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# Science

UCD offers one of the widest choices of science subjects in Ireland, providing access to 26-degree subjects in Biological, Biomedical, Biomolecular Sciences, Chemistry, Earth & Environmental Sciences, Mathematics, Physics, including fully accredited Science, Mathematics & Education degrees.

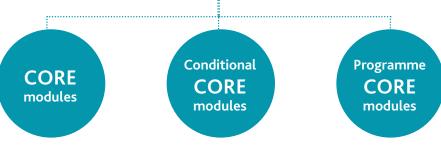
**Table 1** Streams and Degree Subjects within Science

Stream	Degree Subjects
Biological, Biomedical &	Biochemistry & Molecular Biology
Biomolecular Sciences Stream	Cell & Molecular Biology
	Environmental Biology
	Genetics
	Microbiology
	Neuroscience
	Pharmacology
	Physiology
	Plant Biology
	Zoology
Earth & Environmental Sciences Stream	Earth Sciences
Strediti	Environmental Biology
Chemistry (includes Medicinal/	Chemistry
Sustainable) Stream	Chemistry with Environmental & Sustainable Chemistry
	Medicinal Chemistry & Chemical Biology
Mathematics (includes Applied/	Applied & Computational Mathematics
Financial/Statistics)	Financial Mathematics
Stream	Mathematics
	Statistics
Physics (includes Theoretical/	Physics
Astronomy & Space Science)	Physics with Astronomy & Space Science
Stream	Theoretical Physics
	Theoretical Frysics
Science, Mathematics &	Applied Mathematics, Mathematics & Education
Education	Biology, Mathematics & Education
Stream	Chemistry, Mathematics & Education
	Computer Science, Maths. & Education
	Physics, Mathematics & Education
Explore Multiple Streams	Students can select a number of streams in the Explore Multiple Streams option. As with all streams in Stage 1, careful selection of modules will ensure that you keep your options open for Stage 2.
	The information in Table 2 will guide you when you come to choose your modules for Stage 1.

The course in Stage 1 is divided into 12 modules. Students choose their modules in order to fulfil the requirements of the subjects that they wish to keep open in the degree programme.

Students can either focus on a particular area, while fulfilling the requirements for at least 2 subjects, or choose to cover the core requirements for a wide range of subjects.

## Modules required for BSc Degrees within Science



A module that students must do as part of their programme.

Students must take these modules in Stage 1 of the Science programme if they have not achieved the specified grade (see Table 3) or completed the subject at Leaving Certificate standard, or

Are also compulsory, but students can choose to take them in Stage 1 or Stage 2.



**Table 2** Modules required for Science Degree subjects in Stage 1

Key: For modules marked with a plus symbol (+) Please refer to Table 4 Mathematics requirements table for further required criteria.

Biological, Biomedical & Biomolecular Sciences Stream									
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules						
Biochemistry & Molecular Biology Cell & Molecular Biology Environmental Biology Genetics Microbiology Neuroscience Pharmacology Physiology Plant Biology Zoology	Refer to table 3 on page 7 for further details on these modules BIOL00010 Fundamentals of Biology CHEM00010 Introductory Chemistry MATH00010 Introduction to Mathematics PHYC10070 Foundations of Physics (this is a conditional core for Neuroscience and Physiology)	SCI10010 Scientific Enquiry BIOL10110 Cell Biology & Genetics CHEM10050 Basis of Organic & Biological Chemistry MATH10290 Linear Algebra for Science MATH10310 Calculus for Science	At least two of:  BIOL10130 Biology in Action  BIOL10140 Life on Earth  BMOL10030 Biomedical Sciences  *Please refer to table 4 on page 8 for modules						
Earth & Environmental Sci	2 33.		p S						
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules						
Environmental Biology  Students who complete the modules for this subject will also be eligible for subjects listed under the Biological, Biomedical & Biomolecular Stream in Stage 2.	Refer to table 3 on page 7 for further details on these modules BIOL00010 Fundamentals of Biology CHEM00010 Introductory Chemistry MATH00010 Introduction to Mathematics PHYC10070 Foundations of Physics (this is a conditional core for Neuroscience and Physiology)	SCI10010 Principles of Scientific Enquiry BIOL10110 Cell Biology & Genetics CHEM10050 Basis of Organic & Biological Chemistry MATH10290 Linear Algebra for Science MATH10310 Calculus for Science	At least two of:  BIOL10130 Biology in Action BIOL10140 Life on Earth BMOL10030 Biomedical Sciences  *Please refer to table 4 on page 8 for modules						
Earth Sciences	Refer to table 3 on page 7 for further details on these modules  MATH00010 Introduction to Mathematics	SCI10010 Principles of Scientific Enquiry GEOL10060 Introduction to Earth Sciences MATH10290 Linear Algebra for Science MATH10310 Calculus for Science	GEOL10070 Understanding Earth Systems  *Please refer to table 4 on page 8 for modules						

Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules
Chemistry Chemistry with Environmental & Sustainable Chemistry Medicinal Chemistry & Chemical Biology	Refer to table 3 on page 7 for further details on these modules  CHEM00010 Introductory Chemistry  MATH00010 Introduction to Mathematics  BIOL00010 Fundamentals of Biology (Conditional core for Medicinal Chemistry)	SCI10010 Principles of Scientific Enquiry CHEM10050 Basis of Organic & Biological Chemistry MATH10290 Linear Algebra for Science MATH10310 Calculus for Science BIOL10110 Cell Biology & Genetics (Core module for Medicinal Chemistry)	*Please refer to Table 4 on page 8 for modules

Mathematics (include:	s Applied/Financial/Statistics	) Stream	
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules
Applied & Computational Mathematics Mathematics Financial Mathematics Statistics	Refer to Table 3 on page 7 for further details on these modules  ACM10080 Introduction to Applied & Computational Mathematics (Conditional core for Applied & Computational Mathematics only)  COMP10290 Computation for Scientists	SCI10010 Principles of Scientific Enquiry  ACM10060 Applications of Differential Equations  MATH10340 Linear Algebra (MPS)  MATH10350 Calculus (MPS)  STAT10060 Statistical Modelling	MATH10040 Numbers & Functions (required for Mathematics & Financial Maths)  MATH10320 Mathematical Analysis (required for Applied & Computational Mathematics; Financial Math., Mathematics & Statistics)  ECON10720  Microeconomics for Business (Required for Financial Maths. Students who wish to progress with both Applied & Computational Math and Financial Maths in Stage 2 must take ECON10720 in Stage 1.)

Physics (includes Theoretical/Astronomy & Space Science) Stream								
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules					
Physics Physics with Astronomy & Space Science Theoretical Physics	Refer to Table 3, page 7 for further details on these modules ACM10080 Introduction to Applied & Computational Mathematics MATH00010 Introduction to Mathematics PHYC10070 Foundations of Physics COMP10290 Computation for Scientists	Principles of Scientific Enquiry PHYC10080 Frontiers of Physics MATH10340 Linear Algebra (MPS) MATH10350 Calculus (MPS) or MATH10400 Calculus (Online)	ACM10060 Application of Differential Equations (Must be taken in Stage 1 for Theoretical Physics)  PHYC10050 Astronomy & Space Science (Must be taken in Stage 1 for Physics with Astronomy & Space Science)  PHYC10250 Thermal Physics & Materials (Taken in Stage 1 or Stage 2 for all Physics degree subjects)  PHYC20080 Fields, Waves & Light (Taken in Stage 1 or Stage 2 for all Physics degree subjects. Can only be taken in Stage 1 if students have achieved H3 in Mathematics at Leaving Cert or equivalent.					

