College of Science, Engineering & Food Science

UCC

University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

BSc (Joint Honours)
APPLIED MATHEMATICS and PHYSICS

Course Code: CK407 Mathematical Sciences
CK408 Physics & Astrophysics

Duration: 4 years

Further Information:
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E: maths@ucc.ie or physics@ucc.ie
W: http://physics.ucc.ie
or http://www.ucc.ie/en/euclid/

Why study Applied Mathematics and Physics?

Applied Mathematics is closely associated in modern science with mathematical modelling, which is widely recognised as the key universal tool of science and engineering. Models are commonly demanded for the description and prediction of physical phenomena and also for very many processes of society. The range is very wide: spanning from Economics to Ecology and from Medicine to Meteorology.

Successful mathematical modelling requires the applied mathematician to master many skills; such as an understanding of physical phenomena, the construction of model equations, the ability to solve equations and the capacity for model evaluation. In this regard, Applied Mathematics and Physics are genuinely complementary disciplines. Physical intuition provides a useful insight into the formulation and solution of equations; mathematical thought and ideas provide a fundamental interpretation and insightful understanding of the phenomena.

Physics occupies a central position in science and technology and is the basis of much present and future technology, tackling problems that are as pressing and diverse as the development of new energy sources, safer medical diagnostics, high-temperature superconductors and ever smaller and faster devices for electronics.

The attributes needed by a good Physicist include spatial and conceptual vision, mathematical fluency, curiosity and imagination, and problem solving skills.

Programme Overview

This Degree Programme is offered jointly by the Departments of Physics and by the School of Mathematical Sciences. It provides a solid grounding in Applied Mathematics and Physics with an emphasis on developing students' problem-solving skills and their capacity for analytical and logical thinking in the applications of mathematics, as well as their intuitive and analytical understanding of Physics.

Career Opportunities

Graduates from the BSc (Hons) in Applied Mathematics and Physics are very well placed in the employment market because of the skills they possess. Their disciplined background in Applied Mathematics and Physics, as well as computing expertise, equips them for a wide range of careers. Employers readily recognise that graduates of these disciplines have already proven their ability to master difficult ideas and solve challenging problems, and can confidently be expected to possess the capacity and flexibility to learn new techniques and new problem-solving skills quickly.

There is a wide range of careers open to graduates of this degree:

- Careers directly related to a qualification in this subject, such as scientific and industrial research and development, lecturing and teaching, software development and computing.
- Careers that require the ability to think logically and quantitatively, such as banking, management, consulting and insurance; careers requiring further specialist technical training or a dedicated postgraduate degree, such as accounting, financial mathematics or meteorology.
- Careers open to graduates in any discipline, such as retailing, sales and marketing, administration, the media and the civil service.

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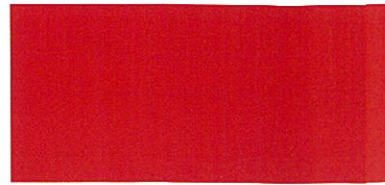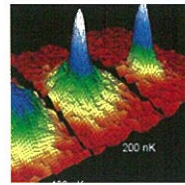
What will you be studying?

Year 1
CK407
Core Modules:
• Introduction to Mechanics (5 credits) • Introduction to Mathematical Modelling (5 credits) • Mathematical Software (5 credits) • Calculus (5 credits) • Introduction to Analysis (5 credits) • Introduction to Abstract Algebra (5 credits) • Introduction to Linear Algebra (5 credits) • Introduction to Probability and Statistics (5 credits) Students must choose Introductory Physics I (10 credits) • Introductory Physics II (10 credits) • Special Topics in Physics (5 credits)

CK408
Core Modules:
• Introductory Physics I (10 credits) • Introductory Physics II (10 credits) • Calculus (5 credits) • Introduction to Analysis (5 credits) • Introduction to Linear Algebra (5 credits) • Introduction to Mechanics (5 credits) • Introduction to Mathematical Modelling (5 credits) • Mathematical Software (5 credits)
Elective Modules: Chosen from • Chemistry • Computer Science • Geology • Mathematics • Physics • Statistics

