NUI Galway
OÉ Gaillimh

College of Science

BACHELOR OF SCIENCE DEGREE

www.nuigalway.ie/science

OVERVIEW

Year 1	Year 2	Year 3	Year 4
[60 Credits]	**[60 credits]**	**[60 credits]**	**[60 credits]**
Choose four of the following modules: Each module is 15 Credits. At least one of: Applied Mathematics Mathematics At least two of: Biology Chemistry Computer Science Physics	Choose three pathways (or two pathways plus electives. Please refer to Page 3 for instructions on Pathway Selection) Anatomy Applied Mathematics Biochemistry Botany and Plant Science Chemistry Computing Earth and Ocean Sciences Mathematics Mathematics and Applied Mathematics; Mathematics and Computing; Mathematical Studies and Computing Mathematical Studies Medicinal Chemistry Microbiology Pharmacology Physics and Applied Physics Physiology Plant and AgriBiosciences Zoology Electives: A variety of electives are offered.	Choose two pathways: (Please refer to Page 3 for instructions on Pathway Selection): Anatomy Applied Mathematics (Honours) Biochemistry Botany and Plant Science Chemistry Computing Earth and Ocean Sciences Mathematics (Honours) Mathematics and Applied Mathematics Mathematics and Computing Mathematical Studies and Computing Medicinal Chemistry Microbiology Pharmacology Physics and Applied Physics Physiology Plant and AgriBiosciences Zoology	Choose your honours degree: Anatomy Applied Mathematics Biochemistry Botany and Plant Science Chemistry Computing Earth and Ocean Sciences Mathematics Mathematics and Applied Mathematics Mathematics and Computing Mathematical Studies and Computing Microbiology Pharmacology Physics and Applied Physics Physiology Plant and AgriBiosciences Zoology

Module Descriptors for Years 1 to 4 are available at: http://www.nuigalway.ie/science/undergraduate-courses/bachelorofscience/#course_outline

PATHWAY SELECTION

Year 1	Year 2	Year 3	Year 4
[60 Credits]	**[60 credits]**	**[60 credits]**	**[60 credits]**
Choose **four** 15-credit modules. 4 x 15 = 60 Credits.	Choose **three** 20-credit 2nd Year degree pathways 3 x 20 = 60 Credits **OR** Choose **two** 20-Credit 2nd Year degree pathways **plus** 20 Credits of electives 2 x 20 + 20 = 60 Credits **Electives Notes:** 1. Some pathways share modules (BO201 and/ or BO202). These two modules can only be counted once in credit accumulation. When choosing two or more pathways containing these shared modules, please select additional elective(s) to compensate for this double counting. 2. Similarly, credit cannot be accumulated for elective modules that are also included as part of a pathway.	Choose **two** 30-Credit 3rd Year degree pathways 2 x 30 = 60 Credits ***Required*** *if taking a Biological pathway or taking a joint degree option in 4th Year.* *Biological Pathways: Anatomy, Biochemistry, Botany and Plant Science, Microbiology, Pharmacology, Physiology, Plant and AgriBiosciences, Zoology* **OR** Choose one 30- (or 40- or 60-) credit 3rd Year degree pathway and 30 (or 20) credits of electives 1 x 30 + 30 = 60 Credits / 1 x 40 + 20 = 60 Credits / 1 x 60 = 60 Credits ***Single Pathways*** *exempt from the 2 Pathways requirement are: Applied Mathematics, Chemistry (40 Credits), Computing, Earth and Ocean Science (40 Credits), Mathematics (40 Credits), Mathematics and Applied Mathematics (60 Credits), Mathematics and Computing (60 Credits), Mathematical Studies and Computing (60 Credits), Medicinal Chemistry (60 Credits), Physics and Applied Physics (40 Credits).*	Choose one 60-Credit degree pathway (single degree option or a joint degree option) 1 x 60 = 60 Credits **Joint Degree Options:** Mathematics and Computing; Mathematical Studies and Computing; Mathematics and Applied Mathematics **Single Degree Options:** Anatomy, Applied Mathematics, Biochemistry, Botany and Plant Science, Chemistry, Computing, Earth and Ocean Science, Mathematics, Microbiology, Pharmacology, Physics and Applied Physics, Physiology, Plant and AgriBiosciences, Zoology
	Module Options within Pathways: Where module options are indicated within a pathway, these modules are highlighted in colour.		

Allocation of 2nd Year Pathway/Elective Places:

In 2nd Year, there is a capacity limit on the places available in each pathway/elective. Students are allocated their pathways based on their overall 1st Year results and submitted pathway preferences for 2nd Year.

Details on the Procedure/Guidelines for allocating places is in the Student Guide issued to all 1st Year students and available on the web:
http://www.nuigalway.ie/media/collegeofscience/pdfs/ScienceStudentGuide.pdf

Progression to 4th Year:

Every student who achieves an overall result of pass in their third year examinations will be guaranteed a place in the fourth year of the programme. However, students are not necessarily guaranteed their first choice of subject.

If a student achieves 45% overall in his/her third year examinations at the first sitting, he/she will be guaranteed his/her first choice of pathway.
If a student achieves less than 45% overall in his/her third year examinations, he/she will be allocated a pathway from the major pathways taken in third year.

