



NUI Galway  
OÉ Gaillimh

College of Science and Engineering  
2021/2022

Fullscreen

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# BSc PHYSICS

Applied Physics, Astrophysics,  
Biomedical, Climate, Theoretical



(V.1)

[www.nuigalway.ie/science-engineering](http://www.nuigalway.ie/science-engineering)

## Overview

Year 1	Year 2	Year 3	Year 4
<b>[60 credits]</b>	<b>[60 credits]</b>	<b>[60 credits]</b>	<b>[60 credits]</b>
<p><b>Physics and Applied Physics:</b></p> <p>There are 30 credits of Core modules.</p> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Mathematics (Honours)</li> <li>Mathematical Studies</li> </ul> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Biology</li> <li>Applied Mathematics</li> </ul> <p><b>Physics with Astrophysics:</b></p> <p>There are 45 credits of Core modules.</p> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Mathematics (Honours)</li> <li>Mathematical Studies</li> </ul> <p><b>Physics with Biomedical Physics:</b></p> <p>There are 45 credits of Core modules.</p> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Mathematics (Honours)</li> <li>Mathematical Studies</li> </ul> <p><b>Physics and Climate Physics:</b></p> <p>There are 45 credits of Core modules.</p> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Applied Mathematics</li> <li>Mathematics (Honours)</li> <li>Mathematical Studies</li> </ul> <p><b>Physics and Theoretical Physics:</b></p> <p>There are 45 credits of Core modules.</p> <p>Choose one module to a value of 15 credits:</p> <ul style="list-style-type: none"> <li>Mathematics (Honours)</li> <li>Mathematical Studies</li> </ul>	<p><b>Physics and Applied Physics:</b></p> <p>There are 30 credits of Core modules.</p> <p>Choose 1 pathway to a total value of 20 credits:</p> <ul style="list-style-type: none"> <li>Mathematical Studies</li> <li>Mathematics</li> </ul> <p>Choose Electives to a value of 10 credits from the list available</p> <p><b>Physics with Astrophysics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics with Biomedical Physics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics and Climate Physics:</b></p> <p>There are 40 credits of Core modules.</p> <p>Choose 1 Pathway to a total value of 20 credits:</p> <ul style="list-style-type: none"> <li>Chemistry</li> <li>Earth and Ocean Sciences</li> </ul> <p><b>Physics and Theoretical Physics:</b></p> <p>There are 40 credits of Core modules.</p> <p>Choose 1 Pathway to a total value of 20 credits:</p> <ul style="list-style-type: none"> <li>Astrophysics</li> <li>Mathematical Studies</li> <li>Mathematics</li> </ul>	<p><b>Physics and Applied Physics:</b></p> <p>There are 50 credits of Core modules.</p> <p>Choose Electives to a value of 10 credits from the list available.</p> <p><b>Physics with Astrophysics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics with Biomedical Physics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics and Climate Physics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics and Theoretical Physics:</b></p> <p>There are 60 credits of Core modules.</p>	<p><b>Physics and Applied Physics:</b></p> <p>There are 55 credits of Core modules.</p> <p>Choose an Electives to a value of 5 credits from the list available.</p> <p><b>Physics with Astrophysics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics with Biomedical Physics:</b></p> <p>There are 60 credits of Core modules.</p> <p><b>Physics and Climate Physics:</b></p> <p>There are 55 credits of Core modules.</p> <p>Choose Electives to a value of 5 credits from the list available.</p> <p><b>Physics and Theoretical Physics:</b></p> <p>There are 45 credits of Core modules.</p> <p>Choose 1 project to a value of 10 credits:</p> <ul style="list-style-type: none"> <li>Final Year Project</li> <li>Physics Project</li> </ul> <p>Choose one Elective to a value of 5 credits:</p> <ul style="list-style-type: none"> <li>Algebraic Foundations of Quantum Computing Modelling I</li> </ul>
<p><b>Module Descriptors for Years 1 to 4 are available at: <a href="https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html">https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html</a></b></p>			

