to select your remaining modules when module registration opens in August 2016.

Students with between 50 and 60 Stage 1 credits

Under University regulations, students are entitled to progress to the next Stage carrying up to 2 failed modules. Within the BSc programme, the following additional progression rules apply.

A student may progress to the next Stage of a subject if they have the possibility of meeting the core and optional requirements of the incomplete stage through repeating or selecting modules and with the approval of the School. Module prerequisites may be waived by a School if a student is taking the appropriate Stage modules as co-requisites. A student will be provisionally accepted into a Subject under the mechanism approved by the Programme Board.

STAGE 2 REPEAT STUDENTS

Students returning to a repeat attempt at Stage 2 will find information on how to register to resits and repeats, via the Resit/Repeat/Substitution tab on Current Students website at: http://www.ucd.ie/students/resits_repeats/.

Students returning to a repeat attempt at Stage 2 in 2016-2017 should note that the curriculum for Stage 2 of the BSc degree programme has altered significantly in recent years and, in some instances, a module previously taken by a student in their first attempt at the stage may no longer be offered. In these cases a student should contact the Science Office for advice on appropriate modules (in the place of the now inactive courses) and to ensure that they are meeting the requirements for their subject areas in Stage 2 of their degree. Information on resits and repeats can be found at http://www.ucd.ie/students/resits_repeats/.

Students in a repeat attempt at Stage 2 have the opportunity to select modules from their next stage (via the 'Next Stage' tab in their SIS screen). The ability to take these modules can depend on a number of factors including whether these next stage modules will fit into the timetable for the modules required to complete their repeat stage. Other issues that need to be considered are pre-requisites and capacity.

IMPORTANT: Significant changes to the policy for the potential compensation of E grades came into effect since 2013-2014. **From the 2015-16 academic year no modules are eligible for compensation.**

Incompatible Stage 2 Subject Combinations

There are a number of subjects that cannot be timetabled together and there are some subject combinations (e.g. Theoretical Physics and Neuroscience) that would require a workload that is greater than 60 credits. Every effort has been made to ensure that students can combine a broad choice across all subject areas in second year (Stage 2) but certain combinations of subjects may not be feasible in the timetable. These incompatible combinations are not often sought by students and may be encountered, in limited cases, when students attempt to combine particularly diverse subject areas across the BBB, CCS and MPG groups. In a small number of cases, students may not be able to combine subjects from **within** one of the BBB, CCS or MPG groups of subjects. These cases are listed below for your information:

Incompatible Combinations within the 'BBB' group of subjects	
Subject	Is incompatible with
Physiology	Plant Biology
Incompatible Combinations within the 'MPG' group of subjects	
Subject	Is incompatible with
Mathematical Science	Geology, Physics, Physics Astronomy & Space Science, Theoretical Physics
Statistics	Theoretical Physics
There are no incompatible combinations within the 'CCS' group of subjects	

SYLLABUS OF STAGE 2 SUBJECTS IN SCIENCE

The information given below, while final at the time of printing, should only be used as a guide and not as an official statement of this curriculum. Further information on the programme curriculum, as well as detailed module information, can be found at www.ucd.ie/students/course_search.htm

Cores (C), Options (O) and Programme Cores (PC)

The tables below list the Cores (C) and Options (O) for each subject in Stage 2 Science. In addition, the tables also list Programme Cores (PC) which are modules that must be taken but not necessarily in Stage 2; they may already have been taken in Stage 1. There are also Programme Cores that can be taken in Stage 3. There are some Programme Cores that affect more than one subject.

Recommended or suggested modules are also listed for some subjects and may be taken by students interested in deepening their knowledge of a particular subject.

Please see Page 50 for a note on CHEM20090 (C*)

BIOLOGICAL, BIOMEDICAL AND BIOMOLECULAR SCIENCES (DN200 BBB)

Biochemistry & Molecular Biology

Students take 5 core modules and **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BIOC20050	Principles of Biochemistry	5	1
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20090	Molecular Genetics & Biotech	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20080	Metabolism, Immunity & Infection	5	2
C*	CHEM20090	Chemistry for Biologists	5	1
Recommended Modules				
	STAT10140	Research Methods for Science	5	1

Cell & Molecular Biology

Students take at least four core modules and **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BIOL20030	Biological Systems	5	1
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20090	Molecular Genetics & Biotech	5	1
C	CELB20060	Principles of Cell & Molecular Biology	5	1
C*	CHEM20090	Chemistry for Biologists	5	1
Recommended Modules				
	GENE20010	Plant and Animal Genetics	5	2
	STAT10050	Practical Statistics	5	1,2

Environmental Biology

Students take at least 3 core modules. Students **MUST ALSO TAKE** CHEM20090, unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BIOL20030	Biological Systems	5	1
C	ENVB20050	Principles of Env.Biol&Ecology	5	2
C	BMOL20060	Biomolecular Lab Skills 1	5	1
PC	CHEM20090	Chemistry for Biologists	5	1
Recommended Modules				
	AESC20060	Soil Science Basics	5	1
	BIOL20010	Global Environment	5	1
	BIOL20020	Applied Plant Biology	5	1
	BOTN20040	Principles of Plant Biology	5	2
	CELB20060	Principles of Cell & Molecular Biology	5	1
	CPSC20040	Physiological Plant Ecology	5	2
	ENVB20030	Microbial Interactions	5	1
	FOR20110	Forests, Climate and Carbon	5	2
	GENE20020	Principles of Genetics	5	2
	STAT10050	Practical Statistics	5	1, 2
	ZOOL20020	Animal Behaviour	5	1
	ZOOL20030	Principles of Zoology	5	2
	ZOOL30030	Evolutionary Biology	5	2

Genetics

Students take 3 core modules and **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Students take at least two options from Set A or one option from Set B, depending on their choice of other subjects.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	GENE20020	Principles of Genetics	5	2
PC	CHEM20090	Chemistry for Biologists	5	1
Set A				
O	BMOL20070	Biomolecular Lab Skills 2	5	2
O	BMOL20080	Metabolism, Immunity & Infection	5	2
Set B				
O	BIOL20030	Biological Systems	5	1

Microbiology

Students take 5 core modules. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20080	Metabolism, Immunity & Infection	5	2
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	MICR20050	Principles of Microbiology	5	2
PC	CHEM20090	Chemistry for Biologists	5	1
Recommended Modules				
	STAT10140	Research Methods for Science	5	1

Neuroscience

Students take the 5 core modules. If not taken in the Leaving Certificate or in Stage 1, students enrolled to Stage 2 Neuroscience **MUST TAKE** PHYC10070. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20080	Metabolism, Immunity & Infection	5	2
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	NEUR20050	Principles of Neuroscience	5	2
PC	CHEM20090	Chemistry for Biologists	5	1
PC	PHYC10070	Foundations of Physics	5	1
Recommended Modules				
	STAT10140	Research Methods for Science	5	1

Pharmacology

Students take the 5 core modules. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20080	Metabolism, Immunity & Infection	5	2
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	PHAR20040	Pharmacology: Biomedical Science	5	2
PC	CHEM20090	Chemistry for Biologists	5	1
Recommended Modules				
	STAT10140	Research Methods for Science	5	1

Physiology

Students take the 6 core modules. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject. If not taken in the Leaving Certificate or in Stage 1, students enrolled to Stage 2 Physiology **MUST TAKE** PHYC10070.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	PHYS20040	An introduction to Physiology	5	1
C	BMOL20080	Metabolism, Immunity & Infection	5	2
C	PHYS20030	Physiology of the internal environment of the human body	5	2
C	PHYS20020	Physiology of Sensing and Responding to the Internal and External Environment	5	2
PC	CHEM20090	Chemistry for Biology	5	1
PC	PHYC10070	Foundations of Physics	5	1

Plant Biology

Students take at least 3 core modules. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BIOL20030	Biological Systems	5	1
C	BOTN20040	Principles of Plant Biology	5	2
PC	CHEM20090	Chemistry for Biology	5	1
Recommended Modules				
	BIOL20020	Applied Plant Biology	5	1
	CELB20060	Principles of Cell & Molecular Biology	5	1
	ENVB20050	Principles of Envir.Biology &	5	2
	GENE20020	Principles of Genetics	5	2
	ZOOL20030	Principles of Zoology	5	2
	STAT10050	Practical Statistics	5	1,2
	CPSC20040	Physiological Plant Ecology	5	2

Zoology

Students take 4 core modules in Stage 2. Students **MUST ALSO TAKE** CHEM20090 unless they are taking a CCS subject.

Core/Option	Code	Title	Credits	Semester
C	BIOL20030	Biological Systems	5	1
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BMOL20090	Molecular Genetics & Biotechnology	5	1
C	ZOOL20030	Principles of Zoology	5	2

PC	CHEM20090	Chemistry for Biology	5	1
Recommended Module				
	ZOOL20020	Animal Behaviour	5	1
	STAT10050	Practical Statistics	5	1,2

Mathematics, Biology & Education

Students wishing to study Mathematics, Biology & Education in Stage 2 **MUST TAKE either Stream A OR Stream B** when selecting their Stage 2 subjects. Stream A focuses on the Biological and Environmental Sciences and Stream B focuses on the Biomolecular and Biomedical Sciences. Students who intend to take Stage 3 Mathematics, Biology and Education must also have taken 10 credits in Chemistry and 10 credits in Physics by the end of Stage 3. Students who intend to take Stage 3 Mathematics, Biology and Education must also have taken 10 credits in Chemistry and 10 credits in Physics by the end of Stage 3.

Stream A:

Students take 10 core modules in Stage 2. If not taken in Stage 1 students must take BIOL10130 and BIOL10140 in Stage 2. Students intending to progress to Stage 3 Mathematics, Biology & Education **MUST TAKE** MST20040 in Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM10070	Math Modelling in the Sciences	5	1
C	BIOL20030	Biological Systems	5	1
C	BMOL20060	Biomolecular Lab Skills 1	5	1
C	BOTN20040	Principles of Plant Biology	5	2
C	CHEM20090	Chemistry for Biology	5	1
C	EDUC20010	Education Issues & Ideas	5	1
C	EDUC20020	Science & Mathematics Pedagogy	5	2
C	ENVB20050	Principles of EnvBiol.& Ecology	5	2
C	MST20070	Multivariable Calculus	5	1
C	ZOOL20030	Principles of Zoology	5	2
PC	BIOL10130	Biology in Action	5	1
PC	BIOL10140	Life on Earth	5	1
PC	BMOL10030	Biomedical Sciences	5	2
PC	MST20040	Analysis	5	2

Stream B:

Students take 9 core modules in Stage 2. If not taken in Stage 1 students must take at least two of BIOL10130, BIOL10140 and BMOL10030 in Stage 2. Students intending to progress to Stage 3 Biology & Mathematics Education **MUST TAKE** MST20040 in Stage 2 or Stage 3. If students wish to pursue Pharmacology in Stage 3 they must take PHAR20040 in Stage 2. If students wish to pursue Genetics in Stage 3 they must take GENE20020 in Stage 2. If students wish to pursue Microbiology in Stage 3 they must take MICR20050 in Stage 2. If students wish to pursue Biochemistry in Stage 3 they must take BIOC20050 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	EDUC20010	Education Issues & Ideas	5	1
C	BMOL20060	Biomolecular Lab Skills 2	5	1
C	BMOL20090	Molecular Genetics & Biotech	5	1
C	CHEM20090	Chemistry for Biology	5	1
C	ACM10070	Math Modelling in the Sciences	5	1
C	MST20070	Multivariable Calculus	5	1

C	EDUC20020	Science & Mathematics Pedagogy	5	2
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20080	Metabolism, Immunity & Infection	5	2
PC	MST20040	Analysis	5	2
PC	BIOL10130	Biology in Action	5	1
PC	BIOL10140	Life on Earth	5	1
PC	BMOL10030	Biomedical Sciences	5	2
O	BIOC20050	Principles of Biochemistry	5	1
O	GENE20020	Principles of Genetics	5	2
O	MICR20050	Principles of Microbiology	5	2
O	PHAR20040	Pharmacology: Biomedical Science	5	2

CHEMISTRY AND CHEMICAL SCIENCES (DN200 CCS)

Chemistry

Students must take CHEM20040. If not taken in Stage 1 students **MUST TAKE** MATH10290, CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	CHEM20040	Organic Chemistry	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry	5	2
PC	MATH10290	Linear Algebra for Science	5	1
Recommended Modules				
	CHEM20030	Functioning of Biomolecules	5	2
	CHEM20050	Medicinal Chemistry & Chemical Biology	5	2
	CHEM20110	Environmental & Sustainable Chemistry	5	2

Chemistry with Biophysical Chemistry

Students take CHEM 20030 and CHEM20040. If not taken in Stage 1 students **MUST TAKE** MATH10290, CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	CHEM20030	Functioning of Biomolecules	5	2
C	CHEM20040	Organic Chemistry	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry	5	2
PC	MATH10290	Linear Algebra for Science	5	1
Recommended Modules				
	BMOL20060	Biomolecular Lab Skills 1	5	1
	BMOL20070	Biomolecular Lab Skills 2	5	2
	CHEM20050	Medicinal Chemistry & Chemical Biology	5	2

	CHEM20110	Environmental & Sustainable Chemistry	5	2
	PHYS20040	An Introduction to Physiology	5	1

Chemistry with Environmental & Sustainable Chemistry

Students take CHEM20040. If not taken in Stage 1 students **MUST TAKE** MATH10290, CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2. Students intending to progress to Stage 3 Chemistry with Environmental & Sustainable Chemistry must take CHEM20110 in either Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	CHEM20040	Organic Chemistry	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry	5	2
PC	MATH10290	Linear Algebra for Science	5	1
PC	CHEM20110	Environmental & Sustainable Chemistry	5	2
Recommended Modules				
	CHEM20030	Functioning of Biomolecules	5	2
	CHEM20050	Medicinal Chemistry & Chemical Biology	5	2

Medicinal Chemistry & Chemical Biology

Students take at least 6 core modules. If not taken in Stage 1 students **MUST TAKE** MATH10290, CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	BIOC20050	Principles of Biochemistry	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	CHEM20040	Organic Chemistry (Level 2)	5	1
C	CHEM20050	Medicinal Chemistry & Chemical Biology	5	2
C	PHAR20040	Pharmacology: Biomedical Science	5	2
PC	MATH10290	Linear Algebra for Science	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry	5	2
Recommended Modules				
	BMOL20060	Biomolecular Lab Skills 1	5	1
	BMOL20080	Metabolism, Immunity & Infection	5	2
	CHEM20030	Functioning of Biomolecules	5	2
	MICR20050	Principles of Microbiology	5	2

Mathematics, Chemistry and Education

Students take 7 core modules. If not taken in Stage 1, students **MUST TAKE** CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2. Students who intend to progress to Stage 3 in Mathematics, Chemistry & Education **MUST TAKE** STAT20110 in Stage 2 or Stage 3. Students who intend to take Stage 3 Mathematics, Chemistry and Education must also have taken 10 credits in Biology and 10 credits in Physics by the end of Stage 3.

