

with the theoretical contents, will be developed.

3) Lab (type T3) (15 contact hours). The students will model the operation of equipment and thermal systems through real laboratory measurements or by simulations (Engineering Equation Solver EES) computer. Contents:

- Calculating properties of substances
- Open Systems Simulation
- Modeling power cycle steam turbine
- Modeling cycle gas turbine power
- Modeling vapor compression cycle (cooling and heating)
- Experimental characterization of operation of a refrigeration cycle
- Balance of energy in an electromagnetic brake
- Application of conduction analysis (buildings, electric wires, insulation of pipes and ducts)
- Improving heat transfer by fins.
- Experimental characterization of convective heat transfer in a tube bank
- Visit the installation of interest in relation to the subject. For example, DHC Expo, building CIEM, ...

Autonomous work: 3.6 ECTS (90 hours)

4) Work (case, project) (T6 type) (20 hours). Activities that the student will perform individually or in groups.

5) Study (type T7) (64 hours).

6) Evaluation tests (T8) (6 hours).

4.3. Syllabus

The course will address the following topics:

- Introduction to Thermodynamics: concepts and definitions.
- Calculation of properties of real substances.
- The first and second laws of thermodynamics.
- Power and cooling cycles.
- Basics of heat transfer: conduction, convection, and radiation.
- Heat conduction.
- Forced and natural convection.
- Heat exchangers.

4.4. Course planning and calendar

Lectures, problem classes, and practice sessions will be according to the schedule set by the center (schedules available on E I N A website).

Each teacher will inform about hours of tutoring at the beginning of the semester.

The other activities will be planned according to the teaching assignment set according to the number of students enrolled and will be announced in advance.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29612&Identificador=13315>