Science, Mathematics & Education Stream									
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules						
Biology, Mathematics & Education	Refer to table 3 on page 7 for further details on these modules  BIOL00010  Fundamentals of Biology	SCI10010 Principles of Scientific Enquiry BIOL10110 Cell Biology & Genetics CHEM10050 Basis of Organic & Biological Chemistry MATH10290 Linear Algebra for Science * or MATH10340 Linear Algebra (MPS) * MATH10410 Maths & Science Education MATH10350 Calculus (MPS) STAT10060 Statistical Modelling	At least two of the following three modules must be taken in Stage 1 or Stage 2:  BIOL10130 Biology in Action BIOL10140 Life on Earth BMOL10030 Biomedical Sciences  ACM10060 Appl of Differential Equations (If ACM10060 is not taken in Stage 1, students will instead take ACM10100 in Stage 2)  †Please refer to table 4 on page 8 for modules						
Applied Mathematics, Mathematics & Education	Refer to table 3 on page 7 for further details on these modules  ACM10080 Introduction to Applied & Computational Mathematics  COMP10290 Computation for Scientists	SCI10010 Principles of Scientific Enquiry ACM10060 Application of Differential Equations MATH10350 Calculus (MPS) MATH10410 Maths & Science Education MATH10340 Linear Algebra (MPS) STAT10060 Statistical Modelling	MATH10040 Numbers & Functions MATH10320 Mathematical Analysis						
Computer Science, Mathematics & Education	Refer to table 3 on page 7 for further details on these modules  COMP10290  Computation for Scientists	SCI10010 Principles of Scientific Enquiry  ACM10060 Applications of Differential Equations  MATH10350 Calculus (MPS)  MATH10410 Maths & Science Education  MATH10340 Linear Algebra (MPS)  STAT10060 Statistical Modelling  COMP10020 Introduction to Programming II	MATH10040 Numbers & Functions MATH10320 Mathematical Analysis						

Science, Mathematic	Science, Mathematics & Education Stream								
Degree Subjects	Conditional Core Modules	Core Modules	Programme Core Modules						
Chemistry, Mathematics & Education	Refer to table 3 on page 7 for further details on these modules  CHEM00010 Introductory Chemistry	SCI10010 Principles of Scientific Enquiry CHEM10050 Basis of Organic & Biological Chemistry MATH10290 Linear Algebra for Science or MATH10340 Linear Algebra (MPS) MATH10350 Calculus (MPS) MATH10410 Maths & Science Education STAT10060 Statistical Modelling	ACM10060 Application of Differential Equations CHEM20100 Basis of Inorganic Chemistry  *Please refer to table 4 on page 8 for modules						
Physics, Mathematics & Education	Refer to table 3 on page 7 for further details on these modules  ACM10080 Introduction to Applied & Computational Mathematics PHYC10070 Foundations of Physics COMP10290 Computation for Scientists	SCI10010 Principles of Scientific Enquiry PHYC10080 Frontiers of Physics MATH10350 Calculus (MPS) MATH10340 Linear Algebra (MPS) MATH10410 Maths & Science Education ACM10060 Application of Differential Equations STAT10060 Statistical Modelling	MATH10320 Mathematical Analysis PHYC10250 Thermal Physics & Materials PHYC20080 Fields, Waves & Light						

#### **Explore Multiple Streams**

The "Explore Multiple Streams" option is designed for students with interests in degree subjects in more than one stream. For example, a student may be interested in Biochemistry and Molecular Biology and Chemistry. As Biochemistry and Molecular Biology is in the Biomomolecular\_Biomedical stream and Chemistry is in the Chemistry stream, students interested in these degree subjects can choose "Explore Multiple Streams".