Core/Option	Code	Title	Credits	Semester
C	EDUC20010	Education Issues & Ideas	5	1
C	CHEM20040	Organic Chemistry (Level 2)	5	1
C	ACM10070	Math Modelling in the Sciences	5	1
C	MST20070	Multivariable Calculus	5	1
C	EDUC20020	Science & Mathematics Pedagogy	5	2
C	MST20040	Analysis	5	2
C	MST20010	Algebraic Structures	5	1
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20120	Physical Chemistry (Level 2)	5	2
PC	STAT20110	Probability Theory	5	1

Medicinal Chemistry & Chemical Biology

Students take at least 6 core modules. If not taken in Stage 1 students **MUST TAKE** MATH10290, CHEM20020, CHEM20080, CHEM20100 and CHEM20120 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	BIOC20050	Principles of Biochemistry	5	1
C	BMOL20070	Biomolecular Lab Skills 2	5	2
C	BMOL20090	Molecular Genetics and Biotech	5	1
C	CHEM20040	Organic Chemistry (Level 2)	5	1
C	CHEM20050	Medicinal Chemistry & Chemical Biology	5	2
C	PHAR20040	Pharmacology: Biomedical Science	5	2
PC	MATH10290	Linear Algebra for Science	5	1
PC	CHEM20020	Inorganic Chemistry (Level 2)	5	2
PC	CHEM20080	Basis of Physical Chemistry	5	1
PC	CHEM20100	Basis of Inorganic Chemistry	5	1
PC	CHEM20120	Physical Chemistry	5	2
Recommended Modules				
	BMOL20060	Biomolecular Lab Skills 1	5	1
	BMOL20080	Metabolism, Immunity & Infection	5	2
	CHEM20030	Functioning of Biomolecules	5	2
	MICR20050	Principles of Microbiology	5	2

MATHEMATICAL, PHYSICAL AND GEOLOGICAL SCIENCES (DN200 MPG)

Geology

Students take the 4 core modules. GEOL20050 and GEOL20100 must be taken in either Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	GEOL20010	Sedimentology & Palaeobiology	5	1
C	GEOL20090	Structural Geology & Tectonics	5	1
C	GEOL20120	Mineralogy and Geochemistry	5	2
C	GEOL20130	Field Geology (Stage 2)	5	2
PC	GEOL20050	Geophysical Techniques	5	1
PC	GEOL20100	Environmental Geochemistry	5	1
Recommended Modules				
	GEOL10050	Earth and Humanity	5	1,2
	GEOL10040	Earth, Environment and Society	5	2
	GEOL20110	Global Environmental Change	5	1,2
	GEOL20080	Geophysical Techniques	5	1
	GEOL20100	Environmental Geochemistry	5	2

Physics

Students take at least 5 core modules in Stage 2. If not previously taken in Stage 1, student enrolled to Stage 2 Physics must take all the modules listed in Set A below. Students who have previously passed MATH10280 or MATH10270 are not required to take MATH10340. Students intending to progress to Stage 3 Physics must take ACM20030 in Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	PHYC20090	Electronics & Devices	5	2
C	PHYC20020	Introductory Quantum Mechanics	5	1
C	PHYC20060	Methods for Physicists	5	2
PC	ACM20030	Computational Science	5	2
Set A				
PC	ACM10060	Application of Differential Equations	5	2
PC	MATH10340	Linear Algebra in the Physical and Mathematical Sciences	5	1
PC	PHYC20030	Thermal Physics and Materials	5	2
PC	PHYC20080	Field, waves and light	5	1
Recommended Modules				
	ACM20060	Oscillations in Mech. Systems	5	2
	COMP10060	Computer Science for Engineers I	5	2
	MATH20300	Linear Algebra 2	5	1
	MATH20310	Groups, Rings and Fields	5	2
	PHYC10050	Astronomy & Space Science	5	1
	PHYC20040	Exploring the Solar System	5	2
	STAT10050	Practical Statistics	5	1, 2

Physics with Astronomy & Space Science

Students take at least 6 core modules in Stage 2. If not previously taken in Stage 1, student enrolled to Stage 2 Physics must take all the modules listed in Set A below. Students who have previously passed MATH10280 or MATH10270 are not required to take MATH10340. Students intending to progress to Stage 3 Physics with Astronomy & Space Science must take ACM20030 in Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	PHYC20090	Electronics & Devices	5	2
C	PHYC20020	Introductory Quantum Mechanics	5	1
C	PHYC20040	Exploring the Solar System	5	2
C	PHYC20060	Methods for Physicists	5	2
PC	ACM20030	Computational Science	5	2
Set A				
PC	ACM10060	Introduction to Applied & Computational Mathematics	5	2
PC	MATH10340	Linear Algebra in the Physical and Mathematical Sciences	5	1
PC	PHYC10050	Astronomy & Space Science	5	1
PC	PHYC20030	Thermal Physics and Materials	5	2
PC	PHYC20080	Field, waves and light	5	1
Recommended Modules				
	ACM20060	Oscillations in Mech. Systems	5	2
	COMP10060	Computer Science for Engineers I	5	2
	MATH20300	Linear Algebra 2	5	1
	MATH20310	Groups, Rings and Fields	5	2
	STAT10050	Practical Statistics	5	1, 2

Theoretical Physics

Students take at least 8 core modules in Stage 2. If not previously taken in Stage 1, students enrolled to Stage 2 Theoretical Physics must take all modules in Set A in Stage 2. Students who have previously passed MATH10280 or MATH10270 are not required to take MATH10340.

Core/Option	Code	Title	Credits	Semester
C	ACM20060	Oscillations in Mech. Systems	5	2
C	ACM20030	Computational Science	5	2
C	ACM20050	Classical Mech. & Special Rel.	5	1
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	PHYC20090	Electronics & Devices		2
C	PHYC20020	Introductory Quantum Mechanics	5	1
C	PHYC20060	Methods for Physicists	5	2
Set A				
PC	PHYC20080	Field, waves and light	5	1
PC	MATH10340	Linear Algebra in the Physical and Mathematical Sciences	5	1
PC	PHYC20030	Thermal Physics and Materials	5	2
Recommended Modules				
	MATH10320	Mathematical Analysis	5	2
	MATH20300	Linear Algebra 2	5	1
	MATH20310	Groups, Rings and Fields	5	2
	PHYC10050	Astronomy & Space Science	5	1
	PHYC20040	Exploring the Solar System	5	2
	STAT20110	Probability Theory	5	1
	STAT10050	Practical Statistics	5	1, 2

Applied & Computational Mathematics

Students take 5 core modules. For students progressing to a degree in Applied & Computational Mathematics, the modules MATH20310, MATH20300 and STAT20110 must be taken in Stage 2 or Stage 3. If not taken in Stage 1 students **MUST TAKE** MATH10320 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	ACM20060	Oscillations in Mech. Systems	5	2
C	ACM20030	Computational Science	5	2
C	ACM20050	Classical Mech. & Special Rel.	5	1
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
PC	MATH20300	Linear Algebra 2	5	1
PC	MATH20310	Groups, Rings & Fields	5	2
PC	STAT20110	Probability Theory	5	1
PC	MATH10320	Mathematical Analysis	5	2
Recommended Modules				
	STAT10050	Practical Statistics	5	1 & 2
	ACM10090	Climate Change: Causes & Consequences	5	1
	COMP10060	Computer Sci for Engineers	5	2
	MATH20150	Graphs and Networks	5	1
	MATH20260	The Mathematics of Google	5	2
	MATH20270	Theory of Games	5	2
	PHYC20080	Fields, Waves and Light	5	1
	PHYC20020	Introductory Quantum Mechanics	5	1
	PHYC20030	Thermal Physics and Materials	5	2
	ACM10070	Math Modelling in the Sciences	5	1
	MATH10040	Numbers & Functions	5	1

Financial Mathematics

Students take 6 core modules and 4 option modules. If not previously taken in Stage 1 students enrolled to Stage 2 Financial Mathematics **MUST TAKE** ECON10720, MATH10040 and MATH10320 in Stage 2. Students progressing to a degree in Financial Mathematics **MUST TAKE** ACM20150 in Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	STAT20160	Principles of Finance for Math	5	2
C	MATH20060	Calculus of Several Variables	5	1
C	MATH20300	Linear Algebra 2 (Math Sci)	5	1
C	STAT20110	Probability Theory	5	1
C	ACM20030	Computational Science	5	2
C	STAT20100	Inferential Statistics	5	2
PC	MATH10040	Numbers & Functions	5	1
PC	ECON10720	Business Economics	5	1 & 2
PC	MATH10320	Mathematical Analysis	5	2
PC	ACM20150	Vector Calculus	5	1

Mathematical Science

Students take the 10 core modules. If not previously taken in Stage 1, students enrolled to Stage 2 Mathematical Science **MUST TAKE** MATH10040 & MATH10320 in Stage 2. For students progressing to a degree in Mathematical Science, the module ACM20060 must be taken in either Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM20030	Computational Science	5	2
C	ACM20050	Classical Mech. & Special Rel.	5	1
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	MATH20300	Linear Algebra 2	5	2
C	MATH20310	Groups, Rings and Fields	5	2
C	STAT20100	Inferential Statistics	5	2
C	STAT20110	Probability Theory	5	1
C	STAT30240	Linear Models I	5	1
C	STAT30250	Linear Models II	5	2
PC	MATH10040	Numbers and Functions	5	1
PC	MATH10320	Mathematical Analysis	5	2
PC	ACM20060	Oscillations in Mech. Systems	5	2
Recommended Modules				
	ACM10070	Math Modelling in the Sciences	5	1
	MATH20260	The Mathematics of Google	5	2
	STAT10140	Research Methods for Science	5	1

Mathematics

Students take the 5 core modules. If not taken in Stage 1 students must take MATH10320 and MATH10040 in Stage 2. Students intending to progress to Stage 3 Mathematics must take STAT20110 in either Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM20150	Vector Calculus	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	MATH20300	Linear Algebra 2	5	1
C	ACM20030	Computational Science	5	2
C	MATH20310	Groups, Rings and Fields	5	2
PC	STAT20110	Probability Theory	5	1
PC	MATH10040	Numbers and Functions	5	1
PC	MATH10320	Mathematical Analysis	5	2
Recommended Modules				
	ACM20050	Classical Mech. & Special Rel.	5	1
	MATH20150	Graphs and Networks	5	1
	MATH20260	The Mathematics of Google	5	2
	MATH20270	Theory of Games	5	2
	STAT20100	Inferential Statistics	5	2

Statistics

Students take 5 core modules and must select 1 option module from Set A. Students intending to progress to Stage 3 Statistics must take ACM20030 in either Stage 2 or Stage 3. Students **MUST TAKE** MATH20030 in either Stage 2 or Stage 3.

Core/Option	Code	Title	Credits	Semester
C	STAT20100	Inferential Statistics	5	2

C	STAT20110	Probability Theory	5	1
C	STAT30240	Linear Models 1	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	STAT30250	Linear Models 2	5	2
PC	ACM20030	Computational Science	5	2
PC	MATH20030	Linear Algebra II	5	1
Recommended Modules				
	ACM10070	Math Modelling in the Sciences	5	1
	COMP10010	Introduction to Programming 1	5	1
	MATH20150	Graphs and Networks	5	1
	COMP10020	Introduction to Programming 2	5	2
	MATH20260	The Mathematics of Google	5	2
	MATH20270	Theory of Games	5	2

Mathematics, Physics and Education

Students take 8 core modules. If not taken in Stage 1 students **MUST TAKE** ACM10060, PHYC20030 and PHYC20080 in Stage 2. Students intending to progress to Stage 3 Mathematics, Physics and Education **MUST TAKE** STAT20110 in either Stage 2 or Stage 3. Students who intend to take Stage 3 Mathematics, Physics and Education must also have taken 10 credits in Biology and 10 credits in Chemistry by the end of Stage 3.

Core/Option	Code	Title	Credits	Semester
C	EDUC20010	Education Issues & Ideas	5	1
C	ACM20150	Vector Calculus	5	1
C	PHYC20020	Introductory Quantum Mechanics	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	EDUC20020	Science & Mathematics Pedagogy	5	2
C	PHYC20060	Methods for Physicists	5	2
C	PHYC20090	Electronics & Devices	5	2
C	MATH10320	Mathematical Analysis	5	2
PC	PHYC20080	Field, Waves & Light	5	1
PC	PHYC20030	Thermal Physics & Materials	5	2
PC	ACM10060	Appl. of Differential Equations	5	2
PC	STAT20110	Probability Theory	5	1

Mathematics, Applied Mathematics & Education

Students take 9 core. Students must take MATH10040 and MATH10320 in Stage 2 if not previously taken in Stage 1.

