

## Solar energy

Academic Year: ( 2022 / 2023 )

Review date: 20-06-2022

Department assigned to the subject: Thermal and Fluids Engineering Department

Coordinating teacher: MARUGAN CRUZ, CAROLINA

Type: Electives ECTS Credits : 6.0

Year : Semester :

## DESCRIPTION OF CONTENTS: PROGRAMME

SOLAR RADIATION: Solar angles. Solar radiation. Solar resource.

SOLAR ENERGY COLLECTORS. Flat plate collector. Thermal analysis. Evacuated tube collector.

LOW TEMPERATURE SOLAR ENERGY FACILITIES. Components and f-chart method

THERMOSOLAR POWER. Concentrating collectors for heat production at HIGH temperature

PHOTOVOLTAIC ENERGY. Photovoltaic effect. Semiconductors. Solar cells. Types of PV. i-v curve.

PV APPLICATIONS: PV panels Related equipment: power trackers, inverters, batteries. Efficiency. Stand-alone/Direct-coupled/Grid connected system.

## LEARNING ACTIVITIES AND METHODOLOGY

AF1. THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students must acquire. Receive course notes and will have basic reference texts. Students partake in exercises to resolve practical problems

AF2. TUTORING SESSIONS. Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring/ 100% on-site attendance.

AF3. STUDENT INDIVIDUAL WORK OR GROUP WORK. Subjects with 6 credits have 98 hours/0% on-site.

AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

AF9. FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. It entails 4 hours/100% on-site

AF8. WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

MD1. THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject's main concepts are developed, while providing material and bibliography to complement student learning

MD2. PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group

MD3. TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with teacher as tutor. Subjects with 6 credits have 4 hours of tutoring/100% on-site.

MD6. LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

## ASSESSMENT SYSTEM

Two mid-term exams (partial examination): 40% of the final mark

Practical laboratory work: 20% of the final mark

Final exam at the end of the semester: 40% of the final mark. Minimum mark: 4/10

Voluntary exercises can add up to +1 point in the final exam

% end-of-term-examination: 40

% of continuous assessment (assignments, laboratory, practicals...): 60

## BASIC BIBLIOGRAPHY

- F.P. INCROPERA & DE WITT FUNDAMENTALS OF HEAT TRANSFER, Willey.
- John A. Duffie, William A. Beckman Solar Engineering of Thermal Processes, Wiley, 2013
- S.A. Kalogirou Solar Energy Engineering: processes and systems, Elsevier.

#### BASIC ELECTRONIC RESOURCES

- Christiana Honsberg and Stuart Bowden . Photovoltaic Education Network: <http://www.pveducation.org/>
- William B. Stine and Michael Geyer . Power from the sun: <http://www.powerfromthesun.net/book.html>