**ESOGU AERONAUTICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| **ELASTICITY** | **152415003** |

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| **Semester** | **Number of Course Hours per Week** | **ECTS** |
| **Theory** | **Practice** |
| 5 | 3 | 0 | 4 |

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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 | Compulsory |

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| **Prerequisite(s) if any** | - |
| **Objectives of the Course** | This course lays down the fundamentals of linear elasticity. It introduces the advanced methods for the analysis of deformable bodies and educates students to apply this knowledge in the solution of aerospace engineering problems. It also equips students with the necessary background to design aerosystems and components. |
| **Short Course Content** | Concepts of stress and strain in 3-D. Transformations of stress and strain in 2D and 3D. Stress-strain and strain-displacement relations. Generalized Hooke's law. Energy methods. Castigliano's theorem. Problems in 2D elasticity. Plane stress and plane strain applications. |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Understanding stress and strain in 3D.  | 1, 2 | 1, 11 | A |
| **2** | Understanding vector analysis, computing dot products, moments and resultants related to engineering problems. | 2, 3 | 1, 11 | A |
| **3** | Understanding the structural loadings. | 2, 3 | 1, 11 | A |
| **4** | Analyzing the structures in terms of stress and strain aspects. | 3, 4 | 1, 11 | A |
| **5** | Gaining the basics of aerostructural design. | 5, 6  | 1, 11 | A |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

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| **Main Textbook** | A.C. Ugural and S.K. Fenster, "Advanced Strength and Applied Elasticity" Prentice Hall PTR, 3rd Edition, 1995, ISBN: 0-13-137589-X |
| **Supporting References** | B.K. Donaldson, "Analysis of Aircraft Structures" Mc Graw-Hill Book Company, 1993, ISBN: 0-07-112591-4S.Timoshenko and J.N. Goodier, "Theory of Elasticity", Mc Graw-Hill Book Company, 3rd Edition, 1982, ISBN: 0-07-Y85805-5 |
| **Necessary Course Material** | - |

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| **Course Schedule** |
| **1** |  Analysis of Stress in 2-D and 3-D |
| **2** |  Variation of stress within a body in 2-D and 3-D; Principal stresses in 2-D and 3-D |
| **3** |  Stress-Strain Relations |
| **4** |  Equations of compatibility; Generalized Hooke's Law |
| **5** |  Energy Methods; Strain Energy |
| **6** |  Principles of Work and Energy; Castigliano's Theorem |
| **7** |  2D Problems in Elasticity |
| **8** | Mid-Term Exam |
| **9** |  Plane strain problems |
| **10** |  Plane stress problems |
| **11** |  Thermal stresses |
| **12** |  Torsion of Non-circular Bars |
| **13** |  General solution of the torsion problem |
| **14** |  Torsion of thin-walled members of open cross-section |
| **15** |  Torsion of thin-walled members of open cross-section |
| **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 | 3 | 6 |
| 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) |  |  |  |
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| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 30 | 30 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 30 | 30 |
|  | **Total workload** | **112** |
|  | **Total workload / 30** | **3.7** |
|  | **Course ECTS Credit** | **4** |

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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. | 1 |
| **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** | Assoc. Prof. Selim Gürgen |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:**06.06.2024