

## COURSE DESCRIPTION – ACADEMIC YEAR 2023/2024

<b>Course title</b>	<b>Manufacturing Technology</b>
<b>Course code</b>	42154
<b>Scientific sector</b>	ING-IND/16
<b>Degree</b>	Bachelor in Industrial and Mechanical Engineering (L-9)
<b>Semester</b>	1
<b>Year</b>	3
<b>Credits</b>	8
<b>Modular</b>	No

<b>Total lecturing hours</b>	48
<b>Total lab hours</b>	30
<b>Attendance</b>	Attendance is not compulsory, but recommended.
<b>Prerequisites</b>	Students should be familiar with the basic knowledges of solid mechanics and mathematical analysis.
<b>Course page</b>	Microsoft Teams and <a href="https://ole.unibz.it/">https://ole.unibz.it/</a>

<b>Specific educational objectives</b>	<p>The course belongs to the type "caratterizzanti – ingegneria gestionale".</p> <p>The course aims to provide an overview of the leading manufacturing processes in industrial engineering, including the relationships among the properties of metallic materials, manufacturing processes, and the design of mechanical products.</p> <p>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.</p> <p>The main issues concerning the material behavior of metals, bulk and sheet metalworking, metal machining, metal casting, and welding are discussed in this course.</p> <p>Moreover, fundamentals of surface treatments, common coating practices, nondestructive testing, and their use in the manufacturing field are introduced.</p> <p>During the course, the students will acquire the main theoretical knowledge related to the scientific and technological aspects of interest in the manufacturing industry.</p> <p>Practical examples will allow students to reflect on the main features of a production process and its limitations.</p>
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<b>Lecturer</b>	Prof. Pasquale Russo Spena
<b>Contact</b>	pasquale.russospena@unibz.it
<b>Scientific sector of lecturer</b>	ING-IND/16
<b>Teaching language</b>	English
<b>Office hours</b>	During the lecture time span, arrange beforehand by email for the available slots: Tuesday h.18-19 and Wednesday h.10-12.
<b>Lecturing Assistant</b>	Dr. Alessio Malandrucolo
<b>Contact LA</b>	alessio.malandrucolo@unibz.it
<b>Office hours LA</b>	Arrange beforehand by email.

<p><b>List of topics</b></p>	<ul style="list-style-type: none"> <li>• Introduction and overview of manufacturing</li> <li>• Fundamentals of materials: their behavior and manufacturing properties</li> <li>• Structure and mechanical behavior of metals</li> <li>• Metal casting processes</li> <li>• Metal forging processes</li> <li>• Metal rolling processes</li> <li>• Metal extrusion processes</li> <li>• Metal drawing processes</li> <li>• Sheet metal forming processes</li> <li>• Machine processes and machine tools</li> <li>• Fusion- and solid-state welding processes</li> <li>• Powder metal processing</li> <li>• Ceramics and Polymers processing</li> <li>• Surface treatments and coatings</li> <li>• Non-destructive testing (NDT)</li> </ul>
<p><b>Teaching format</b></p>	<p>Frontal lectures, exercises, industrial excursion(s).          The students can also contact the professor to ask questions and have clarifications about the course topics.</p>

<p><b>Learning outcomes</b></p>	<p>Knowledge and understanding:</p> <ul style="list-style-type: none"> <li>• To acquire knowledge and understanding about the main important manufacturing processes.</li> <li>• To know and understand the leading manufacturing equipment and machine tools.</li> <li>• To understand the relationships between materials, manufacturing processes, and product requirements.</li> <li>• To identify the advantages and limitations of the leading industrial manufacturing processes.</li> </ul> <p>Applying knowledge and understanding:</p> <ul style="list-style-type: none"> <li>• Operational capacity to solve problems of medium complexity of manufacturing engineering.</li> <li>• To evaluate which manufacturing process is more suitable to ensure proper cost and technical product requirements.</li> </ul> <p>Making judgments:</p> <ul style="list-style-type: none"> <li>• To critically identify and select the information necessary for the proper selection and planning of a manufacturing process.</li> <li>• To examine objectively the results obtained from analytical processing, numerical simulations, or experimental laboratory tests.</li> <li>• To develop a predisposition to solve problems of medium complexity related to manufacturing technologies.</li> <li>• To make use of technical and scientific literature.</li> </ul> <p>Communication skills:</p> <ul style="list-style-type: none"> <li>• to prepare scientific and technical documentation concerning the main manufacturing processes.</li> </ul>
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- Ability to present, communicate, discuss, and argue the topics covered in the course.

Learning skills

- The student will develop learning skills through the individual study of the topics addressed during the lecture and exercise hours. In addition, the analysis of different issues of manufacturing processes may also be addressed by group discussions.
- The student will have the opportunity to extend the knowledge of the manufacturing processes by consulting scientific literature, specialized texts, and technical and international standards, which the professor may provide during the course.

**Assessment**

**Formative Assessment**

The exercises in the classroom and 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	Frontal and exercise lectures	2, 10, 12, 13, 14
Class exercises	Exercise lectures	1, 3, 5, 8, 9, 11, 13

**Summative Assessment**

The whole exam consists of a written (max. mark 10/30) and oral exam (max. mark 20/30).

The written exam consists of 2 or 3 exercises inherent to all the topics covered in the course (both during the frontal and exercise lectures). A minimum mark 5/30 is a mandatory pre-requisite to take (on the same day) the following oral exam. Otherwise, the whole exam is not passed.

The oral exam consists of theory questions about all the topics covered in the course (both during the frontal and exercise lectures).

Overall, the whole exam is summarized in the following:

Form	Duration	Nr. Learning outc.
Written exam – exercises	2 or 3 exercises (1 or 1.5 hours). The max. mark is 10/30.	3, 5, 9

	<table border="1"> <tr> <td>Oral exam – theory</td> <td>2 or 3 questions (about 30 minutes). The max. mark is 20/30</td> <td>1-4, 6, 7, 12</td> </tr> </table>	Oral exam – theory	2 or 3 questions (about 30 minutes). The max. mark is 20/30	1-4, 6, 7, 12
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<b>Assessment language</b>	English			
<b>Assessment Typology</b>	Monocratic			
<b>Evaluation criteria and criteria for awarding marks</b>	<p>The evaluation criterion of the written exam is the correctness of the solution(s) of each exercise.</p> <p>The evaluation criterion 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 the official language of the course), the pertinence and the relevance of the response, and the autonomy of judgment.</p> <p>The final mark is the sum of the marks obtained in the written and oral exams.</p>			
<b>Required readings</b>	<p>The course material is collected from various textbooks, lecture notes, and research papers. The student can mainly refer to the following textbooks:</p> <ol style="list-style-type: none"> <li>1) S. Kalpakjian, Manufacturing Engineering and Technology, ed. Pearson</li> <li>2) M.P. Groover, Fundamentals of Modern Manufacturing, ed. Wiley</li> </ol>			
<b>Supplementary readings</b>	The professor may provide additional textbooks, lecture notes, research papers, and readings.			