Syllabus

Course Description

Course Title	Engineering Thermodynamics and Heat Transfer
Course Code	42173
Course Title Additional	
Scientific-Disciplinary Sector	IIND-07/B
Language	English
Degree Course	Bachelor in Industrial and Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Marco Baratieri, Marco.Baratieri@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/27442 Prof. Andrea Gasparella, andrea.gasparella@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/30619 dr. Fabian Chidubem Eze, FabianChidubem.Eze@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/53713
Teaching Assistant	
Semester	Second semester
Course Year/s	2
CP	10
Teaching Hours	60
Lab Hours	30
Individual Study Hours	160
Planned Office Hours	30
Contents Summary	The aim of the course is to provide the students with a suitable knowledge of the general scientific contents, of the methods and of some specific professional skills.

	- Fundamentals of Thermodynamics; - Energy conversion; - Energy of open and closed systems - Heat transfer; - Mass transfer; - Ideal gases; - Process; - Irreversibility.
Course Topics	
Keywords	
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	The course consists of classroom lectures introducing theoretical concepts and exercise classes providing numerical examples of technical application. Lectures format includes blackboard, slides, videos, etc. Integrative teaching material (handouts) will be available for the students through the teams file repository.
Mandatory Attendance	Not compulsory.
Specific Educational Objectives and Learning Outcomes	The course belongs to the type "caratterizzanti ". The course deals with the fundamentals of engineering thermodynamics, which are needed to understand the conventional and innovative energy conversion systems. The study of prime movers based on direct cycles (steam and gas cycles) and inverse cycle systems is presented. Fundamentals of heat transfer and heat exchanger design and operation and thermodynamics of moist air complete the course program. The students will learn theoretical concepts as well as acquire the ability to apply these concepts to some reference system calculations. The learning outcomes need to refer to the Dublin Descriptors: Knowledge and understanding 1. Knowledge and understanding of the fundamentals topics dealing with technical systems' energy balance, heat transfer mechanisms and thermodynamic processes.

	Applying knowledge and understanding 2. Applying knowledge and understanding to the solution of energy balance analysis and to the quantification of energy fluxes within and among physical systems Making judgements 3. Making judgments through the acquisition of the basics of the thermodynamic analysis of complex systems and the analysis approach based on simplification and de-structuration. Communication skills 4. Communication skills dealing with the correct use of highly specific terms and definitions, including the correct use and conversion of the units of measurement Ability to learn 5. Lifelong learning skills through the comparison of different sources, and engineering methods and the acquisition of a critical sense.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	- Formative Assessment: In class exercises and discussion: 30 hours (average duration 30 minutes/exercise); ILOs assessed: 1, 2, 3, 4, 5; - Summative Assessment: The exam consists of two written parts. The first deals with the solution of a well-structured numerical exercise related to the calculation of energy balance and exchanges of the technical systems considered in the course. This way we can assess the ability of the student of applying the knowledge and understanding of the analysis and solution techniques, and of making judgment and to correctly use the units of measurement.

	The second one consists of some open questions dealing with theoretical aspects of each main topic of the course (engineering thermodynamics, heat transfer, thermodynamics of moist air). This way the knowledge and understanding of the fundamental topics, the written communication skills are assessed. 33% written exam, numerica exercise: 1 exercise (1 hour); ILOs assessed: 1, 2, 3; 67% written exam, theory: 3 open-ended questions (1.5 hours); ILOs assessed: 1, 2, 3, 4, 5.
Evaluation Criteria	To the admission to the second part the first one has to be successfully passed. The first part (numerical exercise) consists of six numerical questions. The answer is correct when the number provided is within a given tolerance with respect to the reference value. Each student works on the same problem but with personal starting data. The evaluation is based on the accuracy of the numerical result of each question. The starting mark is assigned considering 3 points per each correct answer (starting from 12). The score of this part contributes for 1/3 to the final mark. In the second part, each question – out of the proposed 3 – concerns a different section of the program (applied thermodynamics, heat transfer, thermodynamics of moist air). It equally contributes to the mark, with the exception of one of the 3, which is 4/3 of the others- and requires some steps to prove a proposition. The evaluation is based on the completeness of the answer in terms of 1) definition of the subject 2) analytical description 3) graphical and mathematical representations 4) proof (if required) The score of this second part contributes for 2/3 of the final mark.
Required Readings	Teacher's handouts and booklets (available in the reserve collection).
Supplementary Readings	· G.F.C. Rogers, Yon Mayhew. Engineering Thermodynamics: Work and Heat Transfer (4th Edition/or later) Pearson Education (1996) · F. Incropera, D. DeWitt, Fundamentals of Heat and Mass Transfer (5th Edition/or later) Wiley (2002)

Further Information	
Sustainable Development Goals (SDGs)	