

LONDON'S GLOBAL UNIVERSITY



UCL

MEDICAL
PHYSICS AND
BIOENGINEERING

UNDERGRADUATE ENTRY 2010



Medical Physics degree programmes

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MEDICAL PHYSICS AND BIOENGINEERING

Undergraduate entry 2010

UCL UCAS Code: UCL U80

↘ **F350**

Medical Physics MSci 4 years

↘ **F351**

Physics with Medical Physics BSc 3 years

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WELCOME

to UCL and to the Medical Physics and Bioengineering degree programmes

Your choice of which degree programme to study, and which university to study at, is an important and personal decision. It will influence the next few years of your life as you study, and consequently shape your future life and career.

In selecting subjects and universities you need to be well-informed, with access to reliable and up-to-date facts. In the following pages we describe degree content and structure, the specialist resources and expertise you will access, and the skills you will develop, and aim to provide an authentic insight into student life at one of the world's top universities

Key facts

- Our department has a distinguished history: The Joel Professor of Physics Applied to Medicine, established in 1920, was the first Chair of Medical Physics in the UK. We developed some early methods for measuring radiation dose as well as the first system for continuous monitoring of arterial oxygen levels in sick newborn babies in 1980
- You will be based in a new, purpose-built facility where most of our teaching and research is conducted
- Our close links with University College London Hospital (UCLH) enables students to learn about the latest developments in physics applied to medicine and to experience medical physics and bioengineering in a clinical setting
- Both of our degrees are accredited by the Institute of Physics, providing the first step to chartered physicist (CPhys) status.

What do we offer?

What are Medical Physics and Bioengineering?

Medical physics and bioengineering involve using physics and engineering to solve medical problems and ultimately save lives and improve patients' quality of life.

Medical physics and bioengineering can be classified into two broad areas: diagnosis and therapy. Diagnosis involves the many different methods and technologies which are used to detect disease, assess injury, or monitor how well the human body is functioning. The therapeutic aspects concern dealing with patients' illness, discomfort or disability, often after diagnostic procedures have been applied.

Almost all areas of physics have some relevance to modern medicine, such as nuclear physics, quantum mechanics, acoustics, electromagnetism and optics. Thus our degree programmes are carefully designed to give students an excellent foundation in core physics subjects as well as covering all the major areas of physics applied to medicine. For example, students learn about imaging using x-rays, ultrasound, and magnetic resonance imaging (MRI), diagnostic techniques such as endoscopy and computed tomography (CT), and treatments such as laser surgery and radiotherapy.

Since the core of our BSc and MSci degrees is based on physics rather than engineering, the emphasis is on Medical Physics rather than Bioengineering, although the latter represents a minority (optional) component.

While the solid foundation in physics provided by our degrees will assist Medical Physics graduates in pursuing careers in many fields, including other areas of physics, our degrees expose students to a broad variety of careers specifically within the medical field. For example, some medical physicists are employed directly by hospitals, providing support for various diagnostic and therapeutic technologies, as well as running dedicated hospital facilities in partnership with clinical colleagues. This requires flexibility, the willingness to take responsibility, the ability to work in multidisciplinary teams and excellent physics skills, either as an experimentalist or a theoretician.

Other medical physics graduates elect to work in industry, developing the latest healthcare devices. Since demand is always high, companies involved in designing and supplying innovative medical technology represent a growing and prosperous area of the commercial sector.