Core/Option	Code	Title	Credits	Semester
C	ACM20050	Classical Mech. & Special Rel	5	1
C	ACM20150	Vector Calculus	5	1
C	EDUC20010	Education Issues & Ideas	5	1
C	MATH20060	Calculus of Several Variables	5	1
C	MATH20300	Linear Algebra 2 (MathSci)	5	1
C	ACM20030	Computational Science	5	2
C	ACM20060	Oscillations in Mech. Systems	5	2
C	EDUC20020	Science & Mathematics Pedagogy	5	2
C	MATH20310	Groups, Rings & Fields	5	2
PC	MATH10040	Numbers & Functions	5	1
PC	MATH10320	Mathematical Analysis	5	2

DENOMINATED PROGRAMMES STAGE 2**BSC IN COMPUTER SCIENCE**

Students take 10 core modules. If not taken in Stage 1 students MUST TAKE MATH10200 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	COMP20010	Data Structures & Algorithms I	5	1
C	COMP20020	Digital Systems	5	2
C	COMP20040	Data Structures & Algorithm II	5	2
C	COMP20050	Software Engineering Project 2	5	2
C	COMP20070	Databases and Info. Systems	5	1
C	COMP20110	Discrete Maths for Computer Science	5	1
C	COMP20180	Introduction to Operating Systems	5	2
C	COMP20190	Introduction to Functional Programming	5	2
C	MST20050	Linear Algebra II	5	2
C	COMP20250	Introduction to Java	5	1
PC	MATH10200	Matrix Algebra	5	1
Recommended Modules				
O	COMP20030	Web Design	5	2
O	COMP20200	UNIX Programming	5	2

BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES

Students take 9 core modules and 1 option modules.

Core/Option	Code	Title	Credits	Semester
C	FIN20010	Principles of Finance	5	1
C	MATH20130	Fund. Actuarial Mathematics I	5	1
C	MATH20210	Fund. Actuarial Mathematics II	5	2
C	MIS30040	Analytics Modelling	5	2
C	STAT20100	Inferential Statistics	5	2
C	STAT20110	Probability Theory	5	1
C	STAT30240	Linear Models 1	5	1
C	STAT30250	Linear Models II	5	2
C	STAT20150	Fundamental Concepts in Ac Sci	5	2
O	COMP20010	Data Structures & Algorithms	5	1
O	ECON30100	Health Economics	5	2
O	ECON20020	Intermediate Macroeconomics	5	2
O	ECON30190	Economics of Public Policy	5	1
O	ECON30290	Advanced Microeconomics	5	1
O	MATH10320	Mathematical Analysis	5	2
O	MATH20060	Calculus of Several Variables	5	1
O	MATH20260	The Mathematics of Google	5	2
O	MATH20270	Theory of Games	5	2
O	MATH20300	Linear Algebra 2 (Math Sci)	5	1
O	MST30070	Geometry	5	2

SCIENCE STAGE 3

SCIENCE (DN200)

COMPUTER SCIENCE (DN201)

BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES (DN230)

INFORMATION ON PROGRESSION TO STAGE 3 SCIENCE

Students entering Stage 3 in September 2016 will be allocated to their majors prior to the start of the 2016-2017 academic year. Students will be guaranteed one subject from within their chosen subject stream (i.e. one subject from within the groups BBB, CCS or MPG). Stage 2 students will be given more detailed advice on this process at an advisory session in Semester 2 of the 2016-2017 academic year. During Semester 2 of Stage 2 students will be asked to list their preferred degree majors in order of preference. A small number of majors will have a limit on places and, where the number of applications exceeds the number of available places, allocation will be made competitively on the basis of GPA.

The satisfactory completion of the requirements of Stage 3 and achieving a minimum GPA of 2.48 will allow a student to proceed into their allocated major in Stage 4. Students who complete Stage 3 with a GPA of 2.47 or below, will graduate with a BSc (General Science) Degree. **Students who have completed Stage 3 will not be permitted to replace or substitute modules with a view to raising their GPA.** The BSc (General Science) degree is a level 8 Honours degree. Further information on this qualification can be found at: <http://www.ucd.ie/registry/academicsecretariat/progsnfg.htm>

Please note that for the academic year 2016-2017, Joint Major Degrees are only available in the following subject areas and require the approval of the relevant Heads of Subject: Applied & Computational Mathematics, Cell & Molecular Biology, Mathematics, Physics, Physiology, Plant Biology, Statistics and Zoology. The choice of subjects is contingent on the approval of the Schools concerned and not all combinations may be available.

CHANGE OF MIND:

Should you wish to change your choice of subject areas once the allocation of places has been made, you should seek advice from the Science Office. You **may** be able to change your selection of subject areas but the choices available to you may be limited as some majors have a limited number of places.

Degree GPA Calculation:

The final degree GPA is based 70% on the final year and 30% on the penultimate year. For a four year degree it is 70:30 based on Stage 4: Stage 3. Students who graduate on completing Stage 3 with a BSc (General Sciences) Degree will have their degree GPA based 70% on Stage 3 and 30% on Stage 2. Students considering an international exchange for one or two semesters should visit: http://www.ucd.ie/science/current_students/Degree_GPA_Calculation.html for further information.

This rule generally applies to students who entered the undergraduate Science programme from September 2011, but also applies to students who entered the programme prior to September 2011 but have had to complete repeats and resits requiring them to take one or more additional semester(s) to complete their degree. For students who commenced their degree before September 2011 but were unable to complete their degree prior to 2014-2015 due to Extenuating Circumstances, it may be possible to have their degree GPA calculated under the old regulation of their GPA being calculated on 100% Stage 4. Any student who believes they are eligible for this should contact the Science Office to discuss their case.

In the BAFS programme the final degree GPA is calculated on the unweighted GPAs of the final and penultimate stages of the programme and based on modules, including elective modules, that the student completes and passes to satisfy the credit requirements of those stages.

STAGE 3 REPEAT STUDENTS

Students returning to a repeat attempt at Stage 3 will find information on how to register to resits and repeats, via the Resit/Repeat/Substitution tab, on the Current Students website at: http://www.ucd.ie/students/resits_repeats/.

Students in Stage 3 of the BSc degree programme need to achieve a Stage 3 GPA of 2.48 in order to progress to Stage 4 of their programme. Students returning to a repeat attempt at Stage 3 should note that the result that they achieve in the resit or repeat attempt at these modules will be capped with a GPA of 2.0.

Students, in a repeat attempt at Stage 3, hoping to achieve the required Stage 3 GPA by substitution of option/elective modules must seek academic advice from the relevant School and the Science Office. Students need to consider the financial implications associated with the substitution of modules. Further information on fees and grants can be found www.ucd.ie/fees

Students who earn 50 or 55 credits after a full attempt at Stage 3 of the degree may be able to progress to Stage 4 carrying these failed modules. In order to do this, it must be clear that the student was in a position to achieve the required GPA of 2.48 even with the minimum passing grade achieved in their failed modules. A student who earns 50 or 55 credits, but is not in a position to clearly achieve a GPA of 2.48 upon completing Stage 3, will be advanced to a repeat attempt at Stage 3 in the following academic year. The Science Office will advise students who have earned 50 or 55 credits in Stage 3, after the release of the Semester 2 examination results, whether they have progressed to Stage 4 of their programme or whether they are returning to a repeat attempt at Stage 3 of the degree.

If you complete Stage 3 with a GPA of 2.47 or below, you will graduate with a BSc (General Science) Degree. Once you have completed Stage 3 you will not be permitted to replace or substitute modules with a view to raising your GPA.

Although a student can take 'Next Stage' modules while in a repeat attempt at a stage, students in a repeat attempt at Stage 3 are **strongly advised against doing so** if they have not achieved the required GPA. Enrolling to Stage 4 modules does not remove the requirement for a minimum Stage 3 GPA and fees spent on Stage 4 modules cannot be refunded to students who do not achieve the Stage 3 GPA required to progress into Stage 4.

SYLLABUS OF STAGE 3 SUBJECTS IN SCIENCE

The information given below, while final at the time of printing, should only be used as a guide and not as an official statement of this curriculum. Further information on the programme curriculum, as well as detailed module information, can be found at www.ucd.ie/students/course_search.htm

Recommended or suggested modules are also listed for some subjects and may be taken as electives by students interested in deepening their knowledge of a particular subject.

BIOLOGICAL, BIOMEDICAL AND BIOMOLECULAR SCIENCES (DN200BBB)

Biochemistry & Molecular Biology

Students take 8 core modules and at least 2 options.

Core/Option	Code	Title	Credits	Semester
C	BIOC30010	Metabolism and Disease	5	1
C	BIOC30090	Proteins & Enzymes	5	1
C	BIOC30030	Biochemist's Toolkit	5	2
C	BMOL30020	Molecular Basis of Disease	5	2
C	BMOL30030	Regulation of Gene Expression	5	1
C	BMOL30040	Receptor-Mediated Cell Signalling	5	1
C	BMOL30050	Genomics and Proteomics	5	2
C	CELB30090	Advanced Cell Biology	5	2
O	CHEM30190	Chemistry of Biomolecules	5	2
O	GENE30030	Genetic Basis of Disease	5	2
O	GENE30040	Introduction to Programming for Biologists	5	2
O	MEIN30240	Bioinformatics	5	1
O	MICR30020	Microbial Cell Factory	5	2
O	PHAR30050	Experimental and Therapeutic Strategies in Molecular Pharmacology	5	2
O	STAT20070	Data Modelling for Science	5	1
Recommended Modules				
	STAT10050	Practical Statistics	5	1 & 2

Cell & Molecular Biology (Single Major)

Students take 7 core modules and at least 3 options.

Core/Option	Code	Title	Credits	Semester
C	BMOL30030	Regulation of Gene Expression	5	1
C	BIOL30030	Working with Biological Data	5	2
C	CELB30100	Developmental Biology	5	1
C	CELB30110	Plant Cell Biology	5	1
C	CELB30080	Research Methods in Cell Biology	5	2
C	CELB30090	Advanced Cell Biology	5	2
C	GENE30010	Genetics	5	1
O	BIOL30040	Scientific Writing for Biology	5	2
O	BMOL30020	Molecular Basis of Disease	5	2
O	BMOL30040	Cell Signalling	5	1
O	BMOL30050	Genomics & Proteomics	5	2
O	BOTN30130	Plant Biotechnology & Entrepreneurship	5	2

O	GENE30020	Genome Structure	5	2
O	GENE30030	Genetic Basis of Disease	5	2
O	ZOOL30030	Evolutionary Biology	5	2

Cell & Molecular Biology (Joint Major)

Students take 5 core modules. Students must speak with the Cell & Molecular Biology Programme Coordinator before selecting modules.

Core/Option	Code	Title	Credits	Semester
C	CELB30100	Developmental Biology	5	1
C	CELB30110	Plant Cell Biology	5	1
C	GENE30010	Genetics	5	1
C	CELB30080	Research Methods in Cell Biology	5	1
C	CELB30090	Advanced Cell Biology	5	2

Environmental Biology

Students take 5 core modules and least 5 option modules. Students must select 5 options in total but at least three modules must be selected from List A and one module from List B. The fifth option module may be selected from List A, B or C.

Core/Option	Code	Title	Credits	Semester
C	BIOL30030	Working with Biological Data	5	2
C	BOTN30050	Diversity of Plant Form & Function	5	2
C	ENVB30010	Systems Ecology	5	1
C	ENVB30020	Wildlife and Fisheries	5	1
C	ENVB30100	Ecology & Environmental Microbiology	5	2
List A				
O	ENVB20030	Microbial Interactions	5	1
O	BOTN30110	Plant Growth & Nutrients	5	2
O	GENE20020	Principles of Genetics	5	2
O	ZOOL30020	Arthropoda	5	2
O	ZOOL30040	Diversity of Vertebrates	5	2
O	ZOOL30050	Diversity of Invertebrates	5	1
O	ZOOL30060	Biogeography & Field Biology	5	2
List B				
O	ZOOL 30040	Diversity of Vertebrates	5	2
O	ZOOL 30050	Diversity of Invertebrates	5	1
List C				
O	AESC30080	Agri-Env. Issues & Policy	5	1
O	BIOL30040	Scientific Writing for Biology	5	2
O	AESC30190	Wastes Policy & Management	5	2
O	AESC30220	Soil Science Applications	5	1
O	ENVB30110	Food Microbiology	5	1
O	MICR30040	Microbial Diversity & Growth	5	1
O	ZOOL20020	Animal Behaviour	5	1
O	ZOOL30030	Evolutionary Biology	5	2

Genetics

Students take 8 core modules and 1 option. Students who did not complete STAT2007 in Stage 2 must take

this module in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	BMOL30030	Regulation of Gene Expression	5	1
C	BMOL30050	Genomics & Proteomics	5	2
C	CELB30100	Developmental Biology	5	1
C	GENE30010	Genetics	5	1
C	GENE30020	Genome Structure	5	2
C	GENE30030	Genetic Basis of Disease	5	2
C	MEIN30240	Bioinformatics	5	1
C	ZOOL30030	Evolutionary Biology	5	2
PC	STAT20070	Data Modelling for Science	5	1
O	BMOL30020	Molecular basis of disease	5	2
O	BMOL30040	Cell Signalling	5	1
O	BOTN30130	Pl. Biotech & Entrepreneurship	5	2
O	CELB30090	Advanced Cell Biology	5	2
O	CHEM30190	Chemistry of Biomolecules	5	2
O	GENE30040	Programming for Biologists	5	2
O	MEMI30010	Medical Microbiology	5	2
Recommended Module				
	STAT10050	Practical Statistics	5	1&2

