| COURSE INFORMATON | | | | | |
|---|---|---|---|---|---|
| **Course Title** | *Code* | *Semester* | *L+P Hour* | *Credits* | *ECTS* |
| **ADVANCED CHEMICAL ENGINEERING I:FLUID MECHANICS** | **CHBE 531** | **1 or 2** | **3 + 1** | **3** | **10** |

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| **Prerequisites** | NONE |

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| **Language of Instruction** | English |
| **Course Level** | Master's Degree (Second Cycle Programmes) |
| **Course Type** | Compulsory |
| **Course Coordinator** | |
| **Instructors** | |
| **Assistants** | |
| **Goals** | The aim of this course is to provide students with the ability to model fluid behavior in complex systems and solve model equations using analytical and numerical techniques. |
| **Content** | Incompressible flow, potential flow. Compressible flow. Thermodynamics of flow. Viscous flow, creeping flow. Turbulent flow. Boundary layer theory. Some exact and approximate solutions of Navier-Stokes equations. |

| **Course Learning Outcomes** | **Program Learning Outcomes** | **Teaching Methods** | **Assessment Methods** |
|---|---|---|---|
| 1) Ability to derive models for flow systems in a hierarchy of levels from the simplest to the most complex using the fundamental laws of physics | 2,4 | 1,2 | A,C |
| 2) Ability to solve ordinary and partial differential model equations using analytical and numerical techniques | 2,4 | 1,2 | A,C |
| 3) Ability to communicate effectively in English | 8 | 1,2 | A,C |

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| **Teaching Methods:** | 1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study |
| **Assessment Methods:** | A: Testing, B: Experiment, C: Homework, D: Project |
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| COURSE CONTENT | | |
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| **Week** | **Topics** | **Study Materials** |
| 1 | INCOMPRESSIBLE FLOW | Lecture Notes |
| 2 | INCOMPRESSIBLE FLOW | Lecture Notes |
| 3 | POTENTIAL FLOW | Lecture Notes |
| 4 | COMPRESSIBLE FLOW | Lecture Notes |
| 5 | COMPRESSIBLE FLOW | Lecture Notes |
| 6 | THERMODYNAMICS OF FLOW | Lecture Notes |
| 7 | MIDTERM EXAM I | LectureNotes |
| 8 | VISCOUS FLOW | Lecture Notes |
| 9 | CREEPING FLOW | Lecture Notes |
| 10 | TURBULENT FLOW | Lecture Notes |
| 11 | BOUNDARY LAYER THEORY | Lecture Notes |
| 12 | BOUNDARY LAYER THEORY | Lecture Notes |
| 13 | NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS | Lecture Notes |
| 14 | MIDTERM EXAM II | LectureNotes |

| RECOMMENDED SOURCES | |
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| **Textbook** | |
| **Additional Resources** | John C. Slattery, Advanced Transport Phenomena, 1999 |

| MATERIAL SHARING | |
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| **Documents** | |
| **Assignments** | |
| **Exams** | |

| ASSESSMENT | | |
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| **IN-TERM STUDIES** | **NUMBER** | **PERCENTAGE** |
| Mid-terms | 2 | 63 |
| Assignment | 5 | 37 |
| **Total** | | **100** |
| **CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE** | | 40 |
| **CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE** | | 60 |
| **Total** | | **100** |

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| **COURSE CATEGORY** | Field Courses |

| COURSE'S CONTRIBUTION TO PROGRAM | | | | | | | |
|---|---|---|---|---|---|---|---|
| No | Program Learning Outcomes | Contribution | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | |
| 1 | Acquire expanded and in-depth information via performing scientific research in the field of Chemical Engineering, evaluate, interpret and implement knowledge. | | | | | | |
| 2 | Be knowledgable in the contemporary techniques and methods applied in Chemical Engineering and their respective constraints. | | | | | + | |
| 3 | Be cognizant of the novel and developing applications of his/her profession, study and learn them as required. | | | | | | |
| 4 | Formulate Chemical Engineering problems, develop methods to solve them and implement innovative techniques in solutions | | | | | + | |
| 5 | Design and conduct analytical modeling and experimental research, analyze and interpret complex problems encountered in this process. | | | | | | |
| 6 | Develop novel and/or original ideas and methods; conceive innovative solutions in systems, component and process design | | | | | | |
| 7 | Complete information via processing limited or incomplete data by the use of scientific methods and implement it; integrate knowledge from different disciplines | | | | | | |
| 8 | Communicate in at least one foreign language at the level of European Language Portfolio B2 orally and in writing. | | | + | | | |
| 9 | Communicate stages and results of his/her studies in a systematic and clear manner orally or in writing in intra or interdisciplinary national and international settings. | | | | | | |
| 10 | Defines societal and environmental aspects of Chemical Engineering applications | | | | | | |

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| 11 | Observe social, scientific and ethical values during collection, interpretation, and dissemination of data and in all professional activities. | | | | | |
| 12 | Lead multidisciplinary teams, develop solution methodologies for complex problems and take responsibility | | | | | |

| **ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION** | | | |
|---|---|---|---|
| Activities | Quantity | Duration (Hour) | Total Workload (Hour) |
| Course Duration (Including the exam week: 16x Total course hours) | 14 | 4 | 56 |
| Hours for off-the-classroom study (Pre-study, practice) | 14 | 10 | 140 |
| Mid-terms | 2 | 3 | 6 |
| Ödev | 5 | 8 | 40 |
| Final examination | 1 | 3 | 3 |
| **Total Work Load** | | | 245 |
| **Total Work Load / 25 (h)** | | | 9.8 |
| **ECTS Credit of the Course** | | | 10 |