2MEMS3 Manufacturing Engineering Design I [5 credits]

Lecturer(s): Associate Professor David Hoey (dahoey@tcd.ie)

Module organisation

SEMESTER: 2	LECTURE/WEEK: 3	TUTORIALS/WEEK: 1
DURATION (WEEKS): 12	TOTAL: 33	TOTAL: 11

Module description, aims and contribution to programme

Although now in their second year, students taking this module have no previous knowledge or experience of engineering a designed artefact. The objective is thus to introduce them to the thought processes of engineering design. The desire is to have students who have experienced the design cycle in terms of, abstraction from a specification, conceptual design & ranking methods and embodiment design. The design process followed is a systematic one (VDI 2221) and the course concentrates on artefacts which have a low component count. There is, at this stage, no specific emphasis on regulatory issues although the importance of ethical considerations is discussed.

Learning outcomes

Design Module

On successful completion of this module, students will be able to understand and use techniques for:

	Fulfillment of Criteria
1. Group based thought generation processes and exercise	***b(i) : c(ii, iii)***
2. Group based oral/visual presentations	***g(i,ii, v)***
3. Specification processes	***a(iii)***
4. Conceptual design processes	***b(i), c(i, ii, iii, iv*): d(i, iii,iv)****
5. Embodiment design	***c(i, iii) : b(ii, vi)***
6. Costing	***c(i)***
7. Communication of their thoughts for devices &/or manufacturing requirements.	***e(i, iv) : f(iv, vii, viii)****

Module content

Engineering Design.

- Developing and clarifying the specification
- Abstracting from the specification
- Group thought development processes – Brainstorming – method 365
- The conceptual Design phase and thinking conceptually
- Developing the Overall Function and a Function Structure
- Developing and ranking Concept Variants.
- Embodiment Design techniques and their application to a chosen Concept Variant
- Introduction to Anthropometrics & Ergonomics

Teaching Strategies

In the design module lectures are punctuated by short exercises, peer-to-peer discussion and generalized question-and-answer sessions on current topics. The drive is always to foster that aspect of thought – *divergent thinking* - which is so essential to the design engineer and so different from the *convergent* thinking processes used for engineering science problems. Although the design portfolio is individual, group methods (brainstorming etc) are encouraged in the early phases of design work.

Assessment

The module marks are derived solely from continuous assessment.
The design module has various within-class exercises which are graded as is a portfolio for a major exercise in engineering design. There are a number of team assignments for which the students give an oral/visual presentation, these too are graded.

Required textbook

- Full notes are given to the students. No text book is essential.
- Students are encouraged to explore the range of texts available in the College library. Recourse to some of these books is essential for their assignments.

OTHER RELEVANT TEXT(S)

***Conceptual design for engineers*.** M French. Springer, 3rd Edition, 1999. ISBN 1852330279 TCD Shelf Mark. HL-217-239

Invention by design: how engineers get from thought to thing, Petroski H. Cambridge, Mass., London, Harvard University Press, 1996. ISBN 0674463676. TCD Shelf Mark. 201-230