Module Codes

AN	Anatomy	HP	Occupational Health		
BG	Biotechnology	IE	Engineering		
BI	Biochemistry	MA	Mathematics / Mathematical Studies		
BM	Biomedical Science	MI	Microbiology		
BO	Biology	MP	Applied Mathematics		
BPS	Botany & Plant Science	MR	Marine Science		
CH	Chemistry	PH	Physics & Applied Physics		
CS	Computer Science	PM	Pharmacology		
EC	Economics	SI	Physiology		
EOS	Earth & Ocean Sciences	PAB	Plant and AgriBiosciences		
EV	Environmental Science	ST	Statistics		
FR	French	TI	Geography		
GR	German	ZO	Zoology		

ANATOMY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 30 credits]**	**[Core: 60 credits]**
Full Year – Semester 1 and Semester 2	***Semester 1***	***Semester 1***	***Semester 1***
BO101 **Biology [15]**	AN2101 **Cells and Tissues [10]**	AN3105 **Gross Anatomy I [10]**	AN440 **Advanced Neuroanatomy [5]**
CH101 **Chemistry [15]**	***Semester 2***	AN326 **Neuroanatomy [5]**	AN4101 **Gross Anatomy III [10]**
PH101 **Physics [15]**	AN223 **Embryology & Development [5]**	***Semester 2***	AN4103 **Microscopy and Imaging [10]**
	AN226 **Systems Histology [5]**	AN3106 **Gross Anatomy II [10]**	AN445 **Scientific Writing [5]**
		AN327 **Head and Neck Practical [5]**	***Semester 2***
			AN437 **Advanced Cell Biology and Development [5]**
			AN441 **Physical Anthropology [5]**
			AN444 **Research Project [20]**

APPLIED MATHEMATICS PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 30 credits]	[Core: 55 credits; Options: 5 credits]
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 MP180 **Applied Mathematics [15]**	*Semester 1* MP231 **Mathematical Methods I [5]** MP236 **Mechanics I [5]** *Semester 2* MP232 **Mathematical Methods II [5]** MP237 **Mechanics II [5]**	*Semester 1* MP345 **Mathematical Methods I [5]** MP410 **Non-Linear Elasticity [5]^** MP356 **Quantum Mechanics I [5]^** *Semester 2* MP346 **Mathematical Methods II [5]** MP491 **Non Linear Systems [5]** MP357 **Quantum Mechanics II [5]^**	*Full Year - Semester 1 and Semester 2* MA4101 **Teaching and Learning in Mathematics [5]*** *Semester 1* MP403 **Cosmology And General Relativity [5]** MA3101 **Euclidean and Non-Euclidean Geometry [5]** MP305 **Modelling I [5]** MA385 **Numerical Analysis I [5]** MP410 **Non-Linear Elasticity [5]^** MP356 **Quantum Mechanics I [5]^** MA335 **Algebraic Structures [5]*** ST313 **Applied Regression Models [5]*** ST311 **Applied Statistics I [5]*** PH466 **Astrophysics [5]*** MA302 **Complex Variable [5]*** PH334 **Computational Physics [5]*** MA3343 **Groups [5]*** MA313 **Linear Algebra I [5]*** CS3304 **Logic [5]*** MA490 **Measure Theory [5]*** MA341 **Metric Spaces [5]*** PH328 **Physics of the Environment I [5]***

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Applied Mathematics Pathway – *Continued*

			MA416 **Rings [5]***
			PH422 **Solid State Physics [5]***
			ST416 **Time Series Analysis [5]***

			Semester 2
			MP420 **Applied Mathematics Project [10]**
			MP307 **Modelling II [5]**
			MA378 **Numerical Analysis II [5]**
			MP357 **Quantum Mechanics [5]^**
			MA4344 **Advanced Group Theory [5]***
			ST312 **Applied Statistics II [5]***
			MA410 **Artificial Intelligence [5]***
			CS402 **Cryptography [5]***
			MA3491 **Fields and Applications [5]***
			MA482 **Functional Analysis [5]***
			ST417 **Introduction to Bayesian Modelling [5]***
			PH329 **Physics of the Environment II [5]***
			ST415 **Probability Theory and Applications [5]***
			CS319 **Scientific Computer [5]***
			MA342 **Topology [5]***
		^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.	* Select one 5-credit module. ^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.

BIOCHEMISTRY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 25 credits; Options: 5 credits]	[Core: 60 credits]
Full Year – Semester 1 and Semester 2	*Semester 1*	*Semester 1*	*Full Year – Semester 1 and Semester 2*
BO101 **Biology [15]**	BO201 **Molecular and Cellular Biology (MCB) [5]**	BI309 **Cell Biology [5]**	BI453 **Biochemistry Research Project [15]**
CH101 **Chemistry [15]**	BI208 **Protein Structure and Function (PSF) [5]**	BO3101 **Developmental Biology [5]***	BI446 **Current Topics in Bioscience [5]**
PH101 **Physics [15]**	*Semester 2*	BI318 **Human Nutrition [5]***	BI447 **Literature Review and Presentation [10]**
	BI206 **Gene Technologies and Molecular Medicine [5]**	BI319 **Molecular Biology [5]**	BI451 **Research Paper Analysis [5]**
	BI207 **Metabolism and Cell Signalling [5]**	*Semester 2*	*Semester 1*
		BI313 **Cell Signalling [5]**	BI452 **Biochemistry Principles and Experimental Design [5]**
		BI317 **Human Molecular Genetics [5]**	BI445 **Biomolecules [5]**
		BI321 **Protein Biochemistry [5]**	BI448 **Modern Biotechnologies [5]**
			Semester 2
			BI429 **Advanced Chromosome Biology [5]**
			BI449 **Molecular and Cellular Biology [5]**
		* Select one 5-credit module	

BOTANY AND PLANT SCIENCE PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 50 credits; Options: 10 credits]**	
Full Year – Semester 1 and Semester 2	*Semester 1*	*Semester 1*	*Full Year – Semester 1 and Semester 2*
BO101 **Biology [15]**	BO202 **Evolution and the Tree of Life [5]**	BPS3102 **Plant Resources and Ecosystems [5]**	BPS4105 **Research Skills for Natural Sciences [5]**
	BPS202 **Fundamentals in Aquatic Plant Science [5]**	BPS3103 **Plant Function [5]**	BPS4101 **Major Research Project [20]**
	BO201 **Molecular and Cellular Biology (MCB) [5]**	*Semester 2*	ZO414 **Advanced Zoology Topics [5]***
	Semester 2	BPS3105 **Plant Natural Products [5]**	ZO418 **Phylogenetics & Conservation [5]***
	BPS203 **Plant Diversity, Physiology and Adaptation [5]**	BPS3104 **Plant Interactions [5]**	*Semester 1*
			ZO415 **Biometry [5]**
			BPS402 **Current Topics in Algal Research [5]**
			BPS4103 **Plant Cell [5]**
			EOS418 **Applied Field Hydrogeology [5]***
			BI445 **Biomolecules [5]***
			EOS402 **Global Change [5]***
			ZO417 **Marine & Coastal Ecology [5]***
			BI448 **Modern Biotechnologies [5]***
			Semester 2
			BPS405 **Ecology and Conservation Issues [5]**
			BPS4104 **Primary Productivity and Global Change [5]**
			AR347 **Palaeoecology - Reconstructing Past Environments [5]***
			MI4103 **Environmental Biotechnology [5]***
			MI437 **Bacterial Pathogenesis [5]***

