

## APPENDIX A – COURSE SYLLABI

1. **Course number and name:** 0915321 Chemical Engineering Thermodynamics 1
2. **Course Prerequisite:** 0905212 Chemical Engineering principles II, 0303241 Physical Chemistry (1)
3. **Credits, contact hours, and categorization of credits in Table 5-1** (math and basic science, engineering topic, and/or other): (3 Cr. – Required Course)
4. **Syllabus URL:** <http://elearning.ju.edu.jo>
5. **Instructor's or course coordinator's name:** Dr. Ali Khalaf Al-Matar. Office: ChE307, Telephone: 06/5355000 ext 22890, Email: [aalmatar@ju.edu.jo](mailto:aalmatar@ju.edu.jo).
6. **Textbook, title, author, and year:** Yunus A. Çengel and Michael A. Boles, 'Thermodynamics: An Engineering Approach', 8th edition, McGraw-Hill, 2014.
  - a) S Moran, M. J., Shapiro H. N., Boettner, D. D., Bailey, M. B., 'Principles of Engineering Thermodynamics', 7<sup>th</sup> edition, John Wiley & Sons Inc., 2012
  - b) Smith, J. M. Van Ness, H. C. and Abbott, M. M. 'Introduction to Chemical Engineering Thermodynamics', 7<sup>th</sup> edition, McGraw-Hill, 2004.
  - c) Sandler, S.I., 'Chemical, Biochemical, and Engineering Thermodynamics', 4<sup>th</sup> edition, John Wiley & Sons Inc., 2006.
7. **Live stream platform:** Microsoft Teams  
Live Stream URL: <https://web.microsoftstream.com/video/e671b758-d51c-4d1e-8f8a-305a705cb387>  
YouTube: [https://www.youtube.com/channel/UC2aLJ\\_dDpSM-pQjuOh1R9cw](https://www.youtube.com/channel/UC2aLJ_dDpSM-pQjuOh1R9cw)
8. **Specific course information**
  - a. **Catalog description** (2024 ChE Curriculum): Introduction to engineering thermodynamics. Application of first law of thermodynamics: conservation of energy, control volume analysis (steady and unsteady analysis), flow and work applications. Applications of the second law of thermodynamics: reversible and irreversible processes, entropy relations (control mass & volume analysis), isentropic processes. Component efficiencies: turbines, compressors, pumps, and nozzles efficiency. Thermodynamic cycles and common energy systems: Heat engine cycles, external and internal heat transfer cycles, Rankin cycle, refrigeration, and air conditioning cycles. Thermodynamic Properties of Fluids: Analytical and generalized equations of state. Departure functions based on analytical and generalized relationships. Relationships among thermodynamic properties.
9. **Prerequisite:** 0905212 Chemical Engineering principles II, 0303241 Physical Chemistry (1)
  - a. **Indicate whether a required, elective, or selected elective** (as per Table 5-1) course in the program: required course.

**10. Specific goals for the course**

- a. Specific outcomes of instruction (e.g. The student will be able to explain the significance of current research about a particular topic.)
  - i. Appreciate the role of thermodynamics to society and the need to energy.
  - ii. Study the properties of pure substance.
  - iii. Analyze systems with control volumes and control masses.
  - iv. Analyze processes of steady and un-steady flow.
  - v. Derive the second law of thermodynamics: reversible and irreversible processes; entropy and entropy generation expressions.
  - vi. Analyze vapor, gas and combined power cycles and refrigeration cycles.
  - vii. Derive thermodynamic property relations.

**11. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.**

- i. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.[1]
- ii. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.[2]
- iii. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.[4]

**12. Brief list of topics to be covered:**

- a. Introduction to thermodynamics and basic concepts
- b. Energy, energy forms and general energy analysis
- c. Properties of pure substance
- d. Energy analysis of closed system
- e. Energy analysis of open system
- f. Second law of thermodynamics
- g. Entropy and entropy balance
- h. Gas, vapor and combined power cycles and refrigeration cycles
- i. Thermodynamic property relations

Date 21-9-2025