Module descriptor for 5BIO7: Advanced medical imaging

Module code	ME5BIO7
Module name	Advanced Medical Imaging
ECTS weighting	5 ECTS
Semester taught	Semester 2
Module coordinator/s	Assistant Professor Brooke Tornifoglio
Module learning outcomes (LO) with reference to the graduate attributes and how they are developed in discipline	On successful completion of this module, students should have: LO1: have a theoretical understanding of the fundamental physical and mathematical principles underlying major modern medical imaging technologies (both in research and clinical settings). LO2: perceive the pre-requisites of imaging modalities and any safety considerations. LO3: form the ability to identify, formulate, and adapt medical imaging solutions to unmet biological and medical needs. LO4: appreciate the qualitative and quantitative information obtainable from different modalities and how to extract it. LO5: an awareness of current "state of the art", emerging technologies and advances in the biomedical imaging field. LO6: an understanding of the application of medical imaging in the quality control of medical devices, implants and grafts. LO7: the ability to critically assess imaging techniques in terms of instrumentation, function, safety, state of the art, use, and applications. LO8: the capability of working on multidisciplinary teams from idea generation and researching to effective communication. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced

Module content	This objective of this module is to equip students with an understanding of engineering approaches to advanced biomedical imaging. A strong focus is placed on understanding the physical processes that occur between a particular imaging modality and the biological material being investigated. This module introduces the physical concepts of advanced medical imaging via lectures focused on specific imaging modalities. Lectures will cover various imaging techniques to provide an advanced understanding of the physics of the signal and its interaction with biological tissue; image formation or reconstruction; modality-specific issues for image quality; clinical applications; and biological effects and safety. State-of-the-art emerging imaging modalities in research will be studied in detail and engineering approaches to advance such techniques to the clinic.
Teaching and learning methods	The module is taught using a combination of lectures, laboratories, flipped classroom and assignments. At the end of each lecture students will be expected to undertake self-directed further reading and research. A laboratory demonstration will give students hands-on experience using various imaging modalities.
Assessment details	**Written examination**: • Weighting: 40% of total grade • What: Realtime in person exam • When: Timetabled at end of sem. 2 • Why: LOs 1, 2, 4, 5, 6, 7 **Image analysis reports (qty: 2)**: • Weighting: 30% of total grade (15% each) • What: Analysis, interpretation, and presentation of imaging data • When: Due weeks 4 and 9 • Why: LOs 1, 3, 6 **Group assignment**: • Weighting: 30% of total grade • What: Technology lecture • When: towards end of semester • Why: LOs 5, 7, 8 Attendance is mandatory and will be taken every class. Your attendance will contribute to an individual component of your group assignment grae. Students may be deemed non-satisfactory and not eligible to sit the exam is they attend less than 80% of lectures (except for in case of valid medical note).
Reassment requirements	In the event of reassessment, candidates must repeat the annual examination for which 100% of the module mark will be dependent.

Indicative student workload	**Contact hours**: 33 lecture hours **Independent study**: 40 hours (preparation and review of materials). **Independent study**: 45 hours (preparation and completion of assessments).
Recommended reading list	A wide range of introductory and advanced reading materials will be provided via blackboard.
Module pre-requisite	None
Module co-requisite	None
Module website	Recommend to visit TCD TCBE individual PI research group websites to see what is happening here regarding imaging.
Other schools/departments involved in delivery of this module?	N/A
Module approval date	2025
Approved by	Brooke Tornifoglio
Academic start year	2025
Academic year of date	2025/2026