Microbiology

Students take 8 core modules and 2 options

Core/Option	Code	Title	Credits	Semester
C	BMOL30030	Regulation of Gene Expression	5	1
C	ENVB30100	Ecology & Environmental Microbiology	5	2
C	MEMI30010	Medical Microbiology	5	2
C	MICR30020	Microbial Cell Factory	5	2
C	MICR30030	Microbial Physiology	5	1
C	MICR30040	Microbial Diversity & Growth	5	1
C	MICR30060	Applied Microbiology	5	2
C	MICR30070	Skills in Microbiology	5	Y
O	BMOL30050	Genomics and Proteomics	5	2
O	BSEN40410	Food Chain Integrity	5	1
O	CHEM30190	Chemistry of Biomolecules	5	2
O	MEIN30240	Bioinformatics	5	1
O	PHPS40610	Food Safety	5	1
O	STAT20070	Data Modelling for Science	5	1
O	ZOOL30030	Evolutionary Biology	5	2
Recommended Module				
	STAT10050	Practical Statistics	5	1&2

Neuroscience

Students take 8 core modules and at least 2 options

Core/Option	Code	Title	Credits	Semester
C	BMOL30040	Cell Signalling	5	1
C	NEUR30010	Principles of Nervous System Development	5	2
C	NEUR30060	Sensory Neuroscience	5	2
C	NEUR30070	Higher Cortical Function	5	2
C	NEUR30080	Membrane Biology	5	1
C	PHAR30040	Advanced CNS Pharmacology	5	2
C	PHAR30080	Drugs used in CNS Diseases	5	1
C	STAT20070	Data Modelling for Science	5	1
O	BMOL30020	Molecular Basis of Disease	5	2
O	BMOL30030	Regulation of Gene Expression	5	1
O	GENE30030	Genetic Basis of Disease	5	2
O	MEIN30240	Bioinformatics	5	1
Recommended Module				
	STAT10050	Practical Statistics	5	1&2

Pharmacology (Single Major)

Students take 8 core modules and at least 2 options.

Core/Option	Code	Title	Credits	Semester
C	BMOL30040	Cell Signalling	5	1
C	PHAR30010	Chemotherapeutic agents	5	1
C	PHAR30020	Drug action in body systems II	5	2
C	PHAR30030	Toxicology	5	2
C	PHAR30040	Advanced CNS Pharmacology	5	2
C	PHAR30050	Experimental and Therapeutic Strategies in Molecular Pharmacology	5	2
C	PHAR30080	Drugs used in CNS Diseases	5	1
C	STAT20070	Data Modelling for Science	5	1
O	BMOL30020	Molecular basis of disease	5	2
O	BMOL30030	Regulation of Gene Expression	5	1
O	GENE30010	Genetics	5	1
O	MEIN30240	Bioinformatics	5	1
O	NEUR30070	Higher Cortical Function	5	2
O	PHYS30010	Cardiovascular Physiology	5	1
O	PHYS30040	Endocrine Physiology	5	2
Recommended Module				
	STAT10050	Practical Statistics	5	1&2

Physiology (Single Major)

Students take 8 core modules and 2 options.

Core/Option	Code	Title	Credits	Semester
C	NEUR30080	Membrane Biology	5	1
C	PHYS30010	Cardiovascular Physiology	5	1
C	PHYS30020	Respiratory Physiology	5	2
C	PHYS30040	Endocrine Physiology	5	2
C	PHYS30090	Digestion and Excretion	5	1
C	PHYS30190	Experimental Physiology	5	2
C	PHYS30220	Neuromuscular Physiology	5	2
C	STAT20070	Data Modelling for Science	5	1
O	BIOC30030	Biochemist's Toolkit	5	2
O	BMOL30020	Molecular Basis of Disease	5	2
O	BMOL30040	Cell Signalling	5	1
O	GENE30030	Genetic Basis of Disease	5	2
O	MEIN30240	Bioinformatics	5	1
O	ANAT20010	Anatomy III	5	2
O	PHAR30010	Chemotherapeutic agents	5	1
O	PHAR30050	Molecular Pharmacology	5	2
O	ZOOL30030	Evolutionary Biology	5	2
O	RDGY30520	Medical Imaging (Clin/Res)	5	2

Physiology (Joint Major)

Students take 1 module from List A and 4 modules from List B. Students wishing to register to a Joint Degree programme MUST discuss this request with the Head of Physiology.

Core/Option	Code	Title	Credits	Semester
List A				
O	NEUR30080	Membrane Biology	5	1
O	NEUR30060	Sensory Neuroscience	5	2
O	NEUR30070	Higher Cortical Function	5	2
List B				
O	PHYS30010	Cardiovascular Physiology	5	1
O	PHYS30090	Digestion and Excretion	5	1
O	STAT20070	Data Modelling for Science	5	1
O	PHYS30020	Respiratory Physiology	5	2
O	PHYS30040	Endocrine Physiology	5	2

Plant Biology (Single Major)

Students take 7 core modules and 3 options. Students may not choose both STAT20070 and FOR20100.

Core/Option	Code	Title	Credits	Semester
C	BIOL30030	Working with Biological Data	5	2
C	BIOL30010	Plant Diseases: Biology and Control	5	1
C	BOTN30050	Div. of Plant Form & Function	5	2
C	BOTN30110	Plant Growth & Nutrient Assimilation	5	2
C	BOTN30130	Plant Biotechnology & Entrepreneurship	5	2
C	CELB30110	Plant Cell Biology	5	1

C	GENE30010	Genetics and Recombinant DNA	5	1
O	AESC30110	Diversity in the Rural Landscape	5	2
O	AESC30220	Soil Science Applications	5	1
O	BIOL30040	Scientific Writing for Biology	5	2
O	BOTN30060	Marine Botany	5	2
O	CPSC30090	Crop Breeding	5	1
O	CELB30090	Advanced Cell Biology	5	2
O	ENVB30010	Systems Ecology	5	1
O	ENVB30100	Ecological & Environmental Microbiology	5	2
O	FOR20100	Applied Biostatistics	5	1
O	STAT20070	Data Modelling for Science	5	1
O	ZOOL30030	Evolutionary Biology	5	2

Plant Biology (Joint Major)

Students take 4 core modules and at least 1 option. Students may not choose both STAT20070 and FOR20100.

Core/Option	Code	Title	Credits	Semester
C	BIOL30010	Plant Diseases: Biology and Control	5	1
C	BOTN30050	Diversity of Plant Form & Function	5	2
C	BOTN30110	Plant Growth & Nutrients	5	2
C	CELB 30110	Plant Cell Biology	5	1
O	AESC30110	Diversity in the Rural Landscape	5	1
O	AESC30220	Soil Science Applications	5	1
O	BOTN30060	Marine Botany	5	2
O	BOTN30130	Plant Biotechnology & Entrepreneurship	5	2
O	CPSC30090	Crop Breeding	5	1
O	CELB30090	Advanced Cell Biology	5	2
O	ENVB30010	Systems Ecology	5	1
O	ENVB30100	Ecological and Environmental Microbiology	5	2
O	FOR20100	Applied Biostatistics	5	1
O	GENE30010	Genetics and Recombinant DNA	5	1
O	STAT20070	Data Modelling for Science	5	1
O	ZOOL30030	Evolutionary Biology	5	2

Zoology (Single Major)

Students take seven core modules and at least 4 options. Students cannot take both STAT20070 and FOR20100. Students who did not complete CELB20040, ENVB20010 and GENE20010 in Stage 2 must take CELB20060, ENVB20050 and GENE 20020 in Stage 3. Students must select at least 4 modules from Table B listed below.

Core/Option	Code	Title	Credits	Semester
C	BIOL30030	Working with Biological Data	5	2
C	ENVB30010	Systems Ecology	5	1
C	ZOOL30010	Functional Morphology	5	2
C	ZOOL30020	Arthropoda	5	2
C	ZOOL30030	Evolutionary Biology	5	2
C	ZOOL30040	Diversity of Vertebrates	5	2

C	ZOOL30050	Diversity of Invertebrates	5	1
O	CELB20060	Principles of Cell & MolBiology	5	1
O	ENVB20050	Principles of EnvBiol&Ecology	5	2
O	GENE20020	Principles of Genetics	5	2
O	CELB30100	Developmental Biology	5	1
O	ENVB30020	Wildlife Conservation & Fisheries Management	5	1
O	BIOL30040	Scientific Writing for Biology	5	2
O	ZOOL20020	Animal Behaviour	5	1
O	ZOOL30060	Biogeography & Field Biology	5	2

Zoology (Joint Major)

Students take 4 core modules and 1 option. Students who did not complete CELB20040, ENVB20010 and GENE20010 in Stage 2 must take CELB20060, ENVB20050 and GENE20020 in Stage 3

Core/Option	Code	Title	Credits	Semester
C	BIOL30030	Working with Biological Data	5	2
C	ZOOL30020	Arthropoda	5	2
C	ZOOL30040	Diversity of Vertebrates	5	2
C	ZOOL30050	Diversity of Invertebrates	5	1
O	CELB20060	Principles of Cell & MolBiology	5	1
O	ENVB20050	Principles of EnvBiol&Ecology	5	2
O	GENE20020	Principles of Genetics	5	2
O	ENVB30010	Systems Ecology	5	1
O	ZOOL30010	Functional Morphology	5	2
O	ENVB30020	Wildlife & Fisheries	5	1
O	BIOL30040	Scientific Writing for Biology	5	2
O	ZOOL30030	Evolutionary Biology	5	2

Mathematics, Biology & Education

Students take 8 core modules. Students who took Stream A (Biological & Environmental Sciences) in Stage 2 MUST TAKE option modules ENVB30010 and ZOOL30010 in Stage 3. Students who took Stream B (Biomolecular & Biomedical Sciences) in Stage 2 MUST TAKE option module BMOL30030 and, if two of MICR20050, BIOC20050, GENE20020 or PHAR20040 have not been taken in Stage 2, students MUST TAKE one of MICR20050, GENE20020 or PHAR20040 in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	MATH30320	Mathematics Pedagogy	5	1
C	MATH30340	Peer-Assisted Tutoring	5	1
C	MST20010	Algebraic Structures	5	1
C	MST30020	History of Mathematics	5	1
C	STAT20110	Probability Theory	5	1
C	MATH30030	Placement in Mathematics	5	2
C	EDUC30050	Schools and Society	5	2
C	MST30070	Geometry	5	2
PC	MST20040	Analysis	5	2
O	BMOL30030	Regulation of Gene Expression	5	1
O	ENVB30010	Systems Ecology	5	1
O	MICR20050	Principles of Microbiology	5	2

O	ZOOL30010	Functional Morphology	5	2
O	GENE20020	Principles of Genetics	5	2
O	ZOOL30010	Functional Morphology	5	2
O	PHAR20040	Pharmacology: Biomedical Science	5	2

CHEMISTRY AND CHEMICAL SCIENCES (DN200 CCS)

Chemistry (Single Major)

Students take 10 core modules. Elective modules may also be selected from within the BSc Programme.

Core/Option	Code	Title	Credits	Semester
C	CHEM30060	Quantum Mechanics and Molecular Spectroscopy	5	1
C	CHEM30110	Instrumental Analysis	5	1
C	CHEM30200	Carbonyl Chemistry, Retrosynthesis and Synthetic Methods	5	1
C	CHEM30210	Structure Determination & Aromatic Heterocyclic Chemistry	5	1
C	CHEM30220	Mechanism, Stereochemistry and Alicyclic Chemistry	5	1
C	CHEM30230	Symmetry & Computational Chemistry	5	2
C	CHEM30240	Main Group Chemistry & Bonding	5	2
C	CHEM30250	Organometallic & Solid State Chemistry	5	2
C	CHEM30310	Soft Matter and Interfacial Chemistry	5	2
C	CHEM30320	Chemical Thermodynamics	5	2
Recommended Modules				
	CHEM20030	Functioning of Biomolecules	5	2
	CHEM20110	Env. & Sustainable Chemistry	5	2
	CHEM30090	Chemistry of Materials	5	1
	CHEM30190	Chemistry of Biomolecules	5	2

Medicinal Chemistry & Chemical Biology

Students take 7 core modules and at least 3 options.

