Energy and Water

Academic Year: (2023 / 2024) **Review date: 28-03-2023**

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: PETRAKOPOULOU , FOTEINI KONSTANTINA

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I, II
Writing and Communication Skills
Thermal Engineering
Environmental Technology
Heat power plants
Engineering Fluid Mechanics

SKILLS AND LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
CG4. Knowledge and ability to apply current legislation as well as the specifications, regulations and mandatory standards in the field of Industrial Engineering.
CG5. Adequate knowledge of the concept of company, institutional and legal framework of the company. Organisation and management of companies.
CG6. Applied knowledge of company organisation.
CG8. Knowledge and ability to apply quality principles and methods.
CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.
RA6. Transversal Skills: To have the necessary skills for the practice of engineering in today's society.

OBJECTIVES

By the end of this content area, students will be able to have:
1. a systematic understanding of the key aspects and concepts of thermal engineering and fluid mechanics.

2. coherent knowledge of thermal engineering and fluid mechanics including some at the forefront of the branch in mechanical engineering.
3. the ability to apply their knowledge and understanding to identify, formulate and solve problems of thermal engineering and fluid mechanics using established methods.
4. the ability to select and apply relevant analytic and modelling methods in thermal engineering and fluid mechanics.
5. the ability to conduct searches of literature, and to use data bases and other sources of information.
6. the ability to select and use appropriate equipment, tools and methods to solve problems of thermal engineering and fluid mechanics.
7. the ability to combine theory and practice to solve problems of thermal engineering and fluid mechanics.
8. function effectively as an individual and as a member of a team.
9. demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction

Water use in society (industrial, commercial, residential)
Climate change, population increase and energy demand
Water for energy & Energy for water

2. Water for Energy

Water use in fossil-fuel plants
Water use in renewable-based plants
Relationships among water use, fuel type, efficiency, technology & environmental impacts
Effects and consequences

3. Energy for water

Water scarcity, stress on water systems and energy generation
Strategies to reduce water use
Processes for desalination and water reuse

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:

1. Lecture slides and recommended bibliography.
2. Problem solving sessions related with the course topics.
3. Homework problems.
4. Preparation and presentation of scientific reports, including three practical sessions.
In addition, the class may include tutorials in groups.

ASSESSMENT SYSTEM

ORDINARY CALL:

- Continuous evaluation (100% of the total grade)

Contents:

- Practical problems on the topics of the course
- Short theoretical questions
- Presentations of scientific papers
- Test quizzes
- Project

The realization of the project is obligatory. A minimum grade of 4.5 out of 10 will be required in the final project to consider the continuous evaluation.

EXTRAORDINARY CALL:

The realization of the project is obligatory. If not delivered in the ordinary call, it must be delivered in the extraordinary call. A minimum grade of 4.5 out of 10 will be required.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

BASIC BIBLIOGRAPHY

- null Sustainable Water for the Future: Water Recycling versus Desalination, Elsevier, 2009
- null Sustainable Water for the Future: Water Recycling versus Desalination, Elsevier, 2009
- Gustaf Olsson Water and Energy- Threats and Opportunities, IWA Publishing, 2012
- Gustaf Olsson Water and Energy- Threats and Opportunities, IWA Publishing, 2012