EFS7AC HEAT TRANSFER

EFS7AC **Heat Transfer**	**ECTS Credits : 4** **Duration : 42 hours + 15 h Dept**	**Semester : S7**

Person(s) in charge:

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Keywords : Heat transfer, Heat exchangers

Prerequisites : Thermodynamics, integral calculus, differential equations

Objective :

Be able to calculate heat transfers in order to participate to the management of energy

Program and Contents:

Energy management obviously requires a sharp understanding of heat transfer mechanisms.

Their study is all the more interesting as each of the three transfer modes (conduction, convection, radiation) has its own particular procedure: resolution of a partial differential equation with usual methods (separation of variables, Laplace transforms…) for conduction, the study of the coupling between flows and heat transfer for convection, physical modeling for radiation.

The tutorials («Travaux Dirigés», TD, in French), are not only used to acquire knowledge, but also to develop physical understanding in order to be able to model by oneself. They are complemented with presentations prepared and given by the students, and mini-projects where the coupling phenomena will be taken into account.

Numerical practical works are realized during the mid-term seminar, at the very end of the first semester, using the softwares Matlab and COMSOL.

Abilities :

Levels	Description and operational vocabulary
Know	The definition of the main variables used to describe heat transfers. The equations governing the different heat transfer modes. The different ways to solve the heat equation and the resulting differential systems.
Understand	The mecanism of conduction, convection and radiation heat transfer The thermal design of a building by studying the influence of a wall properties on thermal transfer. The influence of radiation on thermal metrology Greenhouse effect and global warming The notion of energetic optimum applied to fins or a heat exchanger.
Apply	Take an inventory of the different heat transfer modes in a system. Carry out the global thermal balance of a whole system. Get the differential system satisfied by the different thermal variables (temperature, heat flux) Solve this type of system to calculate the evolution of temperature and heat flux
Analyse	A heat transfer problem and put it into equation Estimate the magnitude order of the different thermic phenomena in a system to be able to make symplifying assumptions allowing to get a solution The physical coherence of the mathematical solution obtained.
Summarise	Be able to solve a thermic transfer problem where the different transfer modes take place simultaneously Be able to solve the system of equations describing the thermic evolution of a system by choosing the appropriate method.
Assess	Be able to use wether an analytic or a numeric calculus to determine the efficiency and the behavior of a complex energetic system.

Evaluation :				
☑ Written test	☑ Continuous Control	☑ Oral report	☑ Project	☑ Written report