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Botany and Plant Science Pathway – *Continued*

			EOS409 **Biophysical Interactions in the Ocean [5]***
			MI442 **Bioprocessors and Recombinant Protein Production [5]***
			MI440 **Dynamics of Microbial Gene Regulation [5]***
			EOS407 **History of Life [5]***
			ZO416 **Integrative Zoology [5]***
			ZO425 **Literature Review and Presentation [5]***
			MI4102 **Microbial Ecosystems & Systems Biology [5]***
			BI449 **Molecular and Cellular Biology [5]***
			EOS4104 **Geomechanics & Resources [5]***
			MI413 **Problem Solving Papers I & II [5]***
			EOS422 **Sedimentary Basins [5]***
			MI4104 **Scientific Communication [5]***
			MI439 **The Meaning of Life: Bioinformatics [5]***
			* Select remaining modules to a value of 10 credits.

CHEMISTRY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 40 credits]**	**[Core: 60 credits]**
Full Year – Semester 1 and Semester 2 CH101 **Chemistry [15]**	*Semester 1* CH204 **Inorganic Chemistry [5]** CH203 **Physical Chemistry [5]** *Semester 2* CH205 **Analytical and Environmental Chemistry [5]** CH202 **Organic Chemistry [5]**	*Semester 1* CH326 **Analytical Chemistry & Molecular Structure [5]** CH333 **Experimental Chemistry I [5]** CH311 **Organic Chemistry [5]** *Semester 2* CH3101 **Computers and Chemical Research [10]** CH334 **Experimental Chemistry II [5]** CH307 **Inorganic Chemistry [5]** CH313 **Physical Chemistry [5]**	*Full Year – Semester 1 and Semester 2* CH4101 **Research - Independent Investigation [20]** CH4102 **Synthesis, Organometallic & Analytical Chemistry [10]** CH4103 **Physical and Biophysical Chemistry [10]** CH4104 **Organic and Bioorganic Chemistry [10]** CH4105 **Inorganic and Bioinorganic Chemistry [10]**

COMPUTING PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 20 credits; Options: 10 credits]	[Core: 40 credits; Options: 20 credits]
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 CS102 **Computer Science** [15]	*Semester 1* CT2101 **Object Oriented Programming 1** [5] CS2101 **Programming for Science and Finance** [5] *Semester 2* CT2102 **Object Oriented Programming 2** [5] CS211 **Programming and Operating Systems** [5]	*Semester 1* CS3304 **Logic** [5] CT3535 **Object Oriented Programming** [5] CT511 **Databases** [5]* MA215 **Mathematical Molecular Biology I** [5]* MP305 **Modelling I** [5]* CT331 **Programming Paradigms** [5]* *Semester 2* CT2108 **Networks and Data Communications I** [5] CS319 **Scientific Computing** [5] MA216 **Mathematical Molecular Biology II** [5]* MP307 **Modelling II** [5]* CT411 **Multimedia Development** [5]*	*Full Year – Semester 1 and Semester 2* CS4101 **Computer Science Project** [10] *Semester 1* CT336 **Graphics And Image Processing** [5] CT475 **Machine Learning and Data Mining** [5] CS424 **Object Oriented Programming/ Internet Programming** [5] CT421 **Artificial Intelligence** [5]* CT865 **Human Computer Interaction** [5]* MP305 **Modelling I** [5]* CT422 **Modern Information Management** [5]* MA385 **Numerical Analysis I** [5]* CT331 **Programming Paradigms** [5]* *Semester 2* CS428 **Advanced Operating Systems** [5] CS402 **Cryptography** [5] CS4423 **Networks** [5] CT414 **Distributed Systems and Cooperative Computing** [5]* MP307 **Modelling II** [5]* MA378 **Numerical Analysis II** [5]* CT548 **Object Oriented Software Design & Development** [5]*
		* Select two 5-credit modules	* Select four 5-credit modules