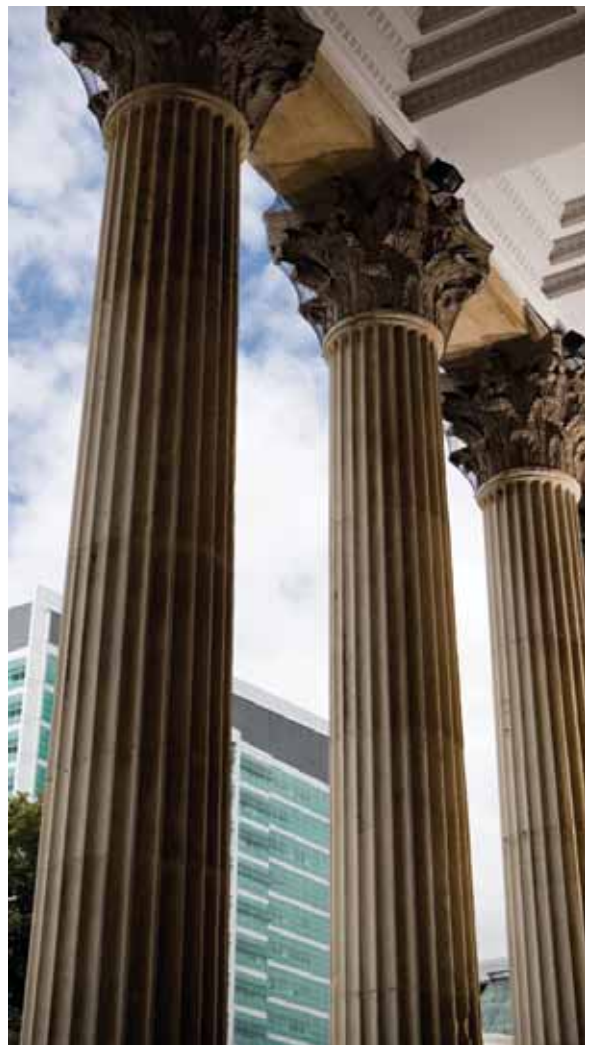
Meanwhile, many medical physicists also work in research in universities, improving existing techniques and developing completely new ones. Notable achievements in medical physics include Nobel prizes for two British scientists, Sir Godfrey Hounsfield for developing X-ray CT, and Sir Peter Mansfield for the development of MRI.

Finally, one of the great attractions of a career in medical physics is the multidisciplinary environment it offers, where physicists inevitably work alongside doctors, engineers, biologists, mathematicians, computer scientists, and biochemists. Because of the obvious healthcare application, Medical Physics generally attracts people who are interested in people as well as physics, and roughly equal numbers of men and women are working as medical physicists.

Medical Physics and Bioengineering at UCL

Studying medical physics at UCL means being based at one of the largest departments of its kind in the UK and at one of the world's top universities. Our department has an excellent record of academic research (60% of submitted research in the Research Assessment Exercise 2008 was rated at 4* or 3*, indicating research of 'world-leading' or 'internationally important' quality), with an internationally leading reputation in areas such as medical imaging, physiological monitoring, and implanted devices. Undergraduate lectures are all given by staff who are active researchers in medical physics and bioengineering, which enables students to learn about the latest developments in the field from the leading experts.

Our department has close links to several major teaching hospitals, and with UCLH in particular. We are a joint department with Medical Physics in the UCLH NHS Trust, enabling our staff to work side-by-side with



doctors and other healthcare professionals. This arrangement also allows our students to experience medical physics in its clinical setting and appreciate the extra excitement, responsibility and complexity which results when physics and engineering are used to benefit patients.

Both of our degrees are accredited by the Institute of Physics, providing the first step to chartered physicist (CPhys) status.

In 2004, we moved into a brand new purpose-built building on the main UCL campus. Our research and teaching is now mainly concentrated on this site, so our students can interact with the huge variety of academic and social activities going on around them. During the final year of their degree, our students join one of our research groups to carry out a major project. This gives students an opportunity to experience life as a research scientist, and this often has a significant impact on their decisions regarding their future careers.

Finally, our staff are committed to being approachable and accessible, and maintaining a friendly environment for our students. The staff-to-student ratio in our department is relatively high, which means staff and students can get to know each other as well. Medical Physics is an exciting and thriving area in which to work, and we are very proud of the opportunity we have to communicate this excitement to our students.



Your degree

We offer the option of studying for a three-year BSc programme or a more in-depth four-year MSci programme. Your first two years of study will be taught mostly in the Department of Physics and Astronomy, along with other physics students. These two years are identical for both programmes and transfer between the two is possible at the end of the second year. We advise applying for the MSci initially, which makes it easier to defer your decision.

In the first year, you receive an exciting introduction to medical physics involving demonstrations, museum visits and guest lectures. This will focus on the history, current practice and future of medical imaging and physiological monitoring.

In the second year, you will cover the basic physics involved in the uses of radiation for imaging the body and treating disease, while the Human Physiology course provides an introduction to the physiology of the body for physicists and engineers.

During year three (and for the MSci, year four) the courses you take will become focused in the Department of Medical Physics and Bioengineering. You will choose three medical physics courses each of these years from a range of options and, in your final year, will work on a major project with one of the department's research groups.

Degree structure

The degree programmes are organised on a course-unit system, in which students take a number of individual courses, each assigned a course-unit (CU) value depending on the amount of work involved. UCL has extended this system to assign each course a European Credit Transfer System (ECTS) value. ECTS allows students to gain recognition for academic achievement at participating institutions across Europe, which can assist UCL students who wish to pursue educational or career opportunities throughout Europe. One course unit is equivalent to 15 ECTS credits.