## BSc Physics – Stream: Physics and Applied Physics

Year 1	Year 2	Year 3	Year 4
<b>[Core: 30 credits; Options: 30 credits]</b>	<b>[Core: 30 credits; Options: 10 credits; Pathway: 20 credits]</b>	<b>[Core: 50 credits; Options: 10 credits]</b>	<b>[Core: 55 credits; Options: 5 credits]</b>
<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>PH101 <b>Physics</b> [15]</p> <p>PH109 <b>Physics Special Topics</b> [10]</p> <p><b>One of:</b></p> <p>MA180 <b>Mathematics (Honours)</b> [15]*</p> <p>MA161 <b>Mathematical Studies</b> [15]*</p> <p><b>One of:</b></p> <p>BO101 <b>Biology</b> [15]*</p> <p>MP180 <b>Applied Mathematics</b> [15]*</p> <p>-----</p> <p><b>Semester 1</b></p> <p>CS103 <b>Computer Science</b> [5]</p>	<p><b>Semester 1</b></p> <p>MP231 <b>Mathematical Methods I</b> [5]</p> <p>PH2105 <b>Mechanics and Thermodynamics</b> [5]</p> <p>-----</p> <p>MP236 <b>Mechanics I</b> [5]*</p> <p>PH2102 <b>Physics Laboratory and Problem Solving I</b> [5]</p> <p>CS2101 <b>Programming for Science and Finance</b> [5]</p> <p>ST2001 <b>Statistics in Data Science I</b> [5]*</p> <p>-----</p> <p><b>Semester 2</b></p> <p>PH2016 <b>Atomic Physics and Electromagnetism</b> [5]</p> <p>MP232 <b>Mathematical Methods II</b> [5]</p> <p>MP237 <b>Mechanics II</b> [5]*</p> <p>PH2104 <b>Physics Laboratory and Problem Solving II</b> [5]</p> <p>CS211 <b>Programming and Operating Systems</b> [5]*</p> <p>ST2002 <b>Statistics in Data Science II</b> [5]*</p> <p>-----</p> <p><i>Continued...</i></p>	<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>PH3101 <b>Experimental and Computational Physics</b> [15]</p> <p>-----</p> <p><b>Semester 1</b></p> <p>ST311 <b>Applied Statistics I</b> [5]*</p> <p>PH222 <b>Astrophysical Concepts</b> [5]*</p> <p>MP345 <b>Mathematical Methods I</b> [5]</p> <p>MP305 <b>Modelling I</b> [5]*</p> <p>PH328 <b>Physics of the Environment I</b> [5]*</p> <p>PH338 <b>Properties of Materials</b> [5]</p> <p>PH333 <b>Quantum Physics</b> [5]</p> <p>PH331 <b>Wave Optics</b> [5]</p> <p>-----</p> <p><b>Semester 2</b></p> <p>ST312 <b>Applied Statistics II</b> [5]*</p> <p>MP346 <b>Mathematical Methods II</b> [5]</p> <p>MP307 <b>Modelling II</b> [5]*</p> <p>PH335 <b>Nuclear and Particle Physics</b> [5]</p> <p>PH329 <b>Physics of the Environment II</b> [5]*</p> <p>PH362 <b>Stellar Astrophysics</b> [5]*</p> <p>PH337 <b>Thermal Physics</b> [5]</p>	<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>PH4102 <b>Final Year Project</b> [20]</p> <p>PH4101 <b>Physics Problem Solving</b> [5]</p> <p>-----</p> <p><b>Semester 1</b></p> <p>PH423 <b>Applied Optics &amp; Imaging</b> [5]</p> <p>PH428 <b>Atmospheric Physics &amp; Climate Change</b> [5]*</p> <p>PH430 <b>Biophotonics</b> [5]*</p> <p>PH421 <b>Quantum Mechanics</b> [5]</p> <p>PH422 <b>Solid State Physics</b> [5]</p> <p>-----</p> <p><b>Semester 2</b></p> <p>PH424 <b>Electromagnetism and Special Relativity</b> [5]</p> <p>PH466 <b>Astrophysics</b> [5]*</p> <p>PH425 <b>Lasers &amp; Spectroscopy</b> [5]</p> <p>PH429 <b>Nanotechnology</b> [5]</p>

