**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Rotorcraft Dynamics and Design | **152417xxx** |

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| **Semester** | **Number of Course Hours per Week** | | **ECTS** |
| **Theory** | **Practice** |
| 8 | 3 | 0 | 5 |

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| **Course Category (Credit)** | | | | |
| **Basic Sciences** | **Engineering Sciences** | **Design** | **General Education** | **Social** |
|  | X |  |  |  |

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| **Course Language** | **Course Level** | **Course Type** |
| English | Undergraduate | Elective |

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| **Prerequisite(s) if any** | - |
| **Objectives of the Course** | This course aims to convey to students the principles of rotorcraft dynamics and design.. |
| **Short Course Content** | This course will introduce fundamentals of helicopter flight dynamics including aspects of modeling, simulation, stability and control of helicopters. |

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| **Learning Outcomes of the Course** | | **Contributed PO(s)** | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Students will be introduced to general equations of motion of a helicopter, | 1, 2 | 1, 11 | A |
| **2** | Students will be introduced to simplified trim equations, stability and control derivatives, static and dynamic stability of helicopters. | 2, 3 | 1, 11 | A |
| **3** |  |  |  |  |
| **4** |  |  |  |  |
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| **Main Textbook** | Helicopter Theory, W. Johnson, Dover Publications, 1994. |
| **Supporting References** | Helicopter Flight Dynamics: The Theory and Application of Flying Qualities and Simulation Modeling, G.D. Padfield, AIAA Education Series, 1996. |
| **Necessary Course Material** | - |

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| **Course Schedule** | |
| **1** | Introduction, basic terminology |
| **2** | General equations of motion |
| **3** | Rotor dynamics |
| **4** | Rotor wake and inflow dynamics |
| **5** | Rotor forces and moments |
| **6** | Simplified trim equations |
| **7** | Linearized equations of motion |
| **8** | Mid-Term Exam |
| **9** | Stability and control derivatives |
| **10** | Static stability characteristics |
| **11** | Longitudinal dynamics characteristics |
| **12** | Lateral/yaw dynamics characteristics |
| **13** | Handling qualities |
| **14** | Flight control system design |
| **15** | Flight control system design |
| **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,….) | 2 | 4 | 8 |
| Homework |  |  |  |
| Quiz Exam |  |  |  |
| Studying for Quiz Exam |  |  |  |
| Oral exam |  |  |  |
| Studying for Oral Exam |  |  |  |
| Report (Preparation and presentation time included) |  |  |  |
| Project (Preparation and presentation time included) |  |  |  |
| Presentation (Preparation time included) |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Mid-Term Exam | 1 | 3 | 3 |
| Studying for Mid-Term Exam | 1 | 45 | 45 |
| Final Exam | 1 | 3 | 3 |
| Studying for Final Exam | 1 | 45 | 45 |
|  | **Total workload** | | **146** |
|  | **Total workload / 30** | | **4.87** |
|  | **Course ECTS Credit** | | **5** |

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| **Evaluation** | |
| **Activity Type** | **%** |
| Mid-term | 40 |
| Quiz |  |
| Homework |  |
| Bir öğe seçin. |  |
| Bir öğe seçin. |  |
| **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. | 4 |
| **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. | 4 |
| **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. |  |
| **8** | Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement. |  |
| **9** | Understanding of professional and ethical issues and taking responsibility |  |
| **10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. |  |
| **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. |  |
| **12** |  |  |

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| **LECTUTER(S)** | | | | |
| **Prepared by** | Dr. Öğr. Üyesi Zafer ÖZNALBANT |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:**06.06.2024