MRes Medical Robotics and Image Guided Intervention
Introduction

The intention of the course is to provide postgraduate students from engineering, physical or life sciences undergraduate programmes with an advanced academic and laboratory training in medical robotics and image guided intervention, with a strong emphasis on current engineering and medical research topics. The course is designed to allow you to learn new skills and explore this interdisciplinary research area in a supportive environment as well as undertake a cutting edge research project.

This one year course will provide you with the research experience required to work within the highly innovative and expanding field of medical robotics and surgical technology. It will enhance your engineering and technology knowledge/skills and you will be able to contribute to the development of less invasive and less harmful surgery. All teaching and research will take place in the brand new facilities of the Hamlyn Centre.

A one year full time Master's course

The initial three month period consists of lecture courses to provide you with an overview of the background knowledge for this field, including an introduction to surgery specialties and minimally invasive surgery, the use of robotics and imaging technologies, and the current state of computer assisted surgery. You will also gain further engineering experience by working within a small group to complete a short laboratory project interfacing various technologies into a surgical instrument.

During the eight month research project you will gain experience in the methods and ethos of engineering research, including completing a literature survey with critical review, designing the research project, planning experiments to validate the concept, troubleshooting of experimental problems, data analysis, presentation and interpretation, and preparation and presentation of work for publication (thesis). This course provides an excellent training prior to registration for a PhD or industrial engineering position.
How will the course benefit me?

By the end of the course, you will:

- have a broad general knowledge of the current technology used within clinical work;

- have applied interdisciplinary knowledge by working in collaboration with surgeons to develop new technological advances in the field of surgery;

- have experience in the methodology and principles of conducting research with application to clinical medicine and surgery; and

- have the skills required to have a successful career within industry, or an academic research position such as a PhD studentship.
How is the course structured?

Students attending the MRes MRIGI come from a range of backgrounds across the sciences and engineering, and since the field itself is also very interdisciplinary, the first term consists of five classroom modules of 16 taught hours and 8 hours of classworks each to teach the most important material. During the same period there will be a group research project that is designed to allow the acquisition of new research skills. Groups will be selected to include a range of skills and an opportunity for peer-to-peer learning will be provided. Students will also have the opportunity to create their own journal club/reading group during the first term.

The individual project will then begin with a literature review followed by the research project over a period of approximately eight months. Projects will be selected from a list of topics provided by the Hamlyn academics and others at Imperial or further afield (including industry) and students will rank these according to their preferences. These will be designed to be at the cutting edge of research in this field.
What do the taught modules cover?

**Module 1: Medical Robotics and Instrumentation**
This module will provide an introduction to the mechanical principles and design of robots. It will also provide an overview of the key technologies and techniques used in robotic surgery.

**Module 2: Minimally Invasive Surgery**
This module will provide an introductory level course in the key surgical disciplines at a level that is accessible to engineering and physical sciences students.

**Module 3: Medical Imaging**
Medical imaging is providing an increasingly important role in surgical navigation and medical robotics. The principles behind the imaging methods are relatively complex and this course will provide an overview of the different methods in common use. Most surgical imaging is carried out using light, and the use of optical technology in endoscopy will also be described.

**Module 4: Image Guided Intervention**
This module will provide an introduction to image-guided intervention. It will run in parallel to the medical imaging module and will outline the common image processing and analysis methods.

**Module 5: Human Perception and Neuroergonomics**
Understanding the interaction between the surgeon and the instrument is important for fully realising the promise of computer assisted surgical technology. The human machine interface is studied in the module, including from the human learning perspective.
Where is the course located?
The Hamlyn Centre is split across two locations, having both a hospital base and a university campus site. The Hamlyn Centre in South Kensington is located on the fourth and fifth floors of the Bessemer Building. The hospital site is at St Mary’s in Paddington and is located on the third floor of the Paterson Wing.

Most of the classroom based teaching occurs at St Mary’s. The 9 month research project takes place on a variety of locations, including at South Kensington and St Mary’s as well as other Imperial Hospital campuses, or in an industrial setting.

What career can I have with this qualification?
The MRes MRIGI from the Hamlyn Centre is designed to provide students with an advanced level of research skills that will lead to industrial or academic research and engineering careers. We expect that our students will obtain positions for further study towards PhD degrees in leading universities, or will obtain an industrial placement. In some cases this may follow on directly from the individual research project. We anticipate that this qualification will become widely recognised for students pursuing a career in these areas and the quality will be backed up by the Hamlyn Centre with its world-leading reputation for translational research quality.
More Frequently Asked Questions

When does the course begin?
The course begins on 6th October 2013 with a week-long induction and inaugural sessions, with formal lectures starting during the second week of term.

Who will be doing the teaching?
The majority of the teaching is carried out by academics from the Hamlyn Centre. Research projects may be supervised by any other academic working in a related field at Imperial College London, or with an industrial supervisor.