	<p><b>MATHEMATICAL STUDIES PATHWAY*</b></p> <p><u>Semester 1</u></p> <p>MA211 <b>Calculus I</b> [5]</p> <p>MA284 <b>Discrete Mathematics</b> [5]</p> <p>-----</p> <p><u>Semester 2</u></p> <p>MA212 <b>Calculus II</b> [5]</p> <p>MA203 <b>Linear Algebra</b> [5]</p> <p><b>MATHEMATICS PATHWAY*</b></p> <p><u>Semester 1</u></p> <p>MA2286 <b>Differential Forms</b> [5]</p> <p>MA284 <b>Discrete Mathematics</b> [5]</p> <p>-----</p> <p><u>Semester 2</u></p> <p>MA2287 <b>Complex Analysis</b> [5]</p> <p>MA283 <b>Linear Algebra</b> [5]</p>		
* Select two 15-credit modules	* Select modules to a value of 10 credits – 5 credits per semester. Select 1 Pathway to a value of 20 credits.	* Select modules to a value of 10 credits – 5 credits per semester	* Select one 5-credit module
<p><b>Module Descriptors for Years 1 to 4 are available at: <a href="https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html">https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html</a></b></p>			

## BSc Physics – Stream: Physics with Astrophysics

Year 1	Year 2	Year 3	Year 4
<b>[Core: 45 credits; Options: 15 credits]</b>	<b>[Core: 60 credits]</b>	<b>[60 credits]</b>	<b>[60 credits]</b>
<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>MP180 Applied Mathematics [15]</p> <p>PH101 Physics [15]</p> <p>PH109 Physics Special Topics [10]</p> <p>MA180 Mathematics (Honours) [15]*</p> <p>MA161 Mathematical Studies [15]*</p> <p>-----</p> <p><i>Semester 1</i></p> <p>CS103 Computer Science [5]</p>	<p><i>Semester 1</i></p> <p>PH222 Astrophysical Concepts [5]</p> <p>MP231 Mathematical Methods I [5]</p> <p>PH2105 Mechanics and Thermodynamics [5]</p> <p>MP236 Mechanics I [5]</p> <p>PH2102 Physics Laboratory and Problem Solving I [5]</p> <p>CS2101 Programming for Science and Finance [5]</p> <p>-----</p> <p><i>Semester 2</i></p> <p>PH2016 Atomic Physics and Electromagnetism [5]</p> <p>MP232 Mathematical Methods II [5]</p> <p>MP237 Mechanics II [5]</p> <p>PH223 Observational Astronomy [5]</p> <p>PH2104 Physics Laboratory and Problem Solving II [5]</p> <p>PH2103 Thermodynamics &amp; Atomic Physics [5]</p> <p>CS211 Programming and Operating Systems [5]</p>	<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>PH363 Astronomical Data Analysis [5]</p> <p>PH3101 Experimental and Computational Physics [15]</p> <p>-----</p> <p><i>Semester 1</i></p> <p>MP345 Mathematical Methods I [5]</p> <p>PH338 Properties of Materials [5]</p> <p>PH333 Quantum Physics [5]</p> <p>PH331 Wave Optics [5]</p> <p>-----</p> <p><i>Semester 2</i></p> <p>MP346 Mathematical Methods II [5]</p> <p>PH335 Nuclear and Particle Physics [5]</p> <p>PH362 Stellar Astrophysics [5]</p> <p>PH337 Thermal Physics [5]</p>	<p><i>Full Year – Semester 1 and Semester 2</i></p> <p>PH4102 Final Year Project [20]</p> <p>PH4101 Physics Problem Solving [5]</p> <p>-----</p> <p><i>Semester 1</i></p> <p>PH423 Applied Optics &amp; Imaging [5]</p> <p>MP403 Cosmology and General Relativity [5]</p> <p>PH421 Quantum Mechanics [5]</p> <p>PH422 Solid State Physics [5]</p> <p>-----</p> <p><i>Semester 2</i></p> <p>PH466 Astrophysics [5]</p> <p>PH424 Electromagnetism and Special Relativity [5]</p> <p>PH425 Lasers &amp; Spectroscopy [5]</p>
* Select one 15-credit module			
<b>Module Descriptors for Years 1 to 4 are available at: <a href="https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html">https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html</a></b>			

