3MEMS3 Manufacturing Engineering Design II [10 credits]

Lecturer(s): Assistant Prof. Daniel Trimble (dtrimble@tcd.ie), Assistant Prof. Conor Mc Ginn (mcginnc@tcd.ie) Assistant Prof. Garret O’Donnell (odonnege@tcd.ie)

Module organisation

Semester 1 & 2

<table>
<thead>
<tr>
<th>Start Week</th>
<th>End Week</th>
<th>Lectures per week</th>
<th>Lectures total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>3</td>
<td>66</td>
</tr>
</tbody>
</table>

Module description, aims and contribution to programme

AIM/OBJECTIVES
Building upon previously skills and knowledge developed in Manufacturing Engineering Design I (2MEMS10), students will progress from the design and manufacture of static systems/assemblies to mechanical systems. This module presents an integrated approach to mechanical system design. In addition to developing fundamental skills in mechanical design, students will also design systems that can incorporate the state-of-the-art in electronics and digital technology. The core element of the module focuses on a group based project. Students are tasked with the design and manufacture of a miniature wind turbine. Each group will be responsible for the design, part-sourcing and manufacture of their wind turbine. Some parts will be standard components, some will be machined in-house and others will be printed in 3D.

SYLLABUS

- Communication skills
- Actuators and Sensors
- Microcontrollers and GUI (graphical user interface)
- Standard components (Bearings, shafts, springs, gears, fasteners)
- Introduction to geometrical dimensioning and tolerancing
- Introduction to finite element analysis
- International standards
- Additive manufacturing – 3D printing
- Wind turbine project
Learning outcomes

On successful completion of this module, students will (be able to):

**Project:**

1. Understand the operating principles of a range of sensing and actuation technology
2. Develop graphical user interfaces (GUI)
3. Automate tasks using microcontrollers
4. Communicate a design to an audience
5. Design systems using standard components
6. Spec standard components such as bearings, gears, springs, fasteners and shafts
7. Create a manufacturing drawing with geometrical tolerances
8. Design and manufacture components using 3D printing
9. Design basic finite element simulation to make informed design decisions
10. Use documents on international standards to make informed design decisions
11. Design a fully functional miniature wind turbine to meet well-defined specification

Teaching Strategies

The module is taught using a combination of lectures, laboratory demonstration and through project sessions at which teaching team members and teaching assistants interact with the project teams. The groups are also expected to undertake independent research and development work, with appropriate guidance and feedback, on the project.

Assessment

Continuous Assessment (100%).

NB: As this course is 100% continuous assessment and involves substantial groupwork, supplemental examination will not be possible.

Prerequisites
2MEMS10

Required textbook

- No prescribed texts – class notes and instruction should suffice.
- The following texts may provide useful additional information: