SUBJECT TEACHING GUIDE

G736 - Thermodynamics and Thermotechnics

Degree in Mechanical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Mechanical Engineering			Type and Year	Compulsory. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Thermofluid Mechanics Module in Common with the Industrial Branch				
Course unit title and code	G736 - Thermodynamics and Thermotechnics				
Number of ECTS credits allocated	6	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	INMACULADA FERNANDEZ DIEGO
E-mail	inmaculada.fernandez@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESOR (S3027)
Other lecturers	LUIS VICENTE ORTIZ DE ZARATE VIDAL

3.1 LEARNING OUTCOMES

- UNDERSTAND THE FUNDAMENTALS OF THERMODYNAMICS AND THERMOTECHNICS. THESE WILL BE USED INTO TECHNICAL APPLICATIONS (THERMAL POWER PLANTS, INDUSTRIAL COOLING...), WHICH USE THERMAL MACHINES THAT TRANSFORM HEAT TO MECHANICAL ENERGY, STUDYING THEIR COMPONENTS AND THERMODYNAMIC CYCLES.

4. OBJECTIVES

PROVIDE STUDENTS THE FUNDAMENTALS OF THERMODYNAMICS AND THERMOTECHNICS WHICH WILL ARE THE BASIS TO UNDERSTAND OTHER COURSES SUCH AS THERMAL ENGINEERING, THERMAL MACHINES AND ENGINES, AND FLUID-MECHANICAL SYSTEMS AND MACHINES.

6. COURSE ORGANIZATION

CONTENTS	
1	THERMODYNAMICS' LAWS AND CYCLES
1.1	Fundamental concepts (Thermodynamic System, Type of Systems, Equilibrium Systems, Systems' Properties, Processes and Phase Changes, Equations of State)
1.2	First and Second Laws of Thermodynamics (Internal energy, Heat and Work, First law in closed systems, Expansion work, Flow energy, First law in open systems, Fundamental ecuations of a flow, Application ot First Law to opern systems, heat capacity and specific heat capacity, Cycles, Carnot cycle, entropy function, Entropy estimation, T-s diagram, thermal irreversibilities, Exergy Analysis)
1.3	Steam (steam properties, calorimetric study of the steam, T-s, h-s, p-h, ex-h diagrams, steam tables)
1.4	Power cycles (Carnot cycle, Ideal Rankine Cycle, Reheat Rankine Cycle, Binary cycles, Irreversible Rankine Cycle, Exergy Balance, Real Regenerative Rankine Cycle, Standard Air Otto Cycle, Standard Air Diesel Cycle)
1.5	Refrigeration cycles (Compression refrigeration, Refrigerant properties, Multi-stage vapour compression refrigeration and cascade systems, Absorption refrigeration, Heat pumps)
2	THERMOTECHNICS
2.1	Combustion (Combustion properties, Fuels, Combustion Thermodynamics)
2.2	Psychrometry (Psychrometric diagram, Psychrometric transformations)
3	HEAT TRANSFER
3.1	Introduction to heat transfer mechanisms (Conduction, Convection, Combined mechanisms)

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
MID-TERM EXAM	Written exam	Yes	Yes	40,00
PRACTICAL EXERCISE I	Others	No	Yes	10,00
PRACTICAL EXERCISE II	Others	No	Yes	10,00
FINAL EXAM	Written exam	Yes	Yes	40,00
TOTAL				100,00

Observations

TO PASS THE SUBJECT THROUGH CONTINUOUS ASSESSMENT IS NECESSARY TO OBTAIN A FINAL AVERAGE SCORE OF 50% OR MORE OF THE MAXIMUM SCORE, AS WELL AS TO ATTEND TO LABORATORY ACTIVITIES. THE FINAL AVERAGE SCORE IS OBTAINED FROM THE SCORES OBTAINED IN CONTINUOS ASSESSMENT AND THE FINAL EXAM.
THIS AVERAGE ONLY COULD BE POSSIBLE IF STUDENTS HAVE OBTAINED MORE THAN 35% OF THE MAXIMUM SCORE IN BOTH (CONTINUOUS ASSESSMENT AND FINAL EXAM).
THE CONTINUOS ASSESSMENT INCLUDES: MID-TERM EXAM, PRACTICAL EXERCISE I AND PRACTICAL EXERCISE II.

Observations for part-time students

PART-TIME STUDENTS MUST TAKE AN EXAM OF ALL THE CONTENTS OF THE SUBJECT INCLUDED LABORATORY ACTIVITIES IN ORDINARY OR EXTRAORDINARY CALL.
TO PASS THE COURSE IT IS NECESSARY TO OBTAIN A SCORE OF 50% OR MORE OF THE MAXIMUM SCORE.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

- Fundamentos de Termodinámica Técnica (2 tomos). Morán-Shapiro. Reverte.
- Motores de combustión interna alternativos. Muñoz-Payri. U. Valencia.
- Principios de Refrigeraciön. Dossat R.J. Cecsa.
- Termodinámica Lógica Y Motores Termicos. Aguera Soriano. Ciencia 3 (http://www.uco.es/termodinamica/)
- Problemas Resueltos de Termodinámica Lógica y Motores Térmicos. Aguera Soriano (http://www.uco.es/termodinamica/)