Computational fluid dynamics

Academic Year: (2019 / 2020) **Review date: 30-04-2020**

Department assigned to the subject: Department of Thermal and Fluids Engineering

Coordinating teacher: IGLESIAS ESTRADE, MARIA IMMACULADA

Type: Electives ECTS Credits : 6.0

Year : Semester : 2

STUDENTS ARE EXPECTED TO HAVE COMPLETED

Engineering Fluid Mechanics
Fluid Mechanics (highly recommended, since use is made of the differential form of the Navier-Stokes equations)

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

Computer simulation of fluid mechanics problems. It is intended that students come to understand and apply the basic concepts of numerical simulation, to know the vocabulary and notation used normally in this discipline, and learn the general procedure to obtain and validate a numerical solution of a fluid problem.

DESCRIPTION OF CONTENTS: PROGRAMME

- Introduction to CFD.
- The basic equations of fluid mechanics.
- Levels of approximation.
- Mathematical nature of the equations and their boundary conditions.
- Discretization techniques.
- Numerical mesh generation.
- Finite difference method for model equations.
- Finite difference and finite volume method for the Navier-Stokes equations.
- Turbulence modeling.
- Applications: programming a finite differences code to solve a simple problem, and using a commercial code (ANSYS FLUENT) to solve a real-life industrial problem.

LEARNING ACTIVITIES AND METHODOLOGY

The development of the course includes lectures where the theoretical concepts are exposed, combined with practical application classes in a computer room.

ASSESSMENT SYSTEM

- Final exam (30%)
- Attendance and participation in class (10%)
- Programming of a finite differences code to solve a simple flow problem (30%)
- Implementation of a problem of industrial interest in a general purpose commercial CFD code (30%)

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

- Hirsch, C. Numerical Computation of Internal and External Flows (Second Edition) , Elsevier, 2007

ADDITIONAL BIBLIOGRAPHY

- null ANSYS FLUENT Theory Guide, ANSYS.

- null ANSYS FLUENT User's guide, ANSYS.

BASIC ELECTRONIC RESOURCES

- Hirsch, C. . Numerical Computation of Internal and External Flows (Second Edition) : http://www.sciencedirect.com/science/book/9780750665940#ancPR4