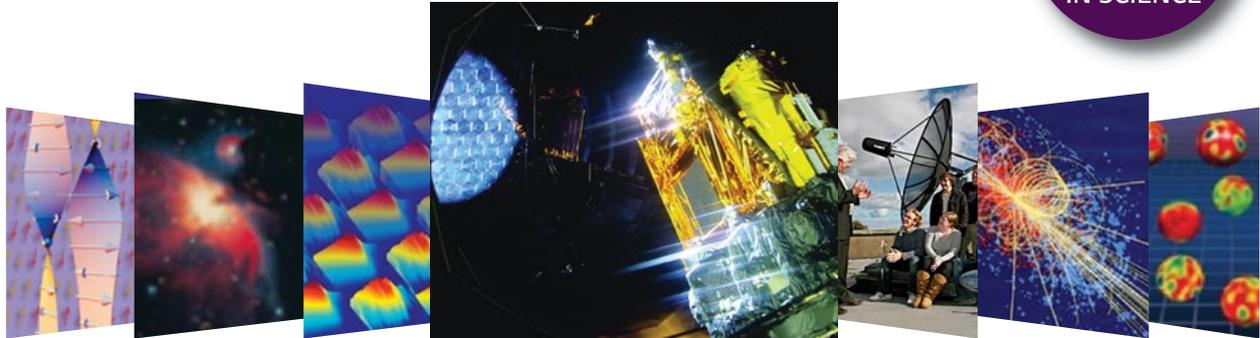




# DN200 Mathematical, Physical and Geological Sciences

- Physics
- Theoretical Physics
- Physics with Astronomy and Space Science
- Physics and Mathematics Education

YOUR  
FUTURE  
**CAREER**  
IN SCIENCE



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## Why study a Physics degree at UCD?

Physics is a fundamental science seeking to investigate and understand the physical world both mathematically and experimentally, from the outermost reaches of the universe, to the innermost parts of the atom. It is the subject that constantly asks ‘why?’ questioning why matter and energy exist as they do, and discovering the underlying rules which govern their behaviour. Physicists believe

that all phenomena observed in the universe can be explained in terms of a handful of forces: gravity, electricity, magnetism, weak nuclear, and strong nuclear interactions. Understanding physical principles and discovering new laws that explain our universe are the challenges that confront physicists and advance the subject in the 21st century.

## What will I study?

The Physics degree provides a strong foundation in the core of the subject with opportunities to specialize in areas of particular interest. The course achieves a balance both theoretically and experimentally. The UCD Physics courses offer the following topics to study:

- **Physics** – relativity, quantum physics, condensed matter physics, electromagnetism, optics, thermodynamics, astrophysics, biophysics, nanophysics, medical physics, nuclear physics and particle physics
- **Physics with Astronomy and Space Science** – stellar and planetary formation; end-points of stellar evolution, including black holes; galaxies and cosmology
- **Theoretical Physics** – relativity theory, theoretical astrophysics, statistical mechanics, quantum field theory, high energy physics
- **Physics and Mathematics Education** – foundations of physics, frontiers of physics, methods for physicists, education issues and ideas, science education, vector integral and differential calculus, probability theory, complex analysis

Detailed information on all the topics available to study are online at [www.ucd.ie/science/ucdsience.pdf](http://www.ucd.ie/science/ucdsience.pdf)

## What are the internship opportunities?

The School of Physics runs a summer undergraduate internship programme and approximately 10 placements are funded annually. Students can choose from a range of projects within the School's cutting-edge research groups and teaching enhancements activities. Project details from previous years can be found at [www.ucd.ie/physics/internships](http://www.ucd.ie/physics/internships). Additionally, staff assist students in applying for placements in external institutes such as CERN and the European Space Agency.

## What are the career opportunities?

The Physics degree trains students to think independently and critically, and to understand and analyse scientific and technological information. Due to their problem-solving abilities, employers hire physicists in sectors such as:

- Material Science and Nanotechnology
- Medical Physics
- Environmental Consultancy
- Geoscience and Analytics
- Energy Technology
- Meteorology
- ICT & Financial Industries
- Academia, Education & Research



“Physics-based sectors contribute more than €7bn to the Irish economy – 5.9% of total economic output – and support more than 86,000 jobs – 4.5% of the Irish workforce.”

