

Autumn 2009

Physics

- the fundamental science
that drives technology

Third Level
Physics Courses
in Ireland

IOP | Institute of Physics
In Ireland

www.iopireland.org

The Institute of Physics Accredited Physics courses are highlighted below in blue. Courses with accreditation pending are marked #. In some cases Accreditation is still pending as the course listed is a new degree with the first cohort of students still due to graduate.

CAO CODE		Qualification Title	Main Features	First Year Subjects
Belfast	QUB	www.qub.ac.uk/mp or www.qub.ie/mp	Core Physics with Mathematics and Computing. Core Physics with Medical Applications. Core Physics plus Galactic Astronomy, Astrophysical Techniques, Stellar Physics, The Early Universe. Core Physics with Applied Mathematics. Core Physics with European language and 1 year Physics study abroad; language qualification required. Selected modules of Physics/Applied Mathematics. Wide choice of Physics and Computing modules at later stages.	Physics, Mathematics and Computing.
N/A		BSc and MSci (3/4 years) Physics Physics with Medical Applications # Physics with Astrophysics Physics with Applied Mathematics Physics with Extended Studies in Europe Theoretical Physics BSc only: (3 years) Physics and Computer Science		
Cork	CIT	www.cit.ie		Core Physics and Computing.
CR001		Applied Physics & Instrumentation Higher Certificate (2 years), BSc Degree (3 years), BSc Honours Degree (4 years)	Certificate provides basic education in instrumentation enabling graduates to perform as instrument technicians. Ordinary degree provides specialist education in measurement/control that helps develop design capabilities in instrumentation. Honours degree programme option for suitably qualified graduates.	Applied Physics, Instrumentation, IT, Electronics, CAD, Maths, Complementary Studies, Chemistry, Workshop.
CR360		BSc Honours – Instrument Engineering (4 years)	This physics based programme aims to produce instrument engineers for process and related industries, their service providers and system integrators.	Instrumentation, Physics, IT, Electronics, Maths and Chemistry
Cork	UCC	www.ucc.ie		
CK408		BSc Single Honours (4 years) Physics Astrophysics Chemical Physics Education in Physical Sciences	Mainstream Physics degree for those wishing to be professional physicists in industry (e.g. telecommunications, finance, IT, etc.) and research. Includes theoretical and experimental aspects. Core physics topics with astrophysics modules. Programme in Physics and Physical Chemistry with topics related to molecular sciences, spectroscopy, photophysics and theoretical modelling. Experience of second level teaching to help students determine if they would like to become physical sciences teachers.	Physics, Mathematics and Applied Mathematics with options from Chemistry and Computer Science. <i>Note: the CK408 degree can also be entered from the CK407 Mathematical Sciences programme.</i>
CK407		BSc Joint Honours in Mathematical Sciences Physics and Mathematics Physics and Applied Mathematics	Core physics combined with high level abstract mathematics recommended for theoretical physicists. Core physics combined with advanced mathematical and computation methods recommended for theoretical physicists.	Physics, Mathematics, Applied Mathematics and Statistics. <i>Note: the CK407 degree can also be entered from the CK408 Physics and Astrophysics programme.</i>
Dublin	DCU	www.dcu.ie		
DC171		BSc Applied Physics (4 years)	Fundamental physics with specialisation in Lasers/Optoelectronics, Electronics/Instrumentation, IT/Computing. Emphasis on laboratory work and projects. Options: Nine month Industrial Placement or research laboratory placement in third year.	Physics, Mathematics, IT, Astronomy, Chemistry.
DC167		BSc Physics with Astronomy (4 years)	Strong background in Physics with Mathematics and IT for astronomy applications. Astronomy content throughout all 4 years. Individual and group project work (some in conjunction with local and foreign observatories) throughout and includes a foreign observatory field trip.	Physics, Mathematics, IT, Astronomy, Mathematics, IT, Astronomy, Chemistry.
DC 173		BSc Physics with Biomedical Sciences (4 years)	Physics with the chemical and biological principles and techniques needed to pursue a career in biomedical health and medical physics, incorporating a placement in industry, research group or a hospital physics department.	Physics, Mathematics, IT, Physiology, Chemistry.
DC203		BSc Science Education (4 years)	Training of Science teachers qualified to Leaving Certificate Level in two from Physics, Chemistry and Mathematics. Experience of secondary level teaching is provided mainly in years 2 and 3.	Physics, Chemistry, Mathematics, Biology, & Education.
DC165		Science International Entry	Choice from range of Science degrees at end of first year, including Applied Physics. International placement in year 3.	Physics, Chemistry, Mathematics and Biology.
DC201		BSc Applied Physics (4 years) Common Science Entry BSc Applied Physics (4 years)	Introduction to Physics, Chemistry, Biology and Mathematics. Choice from range of science degrees at end of first year including Applied Physics and Physics with Astronomy.	Physics, Chemistry, Biology, Mathematics.

