EFS7AD NUMERICAL METHODS FOR MECHANICS AND ENERGETICS

EFS7AD Numerical methods for mechanics and energetics	ECTS Credits : 2 Duration : 21 hours	Semester : S7

Person(s) in charge:

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Keywords : Thermal transfer, Heat exchanger

Prerequisites : Mathematica, matrix calculus, general knowledge in fluid mechanics and heat transfer

Objective :

Get basic knowledge in numerical methods to solve fluid mechanics or heat transfer problems

Program and Contents:

The object of this module is to initiate students to the main numerical methods for solving engineering problems in heat and mass transfer: finite differences, finite elements, finite volumes. The students will program these methods in simple cases using Mathematica. This course prepares the smart end-use of commercial codes like Fluent, used in Research and Development. The aim is not to become a excellent user of industrial codes but to open the "black boxes" of these softwares so as to understand how they are designed. This knowledge gives students the means to use numerical methods smartly (choice of methods, etc.). The utilization, strictly speaking, of commercial codes can be learned in the elective course CET45 and in the 3rd year course SE151 of the Energy Department. Content :

- Discretization principles of partial differential equations : finite differences, finite elements, finite volumes; explicit vs implicit schemes.
- Newton's method, Gaussian elimination, LU decomposition)
- Programming with Mathematica: stationary and nonstationary spatial problems

Abilities :

Levels	Description and operational verbs
Know	the discretization methods and principles
Understand	the discretization methods and principles in order to choose the appropriate ones
Apply	programming stationnary and nonstationnary one dimension problems using Mathematica
Analyse	the results returned by a code keeping in mind its functioning and limits
Summarise	
Assess	

Evaluation :

☑ Written test	☐ Continuous Control	☐ Oral report	☐ Project	☐ Written report