Year 2
Applied Mathematics: • Mathematical Modelling • Mathematical Experimentation and Chaos • C/C++ Programming with Applications • Computer Modelling and Numerical Techniques • Fourier Methods • Multivariable Calculus
Physics: • Classical Mechanics • Introduction to Quantum Physics • Electrostatics and Magnetostatics • Introduction to Thermodynamics and Statistical Physics • Introduction to Astrophysics and Special Relativity • Experimental Physics I

Year 3
Applied Mathematics: • Vector and Tensor Methods • Fluid Mechanics I • Optimisation and the Calculus of Variations • Nonlinear Dynamics and Control • Partial Differential Equations with Applications I • Computational Techniques
Physics: • Optics • Quantum Mechanics • Electromagnetism • Statistical Thermodynamics • Nuclear and Particle Physics • Experimental Physics II

Year 4
Applied Mathematics: • Fluid Mechanics II • Topics in Applied Mathematics • Applied Stochastic Differential Equations • Partial Differential Equations with Applications II • Perturbation and Asymptotic Methods • Project
Physics: • Minor Research Project and 3 modules from list (A) and two modules from list (B)
Or
Nuclear and Particle Physics • Stars and the Interstellar Medium • Galactic and Extragalactic Astrophysics • Gravitation and Cosmology • Minor Research Project and one 5 credits module from list (A) or list (B)
List (A) Advanced Mechanics • Advanced Quantum Mechanics • Advanced Electromagnetism • Atomic and Molecular Physics • Gravitation and Cosmology • Experimental Physics III
List (B) Introduction to Condensed Matter Physics • Nuclear and Particle Physics • Observational Astrophysics • Advanced Condensed Matter Physics Quantum Field Theory • Introduction to Plasma Physics • Advanced Computational Physics • Stars and the Interstellar Medium • Galactic and Extragalactic Astrophysics • Quantum Optics and Advanced Spectroscopy • Introduction to Lasers and Photonics

Postgraduate Opportunities in UCC
The College of Science, Engineering and Food Science offers a wide range of one year full-time (or two year part-time) professional diplomas e.g. Postgraduate Diploma in Applied Science (Applied Physics) and Postgraduate Diploma in Applied Science (Modelling and Numerical Computing). There are also programmes leading to MSc (Master of Science) and PhD programmes.

Graduate Profile
Eoin Hyde: BSc (Hons)
Mathematical Sciences
Single Honours 2008

In Autumn 2008, I graduated from UCC with a BSc degree, and many great memories. While I had an overriding sense of excitement about my future plans, part of me was sad to be leaving a place that had, for four years, provided me with everything I could have asked for. The coursework was well-structured, interesting and challenging. Opportunities abounded for experiences outside of the supportive class environment. The School of Mathematical Sciences at UCC is well-respected internationally, and this particular course is broad-based enough to take advantage of many fruitful internships. I was fortunate enough to spend summers working in diverse research areas, ranging from theoretical physics and mathematical biology in Ireland, to materials engineering in California. I found these experiences to be invaluable, and they led me to continue with research after my degree. I'm currently studying for a DPhil. in computational biology at the University of Oxford. Here, I get to apply the mathematical, computational, analytical and general problem-solving skills, that I learned throughout my degree, to the field of cardiac modelling - it's a rewarding position in an ever-stimulating, interdisciplinary environment. I am confident that our work will return powerful clinical applications, and will also provide me with an improved and comprehensive skills-base, one suitable for either continued work in academia, or a move into industry.

Entry Requirements
CK407: Minimum HC3 in two subjects & passes in four subjects at H or O level in the Leaving Certificate, from Irish, English, Mathematics, and three other subjects recognised for entry purposes. Additional entry requirements include HB3 in Mathematics. Students must also have the requisite points for entry to this course.

CK408: Minimum HC3 in two subjects & passes in four subjects at H or O level in the Leaving Certificate, from Irish, English, Mathematics, one laboratory Science subject (i.e. Chemistry, Physics, Biology, Physics with Chemistry (joint) or Agricultural Science) and two other subjects recognised for entry purposes. One of the HC3 subjects must be in a laboratory science subject or Mathematics or Applied Mathematics. In addition students must have the requisite points for entry to a particular course.

For further information contact:
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