### **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 below 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 Introduction to Applied & Computational Mathematics	For the degrees where ACM10080 appears as a Conditional Core Module in Table 2, students must take ACM10080 or have attained a minimum grade H5 in Leaving Certificate Higher Applied Mathematics (A Level; Grade C).
Biology	BIOL00010 Fundamentals of Biology	To take BIOL10110, BIOL10130 and BIOL10140 students must have taken BIOL00010 or have attained a minimum grade O2 or H6 in Leaving Certificate Biology (A Level; Grade D).
Chemistry	CHEM00010 Introductory Chemistry	To take CHEM10050, students must have taken CHEM00010 or have attained a minimum grade O1 or H5 in Leaving Certificate Chemistry (A Level; Grade C).
Mathematics	MATH00010 Introductory Mathematics	Students who did not achieve a minimum grade O1 or H5 in Leaving Certificate Mathematics (GCSE; Grade A*, A Level; Grade C) must take MATH00010 in addition to other required Mathematics modules.
Physics	PHYC10070 Foundations of Physics ACM10080 Introduction to Applied & Computational Mathematics	Students who wish to take Physics subjects must have attained a minimum grade of H5 in Higher Leaving Certificate Physics (A Level; Grade C). Otherwise, they must take PHYC10070 in Stage 1. Students who wish to pursue Neuroscience, Physiology or Biology, Mathematics & Education must have undertaken Leaving Certificate Physics or must take PHYC10070 in Stage 1.  To take any Physics subjects, students must take
		ACM10080 or have attained a minimum grade of H5 in Leaving Certificate Higher Applied Mathematics.
Computer Science	COMP10290 Computation for Scientists	Students who wish to remain eligible for Mathematics or Physics subjects in Stage 2 who did not achieve at least H5 or equivalent in Higher Leaving Certificate Computer Science must take COMP10290 in Stage 1.

#### **Mathematics**

Students are required to take at least two modules in Mathematics (Linear Algebra and Calculus) during their degree in UCD. Mathematics teaching has been tailored to meet the requirements of different subjects. Mathematics is fundamental to many disciplines of Biology and Chemistry. You should consider studying Mathematics to the level of your ability. If you are unsure, you may sample the Mathematics modules required for the Mathematics or Physics degree subjects (i.e. MATH10340 Linear Algebra (MPS) and MATH10350 Calculus (MPS)). If you find those modules too challenging you may change to Mathematics for the Sciences (i.e. MATH10290 and MATH10310) in the first two weeks of the Autumn Trimester. However, keep in mind that MATH10340 and MATH10350 are required core modules for the Mathematics, Physics and some of the Education based degree subjects.

Students must take one Mathematics module in the Autumn Trimester. If a student is required to do MATH00010, then their Calculus module must be deferred until Stage 2. Students who wish to pursue Physics subjects but who have to take MATH00010 in Autumn, MATH10400 can be taken in the Summer Trimester to ensure they meet the prior learning requirements for Stage 2 Physics modules. 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 4:** Mathematics Requirements

S	ubjects/Areas	Mathemat	ics Topics	Comment (to substitute Mathematics modules,
		Linear Algebra	Calculus	you must contact the Science Office www.ucd.ie/askscience)
1	Biological Biomedical and Biomolecular Sciences Chemistry; Medicinal	MATH10290	MATH10310	MATH10340 should be taken instead of MATH10290 if students want to keep Mathematics or Physics degree subjects open.
	Chemistry; Environmental & Sustainable Chemistry			MATH10350 should be taken instead of MATH10310 if students want to keep the Education degrees or Mathematics or Physics degree subjects open.
2	Earth & Environmental Science	MATH10290	MATH10310	MATH10340 should be taken instead of MATH10290 if students want to keep Mathematics or Physics degree subjects open.
				MATH10350 should be taken instead of MATH10310 if students want to keep the Education Mathematics or Physics degree subjects open.
3	Mathematics; Financial Mathematics;	MATH10340	MATH10350	Students who have not attained at least a H3 in Leaving Certificate Mathematics (or equivalent) are strongly advised to consult with the College of
	Applied & Computational Mathematics; Statistics			Science Office for further advice.
4	Mathematics, Physics & Education; Applied Mathematics & Education	MATH10340	MATH10350	Students who have not attained at least a H3 in Leaving Certificate Mathematics (or equivalent) are strongly advised to consult with the College of
	Computer Science, Mathematics & Education			Science Office for further advice.
5	Physics; Theoretical Physics; Physics with Astronomy & Space Science	MATH10340	MATH10350	For students who wish to pursue Physics subjects, MATH10400 can be taken in the Summer Trimester instead of MATH10350 if a student must take MATH00010 in Trimester 1 (Autumn Trimester).
6	Biology, Mathematics & Education	MATH10290	MATH10350	MATH10340 can be taken instead of MATH10290 if students want to keep Mathematics or Physics degree subjects open.
	Chemistry, Mathematics & Education			MATH10350 also fulfils the requirements for all Biological, Biomedical, Biomolecular Chemistry, Earth and Environmental Sciences degree subjects.