## BSc Physics – Stream: Physics with Biomedical Physics

Year 1	Year 2	Year 3	Year 4
<b>[Core: 45 credits; Options: 15 credits]</b>	<b>[Core: 60 credits]</b>	<b>[60 credits]</b>	<b>[60 credits]</b>
<p><u>Full Year – Semester 1 and Semester 2</u></p> <p>BO101 <b>Biology</b> [15]</p> <p>PH101 <b>Physics</b> [15]</p> <p>PH109 <b>Physics Special Topics</b> [10]</p> <p>MA180 <b>Mathematics (Honours)</b> [15]*</p> <p>MA161 <b>Mathematical Studies</b> [15]*</p> <p>-----</p> <p><u>Semester 1</u></p> <p>CS103 <b>Computer Science</b> [5]</p>	<p><u>Semester 1</u></p> <p>AN2102 <b>Histology of the Fundamental Tissues</b> [5]</p> <p>MP231 <b>Mathematical Methods I</b> [5]</p> <p>MA215 <b>Mathematical Molecular Biology I</b> [5]</p> <p>PH2105 <b>Mechanics and Thermodynamics</b> [5]</p> <p>PH2102 <b>Physics Laboratory and Problem Solving I</b> [5]</p> <p>ST2001 <b>Statistics in Data Science I</b> [5]</p> <p>-----</p> <p><u>Semester 2</u></p> <p>PH2016 <b>Atomic Physics and Electromagnetism</b> [5]</p> <p>MP232 <b>Mathematical Methods II</b> [5]</p> <p>MA216 <b>Mathematical Molecular Biology II</b> [5]</p> <p>PH2104 <b>Physics Laboratory and Problem Solving II</b> [5]</p> <p>ST2002 <b>Statistics in Data Science II</b> [5]</p> <p>AN226 <b>Systems Histology</b> [5]</p>	<p><u>Full Year – Semester 1 and Semester 2</u></p> <p>PH3101 <b>Experimental and Computational Physics</b> [15]</p> <p>-----</p> <p><u>Semester 1</u></p> <p>MP345 <b>Mathematical Methods I</b> [5]</p> <p>PH338 <b>Properties of Materials</b> [5]</p> <p>PH333 <b>Quantum Physics</b> [5]</p> <p>PH339 <b>Radiation &amp; Medical Physics</b> [5]</p> <p>PH331 <b>Wave Optics</b> [5]</p> <p>-----</p> <p><u>Semester 2</u></p> <p>PH340 <b>Biomedical Physics</b> [5]</p> <p>MP346 <b>Mathematical Methods II</b> [5]</p> <p>PH335 <b>Nuclear and Particle Physics</b> [5]</p> <p>PH337 <b>Thermal Physics</b> [5]</p>	<p><u>Full Year – Semester 1 and Semester 2</u></p> <p>PH4102 <b>Final Year Project</b> [20]</p> <p>PH4101 <b>Physics Problem Solving</b> [5]</p> <p>-----</p> <p><u>Semester 1</u></p> <p>PH423 <b>Applied Optics &amp; Imaging</b> [5]</p> <p>PH430 <b>Biophotonics</b> [5]</p> <p>PH4106 <b>Properties of Advanced Biomaterials</b> [5]</p> <p>PH421 <b>Quantum Mechanics</b> [5]</p> <p>PH422 <b>Solid State Physics</b> [5]</p> <p>-----</p> <p><u>Semester 2</u></p> <p>PH424 <b>Electromagnetism and Special Relativity</b> [5]</p> <p>PH425 <b>Lasers &amp; Spectroscopy</b> [5]</p>
* Select one 15-credit module			

Module Descriptors for Years 1 to 4 are available at: <https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html>

