| COMBINED HEAT-POWER SYSTEMS | | | | | | | | | | |
|-----------------------------|---|--|---|--|--|--|--|--|--|--|
| 1 | Course Title: | COMBINED HEAT-POWER SYSTEMS | | | | | | | | |
| 2 | Course Code: | MAK621 | 2 | | | | | | | |
| 3 | Type of Course: | Optional | | | | | | | | |
| 4 | Level of Course: | Third Cy | cle | | | | | | | |
| 5 | Year of Study: | 1 | 1 | | | | | | | |
| 6 | Semester: | 2 | | | | | | | | |
| 7 | ECTS Credits Allocated: | 5.00 | | | | | | | | |
| 8 | Theoretical (hour/week): | 3.00 | | | | | | | | |
| 9 | Practice (hour/week): | 0.00 | | | | | | | | |
| 10 | Laboratory (hour/week): | 0 | 0 | | | | | | | |
| 11 | Prerequisites: | None | None | | | | | | | |
| 12 | Language: | Turkish | | | | | | | | |
| 13 | Mode of Delivery: | Face to face | | | | | | | | |
| 14 | Course Coordinator: | Prof. Dr. | Prof. Dr. MUHSIN KILIÇ | | | | | | | |
| 15 | Course Lecturers: | | | | | | | | | |
| 16 | Contact information of the Course Coordinator: | Prof.Dr. Muhsin Kılıç mkilic@uludag.edu.tr Adres: Uludağ Üniversitesi Mühendislik-Mimarlık Fakültesi Ali Durmaz Makine Mühendisliği Binası DM:220 16059 Görükle/BURSA Tel: 0224 294 1953 | | | | | | | | |
| 17 | Website: | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | Objective of the Course: | The object classical and their | ectives of this course are to reinforce the students grasp of thermodynamics, to teach the combined heat-power cycles applications. | | | | | | | |
| 17 18 19 | Objective of the Course: Contribution of the Course to Professional Development: | The object classical and their | ectives of this course are to reinforce the students grasp of thermodynamics, to teach the combined heat-power cycles applications. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The object classical and their | ectives of this course are to reinforce the students grasp of thermodynamics, to teach the combined heat-power cycles applications. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The object classical and their classical and t | Concepts. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The objectassical and their 1 | Understanding of the basic thermodynamic definitions and concepts. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The object classical and their classical and t | Understanding of the basic thermodynamic definitions and concepts. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The objectassical and their and thei | Understanding of the basic thermodynamic definitions and concepts. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. Evaluation of the work and heat transfer of processes. Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The objectassical and their and thei | Understanding of the basic thermodynamic definitions and concepts. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. Evaluation of the work and heat transfer of processes. Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems. Understanding of the termodynamics cycles and their applications. | | | | | | | |
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| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The objectassical and their and thei | Understanding of the basic thermodynamic definitions and concepts. Understances and ideal gases. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. Evaluation of the work and heat transfer of processes. Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems. Understanding of the termodynamics cycles and their applications. Evaluation of the combined heat-power cycles and their applications. | | | | | | | |