DC166	BSc Physics with Astronomy (4 years) BSc Environmental Science & Health (4 years)	Merging the traditional science disciplines with the discipline of health, approached from an environmental perspective. Physics course includes Medical Physics and Meteorology.	Physics, Chemistry, Biology, Mathematics.
Dublin	DIT ■ www.dit.ie		
DT 260	BSc (Ordinary) Industrial and Environmental Physics (3 years)	Technical Training in Applied Physics, with particular focus on physics applied to the industrial workplace and environmental physics. Option to proceed to honours degree programme for suitably qualified graduates.	Physics, Chemistry, Mathematics, Biology, IT, Professional Development.
DT 222	BSc (Honours) Physics Technology (4 years)	These courses provide graduates with scientific and analytical skills as well as problem solving ability. They will provide the student with a soundly based and coherent body of scientific and technical knowledge that is relevant to the technological needs of industry and society.	Physics, Chemistry, Mathematics, IT, Professional Development.
DT 229	BSc (Honours) Clinical Measurement (4 years)	Integrated training in the area of clinical measurement, medical measurement systems and instrumentation. Year 3 is hospital based.	Physics, Chemistry, Biology, Mathematics, Statistics, Computers, Anatomy, Physiology.
DT 235	BSc (Honours) Physics with Medical Physics and Bioengineering (4 years) #	A programme in Physics with particular emphasis on applications of Physics and Engineering to medical devices, medical physics and bioengineering. Industrial placement in year 3.	Physics, Biology, Chemistry, Mathematics, Computational Studies and Professional Development.
DT 227	BSc (Honours) Science with Nanotechnology (4 years) #	Course consists of core physics and chemistry subjects, with an increasing focus on nanoscience and technology in later years. Industrial placement in year 3.	Physics, Chemistry, Biology, Mathematics, Computational Studies, Professional Development.
Dublin	TCD ■ www.tcd.ie		
TR035	BA Theoretical Physics (4 years)	Includes theoretical and experimental aspects, a range of courses in pure and applied mathematics and an introduction to computing, leading in later years to Classical Fields, Quantum Mechanics, Statistical Physics, Condensed Matter Physics, Particle Physics, General Relativity and other topics in theoretical physics. A liking for mathematics is essential.	Mathematics, Physics.
TR076	BA Physics and Chemistry of Advanced Materials (4 years)	Application of physics and chemistry to the development of the advanced materials required by modern technology. In sophomore years this course places particular emphasis on nanomaterials and nanostructures.	Physics, Chemistry and Mathematics.
TR071	BA Physics (4 years) BA Physics and Astrophysics (4 years) # BA Physics and Computer Simulation (4 Years) #	Balanced experimental and theoretical training in core Physics. Specialist courses in years 3 and 4 include Optoelectronics, Superconductivity, Magnetism, Semiconductor devices, Condensed Matter Physics, Quantum Mechanics and High Energy Physics. Students can specialise in year 3 in either Astrophysics or Computer Simulation.	Physics, Mathematics and one from Chemistry, Geology/Geography, Biology.
Dublin	UCD ■ www.ucd.ie/horizons		
DN008	BSc Single Honours (4 years) BSc Joint Honours (4 years) BSc General Science (3 years)	Fully modular degree structure, with 12 modules taken per year. Strong emphasis on training in key laboratory skills. Courses include Medical Physics, High Energy Particle Physics, Lasers, Biophysics, Condensed Matter Physics, Environmental Physics, Quantum Mechanics and Relativity.	Physics, Mathematics, plus four modules from within the Science programme and 2 modules from the entire UCD first year selection.
DN032	BSc Theoretical Physics (4 years)	Major areas of theoretical physics: Mechanics, Relativity Theory, Quantum Mechanics, Computational Physics, Atomic Physics, Nuclear Physics, Condensed Matter Physics and Astrophysics.	Physics, Mathematics, Mathematical Physics, plus 2 other modules.
DN033	BSc Physics with Astronomy and Space Science (4 years) #	This physics degree programme places an emphasis on the applications of physics in astrophysics and space science. Students will gain an understanding of how ground-based and space-based technologies are used to explore the Universe and how modern science can be used to understand it. Students gain hands-on experience in astronomical techniques and, in 3rd year, participate in an international mission design workshop or astronomical observation field trip.	Physics, Astronomy and Space Science, Mathematics, plus 4 other modules (2 from Science).
Galway	GMIT ■ www.gmit.ie		
GA 773	BSc (Ordinary) Physics and Instrumentation. (Higher Cert if required after 2 years). BSc Ordinary (3 years). Option of add on BSc Honours (4 years) BSc (Honours) Physics and Instrumentation (4 years)	Common science entry to first year, students may then choose Physics and Instrumentation course for second year and subsequent years (ladder structure). Course has strong emphasis on practical and project work to compliment theory.	Five from Physics, Instrumentation, Chemistry, Computer Applications, Mathematics, Biology.
GA783		This course develops design and problem solving abilities in Physics, Instrument & Control Systems, Applied Optics and Optoelectronics, Semiconductors, Spectroscopic Instrumentation, Computer Interfacing Digital Signal and Image Processing. These are achieved through an interesting and comprehensive programme of experimental and project work run in conjunction with the theoretical tuition.	Physics, Instrumentation, Chemistry, Computer Applications, Mathematics.
Galway	NUIG ■ www.nuigalway.ie		
GY301	Undenominated Science Entry leading to: BSc Single Honours (4 years)	This degree, with undenominated entry, covers all core Physics and Applied Physics. See entry for GY315 for details.	Four from: Physics, Biology, Chemistry, Computer Science, Earth & Ocean Science.