#### Core Modules required for Stage 1

Core Modules required for Stage 1 Biological, Biomedical & Biomolecular Sciences Stream Earth & Environmental Sciences Stream and Chemistry Stream in DN200

- Conditional core (may need to be taken in Stage 1 depending on Leaving Certificate results)
- Programme core (taken in Stage 1 or 2)

Core (taken in Stage 1)

Module Code Title

Scientific Enquiry

Biology-Cell Biology & Genetics

Basis of Organic & Biol Chem

Fundamentals of Biology

Introductory Chemistry

Foundations of Physics

**Biology in Action** 

**Biomedical Sciences** 

Introduction to Earth Sciences

Understanding Earth Systems

Introduction to Mathematics

Linear Algebra for Science

Basis of Inorganic Chemistry

Calculus for Science

Life on Earth

SCI10010

**BIOL10110** 

CHEM10050

BIOL00010

CHEM00010

PHYC10070

BIOL10130

BIOL10140

BMOL10030

GEOL10060

GEOL10070

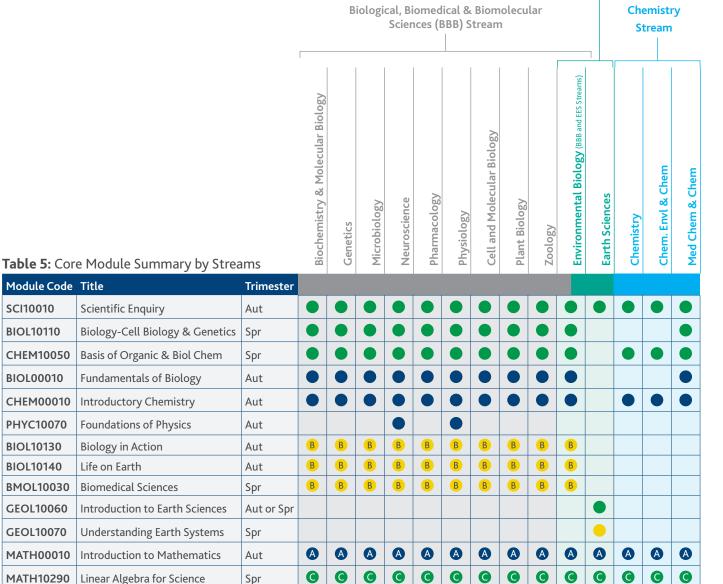
MATH00010

MATH10290

MATH10310

CHEM20100

Earth & Environmental Sciences Stream (EES)



A Students required to take MATH00010 must defer MATH10310 or MATH10350 until Stage 2.

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B Students must take at least 2 of BIOL10130, BIOL10140 or BMOL10030 in either Stage 1 or Stage 2.

C Students required to take MATH10290 can take MATH10340 instead. MATH10340 is required for all Mathematical or Physical Science

D Students required to take MATH10310 can take MATH10350 instead. MATH10350 is required for all Education, Mathematical or Physical Sciences degrees.

