# Syllabus

## *Course Description*

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| **Course Title** | Laboratory of energy efficiency in wood production and final use |
| **Course Code** | 42627 |
| **Course Title Additional** | |
| **Scientific-Disciplinary Sector** | NN |
| **Language** | English |
| **Degree Course** | Professional Bachelor in Wood Technology |
| **Other Degree Courses (Loaned)** | |
| **Lecturers** | Dott. Maja Danovska,<br>Maja.Danovska@unibz.it |
| **Teaching Assistant** | |
| **Semester** | First semester |
| **Course Year/s** | 3 |
| **CP** | 2 |
| **Teaching Hours** | 20 |
| **Lab Hours** | 0 |
| **Individual Study Hours** | 30 |
| **Planned Office Hours** | 6 |
| **Contents Summary** | • Energy Efficiency in Thermo-Chemical Conversion of Wood.<br>• Characterization of Wood-Based Biomass.<br>• Thermo-Chemical Conversion Processes.<br>• Performance and Efficiency of Real Biomass Energy Systems.<br>• Laboratory Instrumentation and Data Interpretation. |
| **Course Topics** | The laboratory course will cover the following topics:<br><br>• Energy Efficiency in Thermo-Chemical Conversion of Wood.<br>• Characterization of Wood-Based Biomass.<br>• Thermo-Chemical Conversion Processes.<br>• Performance and Efficiency of Real Biomass Energy Systems.<br>• Laboratory Instrumentation and Data Interpretation. |

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| **Keywords** | Wood characterization, laboratory, data analysis, conversion processes, real biomass energy systems. |
| **Recommended Prerequisites** | None. |
| **Propaedeutic Courses** | |
| **Teaching Format** | Practical lecture mainly inside the laboratory. Discussion of a real study case to be analysed under different scenarios.<br>Teaching material and additional materials will be provided during the semester. |
| **Mandatory Attendance** | Not compulsory |
| **Specific Educational Objectives and Learning Outcomes** | The present laboratory deals with the practical aspects of energy efficiency with a special focus on the wood engineering sector.<br>The course consists of 20 hours of practical activities carried out mainly through laboratory activities consisting in the:<br>• Analysis the energy efficiency of processes involved thermo-chemical conversion of wood.<br>• Characterization of wood-based biomass through laboratory analysis of properties such as moisture content, calorific value, and elemental composition.<br>• Investigation of the thermo-chemical conversion processes (combustion, pyrolysis, gasification) through laboratory experiments.<br>• Understanding the performance and efficiency of real biomass energy systems through both the analysis of real study cases under different scenarios and the visits to full-scale facilities/plants.<br>• Development of technical skills in operating laboratory instruments and interpreting results for biomass energy applications, as well as applying theoretical concepts to practical and real examples. The learning outcomes need to refer to the Dublin Descriptors:<br><br>1. Knowledge and Understanding<br>Demonstrate comprehensive knowledge of the principles of energy efficiency, thermo-chemical conversion processes, and sustainability within the wood industry and biomass energy systems.<br>2. Applying Knowledge and Understanding<br>Apply theoretical and practical knowledge to analyze and solve problems related to energy efficiency in wood biomass conversion and to design or propose improvement projects for energy |

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| | systems.<br>3. Making Judgements<br>Exercise autonomous judgement in evaluating energy scenarios and performance of biomass conversion systems; critically assess data from laboratory experiments and real facilities to recommend effective energy efficiency strategies in the wood sector.<br>4. Communication Skills<br>Effectively communicate technical concepts, experimental results, and improvement proposals both verbally and in writing, including the clear presentation of numerical analyses related to energy systems in wood production and biomass conversion.<br>5. Ability to Learn<br>Develop lifelong learning skills to acquire advanced knowledge and practical tools in energy efficiency, sustainability, and circular economy principles applicable not only to the wood industry but also to broader industrial and environmental contexts. |
| **Specific Educational Objectives and Learning Outcomes (additional info.)** | |
| **Assessment** | Development and Discussion of a Project Work.<br><br>Students are either marked Passed or Failed.<br><br>Attendance is strongly recommended. |
| **Evaluation Criteria** | The Passed or Failed assessment will be based on the ability to develop energy efficiency and sustainability solutions for real case studies, as well as the effectiveness of topic presentation. |
| **Required Readings** | Çengel, Y. A., & Boles, M. A. (2021). Thermodynamics: An engineering approach (9th ed.). McGraw-Hill Education.<br><br>Çengel, Y. A., & Ghajar, A. J. (2020). Heat and mass transfer: Fundamentals and applications (6th ed.). McGraw-Hill Education. |
| **Supplementary Readings** | Learning material will be provided by the professor during the course. |
| **Further Information** | Software used: in case, information will be provided at the beginning of the course. |
| **Sustainable Development** | Industry, innovation and infrastructure, Affordable and clean |

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| Goals (SDGs) | energy |