**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| Thermal Systems Design | 151817451 |

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| **Semester** | **Number of Course Hours per Week** | **ECTS** |
| **Theory** | **Practice** |
| 7 | 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** |
| Turkish | Undergraduate | Elective |

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| **Prerequisite(s) if any** |  |
| **Objectives of the Course** | The students is to apply knowledge learned in heat transfer, thermodynamics and fluid mechanics courses to thermal system design problems. |
| **Short Course Content** | System design concept, reliability in design, environmental effects in design, mass transfer, thermal analysis and design for condenser and heat exchanger, thermal analysis for airconditioning systems, cost analysis and optimization in design. |

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| **Learning Outcomes of the Course** | **Contributed PO(s)**  | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Model development for complex thermal designs. | 1,2,3 | 1,5  | K |
| **2** | Knowledge of computer programs that can be used in thermal system designs. | 8 | 1 | K |
| **3** | Understanding the importance of reliability and environmental impacts in design. | 8,11 | 1 | K |
| **4** | Calculating design and performance parameters for condensers. | 1,2,3,7,11 | 1,5,10,14 | D,E,G,J,K |
| **5** | Calculating design and performance parameters for heat exchanger. | 1,2,3,7,11 | 1,5,10,14 | D,E,G,J,K |
| **6** |  |  |  |  |
| **7** |  |  |  |  |
| **8** |  |  |  |  |

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| **Main Textbook** | - Incropera F.P., Dewitt,D.P., (2015) “Isı ve Kütle Geçişinin Temelleri”, Palme Yayıncılık- Çengel, Y.A., Boles, M.A., (2000) “Mühendislik yaklaşımıyla Termodinamik”, Literatür yayıncılık - Bird, B.R., Stewart W.E., Lightfoot, E.N., (2006) “Transport Phenomena”, John Wiley and Sons. |
| **Supporting References** | Bejan A., G. Tsatsaronis, M. Moran (1996). Thermal Design and Optimization, John Wiley and Sons. |
| **Necessary Course Material** | Computer, projector. |

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| **Course Schedule** |
| **1** | Introduction to systems design and analysis concepts. |
| **2** | Formulation of design problems, modeling of thermal systems, reliability, environmental effects in design. |
| **3** | Mass transfer |
| **4** | Condensation |
| **5** | Film condensation on a vertical plate |
| **6** | Film condensation on a radial systems |
| **7** | Film condensation in horizontal tubes |
| **8** | Mid-Term Exam |
| **9** | Heat exchanger types |
| **10** | Parallel and counter flow heat exchangers |
| **11** | Heat exchanger analysis using Logarithmic Mean Temperature Difference\_The parallel flow heat exchanger |
| **12** | Heat exchanger analysis using Logarithmic Mean Temperature Difference\_The counterflow heat exchanger |
| **13** | Heat exchanger analysis using the Effectiveness-NTU method. |
| **14** | Methodology of a heat exchanger calculation |
| **15** | Computer aided thermal system engineering |
| **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 | 14 |
| Homework | 1 | 20 | 20 |
| Quiz Exam |  |  |  |
| Studying for Quiz Exam |  |  |  |
| Oral exam  |  |  |  |
| Studying for Oral Exam  |  |  |  |
| Report (Preparation and presentation time included) | 2 | 20 | 40 |
| Project (Preparation and presentation time included) | 1 | 22 | 22 |
| Presentation (Preparation time included) |  |  |  |
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| Mid-Term Exam |  |  |  |
| Studying for Mid-Term Exam |  |  |  |
| Final Exam |  |  |  |
| Studying for Final Exam |  |  |  |
|  | **Total workload** | **138** |
|  | **Total workload / 30** | **4.6** |
|  | **Course ECTS Credit** | **5** |

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| **Evaluation** |
| **Activity Type** | **%** |
| Mid-term |  |
| Quiz |  |
| Homework | 50 |
| Bir öğe seçin. |  |
| Project Observation | 50 |
| **Final Exam** |  |
| **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. | 4 |
| **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. | 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. | 4 |
| **4** | Ability to develop, select and use modern methods and tools required for mechanical engineering applications; ability to effective use of information technologies.  | 2 |
| **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. | 2 |
| **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.  | 2 |
| **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. | 3 |
| **12** |  |  |

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| **LECTUTER(S)** |
| **Prepared by** | Associate Professor Özge ALTUN |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:**06.06.2024