BSc Joint Honours

Applied Mathematics and Physics (4 years)

Mathematics and Mathematical Physics (3 years)

GY315 **BSc Single Honours (4 years)**
Physics and Applied Physics

GY316 **BSc Physics with Medical Physics (4 years)**

GY317 **BSc Physics with Astrophysics (4 years)**

Limerick ■ UL ■ www.ul.ie

LM065 **BSc Applied Physics (4 years)**

LM087 **BSc Energy (4 years)**

LM096 **BSc (Education) Physical Science (4 years)**

Maynooth ■ NUIM ■ www.nuim.ie

MH201 **BSc Single Honours (4 years)**
Experimental Physics

Theoretical Physics

BSc Joint Honours (4 years)
Experimental Physics with Theoretical Physics
with one of Mathematics, Biology, Chemistry,
Computer Science

MH204 **BSc Single Honours (4 years)**
Physics with Astrophysics

MH206 **BSc Honours (3 years)**
Theoretical Physics & Mathematics

MH212 **BSc (Honours) Science Education (4 years)**



This degree has an almost equal emphasis on Physics and on Mathematical Physics through all 4 years. The most important topics of Physics are covered. This course is well suited to students who lean towards the theoretical aspects of Physics. Students enter GY301 and transfer to this programme at the end of their second year.

This degree has its main emphasis on Mathematical Physics and on Mathematics. Physics may be optionally taken in 1st year.

The Physics and Applied Physics course provides comprehensive coverage of Physics, including Mechanics, Heat, Sound, Electricity & Magnetism, Optics, Atomic and Nuclear Physics, Relativity, Quantum Mechanics as well as specialized courses in Optoelectronics, Atmospheric Physics, Nanotechnology, Computational Physics, Signal Analysis and Image Processing. Optional units in Astrophysics or Medical Physics can also be taken.