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| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: | The objectassical and their and thei | Understanding of the basic thermodynamic definitions and concepts. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. Evaluation of the work and heat transfer of processes. Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems. Understanding of the termodynamics cycles and their applications. Evaluation of the combined heat-power cycles and their applications. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: Course Content: | The objectassical and their and thei | ctives of this course are to reinforce the students grasp of thermodynamics, to teach the combined heat-power cycles applications. Understanding of the basic thermodynamic definitions and concepts. Evaluation of the thermodynamic state and properties for pure substances and ideal gases. Evaluation of the work and heat transfer of processes. Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems. Understanding of the termodynamics cycles and their applications. Evaluation of the combined heat-power cycles and their applications. | | | | | | | |
| 17 18 19 20 | Objective of the Course: Contribution of the Course to Professional Development: Learning Outcomes: Course Content: | The objectassical and their and thei | Content: | | | | | | | |

| 1 | Review of basic thermodynamic defir and concepts. | nitions | | | | | | | |
|--|--|-------------------------|---|--------------|--------------------------------|--|--|--|--|
| 2 | Open systems, first law applications. | | | | | | | | |
| 3 | Application of first law to ideal gases. Variable specific heats of ideal gases | 5. | | | | | | | |
| 4 | Second law and Carnot cycle. Heat e refrigeration machine and heat pump | engine, s. | | | | | | | |
| 5 | Entropy. Internal and external irrever TdS relations. Reversible work, actua usefull work and lost work. | sibilities. al work, | | | | | | | |
| 6 | Availability (Exergy) analysis. Second efficiency. | d law | | | | | | | |
| 7 | Gas cycles: Ericson, Stirling, Brayton | cycles | | | | | | | |
| 8 | Repeating courses and midterm exar | n | | | | | | | |
| 9 | Gas cycles: Otto and diesel cycles | | | | | | | | |
| 10 | Pure substances cycles and application | ions | | | | | | | |
| 11 | Pure substances cycles and application | ions | | | | | | | |
| 12 | Basics of the combined heat-power of | ycles | | | | | | | |
| 13 | Combined heat-power cycles applica | tions | | | | | | | |
| 14 | Evaulation of the combined heat-pow cycles applications | /er | | | | | | | |
| 22 | Textbooks, References and/or Other Materials: | | 1. K. Wark. Advanced Thermodynamics for Engineers. McGraw-Hill Inc., 1994. | | | | | | |
| Activit | tes | | Number | Duration (ho | our) Total Work Load (hour) | | | | |
| Theore | lical | | 4 14 A. Çengel and M. Boles. Thermodynamics0An | | | | | | |
| Practic | als/Labs | | 0 | 0.00 | 0.00 | | | | |
| Self stu | dy and preperation | | 14 AT Severe Lb | 3.00 | 42.00 | | | | |
| Homev | vorks | | 6 | 12.00 | 72.00 | | | | |
| Project | 6 | | 0 | 0.00 | 0.00 | | | | |
| Field S | studies | | 0 | 0.00 | 0.00 | | | | |
| Midterr | Texams | NUMBE R | WEIGHT | 18.00 | 18.00 | | | | |
| Others | | | 0 | 0.00 | 0.00 | | | | |
| Qin z i e | xams | 0 | 0.00 | 22.00 | 22.00 | | | | |
| Total V | Vork Load | | | | 196.00 | | | | |
| Frial 🖻 | γρ₃khload/ 30 hr | 1 | 50.00 | | 6.53 | | | | |
| ECTS | Credit of the Course | 11 | | | 5.00 | | | | |
| Contribution of Term (Year) Learning Activities to Success Grade | | | 50.00 | | | | | | |
| Contrib | oution of Final Exam to Success Grade | 9 | 50.00 | | | | | | |
| Total | | | 100.00 | | | | | | |
| | | | 100.00 | | | | | | |
| Measu Course | rement and Evaluation Techniques Us | sed in the | 100.00 | | | | | | |

| 25 | CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS | | | | | | | | | | | | | | | |
|--|--|------------------|-----|-----|-----|-----|----------|-----|-----|----------|------|------|-------------|------|------|------|
| | PQ1 | PQ2 | PQ3 | PQ4 | PQ5 | PQ6 | PQ7 | PQ8 | PQ9 | PQ1 0 | PQ11 | PQ12 | PQ1 3 | PQ14 | PQ15 | PQ16 |
| ÖK1 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ÖK2 | 5 | 5 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ÖK3 | 4 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ÖK4 | 4 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| ÖK5 | 4 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| ÖK6 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LO: Learning Objectives PQ: Program Qualifications | | | | | | | | | | | | | • | | | |
| Contrib ution Level: | 1 \ | 1 very low 2 low | | | | | 3 Medium | | | 4 High | | | 5 Very High | | | |