Year 1	Year 2	Year 3	Year 4
<ul style="list-style-type: none"> • Essential Medical Physics • Mathematical Methods 1 and 2 • Waves, Optics and Acoustics • Classical Mechanics • Thermal Physics • Physics of the Universe • Practical Skills 	<ul style="list-style-type: none"> • Medical Radiation Physics • Mammalian Physiology • Mathematical Methods 3 • Quantum Physics • Atomic and Molecular Physics • Statistical Thermodynamics • Electricity and Magnetism • Practical Physics 	<ul style="list-style-type: none"> • Three Medical Physics and Bioengineering options (see below) • Experimental Physics (MSci only) • Project (BSc only) • Three Physics courses from: Electromagnetic theory; Nuclear and particle physics; Solid state physics; Quantum mechanics 	<ul style="list-style-type: none"> Three Medical Physics and Bioengineering options (see below) • Project • Two further optional Physics courses



We offer the following medical physics and bioengineering options in your third (and fourth) year:

- Optics in Medicine – how light and lasers are used in medicine, including laser surgery, endoscopy, and pulse oximetry
- Medical Imaging with Ionising Radiation – the physics and applications of X-ray imaging, CT scanning and imaging the body with gamma-rays
- Medical Imaging with Non-Ionising Radiation – the principles of magnetic resonance imaging and ultrasound, and how they are used to diagnose illnesses
- Treatment with Ionising Radiation – how radiation can be used to cure cancer
- Medical Scientific Computing – how computers are used to process information and medical images in particular
- Medical Electronics – electronic devices used for diagnosis, therapy and rehabilitation
- Physiological Monitoring - the principles and practical aspects of how to measure pressures, forces and chemical concentrations in the body.

Your learning

As well as attending lectures, you will also undertake tutorials and practical work, including projects. Projects are conducted in active, well-equipped research groups, sometimes involving collaborations with local hospitals. Many medical physics lectures and projects are taken by a mix of medical physics and medical students, reflecting the multidisciplinary nature of the work performed in hospitals and universities.

Most medical physics classes are small (fewer than 30 students) providing you with an informal, interactive teaching environment in which you can easily raise questions.

Courses are normally assessed by a combination of coursework and end-of-year examination.

Living

Accommodation

You need not be concerned about finding a place to live as, subject to you meeting our conditions, we will guarantee you a residential place in your first year irrespective of your permanent home address. With catered Halls of Residence and self-catering Student Houses, you can be sure of finding student accommodation at UCL to suit your lifestyle.

Further details are available on the web at www.ucl.ac.uk/accommodation or in the separate Student Accommodation booklet available from the Study Information Centre (see inside front cover).

Support and welfare

By providing support for your academic work and offering a range of services to assist you in your personal life, we help you to get the most from your studies and enjoy your time as a student here at UCL.

Right from the start you can take advantage of UCL's Transition Programme designed to help you settle in to your first year. Your Personal Tutor will guide you through your academic studies and can also direct you to other sources of help and support including the UCL Union Rights and Advice Centre, the Student Counselling Service, and the UCL Health Centre. Full details are available at www.ucl.ac.uk/current-students/support

Recreation

Studying in the centre of one of the world's great capital cities offers almost unlimited opportunities for you to enjoy your time at UCL. London offers unparalleled resources for learning and entertainment, including museums, exhibitions, theatres, shopping, restaurants and cultural festivals.

UCL has its own fitness centre as well as facilities for a huge range of indoor sports and, in Hertfordshire, outdoor pitches and courts. UCL also has several cafés and bars where you can relax, and our own professionally-equipped theatre, the UCL Bloomsbury. Over 130 clubs and societies covering all aspects of politics, arts, religion, culture and entertainment, as well as a wide variety of sports, are run under the auspices of the UCL Union. See www.ucl.ac.uk/prospective-students/undergraduate-study for more details.

Funding

Money is a concern for all students. Tuition fees, books, food, clothes and general living expenses all need to be covered. However, surveys show that investing in your education pays off and that London graduates can earn starting salaries which are up to 25% higher than the national average.

If you are a UK or EU student you can apply for a loan to cover tuition fees. Loans for maintenance (living expenses) are also available for UK and, in some circumstances, EU students. As a UK student you may also be eligible for a non-repayable Higher Education Maintenance Grant (HEMG). In addition, UCL Bursaries are available to assist those students who are in receipt of an HEMG with their fees and living expenses. A number of UCL scholarships are offered, some tied to particular departments and others to students from specific countries. Full details are on the web at www.ucl.ac.uk/prospective-students/undergraduate-study/fees-and-costs

Your application

Applications to our degree programmes must be made through UCAS; please see the inside front cover of this booklet for contact details.

