**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Fluid Mechanics | **152414004** |

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| **Semester** | **Number of Course Hours per Week** | **ECTS** |
| **Theory** | **Practice** |
| 4 | 3 | 0 | 5 |

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| **Course Category (Credit)** |
| **Basic Sciences** | **Engineering Sciences** | **Design** | **General Education** | **Social** |
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| **Course Language** | **Course Level** | **Course Type** |
| English | Undergraduate | Compulsory |

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| **Prerequisite(s) if any** |  |
| **Objectives of the Course** | Derivations of continuity equation, Euler’s equations of motion, Navier-Stokes equations, Bernoulli equation, momentum equations used in Fluid Mechanics, and their usage and utilization in engineering applications.  |
| **Short Course Content** | Introductory concepts and definitions, The continuity equation, Euler equations of motion, Hydrostatics, Navier-Stokes equations, Some solutions of Navier-Stokes equations, The Bernoulli equation, Engineering applications of the Bernoulli equation, Momentum theorems, Dimensional analysis, Analysis of flow in pipes and over surfaces, Laminar and turbulent boundary layers. |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Define fundamental equations of fluid mechanics. | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **2** | Recognize the streamlines and stream function. | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **3** | Analyze hydrostatic problems. | 1, 2, 4, 6 | 1, 2, 5, 8, 10,13 | A, B, D, E |
| **4** | Comprehends some exact solutions of the Navier-Stokes Equations. | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **5** | Identifies dimensionless parameters employed in fluid mechanics. | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

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| **Main Textbook** | Cengel, Yunus A., and John M. Cimbala. 2017. *Fluid Mechanics: Fundamentals and Applications*. 4th ed. Columbus, OH: McGraw-Hill Education. |
| **Supporting References** | Frank M. White, Fluid Mechanics, McGraw-Hill Book Company. |
| **Necessary Course Material** | Projector, computer, textbook, A4 notebook, pencil, eraser, ruler, calculator |

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| **Course Schedule** |
| **1** | Introduction to Fluid Mechanics, Concepts and Definitions |
| **2** | Hydrostatics |
| **3** | The Continuity Equation, Streamlines and Stream Function |
| **4** | Euler’s Equation of Motion |
| **5** | Bernoulli Equation, Engineering Applications of the Bernoulli Equation. |
| **6** | Derivation of Navier-Stokes Equations |
| **7** | Some Solutions of Navier-Stokes Equations |
| **8** | Mid-Term Exam |
| **9** | Momentum Theorems |
| **10** | Dimensional Analysis |
| **11** | Turbulent Pipe Flow |
| **12** | Flow Around Source, Creation of Lift Around a Cylinder |
| **13** | Flow Around Sink/Source Doubles |
| **14** | Momentum Theorems |
| **15** | General Review |
| **16,17** | Final Exam |

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| **Calculation of Course Workload** |
| **Activities** | **Number** | **Time (Hour)** | **Total Workload (Hour)** |
| Course Time (number of course hours per week) | 14 | 3 | 42 |
| Classroom Studying Time (review, reinforcing, prestudy,….) |  |  |  |
| Homework | 14 | 3 | 42 |
| Quiz Exam | 5 | 10 | 50 |
| Studying for Quiz Exam | 5 | 1 | 5 |
| Oral exam  |  |  |  |
| Studying for Oral Exam  |  |  |  |
| Report (Preparation and presentation time included) |  |  |  |
| Project (Preparation and presentation time included) |  |  |  |
| Presentation (Preparation time included) |  |  |  |
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| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 5 | 5 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 5 | 5 |
|  | **Total workload** | **153** |
|  | **Total workload / 30** | **5,1** |
|  | **Course ECTS Credit** | **5** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term | 15 |
| Quiz | 20 |
| Homework | 20 |
| Report | 15 |
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| **Final Exam** | 30 |
| **Total** | 100 |

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| **RELATIONSHIP BETWEEN THE COURSE LEARNING OUTCOMES AND THE PROGRAM OUTCOMES (PO)** (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low) |
| **NO** | **PROGRAM OUTCOME** | **Contribution** |
| **1** | Sufficient knowledge of engineering subjects related with mathematics, science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems. | 5 |
| **2** | Ability to determine, define, formulate and solve complex engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods. | 5 |
| **3** | Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods. | 2 |
| **4** | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of information technologies. | 2 |
| **5** | In order to investigate engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. | 3 |
| **6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. | 4 |
| **7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. | 4 |
| **8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. | 5 |
| **9** | Understanding of professional and ethical issues and taking responsibility  | 5 |
| **10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. | 2 |
| **11** | Knowledge of actual problems and effects of engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions. | 2 |
| **12** |  |  |

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| **LECTUTER(S)** |
| **Prepared by** | Prof. Dr. Kürşad Melih GÜLEREN |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:** 10.07.2024