Core/Option	Code	Title	Credits	Semester
C	BIOC30030	Biochemist's Toolkit	5	2
C	CHEM30200	Carbonyl Chemistry, Retrosynthesis and Synthetic Methods	5	1
C	CHEM30210	Structure Determination and Aromatic Heterocyclic Chemistry	5	1
C	CHEM30220	Mechanism, Stereochemistry and Alicyclic Chemistry	5	1
C	CHEM30260	Chemical Biology of Natural Products	5	2
C	CHEM30270	Chemical Biology of Macromolecules	5	2
C	CHEM30280	Medicinal Chemistry	5	1
O	MICR30090	Microbial Cell Factory for Chemists	5	2
O	BMOL30020	Molecular basis of disease	5	2
O	CHEM30110	Instrumental Analysis	5	1

O	CHEM30240	Main Group Chemistry & Bonding	5	2
O	MICR30030	Microbial Physiology	5	1
O	MICR30040	Microbial Diversity & Growth	5	1
O	PHAR30010	Chemotherapeutic Agents	5	1
O	PHAR30050	Experimental and Therapeutic Strategies in Molecular Pharmacology	5	2
O	PHAR30080	Drugs used in CNS diseases	5	1

Mathematics, Chemistry & Education

Students take 10 core modules. If not previously taken in Stage 2 STAT20110 must be taken in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	CHEM30110	Instrumental Analysis	5	1
C	CHEM30220	Mechanism and Stereochemistry	5	1
C	MATH30320	Mathematics Pedagogy	5	1
C	MATH30340	Peer-Assisted Tutoring	5	1
C	MST20010	Algebraic Structures	5	1
C	CHEM30240	Main Group Chemistry & Bonding	5	2
C	CHEM30320	Chemical Thermodynamics	5	2
C	MATH30050	Schools and Society	5	2
C	EDUC30030	Post Primary Science	5	2
C	MST30070	Geometry	5	2
PC	STAT20110	Probability Theory	5	1

Chemistry with Environmental & Sustainable Chemistry

Students take 10 core modules. If not taken in Stage 2, students must select CHEM20110 in Stage 3

Core/Option	Code	Title	Credits	Semester
C	CHEM30060	Quantum Mechanics	5	1
C	CHEM30110	Instrumental Analysis	5	1
C	CHEM30200	Carbonyl Chemistry & Synthesis	5	1
C	CHEM30210	Struct. Determ & Heterocyc Chem.	5	1
C	CHEM30220	Mechanism and Stereochemistry	5	1
C	CHEM30230	Symmetry & Computational Chem.	5	2
C	CHEM30240	Main Group Chemistry & Bonding	5	2
C	CHEM30250	Organometal & Solid State Chem.	5	2
C	CHEM30310	Soft matter & Interfacial Chem.	5	2
C	CHEM30320	Chemical Thermodynamics	5	2
PC	CHEM20110	Env. & Sustainable Chemistry	5	2

Chemistry with Biophysical Chemistry

Students take 8 core modules and at least 2 option modules.

Core/Option	Code	Title	Credits	Semester
C	CHEM30060	Quantum Mechanics	5	1
C	CHEM30110	Instrumental Analysis	5	1
C	CHEM30200	Carbonyl Chemistry & Synthesis	5	1
C	CHEM30220	Mechanism & Stereochemistry	5	1
C	CHEM30230	Symmetry & Computational Chem.	5	2

C	CHEM30240	Main Group Chemistry & Bonding	5	2
C	CHEM30310	Soft matter & Interfacial Chem.	5	2
C	CHEM30320	Chemical Thermodynamics	5	2
O	BIOC30090	Proteins & Enzymes	5	1
O	CHEM30210	Struct.Determ. & Heterocyc Chem.	5	1
O	CHEM30280	Medicinal Chemistry (Level 3)	5	1
O	CHEM30030	Biochemist's Toolkit	5	2
O	BMOL30050	Genomics & Proteomics	5	2
O	CHEM30250	Organometal & Solid State Chem.	5	2
O	CHEM30270	Chem. Biology of Macromolecules	5	2

MATHEMATICAL, PHYSICAL AND GEOLOGICAL SCIENCES (DN200MPG)

Geology

Students take nine core modules. GEOL20050 and GEOL20100 must be taken in Stage 3, if they were not taken in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	GEOL30010	Palaeobiology	5	1
C	GEOL30040	Sedimentary Environments	5	1
C	GEOL30080	Precambrian Geology & Geotectonics	5	2
C	GEOL30090	Earth Resources & Applied Geology	5	2
C	GEOL30100	Structural & Petroleum Geology	5	2
C	GEOL30110	Metamorphic Petrology	5	2
C	GEOL30240	Igneous Petrology	5	1
C	GEOL30250	Geological Mapping	5	1
C	GEOL30260	Field Work and Stratigraphy	10	2
PC	GEOL20050	Geophysical Techniques	5	1
PC	GEOL20100	Environmental Geochemistry	5	2
Recommended Modules				
	GEOL10040	Earth, Environment & Society	5	2
	GEOL10050	Earth & Humanity	5	1,2
	GEOL20110	Global Environmental Change	5	1,2

Physics (Single Major)

Students take six core modules and either ACM20030 or PHYC30090. If not taken in Stage 2, students must take ACM 20030. Otherwise, PHYC 30090 must be taken.

Core/Option	Code	Title	Credits	Semester
C	PHYC30010	Thermodynamics & Statistical Physics	5	1
C	PHYC30020	Classical Mechanics & Relativity	5	1
C	PHYC30030	Quantum Mechanics	5	1
C	PHYC30070	Electromagnetism	5	2
C	PHYC30080	Optics & Lasers	5	2
C	PHYC30300	Advanced Laboratory I	20	Y
List A				
PC	ACM20030	Computational Science	5	2
O	PHYC30090	Nuclear Physics	5	2
Recommended Modules:				
	ACM30220	Partial Differential Equations	5	1

	PHYC30100	Stellar Astrophysics	5	1
	STAT20070	Data Modelling for Science	5	1
	SCI30030	Art Science Collaboration	5	2

Physics (Joint Major)

Students must take 25 credits (4 modules) of core Physics modules, 25 credits in another subject and 10 credits as electives. Module choice must be made in consultation with UCD School of Physics.

Core/Option	Code	Title	Credits	Semester
C	PHYC30010	Thermodynamics & Statistical Physics	5	1
C	PHYC30030	Quantum Mechanics	5	1
C	PHYC30070	Electromagnetism	5	2
C	PHYC30310	Advanced Lab. for Joint Honours I	10	Y
Recommended Modules:				
	ACM30220	Partial Differential Equations	5	1
	PHYC30080	Optics & Lasers	5	2
	PHYC30090	Nuclear Physics	5	2
	PHYC30100	Stellar Astrophysics	5	1
	STAT20070	Data Modelling for Science	5	1
	SCI30030	Art Science Collaboration	5	2

Physics with Astronomy & Space Science

Students take six core modules and either ACM20030 or PHYC30090. If not taken in Stage 2, students must take ACM 20030. Otherwise, PHYC 30090 must be taken.

Core/Option	Code	Title	Credits	Semester
C	PHYC30010	Thermodynamics & Statistical Physics	5	1
C	PHYC30020	Classical Mechanics & Relativity	5	1
C	PHYC30030	Quantum Mechanics	5	1
C	PHYC30070	Electromagnetism	5	2
C	PHYC30100	Stellar Astrophysics and Astronomical Techniques	5	1
C	PHYC30170	Astronomy & Astrophysics Lab 1	20	Y
List A				
PC	ACM200030	Computational Science	5	2
PC	PHYC30090	Nuclear Physics	5	2
Recommended Modules:				
	ACM30220	Partial Differential Equations	5	1
	STAT20070	Data Modelling for Science	5	1
	PHYC30080	Optics & Lasers	5	2
	SCI 30030	Art Science Collaboration	5	2

Theoretical Physics

Students take 9 core modules and a further 10 credits as electives.

Core/Option	Code	Title	Credits	Semester
C	ACM30010	Analytical Mechanics	5	1
C	ACM30200	Foundations of Fluid Mechanics	5	2
C	ACM30210	Foundations of Quantum Mechanics	5	2
C	ACM30220	Partial Differential Equations	5	1

C	MATH30040	Functions of One Complex Variable	5	1
C	PHYC30010	Thermodynamics & Statistical Physics	5	1
C	PHYC30030	Quantum Mechanics	5	1
C	PHYC30070	Electromagnetism	5	2
C	PHYC30320	Advanced Laboratory I (TP)	10	Y
Recommended Modules:				
	ACM30020	Advanced Mathematical Methods	5	1
	MATH20300	Linear Algebra 2	5	1
	MATH20310	Groups, Rings and Fields	5	2
	PHYC30080	Optics & Lasers	5	2
	PHYC30090	Nuclear Physics	5	2
	PHYC30100	Stellar Astrophysics	5	1
	STAT20070	Data Modelling for Science	5	1
	ACM30190	Dynamical Systems	5	1
	SCI30030	Art Science Collaboration	5	1

Applied & Computational Mathematics (Single Major)

Students must take seven core modules and three option modules and a further 10 credits as electives. If the modules MATH 20310, MATH 20300 or STAT20110 were not taken in Stage 2 then they must be taken as options in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	ACM 30010	Analytic Mechanics	5	1
C	ACM 40690	Survey of App. & Comp. Mathematics	5	2
C	ACM 30190	Dynamical Systems	5	2
C	ACM 30200	Foundations of Fluid Mechanics	5	2
C	ACM 30210	Foundations of Quantum Mechanics	5	2
C	ACM 30220	Partial Differential Equations	5	1
C	MATH 30040	Functions of One Complex Variable	5	1
PC	MATH 20300	Linear Algebra 2	5	1
PC	MATH 20310	Groups, Rings and Fields	5	2
PC	STAT 20110	Probability Theory	5	1
O	MATH 30090	Metric Spaces	5	1
O	MST 30030	Financial Mathematics	5	1
O	MATH30030	Advanced Linear Algebra	5	1
O	MATH40370	Differential Geometry	5	1
O	STAT20100	Inferential Statistics	5	2
O	PHYC 30010	Thermo & Stat Physics	5	1
O	PHYC 30070	Electromagnetism	5	2
O	STAT 30010	Time Series Analysis	5	1
O	STAT 40380	Bayesian Analysis	5	2

Applied & Computational Mathematics (Joint Major)

Students take 5 core modules.

Core/Option	Code	Title	Credits	Semester
C	ACM 30010	Analytic Mechanics	5	1
C	MATH30040	Functions Pme Complex Variable	5	1
C	ACM 30200	Foundations of Fluid Mechanics	5	2
C	ACM 30210	Foundations of Quantum Mechanics	5	2
C	ACM 30220	Partial Differential Equations	5	1

Recommended Module				
	ACM 30190	Dynamical Systems	5	2
	ACM40600	Comp. Quantum Chemistry (TCD)	5	2

Mathematics (Single Major)

Students take 7 core modules and 2 options. Students registered to Stage 3 Mathematics must take STAT20110 if it was not previously taken in Stage 2. Electives may be selected from within the BSc degree programme.

Core/Option	Code	Title	Credits	Semester
C	MATH30030	Advanced Linear Algebra	5	1
C	MATH30040	Functions One Complex Variable	5	1
C	MATH30090	Metric Spaces	5	1
C	MATH30130	Number Theory	5	1
C	MATH40010	Ring Theory	5	2
C	MATH40240	Combinatorics	5	2
C	MATH40310	Functional Analysis	5	2
PC	STAT20110	Probability Theory	5	1
O	ACM40290	Numerical Algorithms	5	1
O	MATH30340	Maths Peer Tutor	5	1
O	MATH40370	Differential Geometry	5	1
O	MATH40510	Set Theory	5	1
O	MATH30250	Cryptography: Theory & Practice	5	2

Mathematics (Joint Major)

Students must take 3 core modules and 2 option module from the list below. Students must take 25 credits of modules in each of their subjects and a further 10 credits as electives.

Core/Option	Code	Title	Credits	Semester
C	MATH30040	Functions of One Complex Variable	5	1
C	MATH30030	Advanced Linear Algebra	5	1
C	MATH30090	Metric Spaces	5	1
O	MATH30130	Number Theory	5	1
O	MATH30340	Maths Peer Tutor	5	1
O	MATH40370	Differential Geometry	5	1
O	MATH40510	Set Theory	5	1
O	MST30020	History of Mathematics	5	1
O	MATH30250	Cryptography: Theory & Practice	5	2
O	MATH40010	Ring Theory	5	2
O	MATH40240	Combinatorics	5	2
O	MATH40310	Functional Analysis	5	2

Mathematical Science

Students take 9 core modules and 1 option module. To complete a degree in Mathematical Sciences, students must take ACM20060 in Stage 3 if they have not taken ACM20020 in Stage 2.

Core/Option	Code	Title	Credits	Semester
C	ACM30220	Partial Differential Equations	5	1
C	MATH30030	Advanced Linear Algebra	5	1
C	MATH30040	Functions One Complex Variable	5	1

C	MATH30090	Metric Spaces	5	1
C	STAT30010	Time Series Analysis	5	1
C	ACM30200	Foundations of Fluid Mechanics	5	2
C	ACM40690	Survey of Appl & Comp Math	5	2
C	STAT40150	Multivariate Analysis	5	2
C	STAT40380	Bayesian Analysis	5	2
PC	ACM20060	Oscillations in Mech Systems	5	2
O	ACM30010	Analytic Mechanics	5	1
O	MATH40370	Differential Geometry	5	1
O	STAT30090	Models – Stochastic Models	5	1
O	ACM30190	Dynamical Systems	5	2
O	ACM30210	Found. Of Quantum Mechanics	5	2
O	MATH40240	Combinatorics	5	2
O	STAT30270	Statistical Data Mining	5	2

Statistics (Single Major)

Students must take 6 core modules and at least 2 option modules. If not previously taken in Stage 2, students **MUST TAKE** MATH20300 and ACM20030 in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	STAT30010	Time Series Analysis	5	1
C	STAT30020	Survey Sampling	5	1
C	STAT30090	Models – Stochastic Models	5	1
C	STAT30270	Statistical Data Mining	5	2
C	STAT40110	Design of Experiments	5	2
C	STAT40380	Bayesian Analysis	5	2
PC	MATH20300	Linear Algebra (Math Sci)	5	1
PC	ACM20030	Computational Science	5	2
O	ACM20150	Vector Calculus	5	1
O	ACM30220	Partial Differential Equations	5	1
O	COMP20010	Data Structures & Algorithms 1	5	1
O	COMP30120	Machine Learning	5	1
O	MATH30040	Functions One Complex Variable	5	1
O	MATH30090	Metric Spaces	5	1
O	ACM30190	Dynamical Systems	5	2
O	MATH20310	Groups, Rings and Fields	5	2
O	MATH30250	Cryptography: Theory & Practice	5	2

Statistics (Joint Major)

Students take 5 core modules. Students take 25 credits in each of their two majors and a further 10 credits as electives.

