**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 fail  Understands 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** |  |  |  |  |
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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