**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Differential Equations | 151813558 |

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

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| **Prerequisite(s) if any** | - |
| **Objectives of the Course** | The main of the course is to introduce the basic terminology of differential equations and to examine, how differential equations are derived to formulate or describe physical phenomena in terms of mathematics. |
| **Short Course Content** | Differential equations and solutions, first-order differential equations and solution methods, applications of first-order differential equations, higher order differential equations and solution methods, linear differential equation systems |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Define and classify differential equations | 1, 2  | 1, 10 | A, B |
| **2** | Obtain a differential equation by eliminating arbitrary constants from a given relation | 1, 2 | 1, 10 | A, B |
| **3** | Knows first order differential equations and their solutions. | 1, 2 | 1, 10 | A, B |
| **4** | Recognize and solve separable, homogeneous, exact, linear and Bernoulli differential equations | 1, 2 | 1, 10 | A, B |
| **5** | Recognize higher order linear equations and solve some types | 1, 2 | 1, 10 | A, B |
| **6** | Solve linear equations systems | 1, 2 | 1, 10 | A, B |
| **7** | Recognize and solve Cauchy-Euler and Legendre differential equations | 1, 2 | 1, 10 | A, B |

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| **Main Textbook** | Richard Branson, Gabriel B. Costa, Differential Equations, Schaum’s Outline Series, 3rd edition, 2006. |
| **Supporting References** | William E. Boyce, Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th edition, John Wiley & Sons Inc, 2001. |
| **Necessary Course Material** | - |

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| **Course Schedule** |
| **1** | Definition and classification of differential equations |
| **2** | Separable equations and homogeneous equations |
| **3** | Exact differential equations and integrating factors |
| **4** | Linear first order differential equations and solution methods |
| **5** | Bernoulli and Riccati equations |
| **6** | Applications of first-order differential equations |
| **7** | Applications of first-order differential equations |
| **8** | Mid-Term Exam |
| **9** | Linear differential equations, linearly independent solutions |
| **10** | Wronskian, non-homogenous equations |
| **11** | Second and higher order linear homogenous differential equations |
| **12** | Method of undetermined coefficients |
| **13** | Method of variation of parameters |
| **14** | Linear differential equation systems |
| **15** | Cauchy-Euler and Lagrange equations |
| **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 | 2 | 28 |
| Homework | - | - | - |
| Quiz Exam | 2 | 2 | 4 |
| Studying for Quiz Exam | 2 | 5 | 10 |
| 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 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 16 | 16 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 32 | 32 |
|  | **Toplam iş yükü** | **136** |
|  | **Toplam iş yükü / 30** | **4.53** |
|  | **Dersin AKTS Kredisi** | **5** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term | 30 |
| Quiz | 20 |
| **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 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, economic 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** | To investigate 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. | 2 |
| **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. | 3 |
| **9** | Understanding of professional and ethical issues and taking responsibility | 3 |
| **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. | 2 |

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| **LECTUTER(S)** |
| **Prepared by** | Asst. Prof. Dr. Çisil TİMURALP |  | - | - |
| **Signature(s)** |  |  |  |  |

**Date:** 10.07.2024