**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| FAILURE ANALYSIS |  |

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

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| **Course Category (Credit)** |
| **Basic Sciences** | **Engineering Sciences** | **Design** | **General Education** | **Social** |
|  | 3 |  |  |  |

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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** | Understanding how components failUnderstands the meaning and significance of damage.Recognizes types of damage.Knows the reasons for damage.Aware of the types of damage frequently seen in the aviation field. |
| **Short Course Content** | What is failure?Types of Failure: Ductile vs. Brittle Fracture. Overload Failure. Fatigue Failure. Corrosion Failure. Creep Failure. Hot Corrosion Failure. Wear. High Temperature Failure.Causes of Failure: Design. Maintenance. Machining. Heat Treatment. Coating. Assembly / Shipping. Welding, Brazing. Casting. Additive Manufacturing.Failure in Aviation Industry: Gas Turbines. Structural Parts. Accessories.  |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | 1.Understands how damage occurs. | 1-11 | 1,2 | A |
| **2** | Recognizes the importance of damage | 1-11 | 1,2 | A |
| **3** | Knows the types of damage. | 1-11 | 1,2 | A |
| **4** | Knows the factors that contribute to damage. | 1-11 | 1,2 | A |
| **5** | Is aware of the types of damage seen in the aviation industry | 1-11 | 1,2 | A |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

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| **Main Textbook** | ASM Metal Handbook Vol. 11 Failure Analysis and Prevention |
| **Supporting References** |  |
| **Necessary Course Material** | Computer, Projector |

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| **Course Schedule** |
| **1** | Definition of Failures, reviewing with examples |
| **2** | Failure Types, Ductile and Brittle Fractures, Overload |
| **3** | Failure Types, Fatigue |
| **4** | Failure Types, Creep |
| **5** | Failure Types, Corrosion |
| **6** | Failure Types, High Temp Oxidation and Corrosion |
| **7** | Failure Types, Wear, Erosion, Fretting |
| **8** | Mid-Term Exam |
| **9** | Failure – Design relation |
| **10** | Failure– Manufacturing relation |
| **11** | Failure – Manufacturing Processes relation |
| **12** | Failure – Maintenance relation |
| **13** | Failures that have seen in Aviation Industry |
| **14** | Review |
| **15** | 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 | 52 |
| Classroom Studying Time (review, reinforcing, prestudy,….) | 10 | 2 | 20 |
| 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) | 10 | 1 | 10 |
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|  |  |  |  |
| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 2 | 2 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 20 | 20 |
|  | **Total workload** | **108** |
| 8 | **Total workload / 30** | **3.6** |
|  | **Course ECTS Credit** | **3** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term | 30 |
| Quiz |  |
| Homework |  |
| Bir öğe seçin. |  |
| Bir öğe seçin. |  |
| **Final Exam** | 70 |
| **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. | 2 |
| **5** | In order to investigate engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. | 5 |
| **6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. | 2 |
| **7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. | 3 |
| **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  | 2 |
| **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. | 3 |
| **12** |  |  |

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| **LECTUTER(S)** |
| **Prepared by** | Assist. Prof. S. Fehmi DİLTEMİZ |  |  |  |
| **Signature(s)** | A blue line drawing of a person's signature  Description automatically generated |  |  |  |

**Date:**06.06.2024