

## FLUID MECHANICS and TRANSPORT PHENOMENA

### 1.1. Identification

|             |  |   |                |   |                |                              |                |  |             |   |              |
|-------------|--|---|----------------|---|----------------|------------------------------|----------------|--|-------------|---|--------------|
| University: | Alma Mater Studiorum – Università di Bologna |   |                |   |                |                              |                |  |             |   |              |
| School:     | School of Engineering                        |   |                |   |                |                              |                |  |             |   |              |
| Course:     | Fluid Mechanics and Transport Phenomena      |   |                |   |                |                              |                |  |             |   |              |
| ECTS:       | 9  |   |                |   |                |                              |                |  |             |   |              |
| Semester:   | <i>Winter</i>                                |   |                |   |                | <i>Summer</i>                |                |  |             | X |              |
| Category    | <i>Fundamental course</i>                    |   |                |   | X              | <i>Specialisation course</i> |                |  |             |   |              |
| Module      | <i>MFI</i>                                   | X | <i>MFII</i>    |   | <i>MFIII</i>   |                              | <i>MSI</i>     |  | <i>MSII</i> |   | <i>MSIII</i> |
| Teachers:   | Giulio C. Sarti                              |   |                |   |                |                              |                |  |             |   |              |
| Language:   | <i>English</i>                               | X | <i>Italian</i> | X | <i>Swedish</i> |                              | <i>Spanish</i> |  |             |   |              |

### 1.2. Learning-outcomes

- knowledge about the fundamentals of transport processes
- knowledge about the fundamentals of fluid motions, energy transport and mass transfer in the most relevant industrial processes

### 1.3. Competencies

#### ▪ General

- to have critical understanding of technical and scientific tools
- to work and manage teams
- communication skills (both written and oral)
- to work in an international context

#### ▪ Specific

- Understand and quantitatively describe the motion of fluids
- Understand and quantitatively describe heat and mass transfer problems, with and without chemical reactions
- Obtain and use local momentum, energy and mass balances
- Obtain and use macroscopic momentum, energy and mass balances

### 1.4. Contents

1. Local mass balance, momentum balance and energy balance; constitutive equations for the stress, heat flux and mass flux.

2. Formulation and solution of momentum, heat and mass transfer problems, in fluid phases, in the absence and in the presence of chemical reactions. Analogies between transport phenomena.

### **1.5. Teaching Methodology**

- Lecture sessions
- Practical sessions: “cooperative work” for solving problems

### **1.6. Evaluation**

- written exams
- oral evaluation of the problems solved by “cooperative work”

### **1.7. Bibliography**

- Bird, R. Byron, Stewart, Warren E., Lightfoot, Edwin, N. *Transport Phenomena*, J. Wiley
- J. Slattery. *Advanced Transport Phenomena*. McGraw-Hill
- F.P. Incoprera, D.P. Dewitt *Introduction to Heat Transfer*. J. Wiley
- E. Cussler *Diffusion: Mass Transfer in Fluid Systems*. Cambridge Univ. Press