This programme combines essential core Physics modules with Medical Physics, Chemistry, Mathematical Science, Biology and Anatomy. Graduates of this course will be qualified to continue to professional graduate training in medical physics or to pursue a career in research, industry, teaching and other many areas.

This programme has a strong emphasis on Computing and Mathematics, in which the full core Physics programme is complemented by parallel courses which cover the latest advances in Astrophysics. There are substantial Astrophysics units in each year, with hands-on practicals in observing, data analysis, and simulation, including a 3rd year field trip to a large observatory in Italy, and the use of a well-equipped radio and optical observatory on campus.

The programme provides a strong foundation in the fundamental principles of physics, and builds on this to provide a thorough understanding of matter and its manipulation on the atomic scale with the purpose of creating, characterising, controlling and understanding nanodevices/nanomaterials. The course provides the training to work in the high-technology sector, in particular the semiconductor industry, but also prepares graduates for research careers in medical physics, nanotechnology and energy. Students study physics, chemistry, electronics and electrical science, together with introductory courses on energy, sustainable development, and earth science to provide a thorough grounding in energy. In the later years students can study solar, nuclear, wind, ocean and hydroelectric energy, transportation, and advanced methods of energy control and storage. Students can specialise in either Energy Control, Energy Markets, Energy Management or Energy Science, preparing them for careers in these areas.

The core physics, chemistry and mathematics subjects run concurrently with a teacher education programme. Graduates are qualified to teach Leaving Certificate Physics, Leaving Certificate Chemistry and Junior Certificate Science in all Irish post-primary schools.

Programme for those interested in specialising in mainstream Experimental Physics. Topics include Quantum Mechanics, Relativity, Planetary Science, Solid-State Devices, Radiation & Medical Physics, Particle Physics.

Programme for those interested in specialising in mainstream Theoretical physics. Topics include Electromagnetism, Quantum mechanics, Relativity, Chaos, Non-Linear Dynamics & Quantum Information.

Programme for those who want to combine Experimental and Theoretical Physics at an honours level.

Programme for those who want to combine a core Physics programme with another subject at an honours level.

Specialist Astrophysics topics are studied in addition to core Physics courses. Topics include stellar structure and evolution, neutron stars, black holes, high-energy astrophysics, cosmology & astronomical instrumentation. Includes field trips to optical and radio astronomical observatories and ESA.

Accelerated degree in Mathematics and Theoretical Physics.

This degree is for students who wish to become teachers of science in second-level schools. Students study education disciplines at honours level and also gain practical teaching experience. The use of new technologies as a support for teaching and learning is a major feature of this course. Experimental Physics (see MH201) and another science subject can be taken to honours degree level so students will be qualified to teach their chosen science subjects or to follow a career as a physicist.

Physics - the fundamental science

What Physics is about...

Physicists want to understand how the world works, in every detail and at the deepest level. This includes everything from elementary particles, to nuclei, atoms, molecules, macromolecules, living cells, solids, liquids, gases, plasmas, living organisms, the brain, complex systems, supercomputers, the atmosphere, planets, stars, galaxies, and the universe itself. In addition to the pursuit of knowledge, physicists study questions facing today's science and technology, and they work at the forefront of solutions for instrumentation, measurement techniques and innovation in areas such as:

- lasers and optics
(*laser materials, telecommunications*)
- medicine
(*medical imaging, radiation treatment, lasers*)
- space science
(*mission specialists, satellite design, astrophysics, telescopes*)
- environmental science
(*weather, oceanography, pollution control, meteorology*)
- electricity and magnetism
(*electronics, antenna design, instruments, semiconductors*)
- nuclear science
(*reactor design, waste management, medical applications*)

What you do in a Physics degree...

The topics listed above cover a very broad area of knowledge, and no physics degree includes all of them. The particular "flavour" of a physics degree is determined by the emphasis given to different areas of physics (this varies from one university/IT to another), but all physics degrees have these core topics in common – the nature of matter and radiation, the laws governing their properties, and how they interact with each other. The additional elements of a physics degree include specialised knowledge in some areas of physics and advanced scientific and engineering skills which are useful for working in industry and research. More careers information appears on the back page.

