**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Engineering Thermodynamics - II | 151815355 |

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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** |
|  | 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 aim of this course is to teach the basic application areas of thermodynamics and to apply the principles of thermodynamics to related engineering systems |
| **Short Course Content** | 1. Makes availability analysis. 2. Analyzes steam power cycles. 3. Comprehends heat and power production. 4. Analyzes gas-steam power cycles. 5. Knows and calculates refrigeration cycles, refrigeration systems. 6. Analyzes the air conditioning systems |

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| **Learning Outcomes of the Course** | | **Contributed PO(s)** | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Defines availability for engineering systems, defines, calculates and analyzes second law efficiency | 1, 2, 5, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **2** | Define exergy balance and apply it to engineering systems | 1, 2, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **3** | Performs and analyzes availability analysis for closed/open and steady/transient systems. | 1, 2, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **4** | Defines gas-fluid cycles, makes and analyzes first and second law analysis | 1, 2, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **5** | Defines vapor-fluid cycles, makes and analyzes the first and second law analysis | 1, 2, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **6** | Defines refrigeration and heat pump cycles, makes and analyzes the first and second law analysis | 1, 2, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **7** | Defines the properties of atmospheric air, learns to use psychrometry diagram, applies mass and energy balances to air conditioning systems | 1, 2, 3, 6, 7 | 1, 2, 5, 10, 11 | A, B |
| **8** | Establishes the relationship between energy, efficiency, sustainability and environment | 8, 9, 10, 11 | 1, 2, 5, 10, 11 | A, B |

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| **Main Textbook** | Yunus Ali Çengel ve Michael A. Boles, Çeviri Editörü: Ali PINARBAŞI, “TERMODİNAMİK, Mühendislik Yaklaşımıyla”, 5. Baskı, İzmir Güven Kitabevi, 2008. |
| **Supporting References** | Micheal J. Moran and Howard M. Shapiro, “Fundamentals of Engineering Thermodynamics”, Wiley, 2020.  Claus Borgnakke and Richard E. Sonntag, “Thermodynamic and Transport Properties”, John Wiley & Sons, Inc., 1997. |
| **Necessary Course Material** |  |

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| **Course Schedule** | |
| **1** | Exergy |
| **2** | Exergy |
| **3** | Second law analysis of closed and steady state flow systems |
| **4** | Second law analysis of closed and steady state flow systems |
| **5** | Gas-fluid power cycles |
| **6** | Gas-fluid power cycles |
| **7** | Second law analysis of gas-fluid power cycles |
| **8** | Mid-Term Exam |
| **9** | Steam Power Plants |
| **10** | Steam Power Plants |
| **11** | Second law analysis of Steam Power Plants |
| **12** | Refrigeration cycles |
| **13** | Refrigeration cycles |
| **14** | Air conditioning |
| **15** | Air conditioning |
| **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 | 3 | 42 |
| Homework | 0 | 0 | 0 |
| Quiz Exam |  |  |  |
| Studying for Quiz Exam |  |  |  |
| Oral exam | 0 | 0 | 0 |
| Studying for Oral Exam | 0 | 0 | 0 |
| Report (Preparation and presentation time included) | 0 | 0 | 0 |
| Project (Preparation and presentation time included) | 0 | 0 | 0 |
| Presentation (Preparation time included) | 0 | 0 | 0 |
| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 36 | 36 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 42 | 42 |
|  | **Total workload** | | **166** |
|  | **Total workload / 30** | | **5.53** |
|  | **Course ECTS Credit** | | **6** |

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| **Evaluation** | |
| **Activity Type** | **%** |
| Mid-term | 50 |
| Quiz |  |
| **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 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 | 1 |
| **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 effectively in inner or multi-disciplinary teams; proficiency of | 4 |
| **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. | 4 |
| **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. | 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. Haydar ARAS | Prof. Dr. M. Ertunç TAT | Assoc. Prof. Dr. Bahadır DOĞAN | Asst. Prof. Dr. Çisil TİMURALP |
| **Signature(s)** |  |  |  |  |

**Date:** 10.07.2024