DATA SCIENCE PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 40 credits] (Intake: 2019/20)**	**[[Core: 30 credits; Options: 30 credits] (Intake: 2020/21)**	**[Core: 50 credits; Options: 10 credits] (Intake: 2021/22)**
Optional Modules to be chosen in consultation with the School of Mathematics, Statistics and Applied Mathematics			
Full Year – Semester 1 and Semester 2	*Statistics– Semester 1*	*Statistics– Semester 1*	*Full Year – Semester 1 and Semester 2*
MA180 **Mathematics [15]**	ST2XXX **Statistics for Data Science 1 [5]**	ST311 **Applied Statistics [5]**	CS4101 **Computing Project [10]****
CS102 **Computer Science [15]**	*Statistics– Semester 2*	ST235 **Probability [5]**	ST4XXX **Statistics Project [10]****
	ST2XXX **Statistics for Data Science 2 [5]**	*Statistics– Semester 2*	*Statistics– Semester 1*
	Computing - Semester 1	ST312 **Applied Statistics 2 [5]**	ST413 **Statistical Modelling [5]**
	CS2101 **Programming for Science and Finance [5]**	ST236 **Statistical Inference [5]**	ST417 **Bayesian Modelling [5]**
	CT2101 **Object Oriented Programming 1 [5]**	*Computing - Semester 1*	*Statistics– Semester 2*
	Computing– Semester 2	CT511 **Databases [5]**	ST4XXX **Modern Statistical Methods [5]**
	CT2102 **Object Oriented Programming 2 [5]**	CS3304 **Logic [5] ***	ST412 **Stochastic Processes [5] *^**
	Mathematics - Semester 1	CT3535 **Object Oriented Programming [5]***	*Computing - Semester 1*
	MA284 **Discrete Mathematics [5]**	CT331 **Programming Paradigms [5] ***	CS428 **Advanced Operating Systems [5]**
	MA2286 **Differential Forms [5]**	*Computing– Semester 2*	CT475 **Machine Learning and Data Mining [5]**
	Mathematics– Semester 2	CS319 **Scientific Computing [5]**	CS424 **OOP/ Internet programming [5]**
	MA283 **Algebra [5]**	CT411 **Multimedia Development [5]***	CT421 **Artificial Intelligence [5] ***
		CT2108 **Networks and Data Communications [5]***	CT336 **Graphics and Image Processing [5]***
		CS211 **Programming and Operating Systems [5]***	CT865 **Human Computer Interaction [5]***
		Mathematics - Semester 1	CT422 **Modern Info Management [5]***
		MA215 **Mathematical Molecular Biology [5]***	
		MP305 **Modelling I [5]***	
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Data Science Pathway – *Continued*

		Mathematics– Semester 2	***Computing– Semester 2***
		MA2287 **Complex Variables [5] ***	CS402 **Cryptography [5]**
		MA216 **Mathematical Molecular Biology II [5] ***	CS4423 **Networks [5]**
		MP307 **Modelling II [5] ***	CT414 **Distributive and Cooperative Systems [5] ***
			MA461 **Probabilistic Models for Molecular Biology [5] ***
		*Select remaining modules to the value of 30 credits.	** Select one 10-credit project module * Select remaining modules to a value of 10 credits. ^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.

EARTH AND OCEAN SCIENCES PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 10 credits; Options: min 30 Credits]	[Core: 40 credits; Options: 20 credits]
Full Year – Semester 1 and Semester 2 BO101 **Biology [15]** CH101 **Chemistry [15]** PH101 **Physics [15]**	*Semester 1* EOS213 **Introduction to Ocean Science [10]** --- *Semester 2* EOS2102 **The Earth: From Core to Crust [10]**	*Semester 1* EOS305 **Introduction to Applied Field Hydrology [5]*** EOS3103 **Palaeontology and Evolution [5]*** EOS323 **Sediments and the Sedimentary Record [5]*** EOS3105 **The Crystalline Crust [5]*** --- *Semester 2* EOS3104 **Fieldskills Training [5]** EOS3101 **Geological Structures and Maps [5]** EOS304 **Aquatic Geochemistry [5]*** EOS3102 **Environmental and Marine Geophysical Remote Sensing [5]*** EOS303 **Ocean Dynamics [5]***	*Full Year – Semester 1 and Semester 2* EOS405 **Fieldskills in Oceanography [5]*** --- *Semester 1* EOS418 **Applied Field Hydrogeology [5]** EOS402 **Global Change [5]** EOS422 **Sedimentary Basins [5]** TI3115 **Coastal Dynamics [5]*** EOS4102 **EOS Minor Final Year Project [10]*** EOS403 **Final Year Project [20]*** BPS402 **Current Topics in Algal Research [5]*** BPS4103 **Plant Cell [5]*** PAB4103 **Climate Change, Plants & Agriculture [5]*** ZO415 **Biometry [5]*** ZO418 **Phylogenetics & Conservation [5]*** --- *Semester 2* EOS4103 **Advanced Fieldskills [5]** EOS409 **Biophysical Interactions in the Ocean [5]** EOS4101 **Earth Observation and Remote Sensing [5]** EOS407 **History of Life [5]** EOS4104 **Geomechanics & Resources [5]** BPS4104 **Primary Productivity and Global Change [5]***
			* Assigned one project module: EOS403 [20] or EOS4102 [10] If allocated EOS4102, select elective modules to a value of 10 credits.

MATHEMATICS PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 40 credits]	[Core: 30 credits; Options: 30 credits]
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 MA180 **Mathematics [15]**	*Semester 1* MA284 **Discrete Mathematics [5]** MA2286 **Differential Forms [5]** *Semester 2* MA283 **Algebra [5]** MA2287 **Complex Analysis [5]**	*Semester 1* MA3101 **Euclidean and Non-Euclidean Geometry [5]** MA3343 **Groups [5]** MA341 **Metric Spaces [5]** ST235 **Probability [5]** *Semester 2* MA3491 **Fields and Applications [5]** MA378 **Numerical Analysis II [5]** ST236 **Statistical Inference [5]** MA342 **Topology [5]**	*Full Year – Semester 1 and Semester 2* MA430 **Mathematics Project [10]** MA4101 **Teaching and Learning in Mathematics [5]*** *Semester 1* MA490 **Measure Theory [5]** MA416 **Rings [5]** MA495 **Actuarial Mathematics: Life Contingencies II [5]*** ST313 **Applied Regression Models [5]*** MP403 **Cosmology and General Relativity [5]*** MA437 **Introduction to Mathematical Research Topics I [5]*** CS3304 **Logic [5]*** MP345 **Mathematical Methods I [5]*** MP307 **Modelling I [5]*** MP494 **Partial Differential Equations** MA385 **Numerical Analysis I [5]*** CS424 **Object Oriented Programming/Internet Programming [5]*** ST416 **Time Series Analysis [5]***

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Mathematics Pathway – *Continued*

			Semester 2
			MA482 **Functional Analysis [5]**
			MA4344 **Advanced Group Theory [5]**
			CS428 **Advanced Operating Systems [5]***
			CS402 **Cryptography [5]***
			MA418 **Differential Equations with Financial Derivatives [5]***
			ST417 **Introduction to Bayesian Modelling [5]***
			MA438 **Introduction to Mathematical Research Topics II [5]***
			MP346 **Mathematical Methods II [5]***
			MP307 **Modelling II [5]***
			CS4423 **Networks [5]***
			MP491 **Nonlinear Systems [5]***
			MA416 **Probabilistic Models for Molecular Biology [5]***
			ST415 **Probability Theory and Applications [5]***
			CS319 **Scientific Computer [5]***
			ST412 **Stochastic Processes [5]***
			* Select optional modules to a value of 30 credits.

