Module Code	**MEU44B12**
Module Name	**Introduction to Autonomous Mobile Robotics**
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Prof. Conor McGinn (c.mcginn@tcd.ie)
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: 1. Explain the basic operating principles of the major sensors and actuators used on modern robots. 2. Understand and implement (in software) commonly used algorithms used by robots to make sense of their surroundings. 3. Design research experiments involving autonomous robots. 4. Demonstrate basic proficiency developing software applications for robots using the Robotic Operating System (ROS). 5. Gain appreciation of important ethical issues surrounding the development of robotics technology, and how to best mitigate these risks. 6. Gain an understanding of some of the fields biggest research challenges, and the leading approaches being pursued to address them. **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Introduced
● **Module Content**	This module presents a practical and theoretical introduction to modern autonomous mobile robot systems. It's designed to give students a broad introduction to the field spanning topics including hardware, software, AI and machine learning and human-robot interactio and robot ethics. Students taking the module will gain theoretical understanding of the technology and methods underlying a robot's ability to sense and act in its environment. Through a series of labs and assignments, students will gain proficiency developing applications for robots in both simulation and real-world settings The module will comprise the following key components:

- Introduction to mobile robots – sensors, actuators and control paradigms.
- Fundamental theory for autonomous mobile robots (kinematics, localisation, mapping and path planning).
- Scientific methods for evaluating robot performance
- Introduction to field of human-robot interaction
- Robots-in-the-wild: Case studies of real-world robots and their ethical implications

Teaching and Learning Methods

The module is taught using a combination of lectures (may be video recorded), in-person tutorials, and structured labs where students gain practical experience programming real robot systems.

Assessment Component	Assessment Description	LO Addressed	% Total
Labs	Report based on physical lab.	1,2	10%
Case study	Report based on real-world robot case study.	3,5,6	20%
Indiv. Project	Individual project due w12.	1-4	50%
Mid-term	Exam in week 8.	1-2	30%

Reassessment Requirements

Reassessment will involve the completion of simulation-based individual project and accompanying technical report.

Contact Hours

Contact Hours
- 33hrs split between lectures, tutorials, drop-in clinics
- 5hrs labs

Independent Study (preparation for course and review of materials):
- 11 hrs

Independent Study (preparation for assessment, incl. completion of assessment):
- 50 hrs

Recommended Reading List

- Programming Robots with ROS (O'Reilly Press)
- ROS Documentation: https:www.wiki.ros.org/ROS/Tutorials
- Introduction to Autonomous Mobile Robots (MIT Press)