**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| MECHANISM DESIGN | 151815356 |

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| **Semester** | **Number of Course Hours per Week** | **ECTS** |
| **Theory** | **Practice** |
| 5  | 3 | 0 | 6 |

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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** |
| Turkish and English | Undergraduate | Compulsory |

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| **Prerequisite(s) if any** |  |
| **Objectives of the Course** | To prepare students for the machine dynamics course, to teach students the design and synthesis techniques of mechanisms in a kinematical view |
| **Short Course Content** | Basic kinematic approaches to mechanisms, common problems faced in design and analysis of mechanisms, position-velocity and acceleration analyses of linkages, gear and cam mechanisms. |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Knowledge about the types of mechanism (linkage, gear, cam etc.), application areas, | 3, 7, 8 | 1, 8 | K |
| **2** | Knowledge on power transmission and conversion methods and their selective characteristics | 1, 2, 7 | 1, 4, 5, 8 | A, K |
| **3** | Knowledge of and ability to calculate mechanical advantage and efficiency of a mechanisms & machines | 1, 2, 7 | 1, 4, 5, 8, 10 | A, K |
| **4** | Ability to analyze the kinematics of a linkages, gear trains and cam mechanisms | 1, 2, 3, 7 | 1, 4, 5, 8, 10 | A, K |
| **5** | Ability to determine position, velocity and acceleration variations throughout the range of mechanism motions | 1, 2, 3, 7 | 1, 4, 5, 8, 10 | A, K |
| **6** | Ability to design a mechanism producing desired motions  | 1, 2, 3, 7 | 1, 4, 5, 8, 10 | A, K |
| **7** | Knowledge on synthesizing mechanisms | 1, 2, 3, 7 | 1, 4, 5, 8, 10 | A, K |

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| **Main Textbook** | Kinematics and Dynamics of Machinery, R.L. Norton, McGraw-Hill |
| **Supporting References** | 1. Mechanism Design: Analysis and Synthesis, Arthur G. Erdman, George N. Sandor
2. Machines & Mechanisms, David H. Myszka
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| **Necessary Course Material** | Ruler, protractor, pencil compass and standard (non- programmable) calculator are devices allowed for use during the exams |

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| **Course Schedule** |
| **1** | Introduction: definitions, various types of mechanisms; principles of design and synthesis |
| **2** | Mechanism terminology; kinematic diagrams; inversion; Grashof law; Power & losses  |
| **3** | Mechanical efficiency and advantage, transmission angle; Cam-follower and gear types; degree of freedom (joints and mechanisms, Kutzbach-Gruebler equation) |
| **4** | Questions & answers; function, path and motion generation, Freudenstein equation |
| **5** | Instant center of rotation; Arnold-Kennedy theorem; differential kinematics for mechanisms  |
| **6** | Position, velocity and acceleration analysis of linkage mechanisms  |
| **7** | Applications; instant center of rotation method |
| **8** | Mid-Term Exam |
| **9** | Midterm exam evaluation; common gear types & kinematics; friction drives |
| **10** | Planetary gear mechanisms; kinematic analysis |
| **11** | Planetary gear mechanisms; alternative approaches |
| **12** | Questions & answers |
| **13** | Cam-follower mechanisms (classification, basic terms, inversion principle) |
| **14** | SVAJ diagrams |
| **15** | Questions & answers |
| **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,) | 14 | 6 | 84 |
| 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 | 20 | 20 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 20 | 20 |
|  | **Total workload** | **170** |
|  | **Total workload / 30** | **5.66** |
|  | **Course ECTS Credit** | **6** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term | 50 |
| Quiz |  |
| Homework |  |
| Bir öğe seçin. |  |
| Bir öğe seçin. |  |
| **Final Exam** | 50 |
| **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 to mathematics, science and Mechanical Engineering; an ability to apply theoretical and practical knowledge on solving and modeling of Mechanical Engineering problems.  | 5 |
| **2** | Ability to determine, define, formulate and solve complex Mechanical 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, economic 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 Mechanical Engineering applications; ability to effective use of information technologies. | 1 |
| **5** | In order to investigate Mechanical Engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results. | 1 |
| **6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. | 1 |
| **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. | 2 |
| **9** | Understanding of professional and ethical issues and taking responsibility  | 1 |
| **10** | Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development. | 1 |
| **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. | 1 |

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| **LECTUTER(S)** |
| **Prepared by** | Naci Zafer | Sezcan Yılmaz |  |  |
| **Signature(s)** |  |  |  |  |

**Date:**09.07.2024