UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	BUILDING ENGINEERING, INNOVATION AND RETROFITTING
SUBJECT	TECHNICAL PHYSICS FOR THE BUILDING INDUSTRY
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50108-Edilizia e ambiente
CODE	17612
SCIENTIFIC SECTOR(S)	ING-IND/11
HEAD PROFESSOR(S)	PERI GIORGIA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	147
COURSE ACTIVITY (Hrs)	78
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° 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 conclusion 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 understand the associated mathematical equations correctly. In addition, the student will hold the concepts and principles of the thermal hygrometric comfort within enclosed environments and of the “integrated design” (energy and environmental) of buildings, respectively. APPLYING KNOWLEDGE AND UNDERSTANDING With a view to training the student to design, possible applications of Thermodynamics and Heat transfer especially on 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 preparation more complete, the student will be able to identify problems and 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 one oral exam that consists in the solution of typical Thermodynamics and Heat Transfer problems, and in a conversation on topics taught during the course. During the course, a continuous and individual interaction will be established with the students, which will contribute to define the level of maturity reached with respect to the topics covered in class. The level of maturity reached will be verified on the basis of the following criteria: 1) the level of knowledge and mastery of arguments covered in class, evaluating also the ability to establish links among them. The possess of an adequate capability to oral expose the arguments will also be evaluated. 2) the ability of the student to apply the knowledge of the main topics covered in class to solve common problems autonomously. The exam will be considered sufficient when the student shows both an acceptable knowledge of the main course topics, together with a sufficient capability to orally exposing the arguments, and a minimum capability to apply the acquired knowledge for the problems solution autonomously. Below this benchmark, the result of the exam will be considered insufficient. The more effective and detailed knowledge of the topics is, the greater the mastery of them is, the more adequate the capability to orally exposing the arguments is, and 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 oral exam will be. Global final assessment: the total final score (in thirties) will be assigned to the student on the basis of the result obtained in the previously described oral exam. In more detail, the score will be expressed in thirtieths with possible praise, according to the scheme reported in the degree course homepage, i.e. "Metodi di Valutazione".
EDUCATIONAL OBJECTIVES	The course intends to provide student with a robust theoretical knowledge of the fundamental laws of Classical Thermodynamics and Heat Transfer accompanied by the ability to understand the associated mathematical equations correctly. With a view to training the student to design, possible applications of Thermodynamics and Heat Transfer especially on the building envelope and plants typically used in buildings, particularly air conditioning ones, will also be delivered to the student. In addition, the course aims at presenting concepts and principles of the thermal hygrometric comfort within enclosed environments and of the “integrated design” (energy and environmental) of buildings, respectively.
TEACHING METHODS	Lectures in class, Workshops in class.
SUGGESTED BIBLIOGRAPHY	•Alessandro Cocchi. Elementi di termofisica generale e applicata. Progetto Leonardo, Esculapio Ed., 1998, Bologna. ISBN 888504011X (per la parte di

	Termodinamica – for Thermodynamics); •G. Rodonò, R. Volpes. Termodinamica e trasmissione del calore. 2 voll., Dario Flaccovio Ed., Palermo (qualsiasi edizione dei due volumi); •Yunus Çhengel. Termodinamica e trasmissione del calore. McGraw-Hill (qualsiasi edizione); •Yunus Çhengel, Giuliano Dall'O', Luca Sarto. Fisica Tecnica Ambientale con elementi di acustica e illuminotecnica. Prima edizione 2017, McGraw-Hill Education. ISBN 978-88-386-1556-6; •Giovanni Cesini, Giovanni Latini, Fabio Polonara. Fisica tecnica. CittaStudi Edizioni, 2017. ISBN 978-8825174038. Dispense didattiche rese disponibili sul portale UNIPA (didactic material made available on the UNIPA website).

SYLLABUS

Hrs	Frontal teaching
1	Course Introduction
2	Definitions and main concepts of Thermodynamics.
4	First Law of Thermodynamics.
5	Second Law of Thermodynamics.
2	Thermodynamic properties of working fluids.
2	Main thermodynamic cycles
6	Air and main transformations for air conditioning (psycrometry).
1	Thermodynamics vs. Heat Transmission.
2	Heat conduction and main equations of the heat transfer by conduction.
1	Convection and main equations of the heat transfer by convection.
2	Radiation and main equations of the radiative heat exchange.
6	Heat transmission through the building walls in steady state regime.
5	Mass transfer through the building envelope and the problem of condensation on the internal wall surface and within the elements of the building envelope.
1	Thermo-hygrometric comfort of enclosed environments.
2	Building energy and the "integrated design" (energy and indoor environmental) approach of buildings.

Hrs	Practice
4	First Law of Thermodynamics.
3	Second Law of Thermodynamics.
2	Thermodynamic properties of working fluids.
3	Main thermodynamic cycles
4	Main parameters of the air.
4	Air conditioning.
4	Heat transmission through the building walls in steady state regime: temperature profile within the wall.
4	Characteristic parameters of heat transmission through the building walls and heat flow through the wall in steady state regime.
4	The problem of condensation on the wall internal surface of the elements of the building envelope.
4	The problem of condensation within the elements of the building envelope.