**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Fundamentals of Aerodynamics | **152415001** |

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| **Semester** | **Number of Course Hours per Week** | | **ECTS** |
| **Theory** | **Practice** |
| 5 | 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** | In this course, it is aimed to express the basic principles of aerodynamics with equations, to recognize inviscous and incompressible flow, to explain the finite and infinite wing theory and to solve the equations in this context both analytically and numerically. It is aimed to reinforce the objectives with the notes and assignments kept in the lectures. |
| **Short Course Content** | A Brief History of Aviation, Fundamental Equations of Aerodynamics, Inviscous Flow, Incompressible Flow over Airfoil, Incompressible Flow Over Finite Wing, 3-dimensional Incompressible Flow |

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| **Learning Outcomes of the Course** | | **Contributed PO(s)** | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Defines and solves the basic equations of aerodynamics and the equations of inviscous flows | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **2** | Identify and formulate changes related to incompressible flow in the infinite wing and the finite wing. | 1, 2, 4, 6 | 1, 2, 5, 8, 10 | A, B, D, E |
| **3** | Extracts the differences between 3-dimensional and 2-dimensional incompressible flows. | 1, 2, 4, 6 | 1, 2, 5, 8, 10,13 | A, B, D, E |
| **4** |  |  |  |  |
| **5** |  |  |  |  |
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| **Main Textbook** | ANDERSON. (2016). Fundamentals of aerodynamics (6th ed.). McGraw-Hill Education. |
| **Supporting References** | Peiqing Liu. (2022). A General Theory of Fluid Mechanics. Springer.  Aerodynamics for Engineering Students, Sixth Edition, Houghton et al., Elsevier |
| **Necessary Course Material** | Projector, computer, textbook, A4 notebook, pencil, eraser, ruler, calculator |

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| **Course Schedule** | |
| **1** | Brief history of aviation |
| **2** | Basic concepts in aerodynamics |
| **3** | Basic principles in aerodynamics |
| **4** | Basic equations in aerodynamics |
| **5** | Inviscous flows |
| **6** | Incompressible and inviscous flows over airfoil |
| **7** | Incompressible and viscous flows over airfoil |
| **8** | Mid-Term Exam |
| **9** | Incompressible and inviscous flows on a finite wing |
| **10** | Incompressible and viscous flows on a finite wing |
| **11** | 3-dimensional incompressible flows |
| **12** | Theoretical and experimental solutions for aerodynamic problems |
| **13** | Numerical solutions for aerodynamic problems |
| **14** | Project-homework presentations |
| **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. | 3 |
| **4** | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of information technologies. | 3 |
| **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. | 3 |
| **9** | Understanding of professional and ethical issues and taking responsibility | 3 |
| **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