MATHEMATICS AND APPLIED MATHEMATICS PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[40 credits]**	**[60 credits]**	**[60 credits]**
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 MP180 **Applied Mathematics [15]** MA180 **Mathematics (Honours) [15]**	*Mathematics – Semester 1* MA2286 **Differential Forms I [5]** MA284 **Discrete Mathematics [5]** *Mathematics – Semester 2* MA283 **Algebra [5]** MA2287 **Complex Analysis [5]** *Applied Mathematics – Semester 1* MP231 **Mathematical Methods I [5]** MP236 **Mechanics I [5]** *Applied Mathematics – Semester 2* MP237 **Mechanics II [5]** MP232 **Mathematical Methods II [5]**	*Semester 1* MA3101 **Euclidean and Non-Euclidean Geometry [5]** MA3343 **Groups [5]** MP345 **Mathematical Methods I [5]** MP410 **Non-Linear Elasticity [5]^** MP356 **Quantum Mechanics I [5]^** ST235 **Probability [5]** *Semester 2* MA3491 **Fields and Applications [5]** MP346 **Mathematical Methods II [5]** MP491 **Non Linear Systems [5]** MP357 **Quantum Mechanics II [5]^** ST236 **Statistical Inference [5]** MA342 **Topology [5]**	*Full Year – Semester 1 and Semester 2* MP420 **Applied Mathematics Project [10]*** MA430 **Mathematics Project [10]*** *Semester 1* MA490 **Measure Theory [5]** MP305 **Modelling I [5]** MP410 **Non-Linear Elasticity [5]^** MP356 **Quantum Mechanics I [5]^** MA416 **Ring Theory [5]** *Semester 2* MA4344 **Advanced Group Theory [5]** MA482 **Functional Analysis [5]** MP307 **Modelling II [5]** MA378 **Numerical Analysis II [5]** MP357 **Quantum Mechanics II [5]^**
		^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.	*Select one 10-credit project module from MP420 or MA430. ^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.

MATHEMATICS AND COMPUTING PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 40 credits]	[Core: 50 credits; Options: 10 credits]	[Core: 45 credits; Options: 15 credits]
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 MA180 **Mathematics [15]** CS102 **Computer Science [15]**	*Mathematics – Semester 1* MA2286 **Differential Forms [5]** MA284 **Discrete Mathematics [5]** *Mathematics – Semester 2* MA283 **Algebra [5]** MA2287 **Complex Analysis [5]** *Computing – Semester 1* CT2101 **Object Oriented Programming 1 [5]** CS2101 **Programming for Science and Finance [5]** *Computing – Semester 2* CT2102 **Object Oriented Programming 2 [5]** CS211 **Programming and Operating Systems [5]**	*Semester 1* MA3101 **Euclidean and Non-Euclidean Geometry [5]** MA3343 **Groups [5]** CS3304 **Logic [5]** CT3535 **Object Oriented Programming [5]** ST235 **Probability [5]** CT511 **Databases [5]*** CT331 **Programming Paradigms [5]*** *Semester 2* MA3491 **Fields and Applications [5]** CT2108 **Networks and Data Communications I [5]** CS319 **Scientific Computing [5]** ST236 **Statistical Inference [5]** MA342 **Topology [5]** CT411 **Multimedia Development [5]***	*Full Year – Semester 1 and Semester 2* CS4101 **Computer Science Project [10]**** MA430 **Mathematics Project [10]**** *Semester 1* CS428 **Advanced Operating System [5]** CT475 **Machine Learning and Data Mining [5]** MA490 **Measure Theory [5]** CS424 **Object Oriented Programming [5]** MA416 **Rings [5]** CT421 **Artificial Intelligence [5]*** CT865 **Human Computer Interaction [5]*** MA437 **Introduction to Mathematical Research [5]*** CT422 **Modern Information Management [5]*** MA385 **Numerical Analysis I [5]*** CT331 **Programming Paradigms [5]*** *Semester 2* MA4344 **Advanced Group Theory [5]** CS402 **Cryptography [5]** MA482 **Functional Analysis [5]** MA378 **Numerical Analysis II [5]** CT414 **Distributed Systems and Cooperative Computing [5]***

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Mathematics and Computing Pathway – *Continued*

			CS4423 **Networks [5]***
			CT548 **Object Oriented Software Design and Development [5]***
			MA461 **Probabilistic Methods in Bioinformatics [5]***
		* Select modules to the value of 10 credits	** Select one 10-credit project module from MA430 or CS4101 * Select remaining modules to a value of 5 credits.