Core/Option	Code	Title	Credits	Semester
C	STAT30080	Models – Survival	5	1
C	STAT30010	Time Series	5	1
C	STAT30270	Statistical Data Mining	5	2
C	STAT40380	Bayesian Analysis	5	2
C	STAT40110	Designs of Experiments	5	2
Recommended Modules				
	ACM20150	Vector Calculus	5	1
	COMP20010	Data Structures & Algorithms 1	5	1
	MATH20130	Fund. Actuarial Mathematics 1	5	1

	MATH30090	Metric Spaces	5	1
	STAT30020	Survey Sampling	5	1
	ACM20030	Computational Science	5	2
	ACM30190	Dynamical Systems	5	2
	MATH30250	Cryptography: Theory & Practice	5	2

Mathematics, Physics & Education

Students take 9 core modules. If not taken in Stage 2, STAT20110 and MST30020 MUST BE TAKEN in Stage 3.

Core/Option	Code	Title	Credits	Semester
C	MATH30320	Mathematics Pedagogy	5	1
C	MATH30340	Peer-Assisted Tutoring	5	1
C	MST20010	Algebraic Structures	5	1
C	PHYC30020	Classical Mechanics & Relativity	5	1
C	PHYC30030	Quantum Mechanics	5	1
C	MATH30330	Placement in Mathematics	5	2
C	EDUC30050	Schools and Society	5	2
C	MST30070	Geometry	5	2
C	PHYC30070	Electromagnetism	5	2
PC	MST30020	History of Mathematics	5	1
PC	STAT20110	Probability Theory	5	1

Mathematics, Applied Mathematics & Education

Students take 10 core modules.

Core/Option	Code	Title	Credits	Semester
C	ACM30010	Analytic Mechanics	5	1
C	MATH30320	Mathematics Pedagogy	5	1
C	MATH30340	Peer-Assisted Tutoring	5	1
C	MST30020	History of Mathematics	5	1
C	MST30030	Financial Mathematics	5	1
C	STAT20110	Probability Theory	5	1
C	ACM30200	Foundations of Fluid Mechanics	5	2
C	MATH30330	Placement in Mathematics	5	2
C	EDUC30050	Schools and Society	5	2
C	MST30070	Geometry	5	2

BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES

Students take 6 core modules and a 30 credit work experience core module in Semester 2. STAT10010 may NOT be taken as an elective.

Core/Option	Code	Title	Credits	Semester
C	FIN30170	Advanced Corporate Finance	5	1
C	MIS30080	Information Management for Actuaries	5	1
C	STAT30010	Time Series Analysis	5	1
C	STAT30080	Models – Survival Models	5	1
C	STAT30090	Models – Stochastic Models with Actuarial Applications	5	1
C	STAT30290	Workplace Skills for BAFS	5	1
C	STAT30150	BAFS Professional Work Placement	30	2

BSc COMPUTER SCIENCE

Students take 10 core modules.

Core/Option	Code	Title	Credits	Semester
C	COMP30010	Foundations of Computing	5	1
C	COMP30040	Networks and Internet Systems	5	1
C	COMP30060	Program Construction I	5	1
C	COMP30070	Object-Oriented Programming	5	1
C	COMP30020	Computer Graphics I	5	2
C	COMP30050	Software Engineering Project 3	5	2
C	COMP30080	Processor Design	5	1
C	COMP30690	Information Theory	5	2
C	COMP30030	Introduction to AI	5	1
C	MATH20150	Graphs & Networks	5	1
Recommended Modules				
	COMP20090	Introduction to Cognitive Science	5	2
	COMP20130	Introduction to Computer Forensics	5	2
	COMP20140	Introduction to Project Management	5	2
	COMP30390	Enterprise, Innovation & Entrepreneurship	5	1

SCIENCE STAGE 4

SCIENCE (DN200)

BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES (DN230)

COMPUTER SCIENCE (DN201)

REGULATIONS FOR STAGE 4 SCIENCE STUDENTS

UCD Registry will be informed of your designated subject area and you will be automatically enrolled to the core modules. The number of core modules can vary from subject to subject. You will then need to select the appropriate optional modules required for your major(s). **It is your responsibility to ensure that you are correctly registered.**

Stage 4 students should contact their School Office for details of timetables, research projects etc. as local arrangements are in place in each School.

Degree Classification

The BSc Programme Examination Board will classify the overall award to each graduate of an honours bachelors degree based on a degree GPA; for Stage 4 students this is calculated based on 30% for Stage 3 and 70% for Stage 4.

Honours will be awarded in Honours Bachelor degrees using the following classes of Honours:-
First Class Honours, Second Class Honours Grade 1 and Second Class Honours Grade 2. The decision of the Programme Board on the award of Honours will be based on the relevant GPA according to the following scheme:-

GPA	Award
3.68 or greater	First Class Honours
From 3.08 to 3.67 inclusive	Second Class Honours Grade 1
From 2.48 to 3.07 inclusive	Second Class Honours Grade 2
From 2.00 to 2.47 inclusive	Pass

SYLLABUS FOR STAGE 4 SUBJECTS IN SCIENCE

The information given below, while final at the time of printing, should only be used as a guide and not as an official statement of this curriculum. Further information on the programme curriculum, as well as detailed module information, can be found at www.ucd.ie/students/course_search.htm

Applied & Computational Mathematics (Single Major)

Students take 7 core modules and 5 options.

Core/Option	Code	Title	Credits	Semester
C	ACM40010	Electrodynamics & Gauge Theory	5	1
C	ACM40090	Differential Geometry	5	1
C	ACM40290	Numerical Algorithms	5	1
C	ACM40750	Gen Relativity & Black Holes	5	1
C	STAT30090	Models – Stochastic Models	5	1
C	ACM40070	Environmental Fluids	5	2
C	ACM40690	Survey of Appl and Comp Math	5	2
O	ACM40840	Meteorology & Climate Dynamics	5	1
O	MATH30030	Advanced Linear Algebra	5	1
O	MATH30090	Metric Spaces	5	1
O	PHYC40470	Computational Biophysics	5	1
O	PHYC40650	Advanced Statistical Physics	5	1
O	STAT30010	Time Series Analysis	5	1
O	STAT40400	Monte Carlo Inference	5	1
O	ACM40680	Research Projects	5	1 & 2
O	ACM40050	Relativistic Quantum Mechanics	5	2
O	MATH30250	Cryptography: Theory & Practice	5	2
O	MATH40310	Functional Analysis	5	2
O	PHYC40360	Theoretical Astrophysics	5	2
O	STAT40380	Bayesian Analysis	5	2
O	ACM40850	Undergrad. Case Study Climate Science	5	1

Applied & Computational Mathematics (Joint Major)

Students take four core modules. Students may take two options from the ACM option list below or from the option list for the other subject in the Joint Major.

Core/Option	Code	Title	Credits	Semester
C	ACM40010	Electrodynamics & Gauge Theory	5	1
C	ACM40090	Differential Geometry	5	1
C	ACM40290	Numerical Algorithms	5	1
C	ACM40690	Survey of Appl. & Comp Math	5	2
O	ACM40750	Gen Relativity & Black Holes	5	1
O	ACM40840	Meteorology & Climate Dynamics	5	1
O	STAT30090	Models – Stochastic Models	5	1
O	ACM40680	Research Project	5	1 & 2
O	ACM30190	Dynamical Systems	5	2
O	ACM40050	Relativistic Quantum Mechanics	5	2
O	ACM40070	Environmental Fluids	5	2
O	PHYC40360	Theoretical Astrophysics	5	2
O	ACM40850	Undergrad Case Study Climate Sci	5	1

Biochemistry & Molecular Biology

Students take 5 core modules and 1 module from Set A. Students taking BIOC40090 (20 cr) select 3 modules from Set B. Students taking BMOL40100 (15 cr) select 4 modules from Set B.

Core/Option	Code	Title	Credits	Semester
C	BIOC40030	Advanced Cell Signalling	5	2
C	BIOC40040	Biological NMR	5	1
C	BIOC40060	Advanced Neurochemistry	5	2
C	BIOC40070	Protein Structure & Analysis	5	2
C	BIOC40080	Biochemical Research Strategies	5	1
Set A				
O	BIOC40090	Biochemistry Research Project	20	Y
O	BMOL40100	Biomolecular Science Research Project	15	1
Set B				
O	BIOC40220	Hot Topics in Biochemistry	5	2
O	BMOL40040	Cell growth & Differentiation	5	1
O	BMOL40050	Advanced Pharmacology of Cancer	5	2
O	GENE40030	Gene Regulation	5	2
O	GENE40040	Model Organism Genetics	5	2
O	GENE40050	Human Genetics & Disease	5	2
O	MICR40040	Microbial Pathogenicity	5	2
O	MICR40070	Enzyme Technology and Protein Eng	5	2
O	MICR40090	Systems Microbiology	5	2
O	NEUR40010	Molecular Neuroimmunology	5	2
O	NEUR40080	Neuroproteionopathies	5	1
O	PHAR40040	Emerging Therapies	5	2
O	PHAR40050	Drug Discovery & Development	5	2

Cell & Molecular Biology

Students take 1 core modules and 8 options.

Core/Option	Code	Title	Credits	Semester
C	BIOL40360	Research Project	20	Y
O	BIOL40560	Biological Imaging	5	2
O	BMOL40040	Cell growth & differentiation	5	1
O	CELB40020	Developmental Plant Genetics	5	1
O	CELB40030	Programmed Cell Death in Plants	5	2
O	CELB40040	Cell Signalling in Plants	5	2
O	CELB40060	Membrane Trafficking	5	1
O	CELB40070	Cellular Architecture	5	1
O	GENE40010	Epigenetics	5	2
O	GENE40030	Gene Regulation	5	2
O	GENE40040	Model organism genetics	5	2
O	GENE40050	Human Genetics & Disease	5	2
O	ZOOL40040	Molecular Phylogenetics	5	1
O	ZOOL40300	Epithelial Transport	5	1

Cell & Molecular Biology (Joint Major)

Students must take 30 credits of modules from within the Cell & Molecular Biology programme. These 30 credits must include one core.

C	BIOL40040	Joint Major Research Project	10	Y
O	BIOL40560	Biological Imaging	5	2
O	CELB40060	Membrane Trafficking	5	1
O	GENE40040	Model Organisms Genetics	5	1
O	ZOOL40300	Epithelial Transport	5	1
O	BMOL40040	Cell growth & differentiation	5	1

Chemistry

Students take research project and six core modules and two options.

Core/Option	Code	Title	Credits	Semester
C	CHEM40030	Research Project	20	Y
C	CHEM40060	Methods in Organic Synthesis	5	2
C	CHEM40080	Reactivity & Change	5	2
C	CHEM40090	Methods in Organic Synthesis 2	5	1
C	CHEM40110	Advanced Inorganic Chemistry	5	1
C	CHEM40730	Advanced Kinetics & Thermo.	5	2
C	CHEM40740	Electrochemistry	5	1
O	CHEM40050	Metals in Biology	5	1
O	CHEM40140	Modern Methods & Catalysis	5	2
O	CHEM40290	Special topics in Med Chem & Chem	5	1
O	CHEM40870	Nanomaterials Chemistry	5	2

Chemistry (Joint Major)

STUDENTS MUST CONSULT WITH THE STAGE 4 CO-ORDINATOR IN THE SCHOOL OF CHEMISTRY & CHEMICAL BIOLOGY BEFORE CHOOSING THESE MODULES. FAILURE TO DO SO MAY RENDER YOUR MODULE CHOICES AND REGISTRATION INVALID.

Students take 30 credits of modules. Students select at least 5 options from the list below.

Core/Option	Code	Title	Credits	Semester
O	CHEM40040	Research Project	10	Y
O	CHEM40050	Metals in Biology	5	1
O	CHEM40060	Methods in Organic Synthesis	5	2
O	CHEM40080	Reactivity and Change	5	2
O	CHEM40090	Methods in Organic Synthesis 2	5	1
O	CHEM40110	Advanced Inorganic Chemistry	5	1
O	CHEM40140	Modern Methods & Catalysis	5	2
O	CHEM40290	Special topics in Med Chem & Chem	5	1
O	CHEM40730	Advanced Kinetics & Thermo.	5	2
O	CHEM40740	Electrochemistry	5	1

Chemistry with Biophysical Chemistry

Students take 4 core modules and 5 option modules.

Core/Option	Code	Title	Credits	Semester
C	CHEM40740	Electrochemistry	5	1
C	CHEM40870	Nanomaterials Chemistry	5	2
C	CHEM41140	Special Topics Biophysical Chem.	5	2
C	CHEM40030	Research Project20	20	Y
O	CHEM40050	Metals in Biology	5	1
O	CHEM40090	Methods in Organic Syn. 2	5	1
O	CHEM40110	Advanced Inorganic Chemistry	5	1
O	CHEM40290	Special topics in Med Chem & Chem.	5	1
O	CHEM40060	Methods in Organic Synthesis	5	2
O	CHEM40080	Reactivity and Change	5	2
O	CHEM40140	Modern Methods & Catalysis	5	2
O	CHEM40730	Advanced kinetics & thermos.	5	2
O	PHAR40050	Drug Discovery & Development 1	5	2

Chemistry with Environmental & Sustainable Chemistry

Students take 6 core modules and 3 option modules.

