Module Descriptor MEP55BM9

Module Code	MEP55BM9
Module Name	Active Implanted Medical Devices and Systems
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Assistant Professor Alejandro Lopez Valdes
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Describe the concepts involved in implanted devices and systems. LO2. Interact with clinical experts and individuals living with active implanted devices. LO3. Describe and evaluate outcome measures for chronically implanted systems. LO4. Identify, formulate and adapt engineering solutions to unmet biological needs. LO5. Propose research ideas for the development or improvement of active implanted devices and systems. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced
Module Content	The objective of this module is to provide a quantitative background to active implanted neural systems. Focus will also be placed on the neuromodulation effects of electrical stimulation and on the goals of real time, closed loop control of implanted system. The module will be based around a substantial individual assignment (grant proposal) and lectures based on state-of-the-art publications. Topics to cover (Order subject to change): 1) Action Potentials Stimulation and Recording 2) Principles of Electrical Stimulation 3) Microelectrodes for neural interfaces 4) Engineering considerations for Active Implantable Devices 5) Regulatory affairs for Active Implantable Devices 6) Hearing and Vestibular Implants 7) Implantable Systems for Vision Restoration 8) Brain Computer Interfaces 9) Implantable Devices for Pain Management 10) Deep Brain Stimulation 11) Vagus Nerve Stimulation 12) Current topics in Active Implantable Devices 13) Clinical and Patient Perspectives of Active Implantable Devices

[1] TEP Glossary

Teaching and Learning Methods

The module will be based on the combination of podium lectures, group discussion, flipped classroom, patient testimonials, and problem-based learning assignments. In the event of a COVID-19 lockdown, the teaching methods for this module may have to be revised. Your module coordinator will keep you updated.

Assessment Details[2]

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Individual/Group Assignments	Problem Based Learning presentations and report related to Active Implantable Devices.	LO1-LO5	50	23,26,29,31
Final Exam	Final Exam	LO1, LO3, LO4	50	Assessment Period S2
Attendance	Students may be deemed non-satisfactory and penalized on their final mark or not eligible to sit the exam if they attend less than 80% of lectures (except for in case of valid medical note).			

Reassessment Requirements

Reassessment will consist of an assignment worth 100% of the module.

Contact Hours and Indicative Student Workload[2]

Contact hours: 33.
Independent Study (preparation for course and review of materials): 50 hours: Reading Blackboard material, reviewing lecture material and class notes.
Independent Study (preparation for assessment, incl. completion of assessment): 42 hours: Searching, locating, retrieving, analysing, synthesising, discussing research literature. Writing of the assignment reports. Preparation of presentations and videos.

Recommended Reading List

- Prostheses for the brain : introduction to neuroprosthetics / Andrej Kral, Felix Aplin, Hannes Maier. (2021)
- Implantable electronic medical devices / Dennis Fitzpatrick. (2014)
- Implantable medical devices and healthcare affordability : exposing the spiderweb (2023)
- Implantable sensor systems for medical applications (2013)
- Implantable medical electronics : prosthetics, drug delivery, and health monitoring (2016)
- Circuit design considerations for implantable devices (2022)
- Wearable and implantable medical devices : applications and challenges (2019)

[2] TEP Guidelines on Workload and Assessment

	• Complementary Reading Material and News Reports available in the Module Website
Module Pre-requisite	EEU33BM1 Anatomy and Physiology, PG7901 Form and Function of Nervous System and EEU44C05 Digital Signal Processing, Processing; **or** equivalent knowledge plus supplementary reading as advised by module coordinator.
Module Co-requisite	
Module Website	Blackboard
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	Guest lectures from School of Medicine and School of Psychology
Module Approval Date	
Approved by	
Academic Start Year	September 2026
Academic Year of Date	2026-27