4MEMS2 ADVANCED MANUFACTURING – [5 credits]

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Semester: 2

Prerequisite Module: 4B5

Module Organisation

The module runs for 12 weeks of the academic year and comprises three lectures and one tutorial per week (except the study week). Total contact time is 44 hours.

Start Week	End Week	Lectures per week	Lectures total	Tutorials per week	Tutorials total
1	12	3	33	1	11

Module Description

The objective of the module is to provide the students with knowledge of various selected advanced manufacturing topics for state of the art manufacturing industry. The topics are presented from a fundamental scientific perspective, and further developed to consider systems level and integration with other process within the manufacturing enterprise. State of the art manufacturing processes are considered and research led examples are used to inform the teaching.

Learning Outcomes

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

1. List and describe the various types of high end manufacturing processes and calculate appropriate process parameters.

2. Develop and present a conceptual design solution to a manufacturing automation problem.

3. Select appropriate monitoring solutions for specific manufacturing process cases.

4. Develop a process monitoring algorithm using Matlab for a selected manufacturing monitoring application.

5. Demonstrate awareness of the energy consumption in manufacturing processes such as compressed air systems and polymer processing. Demonstrate knowledge of emerging standards.

6. Explain the aspects of laser processing, develop a case for selecting particular laser solution, and discuss the merits of alternative solutions.

7. Undertake critical review of research papers related to the fields of manufacturing engineering.

Module Content

- Additive manufacture
- Rapid Tooling – ACES, Keltool, Quickcast and DSPC
  Monitoring and process supervision
- Polymer processing
- Automation in manufacturing
- Digital Manufacturing
- Laser technology in manufacturing*
- Principles of semiconductor materials IC manufacture*
  Quality and measurement
- Efficient manufacturing
- Coating processes*

Module Notes

Web pages-blackboard-webCT
Selected research papers
Handouts from guest lecturers

Teaching Strategies

This module is typically a small group environment with approx 20 to 40 people participating. Hence the class forms the basis for discussion on topics, as well as more formal podium style lectures. Examples related in the class are often research led through discussion on leading research projects. Visiting lectures range from industry to visiting researchers.

Assessment Modes

Written Exam (85%), Assignment or Lab (15%)

Recommended Texts

- Kalpakjian & Schmid (2006) Manufacturing Engineering & Technology, Pearson
- Groover (2007), Automation, production systems and computer integrated manufacturing, Pearson.

Other Relevant Texts

Tlusty, 1999, Manufacturing Processes And Equipment, Prentice Hall, Journal and Conference papers

Laboratory

Technology demonstrations