Core/Option	Code	Title	Credits	Semester
C	CHEM40110	Advanced Inorganic Chemistry	5	1
C	CHEM40960	Green and Sustainable Chem.	5	1
C	CHEM40060	Methods in Organic Synthesis	5	2
C	CHEM40140	Modern Methods & Catalysis	5	2
C	CHEM40730	Advanced kinetics & thermo.	5	2
C	CHEM40030	Research Project	5	Y
O	CHEM40050	Metals in Biology	5	1
O	CHEM40090	Methods in Organic Syn.2	5	1
O	CHEM40290	Special topics in Med. Chem & Chem.	5	1
O	CHEM40740	Electrochemistry	5	1
O	CHEM40080	Reactivity and Change	5	2
O	CHEM40870	Nanomaterials Chemistry	5	2

Environmental Biology

Students take 1 core modules and 8 options.

Core/Option	Code	Title	Credits	Semester
C	BIOL40360	Research Project	20	Y
O	AESC30080	Agri-Env. Issues & Policy	5	1
O	BOTN40040	Ecological Significance of Different Photosynthetic Pathways	5	1
O	BOTN40180	Plant Atmosphere Climate Interactions	5	1
O	BOTN40190	Plants & Stress	5	2
O	ENVB40020	Marine Community Ecology	5	2
O	ENVB40030	Bioassessment of Freshwaters	5	1
O	ENVB40040	Environmental Impact Assessment	5	1
O	ENVB40050	Ecological & Environmental Microbiology II	5	2
O	ENVB40290	Ecological Modelling	5	2

O	ENVB40310	Peatlands & Environmental Change	5	1
O	MICR40040	Microbial Pathogenicity	5	2
O	MICR40050	Foodborne Pathogens	5	2
O	ZOOL40010	Biodiversity	5	1
O	ZOOL40030	Insect-Plant Interactions	5	2
O	ZOOL40280	Biological Invasions	5	2

Genetics

Students take 6 core modules and 1 module from Set A. Students taking GENE40060 or BIOL40360 (20 cr) select 2 modules from Set B. Students taking BMOL40100 (15 cr) select 3 modules from Set B.

Core/Option	Code	Title	Credits	Semester
C	GENE40010	Epigenetics	5	2
C	GENE40030	Gene Regulation	5	2
C	GENE40040	Model Organism Genetics	5	2
C	GENE40050	Human Genetics & Disease	5	2
C	GENE40070	Genetics Basis of Behaviour	5	1
C	GENE40080	Population Genetics	5	2
Set A				
O	GENE40060	Genetics Research Project	20	Y
O	BIOL40360	Research Project	20	Y
O	BMOL40100	Biomolecular Science Research Project	15	1
Set B				
O	BIOC40030	Advanced Cell Signalling	5	2
O	BIOC40220	Hot Topics in Biochemistry	5	2
O	BMOL40040	Cell Growth & Differentiation	5	1
O	BMOL40050	Advanced Pharmacology of Cancer	5	2
O	CELB40020	Developmental Plant Genetics	5	1
O	MICR40090	Systems Microbiology	5	2
O	NEUR40080	Neuroproteinopathies	5	1
O	PHAR40040	Emerging Therapies	5	2
O	ZOOL40040	Molecular Phylogenetics	5	1

Geology

Students take 8 core modules.

Core/Option	Code	Title	Credits	Semester
C	GEOL40290	Basin Analysis	10	Y
C	GEOL40230	Palaeontology & Stratigraphy	5	2
C	GEOL40240	Palaeobiology	5	2
C	GEOL40170	Field Mapping Research Project	15	Y
C	GEOL40180	Geosynthesis	5	Y
C	GEOL40280	Petrology & Ore Geology	10	1
C	GEOL40460	Advanced Geological Mapping	5	1
C	GEOL40470	Geological Fieldwork	5	2

Mathematics

Students take 7 core modules and 20 credits (4 modules) from the list of options.

Core/Option	Code	Title	Credits	Semester
C	MATH30130	Number Theory	5	1
C	MATH40370	Differential Geometry	5	1
C	MATH40510	Set Theory	5	1
C	MATH30250	Cryptography: Theory & Practice	5	2
C	MATH40010	Ring Theory	5	2
C	MATH40240	Combinatorics	5	2
C	MATH40310	Functional Analysis	5	2
O	ACM30220	1Partial Differential Equations	5	1
O	MST30020	History of Mathematics	5	1
O	STAT30090	Models – Stochastic Models	5	1
O	STAT30240	Linear Models I	5	1
O	ACM40690	Survey of Appl & Comp Math	5	2
O	MATH40450	Undergraduate Research Project	5	2
O	MATH30340	Peer Assisted Tutoring	5	1
O	MST30060	Undergraduate Ambassadors Scheme	5	2

Mathematics (Joint Major)

Students take 3 core modules and at least 10 credits (2 modules) from the option list below.

Core/Option	Code	Title	Credits	Semester
C	MATH40370	Differential Geometry	5	1
C	MATH40010	Ring Theory	5	2
C	MATH40310	Functional Analysis	5	2
O	MATH30130	Number Theory	5	1
O	MATH40510	Set Theory	5	1
O	MATH30250	Cryptography: Theory & Practice	5	2
O	MATH40240	Combinatorics	5	2
O	MATH40450	Undergraduate Research Project	5	2
O	MATH30340	Peer Assisted Tutoring	5	1
O	MST30060	Undergraduate Ambassadors Scheme	5	2

Mathematics, Biology and Education

Students take 10 core modules.

Core/Option	Code	Title	Credits	Semester
C	MICR30040	Microbial Diversity and Growth	5	1
C	EDUC42130	Curriculum and Assessment	5	1
C	EDUC42400	Psychology for Teaching & Learning	5	1
C	EDUC42800	Pedag. Approaches to Mathematics	5	1
C	MST30050	Complex Analysis	5	1
C	EDUC42820	Placement Science and Mathematics	15	Y
C	ENVB30100	Ecology & Environ. Microbiology	5	2
C	EDUC42840	Mathematics Pedagogy in Placement	5	2
C	EDUC42850	Pedag Approaches to Science	5	2
C	EDUC42860	Science Pedag. in Placement	5	2

Mathematical Science

Students take 9 core modules and 15 credits of options (3 modules).

Core/Option	Code	Title	Credits	Semester
C	ACM40090	Differential Geometry	5	1
C	ACM40290	Numerical Algorithms	5	1
C	MATH30130	Number Theory	5	1
C	MATH40370	Differential Geometry	5	1
C	STAT30080	Models – Survival	5	1
C	STAT40400	Monte Carlo Inference	5	1
C	ACM40690	Survey of Appl & Comp Math	5	2
C	MATH40310	Functional Analysis	5	2
C	STAT40510	Applied Statistical Modelling	5	2
O	ACM30010	Analytic Mechanics	5	1
O	MST30020	History of Mathematics	5	1
O	STAT30020	Survey Sampling	5	1
O	STAT40620	Data Programming	5	1
O	ACM30190	Dynamial Systems	5	2
O	ACM30200	Foundations of Fluid Mechanics	5	2
O	ACM40070	Environmental Fluids	5	2
O	MATH30250	Cryptography: Theory & Practice	5	2
O	MATH40240	Combinatorics	5	2
O	STAT40110	Design of Experiments	5	2
O	ACM40680	Research Project	5	1 & 2
O	STAT40880	Research Project 1	5	1 & 2
O	MATH40450	Undergraduate Research Project	5	2
O	MST30060	Undergraduate Ambassadors Scheme	5	2

Medicinal Chemistry & Chemical Biology

Students take 60 credits of modules (core and options) from within the BSc programme. Students take the research project and four core modules (40 credits) and four options (20 credits)

Core/Option	Code	Title	Credits	Semester
C	CHEM40030	Research Project	20	Y
C	CHEM40050	Metals in Biology	5	1
C	CHEM40060	Methods in Organic Synthesis	5	2
C	CHEM40090	Methods in Organic Syn. 2	5	1
C	CHEM40290	Special topics in MedChem& Chem	5	2
O	BIOC40040	Biological NMR	5	1
O	BIOC40070	Protein Structure & Engineering	5	2
O	BMOL40050	Adv. Pharmacology of Cancer	5	2
O	CHEM40080	Reactivity & Change	5	2
O	CHEM40140	Modern Methods & Catalysis	5	2
O	CHEM40870	Nanomaterials Chemistry	5	2
O	PHAR40040	Emerging Therapies	5	2
O	PHAR40050	Drug Discovery & Development I	5	2
O	PHAR40160	Drug Discovery & Development II	5	2

Microbiology

Students take 9 core modules.

Core/Option	Code	Title	Credits	Semester
C	ENVB40050	Ecological & Environmental Microbiology	5	2
C	MEMI40010	Host Pathogen Interactions	5	2
C	MICR40030	Microbiology Research Project	20	Y
C	MICR40040	Microbial Pathogenicity	5	2
C	MICR40050	Foodborne Pathogens	5	2
C	MICR40060	Bioprocessing	5	2
C	MICR40070	Enzyme Technology & Protein Engineering	5	2
C	MICR40080	Natural Product Synthesis	5	2
C	MICR40090	Systems Microbiology	5	2

Neuroscience

Students take a minimum of 60 credits of modules (core and options) from within the BSc programme. Students take six core modules and one module from Set A. Students taking NEUR40060 select two modules from Set B. Students taking BMOL40100 select three modules from Set B.

Core/Option	Code	Title	Credits	Semester
C	BIOC40060	Advanced Neurochemistry	5	2
C	NEUR40010	Molecular Neuroimmunology (UG)	5	2
C	NEUR40020	Synaptic plasticity	5	1
C	NEUR40030	Synaptic signalling	5	2
C	NEUR40070	Advanced topics in neural dev.	5	2
C	PHAR40070	Adv. Neuropharmacology	5	1
Set A				
O	NEUR40060	Neuroscience Research Project	20	Y
O	BMOL40100	Biomolecular Science Research Project	15	1
Set B				
O	BIOC40030	Advanced Cell Signalling	5	2
O	BIOC40220	Hot Topics in Biochemistry	5	2
O	BMOL40040	Cell growth & differentiation	5	1
O	GENE40030	Gene Regulation	5	2
O	GENE40050	Human Genetics & Disease	5	2
O	GENE40070	Genetic Basis of Behaviour	5	1
O	NEUR40100	GPCR's as Therapeutic Targets	5	2
O	NEUR40080	Neuroproteinopathies	5	1
O	PHAR40040	Emerging Therapies	5	2
O	PHAR40050	Drug Discovery and Development I	5	2
O	PHYS30180	Physiological Genomics	5	2
O	PHYS30230	Autonomic Nervous System	5	1

Pharmacology

Students take a total of 60 credits of modules (cores and options) from within the BSc programme. Students take seven core modules and one module from Set A. Students taking PHAR40020 select one module from Set B. Students taking BMOL40100 select two modules from Set B.

Core/Option	Code	Title	Credits	Semester
C	BMOL40050	Adv. Pharmacology of Cancer	5	2
C	GENE40030	Gene Regulation	5	2

C	PHAR40030	Adv. Cardiovascular Pharmacology	5	1
C	PHAR40040	Emerging Therapies	5	2
C	PHAR40050	Drug Discovery & Development I	5	2
C	PHAR40060	Advanced Renal Pharmacology	5	2
C	PHAR40070	Advanced Neuropharmacology	5	1
Set A				
O	PHAR40020	Pharmacology Research Project	20	Y
O	BMOL40100	Biomolecular Science Research Project	15	1
Set B				
O	BIOC40030	Advanced Cell Signalling	5	2
O	BIOC40060	Advanced Neurochemistry	5	2
O	BIOC40220	Hot Topics in Biochemistry	5	2
O	BMOL40040	Cell Growth, Differentiation & Death	5	1
O	GENE40050	Human Genetics & Disease	5	2
O	MICR40040	Microbial Pathogenicity	5	2
O	NEUR40030	Synaptic Signalling	5	2
O	NEUR40100	GPRC's as Therapeutic Targets	5	2
O	NEUR40080	Neurproteinopathies	5	1
O	PHAR40160	Drug Discovery & Development II	5	2

Physics

Students take 5 core modules and 4 option modules. If not taken in Stage 3 students **MUST TAKE** PHYC30090 in Stage 4.

Core/Option	Code	Title	Credits	Semester
C	PHYC40010	Advanced Quantum Mechanics	5	2
C	PHYC40020	Applied Quantum Mechanics	5	1
C	PHYC40080	High Energy Particle Physics	5	1
C	PHYC40250	Condensed Matter Physics	5	1
C	PHYC40370	Advanced Laboratory II	20	Y
PC	PHYC30090	Nuclear Physics	5	2
O	ACM40090	Differential Geometry	5	1
O	ACM40750	General Relativity & Black Holes	5	1
O	PHYC30100	Stellar Astrophysics	5	1
O	PHYC40030	Galaxies & Obs. Cosmology	5	2
O	PHYC40110	Medical Physics	5	2
O	PHYC40120	General Relativity & Cosmology	5	1
O	PHYC40200	Q. Theory of Condensed Matter	5	2
O	PHYC40210	Applied Optics	5	2
O	PHYC40360	Theoretical Astrophysics	5	2
O	PHYC40470	Computational Biophysics	5	1
O	PHYC40650	Advanced Statistical Physics	5	1
O	PHYC40800	Quantum Field Theory	5	2

Physics (Joint Major)

Students must take 30 credits of Physics modules and 30 credits in another subject. Students take four core modules and one option. Module choice must be made in consultation with the School of Physics.

Core/Option	Code	Title	Credits	Semester
C	PHYC40020	Applied Quantum Mechanics	5	1
C	PHYC30080	Optics & Lasers	5	2

C	PHYC30090	Nuclear Physics	5	2
C	PHYC40380	Advanced Laboratory II (Joint)	10	Y
O	PHYC30020	Classical Mechanics + Relativity	5	1
O	PHYC30100	Stellar Astrophysics	5	1
O	PHYC40010	Advanced Quantum Mechanics	5	2
O	PHYC40030	Galaxies & Obs. Cosmology	5	1
O	PHYC40080	High Energy Particle Physics	5	1
O	PHYC40110	Medical Physics	5	2
O	PHYC40210	Applied Optics	5	2
O	PHYC40250	Condensed Matter Physics	5	1
O	PHYC40360	Theoretical Astrophysics	5	2
O	PHYC40470	Computational Biophysics	5	1
O	PHYC40650	Advanced Statistical Physics	5	1
O	PHYC40200	Q. Theory of Condensed Matter	5	2

Physics with Astronomy & Space Science

Students must take 60 credits of Physics modules. Students take 7 specified core (45 credits) and 3 options including either Space Mission Design or Astronomy Field Trip. Please select either PHYC40610 or PHYC40620. Students must take two options from the following list (Set B). If not taken in Stage 3 students **MUST TAKE** PHYC30090 in Stage 4.

Core/Option	Code	Title	Credits	Semester
C	PHYC30080	Optics & Lasers	5	2
C	PHYC40010	Advanced Quantum Mechanics	5	2
C	PHYC40020	Applied Quantum Mechanics	5	1
C	PHYC40030	Galaxies & Obs. Cosmology	5	1
C	PHYC40080	High Energy Particle Physics	5	1
C	PHYC40250	Condensed Matter Physics	5	1
C	PHYC40600	Astronomy & Astrophysics Lab II	15	15
PC	PHYC30090	Nuclear Physics	5	2
Set A				
O	PHYC40610	Space Mission Design	5	2
O	PHYC40620	Astronomy Field Trip	5	2
Set B				
O	ACM40090	Differential Geometry	5	1
O	ACM40750	General Relativity & Black Holes	5	1
O	PHYC40110	Medical Physics	5	2
O	PHYC40120	General Relativity & Cosmology	5	2
O	PHYC40200	Q. Theory of Condensed Matter	5	2
O	PHYC40210	Applied Optics	5	2
O	PHYC40360	Theoretical Astrophysics	5	2
O	PHYC40470	Computational biophysics	5	1
O	PHYC40650	Advanced Statistical Physics	5	1
O	PHYC40800	Quantum Field Theory	5	1

Physiology

Students take 8 core modules and 1 option module.

Core/Option	Code	Title	Credits	Semester
C	PHYS30260	The Physiology of Disease	5	2
C	PHYS30110	Adaptation to hypoxia	5	1
C	PHYS30160	Control of Vascular Resistance	5	1
C	PHYS30180	Physiology Genomics	5	2
C	PHYS30200	Lung Function Under Stress	5	1
C	PHYS30230	Autonomic Nervous System	5	1
C	PHYS40060	Physiology Research Project	20	2
C	PHYS30250	Haemostatis & Thrombosis	5	2
O	BIOC30030	Biochemist's Toolkit	5	2
O	BMOL30020	Molecular Basis of Disease	5	2
O	BMOL30030	Regulation of Gene Expression	5	1
O	GENE30030	Genetic Basis of Disease	5	2
O	GENE40030	Gene Regulation	5	2
O	NEUR40020	Synaptic Plasticity	5	1
O	NEUR40030	Synaptic Signalling	5	2
O	MEIN30240	Bioinformatics	5	1
O	ANAT20010	Anatomy III	5	2
O	RDGY30520	Medical Imaging (Clin/Res)	5	2

Plant Biology

Students take 1 core modules and 8 optional modules

Core/Option	Code	Title	Credits	Semester
C	BIOL40360	Research Project	20	Y
O	BOTN40040	Ecological Significance of Different Photosynthetic Pathways	5	1
O	BOTN40180	Plant-Atm. Climate Interactions	5	1
O	BOTN40190	Plants and Stress	5	2
O	BOTN40240	Future Crops and Food Security	5	2
O	CELB40020	Developmental Plant Genetics	5	1
O	CELB40030	Programmed Cell Death in Plant	5	2
O	CELB40040	Cell Signalling in Plants	5	2
O	ENVB40040	Environmental Impact Assessment	5	1
O	ENVB40050	Ecol. and Env. Microbiology II	5	2
O	ENVB40290	Ecological Modelling	5	2
O	ENVB40310	Peatlands and Env. Change	5	1
O	ZOOL40030	Insect-Plant Interactions	5	2
O	ZOOL40040	Molecular Phylogenetics	5	1
O	ZOOL40280	Biological Invasions	5	2

Plant Biology (Joint Major)

Students must take a total of 30 credits from within the BSc in Plant Biology programme. Students take one core module and four option modules.

Core/Option	Code	Title	Credits	Semester
C	BIOL40040	Joint Major Research Project	10	Y
O	BIOL40010	Core Skills for Research	5	1
O	BOTN 40240	Future Crops and Food Security	5	2
O	BOTN40040	Ecological Significance of Different Photosynthetic Pathways	5	1
O	BOTN40180	Plant-Atm. Climate Interactions	5	1
O	BOTN40190	Plants and Stress	5	2
O	CELB40020	Developmental Plant Genetics	5	1
O	CELB40030	Programmed Cell Death in Plant	5	2
O	CELB40040	Cell Signalling in Plants	5	2
O	ENVB40040	Environmental Impact Assessment	5	1
O	ENVB40050	Ecol. and Env. Microbiology II	5	2
O	ENVB40290	Ecological Modelling	5	2
O	ENVB40310	Peatlands and Env. Change	5	1
O	ZOOL40030	Insect-Plant Interactions	5	2
O	ZOOL40040	Molecular Phylogenetics	5	1
O	ZOOL40280	Biological Invasions	5	2

Statistics (Single Major)

Students take 9 core modules and 3 options. If not taken in Stage 3 students **MUST TAKE** STAT30080 in Stage 4.

Core/Option	Code	Title	Credits	Semester
C	STAT30020	Survey Sampling	5	1
C	STAT30090	Models – Stochastic Models	5	1
C	STAT40020	Actuarial Statistics 1	5	1
C	STAT40400	Monte Carlo Inference	5	1
C	STAT40620	Data Programming	5	1
C	STAT40070	Actuarial Statistics II	5	2
C	STAT40110	Design of Experiments	5	2
C	STAT40150	Multivariate Analysis	5	2
C	STAT40510	Applied Statistical Modelling	5	2
O	STAT30080	Models – Survival	5	1
O	ACM30220	Partial Differential Equations	5	1
O	ACM40290	Numerical Algorithms	5	1
O	COMP47490	Machine Learning	5	1
O	MATH30040	Functions One Complex Variable	5	1
O	MATH30090	Metric Spaces	5	1
O	MATH30340	Peer Assisted Tutoring	5	1
O	STAT40800	Data Prog. With Python (online)	5	1
O	STAT40880	Research Project 1	5	1 & 2
O	ACM40690	Survey of Appl. & Comp. Math.	5	2
O	MATH20310	Groups, Rings & Fields	5	2
O	MATH30250	Cryptography: Theory & Practice	5	2

Statistics (Joint Major)

Students take 4 core modules and 2 options

Core/Option	Code	Title	Credits	Semester
C	STAT30090	Models – Stochastic Models	5	1
C	STAT40150	Multivariate Analysis	5	2
C	STAT40400	Monte Carlo Interference	5	1
C	STAT40510	App. Statistical Modelling	5	2
O	MATH30340	Peer-Assisted Tutoring	5	1
O	MATH40510	Set Theory	5	1
O	STAT30020	Survey Sampling	5	1
O	STAT40020	Actuarial Statistics 1	5	1
O	STAT40620	Data Programming	5	1
O	STAT40800	Data Prog. With Python (online)	5	1
O	STAT40880	Research Project 1	5	1 & 2
O	ACM20030	Computational Science	5	2
O	STAT40070	Actuarial Statistics II	5	2
O	STAT40110	Design of Experiments	5	2

Theoretical Physics

Students take 3 core modules and 9 options. Students take a minimum of 7 modules from Set A and up to 2 option modules from Set B.

Core/Option	Code	Title	Credits	Semester
C	PHYC30090	Nuclear Physics	5	2
C	PHYC40020	Applied Quantum Mechanics	5	1
C	PHYC40260	Projects in Theoretical Physics	5	Y
Set A				
O	ACM30020	Advanced Mathematical Methods	5	1
O	ACM30190	Dynamical Systems	5	2
O	ACM40010	Electrodynamics & Gauge Theory	5	1
O	ACM40050	Relativistic Quantum Mechanics	5	2
O	ACM40070	Environmental Fluids	5	2
O	ACM40080	Advanced Computational Science	5	2
O	ACM40090	Differential Geometry	5	1
O	ACM40690	Survey of Appl. & Comp. Maths	5	2
O	ACM40750	General Relativity & Black Holes	5	1
O	PHYC30100	Stellar Astrophysics	5	1
O	PHYC40010	Advanced Quantum Mechanics	5	2
O	PHYC40030	Galaxies & Obs. Cosmology	5	1
O	PHYC40080	High Energy Particle Physics	5	1
O	PHYC40120	General Relativity & Cosmology	5	1
O	PHYC40200	Q. Theory of Condensed Matter	5	2
O	PHYC40250	Condensed Matter Physics	5	1
O	PHYC40360	Theoretical Astrophysics	5	2
O	PHYC40470	Computational Biophysics	5	1
O	PHYC40650	Advanced Statistical Physics	5	1
O	PHYC40800	Quantum Field Theory	5	1
Set B				
O	PHYC40110	Medical Physics	5	2
O	PHYC40210	Applied Optics	5	2

O	PHYC40330	Advanced Laboratory for TP III	5	Y
O	PHYC40690	Advanced Laboratory Physics	5	Y

Zoology

Students take 1 core modules and 8 options, with at least 2 options from Set A and 5 options from Set B.

Core/Option	Code	Title	Credits	Semester
C	BIOL40360	Research Project	20	Y
Set A				
O	ENVB40040	Environmental Impact Assessment	5	1
O	ZOOL40010	Biodiversity	5	1
O	ZOOL40040	Molecular Phylogenetics	5	1
Set B				
O	ENVB40020	Marine Community Ecology	5	2
O	ENVB40030	Bioassessment of Freshwaters	5	1
O	ENVB40290	Ecological Modelling	5	2
O	GENE40010	Epigenetics	5	2
O	GENE40080	Populations Genetics	5	2
O	ZOOL40030	Insect-Plant Interactions	5	2
O	ZOOL40280	Biological Invasions	5	2
O	ZOOL40300	Epithelial Transport	5	1

Zoology (Joint Major)

Students take 1 core and 4 options.

Core/Option	Code	Title	Credits	Semester
C	ZOOL40310	Joint Major Research Project	10	Y
O	ENVB40020	Marine Community Ecology	5	2
O	ENVB40030	Bioassessment of Freshwaters	5	1
O	GENE40010	Epigenetics	5	2
O	GENE40080	Populations Genetics	5	2
O	ZOOL40010	Biodiversity	5	1
O	ZOOL40030	Insect-Plant Interactions	5	2
O	ZOOL40040	Molecular Phylogenetics	5	1
O	ZOOL40280	Biological Invasions	5	2
O	ZOOL40300	Epithelial Transport	5	1

BACHELOR OF ACTUARIAL AND FINANCIAL STUDIES

Students take 10 core modules and at least one option from the list provided. Students may also select 5 credits of electives.

Core/Option	Code	Title	Credits	Semester
C	FIN30150	Financial Economics I	5	1
C	FIN30160	Financial Economics II	5	2
C	STAT40020	Actuarial Statistics 1	5	1
C	STAT40060	Act. Maths 1	5	1
C	STAT40070	Actuarial Statistics II	5	2
C	STAT40100	Act. Maths 2	5	2
C	STAT40550	Actuarial Risk Management I	5	1
C	STAT40560	Actuarial Risk Management II	5	1
C	STAT40570	Actuarial Risk Management III	5	2
C	STAT40580	Actuarial Risk Management IV	5	2
O	ACC20010	Financial Accounting 2	5	1
O	ECON30150	International Money & Banking	5	2
O	ECON30190	Economics of Public Policy	5	1
O	ECON30100	Health Economics	5	2
O	FIN30030	Intl. Financial Management	5	1
O	FIN30080	Financial Institution Management	5	2
O	FIN30190	Behavioural Finance	5	2
O	STAT40380	Bayesian Analysis	5	2
O	STAT40400	Monte Carlo Inference	5	1

BSc in COMPUTER SCIENCE

Students take 1 core modules and 9 options

Core/Option	Code	Title	Credits	Semester
C	COMP30170	Computer Science Project	15	Y
O	COMP30110	Spatial Information Systems	5	1
O	COMP30190	Program Construction II	5	1
O	COMP30220	Distributed Systems	5	1
O	COMP30240	Multi-Agent Systems	5	1
O	COMP30250	Parallel and Cluster Computing	5	1
O	COMP30260	AI for Games and Puzzles	5	1
O	COMP30520	Cloud Computing (UG)	5	1
O	COMP40370	Data Mining	5	1
O	COMP40660	Advances Wireless Networking	5	1
O	COMP41690	Practical Android Programming	5	1
O	COMP47490	Machine Learning	5	1
O	COMP30230	Connectionist Computing	5	2
O	COMP30490	Collective Intelligence	5	2
O	COMP30540	Game Development	5	2
O	COMP30720	Ethical Computer Hacking	5	2
O	COMP40020	Human Language Technologies	5	2
O	COMP40600	Multimed Security & Data Hiding	5	2
O	COMP47390	Mobile App Dev – Cocoa Touch	5	2
O	COMP47480	Contemporary Software Dev	5	2

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