

# BSC (HONS) MATHEMATICAL SCIENCES AND PHYSICS

## Overview

NFQ Level 8, Major Award

## Regulations and Programme Requirements

Students enter the BSc (Hons) Mathematical Sciences and Physics through CK407 (Mathematical Sciences) Area of Study (<https://ucc-ie-public.courseleaf.com/programmes/bscms/>) or CK408 (Physics and Astrophysics) Area of Study (<https://ucc-ie-public.courseleaf.com/programmes/bscpy/>).

### Notes :

1. *The final set of electives and 'project-related' modules offered is subject to the availability of adequate staff resources and therefore may need to be a subset of those indicated.*

## Eligibility for Entry to Second Year Programmes

Students from the Mathematical Sciences Area of Study (CK407) who take the Physics modules PY1052 and PY1053 in First Science, and who pass First Science, will be eligible to enter the Joint Honours programme in Mathematical Sciences and Physics. Students from the Physics Area of Study (CK408) who take Option 2 and, in addition, the elective modules AM1053, AM1054 and MA1057, and who pass First Science, will be eligible to enter the Joint Honours programme in Mathematical Sciences and Physics.

## BSc Ordinary Degree - NFQ Level 7, Major Award

Students who pass Third Year may choose not to proceed to Fourth Year and may opt instead to be conferred with a BSc Ordinary Degree (<https://ucc-ie-public.courseleaf.com/programmes/bscpas/>).

## Programme Requirements

For information about modules, module choice, options and credit weightings, please go to Programme Requirements (p. 1).

## Programme Requirements

Code	Title	Credits
<b>Year 1</b>		<b>60</b>
CK407 ( <a href="https://ucc-ie-public.courseleaf.com/programmes/bscms/">https://ucc-ie-public.courseleaf.com/programmes/bscms/</a> )		
or		
CK408 ( <a href="https://ucc-ie-public.courseleaf.com/programmes/bscpy/">https://ucc-ie-public.courseleaf.com/programmes/bscpy/</a> )		
<b>Year 2</b>		
Students take <b>60</b> credits as follows:		
<i>Core Modules</i>		
AM2052	Mathematical Modelling	5
AM2060	Object Oriented Programming with Applications	5
AM2061	Computer Modelling and Numerical Techniques	5
AM2071	Fourier Methods	5
MA2051	Mathematical Analysis I	5
MA2055	Linear Algebra	5
MA2071	Multivariable Calculus	5
PY2101	Classical Mechanics	5
PY2102	Introduction to Quantum Physics	5
PY2103	Electrostatics and Magnetostatics	5

PY2106	Introduction to Astrophysics and Special Relativity	5
PY2107	Experimental Physics I	5

### Year 3

Students take **60** credits as follows – all listed core modules (**35** credits) and **25** credits of elective modules:

#### Core Modules

AM3051	Vector and Tensor Methods	5
MA3051	Mathematical Analysis II	5
PY2104	Introduction to Thermodynamics and Statistical Physics	5
PY3102	Quantum Mechanics	5
PY3103	Electromagnetism	5
PY3104	Statistical Thermodynamics	5
PY3107	Experimental Physics II	5

#### Elective Modules

Students take modules to the value of **10** credits from the following: 10

PY3101	Optics () <sup>1</sup>	
PY3105	Introduction to Condensed Matter Physics () <sup>1</sup>	
PY3106	Nuclear and Particle Physics () <sup>1</sup>	
PY3109	Observational Astrophysics ()	

Plus modules to the value of **15** credits from the following: 15

AM3052	Introduction to Fluid Mechanics and Wave Theories ()	
AM3062	Optimisation and the Calculus of Variations () <sup>2</sup>	
AM3063	Partial Differential Equations with Applications I ()	
AM3064	Computational Techniques ()	
AM3065	Dynamical Systems and Bifurcation Theory ()	
MA2054	Ordinary Differential Equations ()	
MA3052	Ring and Field Theory ()	
MA3054	Complex Analysis ()	
MA3056	Metric Spaces and Topology ()	
MA3062	Introduction to Modern Algebra ()	
MA3063	Introduction to Differential Geometry ()	
ST2054	Probability and Mathematical Statistics ()	

### Year 4

Students take **60** credits as follows – all listed core modules (**10** credits) and **50** credits of elective modules from the following lists:

#### Project

MS4090	Mathematical Sciences Project	10
or PY4115	Research Project	

#### Elective Modules

Students take modules to the value of **25** credits from Lists A and B: 25

#### List A<sup>3</sup>

AM3052	Introduction to Fluid Mechanics and Wave Theories ()	
AM3062	Optimisation and the Calculus of Variations () <sup>2</sup>	
AM3063	Partial Differential Equations with Applications I ()	
AM3064	Computational Techniques ()	
AM3065	Dynamical Systems and Bifurcation Theory ()	
MA3052	Ring and Field Theory ()	
MA3054	Complex Analysis ()	
MA3056	Metric Spaces and Topology ()	
ST3053	Stochastic Modelling I ()	

*List B*

AM4063	Partial Differential Equations with Applications II ()
AM4064	Perturbation and Asymptotic Methods ()
AM4065	Network Science: Theory and Applications ()
MA4052	Functional Analysis ()
MA4058	Measure Theory and Martingales ()
MA4062	Topics in Modern Algebra ()
MA4063	Topics in Differential Geometry ()
MF4054	Stochastic Analysis ()

Students take modules to the value of **25** credits from Lists C and D: 25

*List C*<sup>3</sup>

PY3101	Optics () <sup>1</sup>
PY3105	Introduction to Condensed Matter Physics () <sup>1</sup>
PY3106	Nuclear and Particle Physics () <sup>1</sup>

*List D*

PY4102	Advanced Quantum Mechanics ()
PY4103	Advanced Electromagnetism ()
PY4104	Advanced Condensed Matter Physics ()
PY4105	Atomic and Molecular Physics ()
PY4106	Relativistic Quantum Theory ()
PY4108	Introduction to Lasers and Photonics ()
PY4109	Advanced Computational Physics ()
PY4110	Stars and the Interstellar Medium ()
PY4111	Galactic and Extragalactic Astrophysics ()
PY4112	Gravitation and Cosmology ()
PY4113	Experimental Physics III ()
PY4117	Quantum Optics ()
PY4118	Physics of Semiconductor Devices ()

**Total Credits** **240**

<sup>1</sup> At least 2 of these 3 modules must be taken during years 3 and 4.

<sup>2</sup> AM3062 must be taken in year 4 if not taken in year 3.

<sup>3</sup> A total of at most 15 credits may be taken from the combination of Lists A and C, and only modules not previously taken may be chosen

- Identify, formulate, analyse and solve physics problems;
- Design an experiment to test a hypothesis or theory in physics;
- Prepare written laboratory reports that provide a description of the experiment, explain the experiment and reasoning clearly, and provide an appropriate conclusion.

## Examinations

Full details and regulations governing Examinations for each programme will be contained in the *Marks and Standards Book* and for each module in the *Book of Modules*.

## Programme Learning Outcomes

### Programme Learning Outcomes for BSc (Hons) Mathematical Sciences and Physics (NFQ Level 8, Major Award)

On successful completion of this programme, students should be able to:

- Apply their knowledge and understanding of the basic concepts, theories, principles and methods of mathematical sciences to analyse and solve problems of a mathematical nature;
- Demonstrate mastery of the core concepts of several areas of mathematical sciences and recognise the interdependency of different areas;
- Communicate with researchers of diverse scientific backgrounds and disciplines, contributing to formulation, testing and verification of mathematical models and solution of science problems by methods of mathematics;