## BSc Physics – Stream: Physics and Climate Physics

Year 1	Year 2	Year 3	Year 4
<b>[60 credits]</b>	<b>[Core: 40 credits; Options: 20 credits]</b>	<b>[60 credits]</b>	<b>[Core: 55 credits; Options: 5 Credits]</b>
<i>Full Year – Semester 1 and Semester 2</i>	<i>Semester 1</i>	<i>Full Year – Semester 1 and Semester 2</i>	<i>Full Year – Semester 1 and Semester 2</i>
MP180 Applied Mathematics [15]*	BSS2103 Introduction to Sustainability I [5]	PH3101 Experimental and Computational Physics [15]	PH4102 Final Year Project [20]
CH101 Chemistry [15]	PH2105 Mechanics and Thermodynamics [5]	-----	PH4101 Physics Problem Solving [5]
PH101 Physics [15]	PH2102 Physics Laboratory and Problem Solving I [5]	<i>Semester 1</i>	-----
PH109 Physics Special Topics [10]	MP231 Mathematical Methods I [5]	MP345 Mathematical Methods I [5]	<i>Semester 1</i>
MA161 Mathematical Studies [15]*	-----	PH328 Physics of the Environment I [5]	PH4103 Atmospheric Composition & Climate Change [5]
MA180 Mathematics (Honours) [15]*	<i>Semester 2</i>	PH338 Properties of Materials [5]	PH424 Electromagnetism and Special Relativity [5]
-----	PH2106 Atomic Physics and Electromagnetism [5]	PH333 Quantum Physics [5]	PH421 Quantum Mechanics [5]
<i>Semester 1</i>	PH2104 Physics Laboratory and Problem Solving II [5]	PH331 Wave Optics [5]	PH422 Solid State Physics [5]
CS103 Computer Science [5]	MP232 Mathematical Methods II [5]	-----	-----
	MG3113 Megatrends [5]	<i>Semester 2</i>	<i>Semester 2</i>
	<b>CHEMISTRY PATHWAY*</b>	MP346 Mathematical Methods II [5]	PH4104 Aerosol Physics and Climate Change [5]
	<i>Semester 1</i>	PH335 Nuclear and Particle Physics [5]	PH425 Lasers & Spectroscopy [5]
	CH204 Inorganic Chemistry [5]*	PH337 Thermal Physics [5]	EOS4101 Remote Sensing [5]*
	CH203 Physical Chemistry [5]*		PH4105 Ocean Climate Physics [5]*
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	<i>Semester 2</i>		
	CH202 Organic Chemistry [5]*		
	CH205 Analytical and Environmental Chemistry [5]*		
	<b>EARTH AND OCEAN SCIENCES PATHWAY*</b>		
	<i>Semester 1</i>		
	EOS213 Introduction to Ocean Science [10]*		
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	<i>Semester 2</i>		
	EOS2102 The Earth: From Core to Crust [10]*		
* Select one 15-credit module	* Select one 20-credit pathway		*One 5-credit elective module

Module Descriptors for Years 1 to 4 are available at: <https://www.nuigalway.ie/science-engineering/undergraduateprogrammes/physics-with-options.html>





	<p><b>MATHEMATICS PATHWAY*</b></p> <p><u>Semester 1</u></p> <p>MA2286 <b>Differential Forms [5]</b></p> <p>MA284 <b>Discrete Mathematics [5]</b></p> <p><u>Semester 2</u></p> <p>MA2287 <b>Complex Analysis [5]</b></p> <p>MA283 <b>Linear Algebra [5]</b></p> <p><b>ASTROPHYSICS PATHWAY*</b></p> <p><u>Semester 1</u></p> <p>PH222 <b>Astrophysical Concepts [5]</b></p> <p>CS2101 <b>Programming for Science and Finance [5]</b></p> <p>-----</p> <p><u>Semester 2</u></p> <p>PH223 <b>Observational Astronomy [5]</b></p> <p>CS211 <b>Programming and Operating Systems [5]</b></p>		
* Select one 15-credit module	* Select 1 Pathway to a value of 20 credits.	^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.	* Select one Project to a value of 10 credits. * Select one elective to a value of 5 credits. ^ These modules are only available every 2nd Year. Alternative modules are offered next academic year.

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