#### Mathematics; Physics; Mathematics & Education Streams in DN200

- Conditional core (may need to be taken in Stage 1))
- Programme core (taken in Stage 1 or 2)
- Core (taken in Stage 1)

Table 6: Core Module Summary by Streams

	s strea		Sta		cs Stre					ق ation St	
Applied & Computational Mathematics	Financial Mathematics	Mathematics	Statistics	Physics	Astronomy & Space Science	Theoretical Physics	Appl Maths, Mathmatics & Education	Biology, Mathmatics & Education	Chemistry, Mathmatics & Education	Computer Science, Mathmatics & Education	Physics, Mathmatics & Education

Table 6: Core	Module Summary by Strear	ns	Ą	這	Σ	St	출	<	F	4	i <u>a</u>	Ū	8	ᇫ
Module Code	ule Code Title Trime				m		Physi	cs Stre	am	Mathe	ematics	& Educ	ation S	tream
SCI10010	Scientific Enquiry	Aut												
BIOL10110	Biology-Cell Biology & Genetics	Spr												
CHEM10050	Basis of Organic & Biol Chem	Spr												
BIOL00010	Fundamentals of Biology	Aut												
CHEM00010	Introductory Chemistry	Aut												
PHYC10070	Foundations of Physics	Aut												
BIOL10130	Biology in Action	Aut									В			
BIOL10140	Life on Earth	Aut									В			
BMOL10030	Biomedical Sciences	Spr									В			
MATH00010	Introduction to Mathematics	Aut					AD	AD	AD					
CHEM20100	Basis of Inorganic Chemistry	Aut												
ACM10080	Intro to Applied & Comp Math	Aut												
ACM10060	Appl of Differential Equations	Spr				•					C	C		
MATH10290	Linear Algebra for Science	Spr												
MATH10340	Linear Algebra (MPS)	Spr												
MATH10350	Calculus (MPS)	Aut					D	Ð	D					
STAT10060	Statistical Modelling	Spr												
MATH10040	Numbers & Functions	Aut												
MATH10320	Mathematical Analysis	Spr		•		•							•	
ECON10720	Microeconomics for Business	Spr	E											
PHYC10080	Frontiers of Physics	Spr												
PHYC10050	Astronomy & Space Science	Aut												
PHYC10250	Thermal Physics and Materials	Aut												
PHYC20080	Fields, Waves & Light	Spr												
MATH10410	Maths & Science Education	Spr									•	•		•
COMP10020	Intro to Programming II	Spr												
COMP10290	Computation for Scientists	Aut												

#### **NOTES:**

- A Students required to take MATH00010 must defer MATH10310 or MATH10350 until Stage 2.
- **B** Students must take at least two of BIOL10130, BIOL10140 or BMOL10030 in either Stage 1 or Stage 2.
- C Students should also take either ACM10060 in Stage 1 or if not taken, take ACM10100 in Stage 2.
- **D** Students who wish to pursue Physical Sciences and who are required to take MATH00010 MUST achieve at least an A- and take MATH10400 in the Summer Trimester as a substitute for MATH10350.
- **E** Students who wish to progress with both subjects Applied & Computational Mathematics and Financial Mathematics in Stage 2 must take ECON10720 in Stage 1.



#### **Top Tips**

- Students are required to study twelve modules in a year – it is recommended that you try to balance your workload as evenly as possible across the year, e.g. study six modules in the Autumn Trimester and six modules in the Spring Trimester. The maximum number permitted in a trimester is eight.
- Eleven of your Stage 1 modules must be from within Science. As well as core modules, there are modules which students can choose from a selection offered in their programme (Option Modules). You may take one non-science elective module in Stage 1 in the Spring Trimester. Elective modules allow you to explore subjects outside of Science or to deepen your knowledge in Science. For example, a student in Science can take a Business or Language elective module. You are advised to consider your choice of elective module carefully.
- The wide variety of science modules available in Stage 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 (compulsory) requirements for your subjects of choice and consider taking Programme Cores (Table 2) 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.
- Laboratory and/or tutorial times for Science modules, where required, will be allocated at the start of trimester after you register online to your preferred area and your optional Science modules.
   Once the allocation to practicals and tutorials has been made, you will be able to see and print your individual timetable.

#### Attendance

Lack of attendance at lectures has been identified in several studies as a significant risk factor for having below average scores in Science courses. Students who attend >75% of lectures generally achieve higher grades.

