U.S. industry leads the world in medical device innovation and production. From imaging instrumentation, monitoring devices, and surgical instruments to stents, implants and ventilators, the next generation of medical devices will build on recent advances in bioengineering, biomaterials, genomics, computing and telecommunications.

The UC San Diego Master of Advanced Study in Medical Device Engineering is a unique interdisciplinary program providing specialized courses in clinical needs assessment and the option of designing and prototyping a medical device or instrument. This is in conjunction with specialized education in mechanics and transport, anatomy and physiology, modern life science technologies, biomaterials, wireless embedded controls, and computer aided design. Students are also introduced to the specific business issues surrounding this industry, including product launching, regulatory and payment issues, and standards and compliance.

The program includes seminars in healthcare economics, biomedical informatics, project management and leadership skills. FDA design control guidance is integrated throughout the curriculum. In addition, students may work individually with faculty to pursue specific educational objectives.

The Medical Device Engineering program is designed to provide a high-quality and focused educational experience for professional engineers who plan to become technical leaders in the field of biomedical instrumentation and devices.

**Vision**

- Learn about the business of medical device design and engineering, including regulatory issues, standards, project management and business development.
- Apply new skills and knowledge to complete the design of diagnostic and therapeutic devices and plan for bringing them to market.
- Courses taught by UC San Diego’s expert faculty, many of whom have practical experience in developing and commercializing successful medical devices.
- Earn a master’s degree in two years. Courses conveniently offered Friday/Saturday.

**Gain a Deep and Broad Education in Biology, Mechanical Design and Materials Focused on Medical Device Engineering.**

Program taught by UC San Diego faculty, who are leading experts in medical devices, clinical needs, control engineering, bioengineering, biology, biomaterials, and physiology.
The Master of Advanced Study (MAS) program in Medical Device Engineering is designed for engineering professionals working in the biotechnology industry, particularly in the areas of medical devices and medical instrumentation. The program is designed for early and mid-career design engineers who are on a technical leadership track within their companies or who are interested in learning the business development and regulatory issues associated with the design of novel devices and instrumentation.

Who Should Apply

The Master of Advanced Study (MAS) program in Medical Device Engineering is designed for engineering professionals working in the biotechnology industry, particularly in the areas of medical devices and medical instrumentation. The program is designed for early and mid-career design engineers who are on a technical leadership track within their companies or who are interested in learning the business development and regulatory issues associated with the design of novel devices and instrumentation.

How to Apply

Visit http://maseng.ucsd.edu/mde for complete application procedures.

Faculty Directors

Juan C. Lasheras
Professor of Mechanical and Aerospace Engineering and Bioengineering
Director, Center for Medical Devices and Instrumentation

John Watson
Professor of Bioengineering
Director, Whitaker Center for Biomedical Engineering

Coursework

The MAS in Medical Device Engineering is a 36-unit degree to be taken over two years in consecutive fall, winter and spring quarters (1-2 courses per quarter). The curriculum consists of eight required courses and a three-quarter capstone project course sequence.

Fall Quarter-Year One

Medical Devices: Clinical Perspectives
This is an exploratory course to experience clinical facilities, view procedures, and learn user requirements from clinicians and surgeons. Students will identify patient needs for medical devices, instrumentation, and diagnostic systems. FDA design control guidance will be integrated throughout the curriculum.

Winter Quarter-Year One

Fundamentals of Physiology and Anatomy
Following a brief survey of modern physiology and anatomy, students will perform integrative physiology case studies related to medical implants, combination products and diagnostic systems.

Mechanics and Transport Processes for Biomedical Device Design
Introduction to the basic definitions of Continuum Mechanics and their mathematical formulation at the graduate level with applications to problems in medicine and biology.

Spring Quarter-Year One

Computer Aided Design of Medical Devices
Computer Aided Analysis and Design with applications to medical devices. Solid model representation, finite element analysis for strength and deformation, material selection, kinematics, statistical analysis, and visualization of analytical results. Software packages used will include 3D CAD, FEA solvers, and student generated code. Analytical methods will be applied to case studies of medical devices.

Life Sciences and Technologies
Human genomic and systems biology approaches for designing and validating medical device safety and performance will be examined. Implant sensor and wireless data communication design will be introduced.

Fall Quarter-Year Two

Design and Implementation of Medical Device Technology I
Introduction of project-based course in medical device engineering, medical product regulation, quality systems and standards, engineering project management, and business development.

Biomaterials: Nano to Macroscale
This class will cover biomaterials and biomimetic materials. Metal, ceramic and polymer biomaterials will be discussed. Emphasis will be on the structure-property relationships, biocompatibility/degradation issues and tissue/material interactions. Synthesis and mechanical testing of biomimetic materials will also be discussed.

Winter Quarter-Year Two

Design and Implementation of Medical Device Technology II
Second of a 3-quarter sequence, project-based course in medical device engineering, medical product regulation, quality systems and standards, engineering project management, and business development. Students will begin to design a medical device and an engineering strategy.

Embedded System Design
This course gives an introduction to Digital Signal Processing (DSP) techniques and Data-Based Parameter Estimation (DBPE) techniques for the measurement, filtering and analysis of experimental data obtained with embedded systems in medical devices.

Spring Quarter-Year Two

Design and Implementation of Medical Device Technology III
Third of a 3-quarter sequence, project-based course in medical device engineering, medical product regulation, quality systems and standards, engineering project management, and business development. Students will complete and implement their medical device design and engineering strategy.

Biobusiness: Small to Large
In this course you will study and analyze start-up proposals, the genesis of the biotech industry, biotech categories and growth strategies, the process of spinning out viable product concepts from academia, financing techniques, business development, acquisition/IPO valuation methods, and potentially disruptive technologies. Exercises, team presentations and case studies.

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