**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Aircraft Stability and Control | 152416003 |

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| **Semester** | **Number of Course Hours per Week** | | **ECTS** |
| **Theory** | **Practice** |
| 6 | 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** | Differential Equations  Dynamic  Fundamentals of Aerodynamic  Aircraft Performance |
| **Objectives of the Course** | It is aimed that students taking this course will have the knowledge about the following topics:  • Understanding the aircraft static and dynamic characteristics,  • Understanding the aerodynamics and control derivatives,  • Derivation of the airplane equations of motion,  • Analysis of the aircraft's time-dependent response,  • Understanding of longitudinal and lateral linear analysis, |
| **Short Course Content** | Understanding the dynamic behavior of the aircraft as a rigid body, derivation of equations of motion under standard atmosphere and flat earth assumption, analysis of static and dynamic stability properties, understanding of linear and non-linear analyses |

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| **Learning Outcomes of the Course** | | **Contributed PO(s)** | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Understanding the aircraft static and dynamic characteristics, | 1, 2, 3, 4, 5, 6, 8 | 4, 11, 12, 14 | D, E, G, I, J, K |
| **2** | Understanding the aerodynamics and control derivatives, | 1, 2, 3, 4, 5, 6, 8 | 4, 11, 12, 14 | D, E, G, I, J, K |
| **3** | Derivation of the airplane equations of motion, | 1, 2, 3, 4, 5, 6, 8 | 4, 11, 12, 14 | D, E, G, I, J, K |
| **4** | Analysis of the aircraft's time-dependent response, | 1, 2, 3, 4, 5, 6, 8 | 4, 11, 12, 14 | D, E, G, I, J, K |
| **5** | Understanding of longitudinal and lateral linear analysis, | 1, 2, 3, 4, 5, 6, 8 | 4, 11, 12, 14 | D, E, G, I, J, K |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

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| **Main Textbook** | Rober C Nelson, Flight Stability and Automatic Control  Bernard Etkin, Lloyd Duff Reid, Dynamics of Flight: Stability and Control |
| **Supporting References** | Yechout, T. R., & Morris, S. L. (2003). Introduction to aircraft flight mechanics: Performance, static stability, dynamic stability, and classical feedback control. Reston, VA: American Institute of Aeronautics and Astronautics. |
| **Necessary Course Material** | Projector |

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| **Course Schedule** | |
| **1** | Lecture details, Basic definitions |
| **2** | Static and dynamic stability |
| **3** | Longitudinal static stability, Contributions of aircraft components, Longitudinal control, Stick-fixed neutral point |
| **4** | Lateral-Directional static stability, Contributions of aircraft components, Lateral-Directional control |
| **5** | Aircraft equations of motion I: force and moment (dynamic) equations |
| **6** | Aircraft equations of motion I: kinematic equations |
| **7** | Linearization of equations of motion |
| **8** | Mid-Term Exam |
| **9** | Stability derivatives |
| **10** | Longitudinal motion dynamic analysis |
| **11** | Longitudinal motion short period and long period (phugoid) approaches |
| **12** | Lateral-Directional motion dynamic analysis |
| **13** | Lateral-Directional motion roll, spiral, Dutch-roll mode approaches |
| **14** | Aircraft response to control or atmospheric inputs |
| **15** | Aircraft response to control or atmospheric inputs |
| **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 |  |  |  |
| Studying for Quiz Exam |  |  |  |
| Oral exam |  |  |  |
| Studying for Oral Exam |  |  |  |
| Report (Preparation and presentation time included) | 1 | 50 | 50 |
| Project (Preparation and presentation time included) |  |  |  |
| Presentation (Preparation time included) | 1 | 5 | 5 |
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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 | 40 |
| Quiz |  |
| Homework |  |
| Report |  |
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| **Final Exam** | 60 |
| **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. | 5 |
| **4** | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of information technologies. | 5 |
| **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. | 5 |
| **7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. | 5 |
| **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** | Asst. Prof. Zafer ÖZNALBANT |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:** 10.07.2024