Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Applied Energetics
Course code	45545
Scientific sector	ING-IND/10
Degree	Master Energy Engineering
Semester	I
Year	1
Academic year	2023/24
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	
Total exercise hours	24
Attendance	Not mandatory
Prerequisites	None
Course page	Course Offering / Free University of Bozen-Bolzano (unibz.it)

Specific educational objectives	This course covers the topics related to the fundamentals of thermodynamics (Zeroth and First Laws of Thermodynamics, Ideal gases), the Second law of Thermodynamics, Heat Transfer, Real Working Fluids, Mixtures and Moist Air, Thermodynamic Cycles without and with Phase Change, Heat Exchanger, Heat Pumps, Mass Transfer. Emphasis is laid on the deeper technical understanding of thermodynamic problems including the apparatus.

Lecturers	Prof. Ochs Fabian Ernst/Prof. Baratieri Marco
Scientific sector of the lecturer	ING-IND/10
Teaching language	English
Office hours	Appointment by email
Teaching assistant *(if any)*	
Office hours	
List of topics covered	Repetition of basic thermodynamics concepts, Introduction EES/Matlab, Second Law, thermodynamic cycles, Heat Pump (basic thermodynamics), Psychrometrics, Introduction to Matlab/CoolProp, Mixtures, Mass Transfer. Heat transfer (conduction, convection, radiation), Heat exchanger, Combustion, heat pumps (applied thermodynamics, how components realize technically the thermodynamic process)

Teaching format	Oral presentation and excercises

Learning outcomes	The learning outcomes need to refer to the Dublin Descriptors: **Knowledge and understanding** Knowledge of basics of thermodynamics and heat and mass transfer, with/without phase change. Knowledge of key factors for different thermal devices and systems, in particular, heat exchangers and heat pumps. **Applying Knowledge and understanding** Analyzing the technical approach to thermodynamic problems of different appliances (space heating surfaces, heat pumps …). The exercise part provides instruction on the calculation methods for thermodynamic problems as well as the calculation of various explicit examples on the white board and with computers. **Making judgements** Autonomous judgement will be enhanced by means of the knowledge of basic concepts and analytical approaches applied to thermodynamic systems. **Communication skills** The student will be able to discuss the learned knowledge with vocabulary and technical terms of the discipline. **Ability to learn** Capability of autonomous study of heat and mass transfer phenomena and mechanisms applied in thermal devices and systems.
Assessment	Written examination
Assessment language	English
Evaluation criteria and criteria for awarding marks	The knowledge and the ability of applying knowledge will be assessed through written examination, aimed also at checking the ability to use the correct technical vocabulary and analyse thermodynamic and heat and mass transfer problems.

Required readings	Lecture book
Supplementary readings	Müller, I., Müller, W. 2009, Fundamentals of Thermodynamics and Applications: With with Historical Annotations and Many Citations from Avogadro to Zermelo, Springer Verlag VDI Wärmeatlas, Springer Verlag Nellis, G., Klein, S., Heat Transfer, 2008 Cambridge

	University Press Baehr, H.D., Kabelac, St. 2005, Thermodynamik, Springer Verlag P.K. Nag, 2005, Engineering Thermodynamics, Tata McGraw-Hill Education	