Deloitte for the Institute of Physics

# What are the career opportunities for graduates with a Physics degree?

About 50% of Physics graduates pursue further study or research after graduation. Of the remaining graduates, approximately 10% make the transition to the financial sector and the same proportion work in the education sector. Employment in scientific and technology industries, the

energy and environment sector and information technology accounts for the career paths of about 15% of graduates with the remaining students working a range of sectors including healthcare and government research. (Source Institute of Physics)

## MATERIAL SCIENCE AND NANOTECHNOLOGY

The properties of many materials change in an interesting way when their dimensions are reduced to nanometers. Material scientists aim to understand these changes and to use them in processing and manufacturing of materials at the nanoscale. Nanotechnology covers the discovery, characterization, properties and products of nanoscale materials. All information technology (IT) and its applications rely on progress at the nanoscale. For this reason major industries such as IBM and Intel invest heavily in research & development. For example in extreme ultraviolet lithography at 13.5 nm to produce faster computer circuits to meet the growing IT needs of society.



“Physics was an excellent choice for developing the ability to solve problems, a ubiquitous skill in most jobs.”

Dr Fergus Quilligan BSc (Hons) Physics, PhD  
Researcher,  
Intel Ireland Ltd

## MEDICAL PHYSICS

Medical physicists are concerned with clinical service, research & development and teaching. Many have responsibilities in areas of diagnosis and treatment e.g. in radiation oncology departments, investigation of equipment performance, organization of quality control in imaging systems, design of radiation installations and control of radiation hazards. Medical physicists play a leading role in research in key areas including cancer, heart disease and mental illness. They are also involved in the advancement of novel instrumentation and technology for use in diagnostic radiology and imaging procedures, infrared and ultrasound, x-ray, computerized tomography and MRI.



“Diagnostic imaging (such as x-ray, MRI, ultrasound and nuclear medicine imaging) is a practical application of physics used for diagnosing and treating patients.”

Dr Seán Courmane BSc (Hons) Theoretical Physics,  
MSc (Physical Sciences in Medicine), PhD  
Medical Physicist, St. James's Hospital

## ENVIRONMENTAL CONSULTANCY

The Radiological Protection Institute of Ireland (RPII) is Ireland's expert on ionising radiation. Their role is to ensure that Irish people and the environment are adequately protected from the harmful effects of ionising radiation. They

provide advice to the public and the Government, monitor people's exposure to radiation, regulate those who use radiation, provide technical support to Ireland's plan to deal with radiation emergencies and cooperate with similar bodies internationally.



“Radon is a naturally occurring radioactive gas that is the second cause of lung cancer in Ireland after smoking. Our work includes research on the behaviour of radon in the environment.”

Ms Stephanie Long BSc  
(Experimental Physics), MSc (Experimental Physics)  
Senior Scientist,  
Radiological Protection Institute of Ireland

## GEOSCIENCE AND ANALYTICS

Geoscientists have backgrounds from diverse areas such as geology, mathematics and physics and are concerned with investigating, imaging and analyzing the physical properties of the Earth's surface and subsurface. This involves applying various physics principles e.g. seismic analysis, electromagnetism, gravity, to extract information from rocks.



“I work with a group of highly-skilled scientists and engineers in an extremely technical environment which is challenging, exciting and rewarding.”

Dr Michelle Galvin BSc (Physics), PhD  
Geoscientist, Tullow Oil Plc.

A degree in physics equips students with a lot of transferable skills and many graduates work in analytics, information technology and finance.



“Industry analytics and statistics continue to play an increasingly important role in the decisions made by business leaders. The skills I gained from a Physics degree, when applied to the business, help us to understand how macro and micro events are impacting clients' and carriers' risk portfolios.”

Jamie Keating, BSc, Physics with  
Astronomy and Space Science  
Consultant, AON Risk Solutions

## How do I find out more?

You can get information about these courses by calling, emailing or writing to:

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[www.ucd.ie/physics](http://www.ucd.ie/physics)