UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Architettura
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	BUILDING ENGINEERING-ARCHITECTURE
SUBJECT	ENVIRONMENTAL TECHNICAL PHYSICS
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50662-Discipline fisico-tecniche ed impiantistiche per l'architettura
CODE	03324
SCIENTIFIC SECTOR(S)	ING-IND/11
HEAD PROFESSOR(S)	PERI GIORGIA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	120
COURSE ACTIVITY (Hrs)	105
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**PERI GIORGIA** Thursday 12:00 14:00 Stanza T215, Edificio 9.

DOCENTE: Prof.ssa GIORGIA PERI

PREREQUISITES	In order to understand course contents and consequently its educational objectives, the student must have a good knowledge of both the principles of the differential and integral calculus of functions of one and more than one independent variables, and the vector algebra (Mathematical Analysis and Physics).
LEARNING OUTCOMES	KNOWLEDGE AND UNDERSTANDING At the end of the course, the student will possess a robust theoretical knowledge of the fundamental laws of Classical Thermodynamics and Heat Transfer, accompanied by the ability to correctly understand the associated mathematical equations. APPLYING KNOWLEDGE AND UNDERSTANDING With a view to training the student to design, possible applications of Thermodynamics and Heat Transfer especially to the building envelope and plants typically used in buildings will also be provided to the student. MAKING JUDGEMENTS Thanks to the knowledge acquired during this course, which contributes to make the student's preparation more complete, the student will also be able to identify problems and to search appropriate solutions, with the aim of improving the building quality under physical, technical and performance perspective, coherently with the degree course goals. COMMUNICATION The student will be able to communicate competently and using the appropriate language when asked to solve applied physics problems. LIFELONG LEARNING SKILLS The student will further boost both the logically thinking skill and the ability to solve problems in a scientifically rigorous way.
ASSESSMENT METHODS	The method chosen here to assess the learning will consist of two exams: one written and one oral. Written exam and assessment criteria: the exam consists in the solution of some exercises. It is mainly aimed at checking the abilities of the student to apply the knowledge of the main topics covered in class to solve typical Thermodynamics and Heat Transfer problems autonomously. The exam will be considered sufficient if the student shows an acceptable capability to apply the acquired knowledge for the problems solution autonomously, using also an acceptable written language. Below this level, the result of the exam will be considered insufficient and the student won't be allowed to access the oral exam. The more adequate the abilities of the student to apply the knowledge acquired during the course are, exhibiting also a mathematical rigor and logical coherence, the higher the assessment of written exam will be. Oral exam and assessment criteria: the exam consists in a conversation on topics taught during the course. It is especially aimed at verifying the level of knowledge and mastery of arguments covered in class, evaluating also the ability to establish links among them. It will also evaluate the use of an adequate language. The exam will be considered sufficient if the student shows a minimum knowledge of the main course topics and use an acceptable language. Below this level, the result of the exam will be considered insufficient. Such a result won't allow the student to pass the global exam, despite a positive result of the written exam had been achieved. The more effective and detailed the knowledge of the topics is and the greater the mastery of them is, using an adequate language as well, the higher the assessment of oral exam will be. Global final assessment: the total final score (in thirties) will be assigned to the student on the basis of the results obtained in the two previously described exams.
EDUCATIONAL OBJECTIVES	•Laws of Thermodynamics (First and Second laws) for close and open systems. •Homogenous thermodynamic systems: thermodynamic properties (internal energy, enthalpy, and entropy) of pure substances in liquid and gas phases as well as in liquid – vapour mixture conditions. •Conversion of heat in work and refrigeration: main thermodynamic cycles (heat engines, refrigerators, heat pumps – internal combustion engines). •Psychrometry: moist air and main psychrometric transformations. •Heat transfer: conduction, convection, radiation and simultaneous presence of different heat transfer modes. •Problem of condensation in building structures: verification of the absence of surface and interstitial condensation.

TEACHING METHODS	Lectures in class, Workshops in class.
SUGGESTED BIBLIOGRAPHY	Il libro di testo (coursebook) e': Alessandro Cocchi. Elementi di termofisica generale e applicata. Progetto Leonardo, Bologna. Si consiglia anche la consultazione dei seguenti testi (it is also recommended the use of the following books): •G. Rodono, R. Volpes. Termodinamica e trasmissione del calore. 2 voll., Dario Flaccovio Ed., Palermo •Yunus Çhengel. Termodinamica e trasmissione del calore. McGraw-Hill.

SYLLABUS

Hrs	Frontal teaching
1	Course introduction.
2	Definitions and fundamental concepts of Thermodynamics.
16	Thermodynamics of close systems.
5	Thermodynamics of open systems.
7	Homogenous thermodynamic systems: thermodynamic properties of liquids, liquid-vapour mixtures, superheated vapours and gases.
7	Main thermodynamic cycles.
7	Heterogeneous systems: mixtures of ideal gases and mixtures of gases and vapours (moist air and main psychrometric transformations).
12	Heat transfer: conduction, convection, and radiation.
1	Simultaneous presence of different heat transfer modes: adduction, global heat transfer (i.e. heat transfer between two fluids separated by a solid material in permanent regime).
2	Problem of condensation in building structures: verification of the absence of surface and interstitial condensation.

Hrs	Practice
1	Basic concepts of Thermodynamics and units definitions.
4	Thermodynamics of close systems.
2	Thermodynamics of open systems.
8	Homogenous thermodynamic systems: thermodynamic properties of liquids, liquid-vapour mixtures, superheated vapours and gases.
8	Main thermodynamic cycles
8	Heterogeneous systems: mixtures of ideal gases and mixtures of gases and vapours (moist air and main psychrometric transformations).
10	Heat transfer: conduction, convection, and radiation. Simultaneous presence of different heat transfer modes: adduction, global heat transfer (i.e. heat transfer between two fluids separated by a solid material in permanent regime).
4	Problem of condensation in building structures: verification of the absence of surface and interstitial condensation.