How will my work be assessed?
The exams are sat over three days in early January, with a brief revision period towards the end of term 1 and over the Christmas break. The research project is assessed by oral viva and a written dissertation. The marks are awarded in the ratio 25:5:70 for exams, group project and individual project respectively.

What are the course fees?
The course fees are £9,000 for UK/EU participants and £24,500 for International participants.

Are any scholarships available?
Imperial provides a range of postgraduate scholarships. For more information see: http://www3.imperial.ac.uk/registry/studentfinancialsupport/pgscholarships. There will be additional scholarships offered by the Hamlyn Centre and Institute of Global Health Innovation.

Will you provide accommodation?
Accommodation is not provided. However, Imperial College can help students looking for accommodation by following this link: http://www3.imperial.ac.uk/accommodation

My question has not been answered here – how can I find out more?
Please contact the course administrator Ruzanna Gulakyan via e-mail (r.gulakyan@imperial.ac.uk) or phone (+44 (0) 20 3312 1962), or the course director Daniel Elson via e-mail (ds.elson@imperial.ac.uk) who will either be able to answer your query or identify someone to respond to you.
Applications

What are the requirements for application?

Applicants are normally required to have achieved a 2:1 (or national equivalent) or better in their first degree in engineering or the sciences, and suitable medical candidates are also considered.

For participants where English is not their first language, they must demonstrate an International English Language Testing System (IELTS) score of 7.0 or better.

What happens if I do not meet these criteria but have extenuating circumstances/other qualifications?

The course director can utilise his discretion, following a phone interview (face-to-face if based in London) to award you a place on the course. Please contact Daniel Elson (ds.elson@imperial.ac.uk).

How do I apply?

Applications should be made online at:
https://apply.embark.com/Grad/Imperial/
During the application, select ‘Postgraduate Masters - MSc, MRes, MEd, Certificates’. When you fill in page 1 of the application form, you can search for ‘Medical Robotics’ or ‘A1H6T’ in the ‘Search Programme Code’ pop-up.
Places are limited and the course will be closed for applications when all places are filled.

What Information do I need to provide?

The application requires:
- Personal details
- Details of two referees (one from an academic background)
- A personal statement (maximum 500 words) covering your interest in the course.
- Proof of degree attainment (e.g. certificate or transcript)
Course Chairs:

Professor Guang-Zhong Yang  
Director The Hamlyn Centre  
Deputy Chairman Institute of Global Health Innovation

Professor the Lord Ara Darzi  
Head of Division of Surgery  
Co-Director The Hamlyn Centre  
Chairman Institute of Global Health Innovation  
Director of Studies  
Hamlyn Centre for Surgical Robotics  
Department of Surgery and Cancer

Course Director:

Dr Daniel Elson  
Reader in Surgical Imaging
Background to Imperial College

Imperial College is a science and medicine-based university with an excellent international reputation. Founded in 1907 from a union of the Royal School of Mines, the Royal College of Science and the City and Guilds College, Imperial College has in the last 100 years had 14 members of staff who have become Nobel Laureates. It is a global university with 13,000 students from 125 countries.

Imperial College has a formal link with Imperial Healthcare Trust, as the university and hospital have come together to become the first Academic Health Science Centre in the UK. The hospitals of Imperial Healthcare Trust have a distinguished history and it was at St Mary’s Hospital that Alexander Fleming discovered penicillin in 1928.

Background to the Hamlyn Centre for Robotic Surgery

The Hamlyn Centre was established for developing safe, effective and accessible imaging, sensing and robotics technologies that can reshape the future of healthcare for both developing and developed countries. Focusing on technological innovation but with a strong emphasis on clinical translation and direct patient benefit with a global impact, the centre is at the forefront of research in imaging, sensing and robotics for addressing global health challenges associated with demographic, environmental, social and economic changes.

In addition to its core research activities, the Centre offers comprehensive PhD and MRes programmes for researchers with a strong technical or clinical background. These programmes are designed to develop cutting edge, disruptive technologies and blue-sky ideas; yet will be appropriate and accessible to both developing and developed countries for addressing different needs of the healthcare challenges with a common ground for technological innovations. Through its endowment fund and close working relationship with industry, government and non-government organisations, the Centre also offers Advanced Fellowships, International Fellowships, Exchange Programmes, and Research Secondment for specific research projects and technical areas.

The Centre plays an active role in international collaboration and outreach activities, as well as in the training of surgeons and engineers in robotic technologies, thereby facilitating a fully integrated clinical approach. http://www3.imperial.ac.uk/roboticsurgery

Establishing this new Centre has been made possible through generous philanthropic support from both the Helen Hamlyn Trust and Lady Hamlyn personally. This has initiated a major funding campaign to raise a dedicated endowment fund, providing long-term support to the interdisciplinary research team and core research programmes.