MATHEMATICAL STUDIES AND COMPUTING PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 40 credits]	[Core: 50 credits; Options: 10 credits]	[Core: 40 credits; Options: 20 credits]
Optional Modules to be chosen in consultation with the School of Mathematics			
Full Year – Semester 1 and Semester 2 CS102 Computer Science [15] MA161 Mathematical Studies [15] or MA180 Mathematics [15]	*Mathematical Studies – Semester 1* MA211 Calculus I [5] MA284 Discrete Mathematics [5] *Mathematical Studies – Semester 2* MA203 Linear Algebra [5] MA212 Calculus II [5] *Computing – Semester 1* CT2101 Object Oriented Programming 1 [5] CS2101 Programming for Science and Finance [5] *Computing – Semester 2* CT2102: Object Oriented Programming 2 [5] CS211 Programming and Operating Systems [5]	*Semester 1* MA335 Algebraic Structures [5] MA302 Complex Variable [5] ST237 Introduction to Statistical Data and Probability [5] MA313 Linear Algebra I [5] CS3304 Logic [5] CT3535 Object Oriented Programming [5] CT511 Databases [5]* CT331 Programming Paradigms [5]* *Semester 2* ST238 Introduction to Statistical Inference [5] CT2108 Networks and Data Communications I [5] CS319 Scientific Computing [5] CS3101 Software for Mathematical Scientists and Educators [5] CT411 Multimedia Development [5]*	*Full Year – Semester 1 and Semester 2* CS4101 Computer Science Project [10]** MA430 Mathematics Project [10]** *Semester 1* CS428 Advanced Operating System [5] MA3101 Euclidean and Non-Euclidean Geometry [5] MA3343 Groups [5] CT475 Machine Learning and Data Mining [5] CS424 Object Oriented Programming [5] T421 Artificial Intelligence [5]* CT865 Human Computer Interaction [5]* CT422 Modern Information Management [5]* MA341 Metric Spaces [5]* MA385 Numerical Analysis I [5]* ST235 Probability [5]* CT331 Programming Paradigms [5]* *Semester 2* MA4344 Advanced Group Theory [5] CS402 Cryptography [5] MA342 Topology [5] ST312 Applied Statistics II [5]* CT414 Distributed Systems and Cooperative Computing [5]*

Continued…

Mathematical Studies and Computing Pathway – *Continued*

			CS4423 **Networks [5]***
			MA378 **Numerical Analysis II [5]***
			CT548 **Object Oriented Software Design and Development [5]***
		* Select modules to a value of 10 credits	** Select one 10-credit project module from MA430 or CS4101 * Select remaining modules to a value of 10 credits.

MEDICINAL CHEMISTRY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 35 credits]**	**[Core: 55 credits; Options: 5 credits]**	**[Core: 30 credits; Options: 30 Credits] (intake: 2019)**
Full Year – Semester 1 and Semester 2 BO101 **Biology [15]** CH101 **Chemistry [15]** PH101 **Physics [15]**	*Full Year – Semester 1 and Semester 2* CH2101 **Medicinal Chemistry [5]** --- *Semester 1* BO201 **Molecular and Cellular Biology (MCB) [5]** CH204 **Inorganic Chemistry [5]** CH203 **Physical Chemistry [5]** PM209 **Applied Concepts in Pharmacology [5]** PM208 **Fundamental Concepts in Pharmacology [5]** --- *Semester 2* CH202 **CH202 Organic Chemistry [5]**	*Semester 1* CH326 **Analytical Chemistry & Molecular Structure [5]** CH333 **Experimental Chemistry I [5]*** CH311 **Organic Chemistry [5]** CH332 **Drug Design & Drug Discovery [10]** PM311 **Introduction to Toxicology [5]** --- *Semester 2* CH3101 **Computers and Chemical Research [10]** CH334 **Experimental Chemistry II [5]** CH307 **Inorganic Chemistry [5]** CH313 **Physical Chemistry [5]** BI317 **Human Molecular Genetics [5]*** CH3103 **Validation in the Pharmaceutical and Medical Device Industry [5]***	**Independent Investigation [30]** **Medicinal Chemistry Special Topics [10]** --- *Electives from:* **Pharmacology [10]** **Analytical and Physical Methods [5]** **Selective synthesis and Organometallic Chemistry [5]** **Biophysical Chemistry [5]** **Bioinorganic and Inorganic Medicinal Chemistry [5]** **Bioorganic Chemistry [5]** **Advanced Organic Chemistry [5]** **Bioorganic Chemistry [5]**
		* Select one 5-credit module	

MICROBIOLOGY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 30 credits]**	**[Core: 25 credits; Options 35 credits]**
Full Year – Semester 1 and Semester 2	*Semester 1*	*Semester 1*	*Semester 1*
BO101 **Biology [15]**	MI202 **Laboratory Skills in Microbiology I [5]**	MI323 **Food and Industrial Microbiology [5]**	MI405 **Project [20]**
CH101 **Chemistry [15]**	BO201 **Molecular and Cellular Biology (MCB) [5]**	MI3101 **Microbial Genomics [5]**	MI4104 **Scientific Communication [5]**
	Semester 2	MI326 **Microbial Metabolic and Molecular Systems [5]**	*Semester 2*
	MI203 **Laboratory Skills in Microbiology II [5]**	*Semester 2*	MI4103 **Environmental Biotechnology [5]***
	MI204 **Microbes and the Environment [5]**	MI322 **Environmental Microbiology [5]**	MI437 **Bacterial Pathogenesis [5]***
		MI324 **Immunology and Recombinant Techniques [5]**	MI442 **Bioprocessors and Recombinant Protein Production [5]***
		MI325 **Microbial Infectious Diseases [5]**	MI440 **Dynamics of Microbial Gene Regulation [5]***
			MI413 **Problem Solving Papers I & II [5]***
			MI4102 **Microbial Ecosystems & Systems Biology [5]***
			MI439 **The Meaning of Life: Bioinformatics [5]***
			MI4101 **Host Microbe Interactions [5]***
			* Select modules to a value of 35 credits

PHARMACOLOGY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 30 credits]**	**[Core: 60 credits]**
Full Year – Semester 1 and Semester 2 BO101 **Biology [15]** CH101 **Chemistry [15]** PH101 **Physics [15]**	*Semester 1* PM209 **Applied Concepts in Pharmacology [5]** PM208 **Fundamental Concepts in Pharmacology [5]** *Semester 2* PM210 **Molecular Pharmacology and Signalling [10]**	*Semester 1* PM309 **Drugs and Disease I [10]** PM311 **Introduction to Toxicology [5]** *Semester 2* PM3103 **Advanced Pharmacology [5]** PM3102 **Neuropharmacology [5]** PM3101 **Pharmacology in Practice [5]**	*Semester 1* PM431 **Research Project [20]** PM432 **Experimental Pharmacology [10]** *Semester 2* PM435 **Advanced Technologies for Therapeutics [5]** PM436 **Advanced Toxicology [5]** PM433 **Drug Development and Emerging Therapies [10]** PM434 **Molecular Pharmacology and Therapeutics [10]**

