

Principles of Medical Device Design

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Target Group: Postgraduate researchers in science, medicine and healthcare with specific interest in tissue engineering and biomaterials concepts, and the development of medical devices.

Indicative Module Description: This course integrates the principles and methods of engineering and life sciences towards the fundamental understanding of structure-function relationships in normal and pathological mammalian tissues. The course gives an introduction to how devices are designed. Concepts of design of biomaterials systems for the intended applications with the evolving paradigm of biocompatibility will be elucidated. Guiding biomechanical principles required for these designs will also be covered. Students will also be exposed to future strategies involving nanotechnology and regenerative medicine concepts. The translation process of how devices are tested and transformed into market will be discussed. Students will learn the process of assessment of clinical need/market, select the optimal treatment strategy and decide on the particular design factors of a medical device which need to be considered for a particular application.

Sessions:

- 1) Introduction to Medical Devices
- 2) Medical Device Industry in Ireland
- 3) A Biomaterials Design Perspective
- 4) A Biomechanical Design Perspective
- 5) Design of an Orthopaedic Implant
- 6) Concepts of Biocompatibility

Selected Topics- Frontiers in Medical Devices

- 7) Regenerative Medicine
- 8) Neural Device Interface
- 9) Design by Self Assembly
- 10) Prototype Development, Scale up and GMP Manufacturing
- 11) Translation of a Medical Device Prototype

Indicative Learning Outcomes:

On successful completion of this course students should

- 1) Have an understanding of the multi- and inter-disciplinary nature of the medical device field
- 2) Understand the concepts of biocompatibility.
- 3) Understand the processes involved in biomaterials and biomechanics principles in designing medical devices.
- 4) Be able to have an insight in the medical device industry in Ireland.