**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Numerical Analysis |  151826370 |

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| **Semester** | **Number of Course Hours per Week** | **ECTS** |
| **Theory** | **Practice** |
| 6 | 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** |
| Turkish | Undergraduate | Compulsory |

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| **Prerequisite(s) if any** | - |
| **Objectives of the Course** | Teaching the students how to use the related numerical methods for the solving the engineering problems. |
| **Short Course Content** | Solving nonlinear equations, solving sets of linear equations, difference tables, interpolation, extrapolation, numerical differentiation, numerical integration, least square approximations, numerical solution of ordinary differential equations, eigen values, eigen vectors |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Solving nonlinear differential equations by applying numerical methods | 1,2,6 | 1, 4 | A |
| **2** | Solving linear equations by using iterative methods | 1,2,6 | 1, 4 | A |
| **3** | Calculating derivatives and integrals of functions known only at some discrete points | 1,2,6 | 1, 4 | A |
| **4** | Curve fitting to given data by least square approximation | 1,2,6 | 1, 4 | A |
| **5** | Solving ordinary differential equations by numerical methods | 1,2,6 | 1, 4 | A |
| **6** |  |  |  |  |

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| **Main Textbook** | Applied Numerical Analysis, Curtis F. Gerald, Parick O. Wheatley |
| **Supporting References** | Numerical Analysis, Richard L. Buraden, J. Douglas Faires |
| **Necessary Course Material** | - |

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| **Course Schedule** |
| **1** | Solving nonlinear equations |
| **2** | Solution of linear differential equations by direct methods |
| **3** | Solution of linear differential equations by iterative methods |
| **4** | Difference tables |
| **5** | Interpolation and extrapolation |
| **6** | Numerical differentiation |
| **7** | Numerical integration |
| **8** | Mid-Term Exam |
| **9** | Numerical integration by quadrature methods  |
| **10** | Least square approximations  |
| **11** | Least square approximations  |
| **12** | Numerical solution of ordinary differential equations, initial value problems |
| **13** | Boundary value problems |
| **14** | Boundary value problems |
| **15** | Eigen values, eigen vectors |
| **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 | 1.5 | 21 |
| 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) |  |  |  |
| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 14 | 14 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 28 | 28 |
|  | **Toplam iş yükü** | **109** |
|  | **Toplam iş yükü / 30** | **3.63** |
|  | **Dersin AKTS Kredisi** | **4** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term | 40 |
| Presentation | 60 |
| **Final Exam (Report)** |  |
| **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 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 constraints or conditions, defined by environmental, economic and political problems; for that purpose an ability to apply modern design methods. | 1 |
| **4** | Ability to develop, select and use modern methods and tools required for engineering applications; ability to effectively use information technologies. | 4 |
| **5** | To investigate engineering problems; ability to set up and conduct experiments and ability to analyze and interpret experimental results. | 3 |
| **6** | Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence. | 5 |
| **7** | Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language. | 2 |
| **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 | 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. | 2 |

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

**Date:** 17.11.2024