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
Degree	Bachelor in Industrial and Mechanical Engineering
Semester	1
Year	III
Academic year	2020/21
Credits	8
Modular	No

Total lecturing hours	48
Total lab hours	
Total exercise hours	30
Attendance	No
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. 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. The main issues concerning material behavior of metals, bulk and sheet metalworking, metal machining, metal casting and welding are discussed in this course. Moreover, an introduction on nondestructive testing and their use in the manufacturing field will be introduced. During the course, the students will acquire the main theoretical knowledges, related to both scientific and technological aspects, relevant to the manufacturing industrial activities. Practical examples will allow students to reflect on the main features of a production process and its limitations.

Professor	Dr. Cristian Cappellini, e-mail cristian.cappellini@unibz.it

Scientific sector of the lecturer	ING-IND/16
Teaching language	English
Office hours	
Teaching assistant *(if any)*	Dr. Alessio Malandruccolo Email Alessio.Malandruccolo@unibz.it
List of topics covered	The course covers the following topics: 1. Introduction to manufacturing engineering; 2. Structure and mechanical behavior of metals; 3. Fundamentals of solidification and metal casting processes; 4. Metal forging processes; 5. Metal rolling processes (shaper rolling, ring rolling, seamless tube piercing); 6. Metal extrusion and drawing processes; 7. Sheet metal forming processes; 8. Machining and tool wear mechanisms; 9. Fusion and solid state welding processes; 10. Fundamentals of NDT (Non-Destructive Testing).
Teaching format	Frontal lectures, exercises (Exercises, case studies and computer lab), excursions. The professor can be also contacted by the students to ask questions and/or have clarifications about the course topics.

Learning outcomes	<u>Knowledge and understanding</u> 1. To know and understand the main mechanical components and their functions; 2. To acquire a knowledge and understanding about the main important manufacturing processes in mechanical industry; 3. To know and understand the relationships between materials, manufacturing processes and product requirements; 4. To identify advantages and limitations of the main industrial manufacturing processes;The student knows the basics of modern production management, <u>Applying knowledge and understanding</u> 5. Operational capacity to solve problems of medium complexity in the main fields of mechanical engineering; 6. To be able to evaluate which manufacturing process is more suitable to ensure proper product requirements. <u>Making judgements</u>

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

Communication skills

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

Learning skills

13. 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;
14. 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	Duration	Nr. Learning outc.
Discussions with the professor	Throughout the course	2, 10, 12, 13, 14
Class exercises	15 exercises lectures (2 hours each)	1, 3, 5, 8, 9, 11, 13

Summative Assessment
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.
The written exam consists of 2 or 3 exercises inherent to

<table>
<tr><td></td><td>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.
The oral exam consists in theory questions about all the topics covered in the course (both during the frontal and exercise lectures).

*In case a written exam cannot be held due to "force majeure" such as COVID-19 restrictions, the course responsible reserves the right to hold only an oral exam instead of the written exam.

Overall, the whole exam can be summarized in the following table:
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<tr><th>Form</th><th>Duration</th><th>Nr. Learning outc.</th></tr>
<tr><td>Written exam – exercises</td><td>Ca. 50% - 2 or 3 exercises (1-1.5 hours)</td><td>3, 5, 9</td></tr>
<tr><td>Oral exam – theory</td><td>Ca. 50% - 2 or 3 questions (30 minutes)</td><td>1-4, 6, 7, 12</td></tr>
</table></td></tr>
<tr><td>Assessment language</td><td>English</td></tr>
<tr><td>Evaluation criteria and criteria for awarding marks</td><td>The evaluation criterion of the written exam is the correctness of the solution(s) of each exercise.
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.
The final grade is the weighted of the written (50%) and oral exam (50%).</td></tr>
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<tr><td>Required readings</td><td>The course material is collected from various textbooks, lecture notes and research papers. The student can mainly refer to the following textbooks:
1) S. Kalpakjian, Manufacturing Engineering and Technology, ed. Pearson
2) M.P. Groover, Fundamentals of Modern Manufacturing, ed. Wiley
3) G.E. Dieter, Mechanical Metallurgy, ed. McGraw-Hill
4) A. Zompì, R. Levi, Tecnologia Meccanica (lavorazioni per deformazione plastica), ed. UTET
5) A. Zompì, R. Levi, Tecnologia Meccanica (lavorazioni ad asportazione di truciolo), ed. UTET</td></tr>
<tr><td>Supplementary readings</td><td>Additional textbooks, lecture notes, research papers and readings may be provided by the professor.</td></tr>
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