

## 29724 - Thermal Engineering

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 29724 - Thermal Engineering

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 434 - Bachelor's Degree in Mechanical Engineering  
330 - Complementos de formación Máster/Doctorado

**ECTS:** 6.0

**Year:** XX

**Semester:** 330 - First semester

434 - First semester

**Subject Type:** 434 - Compulsory

330 - ENG/Complementos de Formación

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on participation and the active role of the student favours the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

#### 4.2.Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.8 ECTS): 45 hours.
- Laboratory sessions (0.6 ECTS): 15 hours.
- Guided assignments (0.4 ECTS): 10 hours.

- Autonomous work (2.8 ECTS): 70 hours.
- Tutorials (0.4 ECTS): 10 hours.

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Laboratory sessions: sessions will take place every 2 weeks (5 sessions in total) and last 3 hours each. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

Guided assignments: students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures. They will be submitted at the beginning of every laboratory sessions to be discussed and analyzed. If assignments are submitted later, students will not be able to take the assessment test.

Autonomous work: students are expected to spend about 70 hours to study theory, solve problems, prepare lab sessions, and take exams.

Tutorials: the professor's office hours will be posted on Moodle and the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

### 4.3.Syllabus

The course will address the following topics:

#### Section I - HEAT TRANSFER

- 1 - Introduction to heat transfer

#### Heat Conduction

- 2 -Fundamentals of heat transfer by conduction: Fourier's Law, Heat Conduction Equation.
- 3 -Steady one-dimensional heat conduction. Fins.
- 4 -Steady two-dimensional and three-dimensional heat conduction. Numerical methods.
- 5 -Transient heat conduction.

#### Convection

- 6 -Fundamentals of convection.
- 7 -External forced convection.
- 8 -Internal forced convection.
- 9 -Heat exchangers.
- 10 -Natural convection.
- 11 -Boiling and condensation.

#### Radiation heat transfer

- 12 - Fundamentals of thermal radiation.
- 13 - Radiation heat transfer.

#### Section II- HEAT PRODUCTION

- 1 - Solar collectors
- 2 - Thermochemistry of Combustion. Boilers

### 4.4.Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the "Escuela de Ingeniería y Arquitectura " website (<https://eina.unizar.es/>)

### 4.5.Bibliography and recommended resources