PHYSICS AND APPLIED PHYSICS PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 40 credits]**	**[Core: 55 credits; Options: 5 credits]**
Full Year – Semester 1 and Semester 2 PH101 **Physics [15]**	*Semester 1* PH2101 **Mechanics and Electromagnetism [5]** PH2102 **Physics Laboratory and Problem Solving I [5]** *Semester 2* PH2103 **Thermodynamics & Atomic Physics [5]** PH2104 **Physics Laboratory and Problem Solving II [5]**	*Full Year – Semester 1 and Semester 2* PH3101 **Experimental and Computational Physics [15]** *Semester 1* PH338 **Properties of Materials [5]** PH333 **Quantum Physics [5]** PH331 **Wave Optics [5]** *Semester 2* PH335 **Nuclear and Particle Physics [5]** PH337 **Thermal Physics [5]**	*Full Year – Semester 1 and Semester 2* PH427 **Practical Work (Including Project) [20]** PH426 **Problem Solving & Physics Research Skills [5]** *Semester 1* PH423 **Applied Optics & Imaging [5]** PH421 **Quantum Mechanics [5]** PH422 **Solid State Physics [5]** PH428 **Atmospheric Physics & Climate Change [5]*** PH430 **Biophotonics [5]*** *Semester 2* PH424 **Electromagnetism and Special Relativity [5]** PH425 **Lasers & Spectroscopy [5]** PH429 **Nanotechnology [5]** PH466 **Astrophysics [5]***
			* Select one 5-credit module

PHYSIOLOGY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 30 credits]**	**[Core: 60 credits]**
Full Year – Semester 1 and Semester 2 BO101 **Biology [15]** CH101 **Chemistry [15]** PH101 **Physics [15]**	*Semester 1* SI206 **Introduction to Physiology and Gastrointestinal [5]** SI207 **Nerve and Muscle [5]** *Semester 2* SI208 **Cardiovascular Physiology [5]** SI212 **Respiratory Physiology [5]**	*Full Year – Semester 1 and Semester 2* SI329 **Laboratory Methods in Physiology [5]** *Semester 1* SI326 **Advanced Cardiovascular Physiology [5]** SI312 **Endocrinology [5]** SI311 **Neurophysiology [5]** *Semester 2* SI328 **Exercise Physiology [5]** SI331 **Renal Physiology [5]**	*Semester 1* SI438 **Advanced GIT [5]** SI422 **Advanced Neurophysiology [5]** SI408 **Immunology [5]** SI437 **Reproduction and Aging [5]** SI4102 **Science Communication Skills [5]** SI436 **Therapeutics [5]** *Semester 2* SI4101 **Case Based Physiology [5]** SI432 **Pathophysiology [5]** SI435 **Project [20]**

PLANT AND AGRIBIOSCIENCES PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	[Core: 20 credits]	[Core: 20 credits]	[Core: 20 Credits; Options: 40 Credits*]
Full Year – Semester 1 and Semester 2 BO101 **Biology [15]**	*Semester 1* BO202 **Evolution and the Tree of Life [5]** BO201 **Molecular and Cellular Biology (MCB) [5]** *Semester 2* PAB2101 **AgriBiosciences [5]** MI204 **Microbes and the Environment [5]**	*Semester 1* PAB3102 **AgriBiosciences for Sustainable Global Development [5]** PAB3101 **Soil Sciences [5]** *Semester 2* PAB3103 **Plant and Agricultural Genetics [5]** PAB3104 **Systems Biology of Plant-Environment Interactions [5]**	*Full Year – Semester 1 and Semester 2* PAB4106 **Current Topics in Plant and AgriBiosciences [5]** PAB4105 **AgriBiosciences Internship Project [20]**** PAB4101 **PAB Research Project [20]**** *Semester 1* PAB4103 **Climate Change, Plants & Agriculture [5]** PAB4102 **Plant Genetics and Systems Biology [5]** *Semester 2* PAB4104 **Plant and Agri-Biotechnologies [5]**
			**Assigned one project module: PAB4101 [20] or PAB4105 [20] *Select remaining modules to a value of 20 Credits – list provided by PAB.

ZOOLOGY PATHWAY

Year 1	Year 2	Year 3	Year 4
[60 credits]	**[Core: 20 credits]**	**[Core: 20 credits; Options: 10 credits]**	**[Core: 40 credits; Options: 20 credits]**
Full Year – Semester 1 and Semester 2	***Semester 1***	***Semester 1***	***Full Year – Semester 1 and Semester 2***
BO101 **Biology [15]**	BO202 **Evolution and the Tree of Life [5]**	ZO317 **Evolutionary Biology [5]**	ZO414 **Advanced Zoology Topics [5]**
	BO201 **Molecular and Cellular Biology (MCB) [5]**	ZO319 **Marine Zoology [5]**	ZO418 **Phylogenetics & Conservation [5]**
	Semester 2	BO3101 **Developmental Biology [5]***	***Semester 1***
	ZO208 **Invertebrate Biology [5]**	***Semester 2***	ZO415 **Biometry [5]**
	ZO209 **Vertebrate Zoology [5]**	ZO315 **Applied Ecology [5]**	ZO423 **Final Year Project in Zoology [15]**
		ZO320 **Concepts in Population and Community Ecology [5]**	ZO417 **Marine & Coastal Ecology [5]**
		AN223 **Embryology & Development [5]***	BI445 **Biomolecules [5]***
		ZO318 **Geographic Information Systems and Biostatistics [5]***	BPS402 **Current Topics in Algal Research [5]***
			EOS402 **Global Change [5]***
			BI448 **Modern Biotechnologies [5]***
			ZO419 **Practical Skills in Zoology [5]***
			Semester 2
			ZO416 **Integrative Zoology [5]**
			MI4103 **Environmental Biotechnology [5]***
			MI437 **Bacterial Pathogenesis [5]***
			MI442 **Bioprocessors and Recombinant Protein Production [5]***
			BPS405 **Ecology and Conservation Issues [5]***
			EOS407 **History of Life [5]***
			ZO425 **Literature Review and Presentation [10]****
			MI4102 **Microbial Ecosystems & Systems Biology [5]***
			BI449 **Molecular and Cellular Biology [5]***
		* Select two 5-credit modules	*Select remaining modules to a value of 20 credits