Your application will be especially interesting to us if you can describe your interest in the medical applications of physics. You should be motivated by a desire to apply your training to the pursuit of improvements in the diagnosis and treatment of disease.

We would particularly like to know of any relevant work experience you may have, any project work you have undertaken, your knowledge of issues and current affairs surrounding this field, or any private reading you have done related to medical physics.

Wherever possible, we will invite you for interview and to tour the UCL campus and the two departments in which your teaching will take place. During your visit you will be able to view our facilities and meet staff and current students. If you are based overseas we will decide whether to make an offer on the basis of your UCAS application and a brief telephone interview. However, if you would like to arrange a visit, you are most welcome to contact us.

Entry requirements

A levels: AAB-BBB to include Physics and Mathematics. A pass in a further subject at **AS** level or equivalent is required for all programmes

IB Diploma: 32–36 points to include Physics and Mathematics at higher level

Other qualifications: see website (above).

UCL University Preparatory Certificates

International students of high academic ability, but whose qualifications are not equivalent to the British system, should consider applying for a UCL University Preparatory Certificate (UPC). These are high-quality one-year undergraduate foundation courses, run by UCL, which aim to help such students gain access to degree programmes at UCL and other leading British universities in

THE STUDENT VIEW

Setrak-Jean Balian

Physics with Medical Physics BSc
Final year

“ Why did I choose UCL? Well, it meant I'd be taught by researchers at the forefront of their field. I was also attracted by the diversity of the student body here. I always enjoyed physics and mathematics in school and became fascinated by challenges associated with applying physics in unusual contexts, such as medicine. The programme at UCL was just what I was looking for. I most enjoy its interdisciplinary nature as I get to spend time with students from the life sciences as well as the physical sciences. This kind of communication has become a central part of modern science. I hope to study for a PhD in medical physics or physics and pursue a career in research. ”



either the areas of mathematical and physical sciences, life sciences and engineering or the areas of humanities and social sciences, depending on the certificate selected.

These courses are not intended for students who have taken, or are taking, A levels or the International Baccalaureate Diploma.

For further details of UCL University Preparatory Certificates see www.ucl.ac.uk/upc or contact UPC Administrators, UCL Language Centre, University College London, 26 Bedford Way, London WC1H 0AP, EMAIL upc@ucl.ac.uk, TEL +44 (0)20 7679 8666, FAX +44 (0)20 7679 8667.

Your career

You will graduate with a recognised physics degree from one of the world's leading universities, so all the careers which are open to physicists will be open to you. Over half of all physicists work in research and development. This may be in academia or in industry, especially in engineering or computing. Other physicists use their numerical and analytical skills in the financial or business sectors, or in teaching.

As a medical physicist though, you will also have access to careers where you can apply your knowledge of physics to medicine. Many medical physicists in the UK are employed by the NHS in roles such as designing, developing and testing new equipment, ensuring the safety of imaging and treatment machines, planning radiotherapy treatment and advising and training medical staff. Other medical physicists work in university medical physics departments, carrying out research and teaching and there is a fast-growing industrial sector. Through exposure to research activities in project work, you may decide to continue your studies to obtain a higher level qualification such as an MSc or PhD.

For more details about teaching and research into medical physics and bioengineering at UCL, see our website, www.ucl.ac.uk/medphys

For more on medical physics in general, see:

www.ipem.ac.uk

www.teachingmedicalphysics.org.uk

www.teachingmedicalphysics.org.uk/jeffrey

And for some medical physics games, try

www.insidestory.iop.org

Disclaimer

This booklet must be read in conjunction with UCL's Undergraduate Prospectus. The information given in this booklet is correct at the time of going to press and UCL will make every effort to provide the programmes described herein. However, the booklet is published well in advance of the session to which it relates and UCL reserves the right to

withdraw any programme, and to withdraw or amend the content of any course forming part of a programme, either before or after students enrol. UCL undertakes all reasonable steps to provide educational services but does not guarantee the provision of such services. Please see the detailed Disclaimer in UCL's Undergraduate Prospectus.

Information in alternative formats

The information in this publication can also be found at www.ucl.ac.uk/prospectus on the UCL website. If you require the information in an alternative format (e.g. large print), please contact UCL Student Disability Services.

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