UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	CYBERNETIC ENGINEERING
SUBJECT	TECHNICAL PHYSICS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10655-Attività formative affini o integrative
CODE	03318
SCIENTIFIC SECTOR(S)	ING-IND/10
HEAD PROFESSOR(S)	CARDONA FABIO Ricercatore a tempo determinato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CARDONA FABIO** Monday 10:00 12:00 Stanza del Docente n. 1019 - edificio 9 - piano primo - Dipartimento di Ingegneria

DOCENTE: Prof. FABIO CARDONA

PREREQUISITES	For a good understanding of the topics discussed during the lectures, the knowledge of basic concepts of Mathematics and Physics, studied in previous modules, is required.
LEARNING OUTCOMES	Knowledge and understanding. The student at the end of the course will have knowledge of basic topics related to thermodynamics, heat transfer, and fluid mechanics. To achieve this objective the course provides lectures, analysis, and discussion of case studies. An oral examination at the end of the module aims to assess if the student has sufficient knowledge of the topics. Applying knowledge and understanding. The student will be able to actually apply the concepts learned during the module to some real problems, this includes design and validation. To achieve this objective, the course includes lectures and guided practical lessons. Part of the final oral examination will include the resolution of simple exercises. Making judgments. The student will be able to recognize and classify the physical phenomena studied during the module and will be able to deal with them in real practical cases. To achieve this objective, the course includes lectures and guided practical lessons. Part of the final oral examination will include the resolution of simple exercises. Communication skills. The student will acquire the ability to communicate and express the concepts regarding the discipline. It will be able to hold conversations and prepare basic documents related to thermodynamics, heat transfer, and fluid mechanics. To achieve this objective, the course includes lectures and guided practical lessons. Part of the final oral examination will include the resolution of simple exercises. Learning ability. The topics learned will allow the student to successfully carry on with engineering studies and will, particularly they will ease his learning process when attending the following related modules. To achieve this objective, the course includes lectures and guided practical lessons. Part of the final oral examination will include the resolution of simple exercises.
ASSESSMENT METHODS	The evaluation is based on a final oral examination. The candidate will have to answer at least four oral questions regarding any of the topics covered by the program which can be found in the recommended textbooks. The final assessment aims to evaluate whether the student has knowledge and understanding of the topics, has acquired critical thinking, and is able of taking decisions independently. A successful outcome can be achieved if the student shows good knowledge and understanding of the topics at least in general terms and reaches a good level of problem-solving; good presentation and communication skills are also important to show the examiner confidence in the topics. If these requirements are not met, the outcome of the examination will be negative. The more, however, the examinee with its argumentative and presentation skills can interact with the examiner and the more his knowledge and application capabilities go into detail on the subject of the discipline, the more the assessment is positive. The assessment is carried out of thirty according to the following schedule. Outcome Rating Rating Excellent30-30 laude The candidate shows an excellent knowledge of the topics, excellent communication skills, good analytical ability. The student is able to apply the knowledge to solve the problems proposed. Very good 26-29 The candidate has a good knowledge of the subject, good communications skills. The student is able to apply knowledge to solve the problems proposed. Good 24-25 The candidate has a basic knowledge of the main topics, discrete properties language, with limited ability to independently apply the knowledge to solve the proposed problems. Satisfactory21-23The candidate does not fully know the main topics but patly know them, satisfactory property language, poor ability to independently apply the knowledge gained. Sufficient18-20 The candidate has a very basic understanding of the main topics and of the technical language, with very little or no ability to independently apply the knowledge gained. InsufficientThe candidate does not show an acceptable knowledge of the topics covered during the module.
EDUCATIONAL OBJECTIVES	The module provides the knowledge for dealing with: Thermodynamics, Heat Transfer, and Fluid Mechanics. The purpose of the course, in addition to the study of the theory, is the acquisition of a certain familiarity with the most common and simple calculation techniques. To achieve that it is recommended to attend exercise classes and to carry on with self-study using the suggested textbooks. Preparatory modules: Mathematics, Physics Analysis I and II.

TEACHING METHODS	Lectures and exercise classes
SUGGESTED BIBLIOGRAPHY	"Elementi di Fisica Tecnica", Y.A. Cengel, J.M. Cimbala, R.H. Turner. McGraw Hill Education, 2017. Materiale integrativo (slides e tabelle) fornite dal docente.

SYLLABUS

Hrs	Frontal teaching
3	Thermodynamic properties of pure substances - Phase transitions - Thermodynamic processes of vapors.
6	First Principle of Thermodynamics for closed and open systems.
5	The Second Principle of Thermodynamics, as formulated by Kelvin-Planck and Clausius - Carnot Cycle-Reversible and Irreversible processes - Carnot theorems.
3	Clausius inequality, entropy and, entropy balances.
3	Direct cycles: Rankine cycle.
3	Inverse cycles: cooling machines and heat pumps.
5	Introduction to Heat Transfer. Heat transfer by thermal conduction.
5	Natural and forced convection.
3	Heat transfer by thermal radiation.
3	Elements of fluid mechanics.

Hrs	Practice
2	Numerical applications on thermodynamic properties of pure substances
5	The First Principle of Thermodynamics: numerical application on closed systems and open systems approached as control volumes.
1	Numerical applications on the 2nd Principle of Thermodynamics and on Entropy
2	Rankine cycle: evaluation of thermodynamic efficiency
1	Numerical application on a refrigeration system operating with R134a: calculation of COP and cooling capacity
3	Numerical exercises on heat transfer in stationary conditions: application to multi-layers wall and cylinders
1	Numerical applications on forced convection.