This summary leaflet on Physics courses in Ireland has been produced by the Institute of Physics in Ireland in co-operation with the Irish Universities and Institutes of Technology. Outline information on Certificate, Ordinary and Honours Degree programmes is presented and the particular flavour of each course is indicated. Students are advised to consult the Institution's prospectus for more detailed information on a particular course including specific entry requirements. We hope that this summary, which shows the range and diversity of Physics courses available in Ireland, will assist you in your decision-making.

Careers and Jobs for Physics Graduates

A physics degree is broad-based, which allows you great freedom of choice in your ultimate employment. In addition to the fundamental knowledge of science and technology that a physics degree entails, the skills acquired doing a physics degree, such as problem solving, information handling, critical reasoning, logical thought, clear communication, and use of computers as an analysis tool, are valued in many fields of employment. For many people, doing a physics degree is an attractive route to becoming a professional engineer. You may end up as a professional physicist, but equally a physics degree fits you for a job in medical physics, communications, manufacturing, teaching, journalism, public service, management, finance and many more. If you like to keep your options open, then physics is a suitable choice to make.

Physics graduates have taken up positions right across the technology and engineering sectors and the range of job titles reflects this. For general Physics careers information please see Careers link at <http://www.iopireland.org> where 'Day in the Life of a Physicist' profiles can be viewed and downloaded.

Typical job titles for Physicists

Aeronautical engineer	Medical Physicist
Archaeological scientist	Meteorologist
Astronomer	Nanotechnology
Audio Engineer	Nuclear Scientist
Econophysicist	Oceanographer
Electronic Engineer	Patent Examiner
Environmental Physicist	Radiation Protection
Failure Analyst	Research Scientist
Financial Analyst	Rocket scientist
Forensic Scientist	Science Communicator
Geophysicist	Semiconductor Engineer
Image processing researcher	Solar Physicist
Laser Physicist	Software Designer
Lecturer/Teacher	Telecomms Engineer
Materials Scientist	Wind Analyst

Some employers of Physicists in Ireland

Abbott Laboratories	Creganna	Intel
Adobe	Eblana Photonics	Iona Technology
IBM	Eircom	Magnetic Solutions
Airtricity	Ericsson	Medtronics
AMO Ireland	ESB	Met. Office
Analog Devices	Financial services	Microsoft
Andor Technology	Firecomms	Motorola
Apple Computer	Flextronics	Oracle
Audio Processing Technology	Glen Dimplex	Schrader Electronics
Bausch & Lomb	Google Ireland	SensL
Bombardier Shorts	Hewlett Packard	Siemens
Boston Scientific	Honeywell	Symantec
Bourns Electronics	International Technologies	Tessera
BT Ireland	Hospitals	Thales Air Defence Ltd
		Trinity Biotech

A significant proportion of honours physics graduates go on to undertake research leading to M.Sc. or Ph.D. degrees, in Ireland and all over the world, contributing at the highest levels to the development of physics and its applications.

A 2007 report from the Institute of Physics, Physics and the Irish Economy noted that over 85,000 jobs in Ireland depend on physics based industries. These are typically well paid positions often in IT, telecommunications and the medical device sector with salaries around one third higher than the national mean.

From a 2005 report by PricewaterhouseCoopers LLP on 'The economic benefits of higher education qualifications' it was reported that physics and chemistry graduates will earn on average **over 30% more during their working lifetimes than 'A' level holders who have not completed a degree.**

An IOP 2007 members' salary survey noted that most physicists can command salaries well above the UK average. As their careers progress, Physics graduates often reach the highest levels in industry, education and the civil service for which salaries can be **€100,000 or more.**

When trying to decide what to study at third level, probably the most important question to ask is 'do you like the subject?' In the 2009 IOP survey of first year physics undergraduates **72% said they chose their degree because of their interest in physics, especially the 'big' areas of astronomy and particle physics.** Interestingly these are fields which are leading to some of the most impressive technology spin-offs with rapid advances in computing, imaging and data storage and hence, high end job creation.

Further Information

For further information on a particular course please go to the relevant website (details inside). For general Physics careers information email alison.hackett@iop.org or use Careers links at <http://www.iopireland.org>

The Institute of Physics in Ireland is not responsible for any incomplete or inaccurate information in this leaflet.