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| **College** | Engineering | | | |
| **Department** | Mechanical engineering | | | |
| **Program** | B.Sc | | | |
| **Course Title** | Thermodynamics 1 | **Course Number:** | | 12210238 |
| **Year** | 2023-2024 | **Semester:** | | Summer |
| **Prerequisite(s)** | Dynamics **12210244** | | | |
| **Instructor** | Mhanna E’baid | | | |
| **Instructor's e-mail** | m.obaid@ptuk.edu.ps | | | |
| **Office Hours** | Sun., Wed.: 11:00-12:30 | | | |
| **Class Time** | Sun, Mon, Tue :  10:00 - 12:00 | | **Class Room:** | H116 |
| **Course description** | This course provides students with thermodynamics concepts and definitions; the thermodynamic system, properties, phase equilibrium of pure substances, equations of state for gases, tables of properties, computer-aided thermodynamic tables, work and heat. First law of thermodynamics; thermodynamic cycles, change of state, internal energy, enthalpy, specific heat; closed and open systems, steady-state and transient processes. Second law of thermodynamics; reversible and irreversible processes, the Carnot cycle and introduction to entropy. | | | |
| **Course Intended Learning Outcomes (CILOs)** | 1- Introduce the student to thermal power systems  2- Provide students with adequate experience in heating and  cooling to meet thermal engineering requirements.  3- Solve classical thermodynamic problems.  4- Equip students with the technical knowledge necessary to work effectively as a power engineers in an industrial environment  . | | | |
| **Textbook(s)** | Fundamentals of Thermodynamics  Seventh Edition  Sontag, Borgnakke and Van Wylen | | | |
| **Other required material (References):** | 1- Applied thermodynamic for engineering technologists  By T.D Eastop & A. Mcconkey  2- [Thermodynamics an engineering approach](http://www.uquni.com/vb/showthread.php/12237-Thermodynamics-an-engineering-approach-sixth-edition-(SI-units)-by-Yunus-A.-Cengel)  by Yunus A. Cengel  3- Fundamentals of Engineering Thermodynamics;   1. By: **Michael J. Moran, Howard N. Shapiro**   4- Fundamentals of thermal fluid sciences. in SI units by Yunus Singal, Robert Turner   1. and John Cinbala   5- Power engineering technologies  Paul. Breeze  6- Introduction to engineering thermodynamics 4th edition 2018  William B. Baratuci | | | |
| **Other Resources used (e.g. e-learning, field visits, periodicals, software, etc. )** | 1- Computer-Aided Thermodynamic Tables 3 - CATT-3  2- Pure substance Thermodynamics tables | | | |

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| **Course Teaching Methods** | |
| **Teaching Method** | **CILOs** |
| Direct instructions and learning | C, D |
| Problem solving | A, B |
| Discussion and presentations | A,B,C |
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| **Assessment Type** | **Details/Explanation of assessment in relation to CILOs** | **Weight** | **Date(s)** |
| **Assignments** | A,B | 15% | 2nd week, 3rd week, 6th week |
| **Forums/quizzes x** | A | 15% | Weekly Question |
| **Mid term** | B | 40% | 4th week |
| **Final Exam** | A, B, D | 45% | 8th week |
| **Total** |  | 100% |  |

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| **Course Intended Learning Outcomes (CILOs)** | | | | | | | | | | |
| **CILOs** | **Mapping to Program ILOs** | | | | | | | | | |
| **On successful completion of the course, students will be able to:** | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **h** | **I** | **j** |
| 1. ability to apply knowledge of math engineering and science | √ |  |  |  |  |  |  |  |  |  |
| ability to design system components or process to meet a need |  | √ |  | √ |  |  |  |  |  |  |
| ability to identify, formulate and solve engineering problems | √ |  |  |  |  |  |  |  |  |  |
| understanding professional and ethical responsibility | √ |  |  | √ |  |  |  |  |  |  |
| Broad education to understand the impact of engineering solutions in a global and societal context |  | √ | √ |  |  |  |  |  |  |  |
| knowledge of contemporary issues |  |  | √ |  |  |  |  |  |  |  |
| ability to use techniques, skills and tools in engineering practice |  |  | √ | √ |  |  |  |  |  |  |

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| **Course Weekly Breakdown** | | | | | |
| **Week** | **Date** | **Topics Covered** | **CILOs** | **Lab Activities** | **Assessment** |
| 1 |  | introduction |  |  |  |
| 2 | 20-26/2/2021 | 1. Some Introductory Comments  Thermodynamics applications in engineering sciences (chapter 1 )  Thermal power plants, fuel cells refrigeration and air conditioning, rockets  steam and gas turbines and pollution | A |  | Problem set |
| 3+4 | 27/2-12/3/2021 | Some Concepts & Definition. (chapter 2)  Thermodynamic system and control volume, Properties and state of a substance, Processes and cycles, Energy, Pressure and specific volume  Temperature scale and the zeroth law of thermodynamics | A |  | Problem set |
| 5+6+7 | 13/3-2/4/2021 | Properties of A pure Substance (chapter 3)  And thermodynamic tables  The pure substance, Vapor-liquid-solid phase equilibrium in a pure substance  Independent properties of a pure substance  Equation of state for the vapor phase  Tables of thermodynamic properties) | A,B |  | Problem set |
| 8+9 | 3-16/4/2021 | Work and Heat (chapter 4)  Definition of work and systems involving work  Definition of heat and modes of heat transfer  Comparison between heat and work  Applications and examples on heat and work | A,B |  | Problem set |
| 10+11 | 17-30/4/2021 | The First Law Of Thermodynamics (chapter 5)  For a closed system  First law for a control mass undergoing a cycle, The first law for a change in state of a control mass, Internal energy and enthalpy , thermodynamic  Properties: The constant volume and constant pressure specific heats  specific heats, internal energy & enthalpy for an ideal gas.  The first law as a rate equation and conservation of mass | A,B |  | Problem set |
| 12+13 | 1-14/5/2021 | First Law Analysis For A control Volume (chapter 6)    Conservation of mass and the control volume, the first law for a control volume, the steady state steady flow process (sssf), the uniform state and uniform flow presses | A,B |  | Problem set |
| 14+15 | 15-28/5/2021 | The second Law Of Thermodynamics (chapter 7) | B |  |  |
| 16 | 29/5-4/6/2021 | Thermodynamics Applications |  |  |  |

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| **Prepared by:** |  | **Signature** |  |
| **Head of Department** |  | **Signature** |  |
| **Date** |  | | |