ELECTIVES

Year 1	Year 2	Year 3	Year 4

Full Year – Semester 1 and Semester 2

FR252 **French [10]**

GR224 **Beginner's German for Science [10]**

GR252 **German [10]**

GR353 **German [10]**

Semester 1

BO201 **Molecular and Cellular Biology (MCB) [5]**

BO202 **Evolution and the Tree of Life [5]**

BO2101 **Scientific Writing Skills [5]**

BPS202 **Fundamentals in Aquatic Plant Science [5]**

EOS213 **Introduction to Ocean Science [10]**

MA284 **Discrete Mathematics [5]**

MA211 **Calculus I [5]**

MA215 **Mathematical Molecular Biology I [5]**

MA2103 **Stratéisí agus Cluichí: Bunús [5]**

MP231 **Mathematical Methods I [5]**

MP236 **Mechanics I [5]**

PM208 **Fundamental Concepts in Pharmacology [5]**

PM209 **Applied Concepts in Pharmacology [5]**

ST237 **Introduction to Statistical Data and Probability [5]**

LN2210 **Scileanna Gaeilge don Eolaíochta 1 [5]**

Continued…

Full Year – Semester 1 and Semester 2

FR365 **Advanced French for Science [10]**

GR224 **Beginner's German for Science [10]**

GR252 **German [10]**

GR353 **German [10]**

Semester 1

AN326 **Neuroanatomy [5]**

BPS3102 **Plant Resources and Ecosystems [5]**

BPS3103 **Plant Function [5]**

CH311 **Organic Chemistry [5]**

CH326 **Analytical Chemistry & Molecular Structure [5]**

CH332 **Drug Design & Drug Discovery [10]**

EOS3105 **The Crystalline Crust [5]**

EOS305 **Introduction to Applied Field Hydrology [5]**

EOS323 **Sediments and the Sedimentary Record [5]**

EOS3103 **Palaeontology and Evolution [5]***

LN2210 **Scileanna Gaeilge don Eolaíochta 1 [5]**

MA215 **Mathematical Molecular Biology I [5]**

MA302 **Complex Variable [5]**

MA313 **Linear Algebra I [5]**

MA335 **Algebraic Structures [5]**

MP231 **Mathematical Methods I [5]**

Continued…

Electives – *Continued*

Semester 2

BPS203 **Plant Diversity, Physiology & Adaptation [5]**

BPS2101 **Botanical Field Skills [5]**

EOS2102 **The Earth: From Core to Crust [10]**

LN2211 **Scileanna Gaeilge don Eolaíochta 2 [5]**

MA203 **Linear Algebra [5]**

MA212 **Calculus II [5]**

MA216 **Mathematical Molecular Biology II [5]**

MP232 **Mathematical Methods II [5]**

MP237 **Mechanics II [5]**

PAB2101 **AgriBiosciences [5]**

ST238 **Introduction to Statistical Inference [5]**

MP305 **Modelling I [5]**

MP345 **Mathematical Methods I [5]**

PAB3101 **Soil Sciences [5]**

PAB3102 **AgriBiosciences for Sustainable Global Development [5]**

PH222 **Astrophysical Concepts [5]**

PH328 **Physics of the Environment I [5]**

PH341 **Measurement of Health Hazards at Work [5]**

PM208 **Fundamental Concepts in Pharmacology [5]**

PM209 **Applied Concepts in Pharmacology [5]**

PM311 **Introduction to Toxicology [5]**

SI311 **Neurophysiology [5]**

SI312 **Endocrinology [5]**

SI317 **Human Body Function [10]**

ST237 **Introduction to Statistical Data and Probability [5]**

ST311 **Applied Statistics I [5]**

Semester 2

BI317 **Human Molecular Genetics [5]**

BPS3104 **Plant Interactions [5]**

BPS3105 **Plant Natural Products [5]**

BPS3101 **Techniques in Field Ecology and Conservation [5]**

CH307 **Inorganic Chemistry [5]**

CH3103 **Validation in the Pharmaceutical and Medical Device Industry [5]**

Continued…

Electives – ***Continued***

		CH313 **Physical Chemistry [5]** CS3101 **Software for Mathematical Scientists and Educators [5]** EOS303 **Ocean Dynamics [5]** EOS304 **Aquatic Geochemistry [5]** EOS3102 **Environmental and Marine Geophysical Remote Sensing [5]** LN2211 **Scileanna Gaeilge don Eolaíochta 2 [5]** MA216 **Mathematical Molecular Biology II [5]** MA334 **Geometry [5]** MA3102 **Codaigh agus Córais Dhinimiciúla Réadacha [5]** MA461 **Probabilistic Models for Molecular Biology [5]** MP232 **Mathematical Methods II [5]** MP307 **Modelling II [5]** MP346 **Mathematical Methods II [5]** MP491 **Non Linear Systems [5]** PAB3103 **Plant and Agricultural Genetics [5]** PAB3104 **Systems Biology of Plant-Environment Interactions [5]** PH329 **Physics of the Environment II [5]** PH362 **Stellar Astrophysics [5]** PM3102 **Neuropharmacology [5]** SI328 **Exercise Physiology [5]** ST238 **Introduction to Statistical Inference [5]** ST312 **Applied Statistics II [5]** ZO318 **Geographic Information Systems and Biostatistics [5]**	