

## Module descriptor for 5BIO7: Advanced medical imaging

<b>Module code</b>	ME5BIO7
<b>Module name</b>	Advanced Medical Imaging
<b>ECTS weighting</b>	5 ECTS
<b>Semester taught</b>	Semester 2
<b>Module coordinator/s</b>	Assistant Professor Brooke Tornifoglio
<b>Module learning outcomes (LO) with reference to the graduate attributes and how they are developed in discipline</b>	<p>On successful completion of this module, students should have:</p> <p>LO1: a theoretical understanding of the fundamental physical and mathematical principles underlying major modern medical imaging technologies in both research and clinical settings.</p> <p>LO2: an appreciation of the pre-requisites of imaging modalities and any safety considerations.</p> <p>LO3: the ability to extract, through comprehensive analysis of the literature, information pertinent to the design of an imaging solution to an unfamiliar problem.</p> <p>LO4: an understanding of how the structure and composition of tissues/cells influence and guide the application of imaging modalities.</p> <p>LO5: an awareness of current “state of the art”, emerging technologies and advances in the biomedical imaging field.</p> <p>LO6: an understanding of the application of medical imaging in the quality control of medical devices, implants and grafts.</p> <p>LO7: an ability to identify, formulate and adapt advance medical imaging solutions to unmet biological needs.</p> <p>LO8: the ability to function on multidisciplinary teams and present information, ideas and findings.</p> <p><b>Graduate Attributes: levels of attainment</b></p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Enhanced</p>

<b>Module content</b>	<p>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.</p>
<b>Teaching and learning methods</b>	<p>The module is taught using a combination of lectures, laboratories, flipped classroom and assignments. At the end of each lecture students will receive more specific learning outcomes for the lecture and be expected to undertake self-directed further reading and research.</p>
<b>Assessment details</b>	<p><b>Written examination:</b></p> <ul style="list-style-type: none"> <li>• Weighting: 40% of total grade</li> <li>• What: Realtime in person exam</li> <li>• When: Timetabled at end of sem. 2</li> <li>• Why: LOs 1, 2, 4, 5, 6, 7</li> </ul> <p><b>Image analysis reports (qty: 2):</b></p> <ul style="list-style-type: none"> <li>• Weighting: 30% of total grade (15% each)</li> <li>• What: Analysis, interpretation, and presentation of imaging data</li> <li>• When: Due weeks 4 and 9</li> <li>• Why: LOs 1, 3, 6</li> </ul> <p><b>Group assignment:</b></p> <ul style="list-style-type: none"> <li>• Weighting: 30% of total grade (15% each)</li> <li>• What: Technology lecture and exam question development</li> <li>• When:</li> <li>• Why: LOs 5, 7, 8</li> </ul> <p>Attendance is mandatory. Students may be deemed non-satisfactory and not eligible to sit the exam if they attend less than 80% of lectures (except for in case of valid medical note).</p>
<b>Reassessment requirements</b>	<p>In the event of reassessment, candidates must repeat the annual examination for which 100% of the module mark will be dependent.</p>

<b>Indicative student workload</b>	<b>Contact hours:</b> 33 lecture hours <b>Independent study:</b> 40 hours (preparation and review of materials). <b>Independent study:</b> 45 hours (preparation and completion of assessments).
<b>Recommended reading list</b>	A wide range of introductory and advanced reading materials will be provided via blackboard.
<b>Module pre-requisite</b>	None
<b>Module co-requisite</b>	None
<b>Module website</b>	<a href="https://www.tcd.ie/biomedicalengineering/msc/currentstudents/">https://www.tcd.ie/biomedicalengineering/msc/currentstudents/</a> ; recommended to visit TCD TCBE research group websites to see what is happening here regarding imaging.
<b>Other schools/departments involved in delivery of this module?</b>	N/A
<b>Module approval date</b>	2024
<b>Approved by</b>	Brooke Tornifoglio
<b>Academic start year</b>	2024
<b>Academic year of date</b>	2024/2025