MICRO-301 **Manufacturing technologies**

Bellouard Yves, Subramanian Vivek

Cursus	Sem.	Type
Microtechnics	BA6	Obl.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	1 weekly
Project	1 weekly
Number of positions	

Summary

This course gives an introduction to production methods and manufacturing technologies used in microengineering. The focus is given on the understanding of physical phenomena underlying the processes, the relation between materials, manufacturing processes and design, as well as economical aspects.

Content

The course is orgnised around lectures and a project related to reverse engineering.

The lectures are organized as follows:

1. Introduction - Material selection
2. Surfaces
3. Laser processing (2 lectures)
4. Metal forming, casting and molding
5. Conventional machining
6. Unconventional machining processes
7. Polymers and related processing
8. Introduction to additive manufacturing methods
9. Assembly processes
10. Electronics and mutiscale integration / Packaging
11. Manufacturing economics and process monitoring
12. Introduction to sustainable manufacturing

For the reverse engineering, students in team of three propose a product they would like investigate.
For the chosen product, through disassembly and observations, they identify the manufacturing processes that were used to manufacture it, analyze the technical choices that were made, and discuss possible variants as well as related sustainability aspects.

Keywords

Manufacturing, physics of manufacturing processes, process quality, process economics, reverse engineering.

Learning Outcomes

By the end of the course, the student must be able to:

- Formalize requirements for a manufacturing process considering a given design
- Analyze a given manufacturing process
- Optimize the choice of material for a manufacturing problem
- Analyze economical aspects for manufacturing

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Communicate effectively, being understood, including across different languages and cultures.
- Keep appropriate documentation for group meetings.
- Demonstrate the capacity for critical thinking

Teaching methods

Note that the teaching is given in French (with the exception of two lectures), but lectures notes are in English, as a preparation to the upcoming master phase.

- Teaching is done through lectures, exercices in class and through dicussion during the reverse engineering project.

Expected student activities

- Individual student do exercises once every two-weeks, for which they see the solution the week after.
- Once every two-weeks, alternating with the exercise sessions, students work in team on their reverse engineering topic. They are expected to write a report on their reverse engineering analysis at the end of the semester.
- Students have the possibility (option) to follow in parallel an 'Engineering English' training. (This companion course is assessed separately.)

Assessment methods

- Six short quizzes during the semester (evaluation is the average of the four best quizzes results) (10% of the grade)
- Written exam at the end of the course (40% of the grade)
- Reverse engineering project (50% of the final grade / break-down: report 40%, video presentation 10%)

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	Yes
Others	• Moodle • Discussion with the professors during the reverse engineering study

Resources

Bibliography

- M. Ashby, Materials selection in Mechanical Design, 4th edition, Elsevier
- M.C. Shaw, P.K. Wright, S. Kalpakjian, Manufacturing Engineering & Technology, Pearson

Ressources en bibliothèque

- Find the references at the Library

Moodle Link

- https://go.epfl.ch/MICRO-301