Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

# Syllabus
# Course description

| | |
|---|---|
| **Course title** | Manufacturing Technology |
| **Course code** | 42154 |
| **Scientific sector** | Ing-Ind/16 Manufacturing Technologies and Systems |
| **Degree** | Bachelor in Industrial and Mechanical Engineering L-9 |
| **Semester** | I |
| **Year** | III |
| **Academic year** | 2019/20 |
| **Credits** | 8 |
| **Modular** | No |

| | |
|---|---|
| **Total lecturing hours** | 50 |
| **Total lab hours** | - |
| **Total exercise hours** | 30 |
| **Attendance** | |
| **Prerequisites** | Students should be familiar with the basic knowledges of solid mechanics and mathematical analysis. |
| **Course page** | |

| | |
|---|---|
| **Specific educational objectives** | The aim of the course is to provide an overview of the main manufacturing processes in industrial engineering, including the relationships among the properties of metallic materials, manufacturing processes, and design of mechanical products.<br>The fundamental principles of manufacturing processes are discussed, also with the intent of providing some concepts about the relationships between these processes and product requirements, in terms of performance and cost.<br>The main issues concerning bulk and sheet metalworking, metal machining, metal casting, welding, as well as additive manufacturing are discussed in this course.<br>Moreover, a comparative analysis between traditional and unconventional manufacturing processes will also be addressed.<br>During the course, the students will acquire the main theoretical knowledges, related to both scientific and technological aspects, relevant to the manufacturing industrial activities.<br>Practical examples will allow students to reflect on the main features of a production process and its limitations. |

| | |
|---|---|
| **Professor** | Prof. Mura Andrea<br>Andrea.Mura@unibz.it |

| | |
|---|---|
| | Dr. Catalano Angioletta Rita<br>AngiolettaRita.Catalano@unibz.it |
| **Scientific disciplinary sector** | |
| **Course language** | English |
| **Office hours** | |
| **Topics** | The course covers the following topics:<br>1. Introduction to manufacturing engineering;<br>2. Structure and mechanical behavior of metals;<br>3. Metal forging processes;<br>4. Metal rolling processes;<br>5. Metal extrusion and drawing processes;<br>6. Sheet metal forming processes;<br>7. Machining and tool wear mechanisms;<br>8. Advanced machining processes;<br>9. Fundamentals of metal casting processes;<br>10. Fusion and solid state welding processes;<br>11. Fundamentals of additive manufacturing. |
| **Teaching format and organization** | The course is based on hours of frontal lectures and hours dedicated to classroom and laboratory activities, as well as on visits to manufacturing companies and/or exhibitions.<br>The topics of the course are reported in the lecture notes provided by the professor, as well as in the textbooks listed in the bibliography. After each lecture, the pdf presentation of the lecture will be uploaded in the Reserve Collection database or, alternatively, send to students by mail.<br>Beyond the lecture notes, the professor may also provide supplementary readings concerning the course topics (e.g., research papers).<br>The professor can be also contacted by the students to ask questions and/or have clarifications about the course topics. |

| | |
|---|---|
| **Learning outcomes** | **Intended Learning Outcomes (ILO)**<br><br><u>Knowledge and understanding.</u><br>1. To know and understand the main mechanical components and their functions;<br>2. to acquire a knowledge and understanding about the main important manufacturing processes in mechanical industry;<br>3. to know and understand the relationships between materials, manufacturing processes and product requirements;<br>4. to identify advantages and limitations of the main industrial manufacturing processes;<br>5. to realize the potentiality of unconventional processes in respect with traditional processes in the industrial |

production;

Applying knowledge and understanding.
6. Operational capacity to solve problems of medium complexity in the main fields of mechanical engineering;
7. to be able to evaluate which manufacturing process is more suitable to ensure proper product requirements.

Making judgements.
8) To able to critically identify and select the information necessary for a proper selection and planning of a manufacturing process;
9) to examine objectively the results obtained from analytical processing, numerical simulations or experimental laboratory tests;
10) to develop a predisposition to solving problems of medium complexity related to manufacturing technologies;
11) to make use of technical and scientific literature.

Communication skills.
12) Ability to structure and prepare scientific and technical documentations inherent to the main manufacturing processes used in the mechanical industry;
13) ability to present, communicate, discuss and argue the topics covered in the course.

Ability to learn.
14) The student will develop learning skills through the individual study of the topics dealt in the lecture and exercise hours. In addition, the analysis of different problems of manufacturing processes may also be addressed by group discussions;
15) the student will have the opportunity to extent the knowledge of the manufacturing processes by consulting scientific literature, specialized texts, technical standards and international standards that the professor may provide during the course.

**Assessment**

**Formative assessment**

The exercises in the classroom and in the laboratory, as well as discussions with the professor during the lectures would allow to assess and evaluate the students ability to apply their knowledge and understanding of the topics covered during the course.

| **Form** | **Length /duration** | **ILOs assessed** |
|---|---|---|
| Discussions | Throughout the course | 2, 11, 13, |

| | |
|---|---|
| | <table><tr><td>with the professor</td><td></td><td>14, 15</td></tr><tr><td>Class exercises</td><td>14 exercises lectures (2 hours each)</td><td>1, 3, 6, 9, 10, 12, 14</td></tr><tr><td>Laboratory exercises</td><td>1 laboratory exercise (2 hours)</td><td>1</td></tr></table><br><br>**Summative assessment**<br><br>The whole exam consists of two parts, a written and an oral exam. A sufficient mark in the written exam is a mandatory pre-requisite to take the oral exam; otherwise, the whole exam is not passed.<br><br>The written exam consists of 2 or 3 exercises inherent to the topics addressed in the exercise lectures. If the student gets a sufficient mark in the written exam, he can access (in the same day) the final oral exam.<br><br>The oral exam consists in theory questions about all the topics covered in the course (both during the frontal and exercise lectures).<br><br>Overall, the whole exam can be summarized in the following table:<br><table><tr><th>Form</th><th>%</th><th>Length /duration</th><th>ILOs assessed</th></tr><tr><td>Written exam – exercises</td><td>50%</td><td>2 or 3 exercises (1-1.5 hours)</td><td>3, 6, 10</td></tr><tr><td>Oral exam – theory</td><td>50%</td><td>2 or 3 questions (30 minutes)</td><td>1-5, 7, 8, 13</td></tr></table> |
| **Assessment language** | English |
| **Evaluation criteria and criteria for awarding marks** | The evaluation criterion of the written exam is the correctness of the solution(s) of each exercise.<br><br>The evaluation criteria of the oral exam is based on the knowledge of the topics of the course, the clarity of the response and the properties of language of the student (in relation to the language of the course), the pertinence and the relevance of the response, and the autonomy of judgment.<br><br>The final grade is the weighted of the written (50%) and oral exam (50%). |

| | |
|---|---|
| **Required readings** | The course material is collected from various textbooks, lecture notes and research papers. The student can mainly refer to the following textbooks:<br>1) S. Kalpakjian, *Manufacturing Engineering and Technology*, ed. Pearson<br>2) M.P. Groover, *Fundamentals of Modern Manufacturing*, ed. Wiley<br>3) G.E. Dieter, *Mechanical Metallurgy*, ed. McGraw-Hill<br>4) A. Zompì, R. Levi, *Tecnologia Meccanica (lavorazioni per deformazione plastica)*, ed. UTET<br>5) A. Zompì, R. Levi, *Tecnologia Meccanica (lavorazioni ad asportazione di truciolo)*, ed. UTET |
| **Supplementary readings** | Additional textbooks, lecture notes, research papers and readings may be provided by the professor. |