

INTRODUCTION TO THERMAL ENERGY SYSTEMS

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| 1 | Course Title: | INTRODUCTION TO THERMAL ENERGY SYSTEMS | |
| 2 | Course Code: | MAK2090 | |
| 3 | Type of Course: | Optional | |
| 4 | Level of Course: | First Cycle | |
| 5 | Year of Study: | 2 | |
| 6 | Semester: | 4 | |
| 7 | ECTS Credits Allocated: | 3.00 | |
| 8 | Theoretical (hour/week): | 2.00 | |
| 9 | Practice (hour/week): | 0.00 | |
| 10 | Laboratory (hour/week): | 0 | |
| 11 | Prerequisites: | - | |
| 12 | Language: | Turkish | |
| 13 | Mode of Delivery: | Face to face | |
| 14 | Course Coordinator: | Prof. Dr. Akın Burak Etemoğlu | |
| 15 | Course Lecturers: | - | |
| 16 | Contact information of the Course Coordinator: | e-posta: aetem@uludag.edu.tr telefon: 224 2941976 adres: UÜMF, Makine Müh. BIm. | |
| 17 | Website: | | |
| 18 | Objective of the Course: | This course covers the principles of Thermodynamics, Heat Transfer and Fluid Mechanics which are the basic sciences that deal with energy. The goal of the course is to provide knowledge about energy transfer and energy economics to undergraduate engineering students at traditional approach. | |
| 19 | Contribution of the Course to Professional Development: | | |
| 20 | Learning Outcomes: | | |
| | | 1 | Determine and solve engineering problems by applying thermodynamics, heat transfer and fluid mechanics principles with appropriate assumptions |
| | | 2 | Apply heat transfer principles to design and to evaluate performance of thermal systems. |
| | | 3 | Calculate heat transfer rates for various processes. |
| | | 4 | Solve governing equations associated with thermal systems using analytical and numerical approaches. |
| | | 5 | Simplify the general heat conduction equation and write boundary/initial conditions for any conduction heat transfer problem. |
| | | 6 | Use appropriate method to solve transient heat conduction problem. |
| | | 7 | Calculate convection heat transfer coefficient and determine convection heat transfer rates for various fluid flow configurations. |
| | | 8 | Compute radiation heat transfer rates. |
| | | 9 | Understand the technological, social, and economic factors related to efficient use of various forms of energy. |
| | | 10 | |
| 21 | Course Content: | | |
| | | Course Content: | |

| Week | Theoretical | Practice |
|------|--|----------|
| 1 | Application areas of heat transfer operations in engineering, conservation laws. | |
| 2 | Modes of heat transfer. | |
| 3 | Introduction to heat conduction. General heat conduction equation. | |
| 4 | Steady-state heat conduction. | |
| 5 | Multilayer heat conduction. | |
| 6 | Transient heat conduction. Lumped systems analysis. | |
| 7 | Transient heat conduction in large plane walls, long cylinders and spheres. | |
| 8 | Repeating courses and midterm exam | |
| 9 | Physical mechanism of convection. Boundary layer. Laminar and turbulent flows. Dimensionless numbers (Nu, Re, Pr, Gr, St). | |
| 10 | Differential convection equations (mass, momentum and energy). External forced convection. | |
| 11 | Internal forced convection. | |
| 12 | Natural convection. | |
| 13 | Radiation heat transfer. | |
| 14 | Energy economics. | |

| Activities | | Number | Duration (hour) | Total Work Load (hour) |
|--|---|--------|-----------------|------------------------|
| Theoretical | | 14 | 12.00 | 28.00 |
| Practicals/Labs | | 0 | 0.00 | 0.00 |
| Self study and preparation | | 2 | 10.00 | 20.00 |
| Assessment | | | | |
| Homeworks | | 0 | 0.00 | 0.00 |
| Projects | R | 1 | 10.00 | 10.00 |
| Field Studies | | 0 | 0.00 | 0.00 |
| Quiz | | | | |
| Midterm exams | 1 | 10.00 | 10.00 | 10.00 |
| Others | | 1 | 10.00 | 10.00 |
| Final Exams | 1 | 50.00 | 12.00 | 12.00 |
| Total Work Load | | | | 90.00 |
| Contribution of Term (Year) Learning Activities to Success Grade | | 50.00 | | 3.00 |
| ECTS Credit of the Course | | | | 3.00 |
| Contribution of Final Exam to Success Grade | | 50.00 | | |
| Total | | 100.00 | | |
| Measurement and Evaluation Techniques Used in the Course | | | | |

24 ECTS / WORK LOAD TABLE

| 25 | CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS | | | | | | | | | | | | | | | |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|
| | PQ1 | PQ2 | PQ3 | PQ4 | PQ5 | PQ6 | PQ7 | PQ8 | PQ9 | PQ10 | PQ11 | PQ12 | PQ13 | PQ14 | PQ15 | PQ16 |
| ÖK1 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| ÖK2 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |

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| ÖK3 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK4 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK5 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK6 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK7 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK8 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| ÖK9 | 5 | 5 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| LO: Learning Objectives PQ: Program Qualifications | | | | | | | | | | | | | | | | |
| Contribution Level: | 1 very low | | | 2 low | | | 3 Medium | | | 4 High | | | 5 Very High | | | |