



The Hashemite University
Faculty of Engineering
Course Syllabus
Department of Mechanical Engineering

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|----------------------|---|-------------------------|-----------------------------|
| Course title: | Thermal Science Lab II 1 (0,1, 3) | Course Number: | 110402426 |
| Designation: | Compulsory | Prerequisite(s): | 110402324 & 110402325 |
| Instructor: | Dr. Mohammad Tarawneh | e-mail: | Mohammad.tarawneh@hu.edu.jo |
| Office Hours: | { Mon, Wed } → (11:00 - 12:00), { Mon, Wed } → (9:30 - 11:00) | | |
| Coordinator: | Dr. Mohammad Tarawneh | | |

Course Description (catalog): Conduct experiments in teams, analyze data, and communicate experimental results in written technical reports in order to improve student knowledge and understand of basic concepts of thermodynamics, air-conditioning, internal combustion engines and solar energy, experiments done on equipment such as : condensation apparatus, boiling heat transfer apparatus, central heating system, refrigeration cycle apparatus, weather station , Four stroke spark ignition engine.

Textbook(s) and/or Other Supplementary Materials:

Thermal science -II laboratory Manual, Dept. of Mechanical engineering, The Hashemite University.

References:

1. Thermodynamics, an Engineering Approach, 8th edition , Yunus A. Cengel, and Michael A. Boles,
2. Fundamentals of Heat and Mass Transfer, F.P. Incropera, D.P. DeWitt, T.L. Bergman, and A.S. Lavine, 7th Edition (John Wiley & Sons)
3. “Engineering Fundamentals of the Internal Combustion Engine” by W. Pulkrabek, Pearson Prentice Hall, 2nd Int. edition, 2004.

Major Topics Covered:

| Topic | # Weeks | # Contact hours* |
|--|-----------|------------------|
| Introduction to the lab [Lab policy, Equipment, Experiments, and safety] | 1 | 3 |
| Experiment 1: Boiling Heat Transfer | 1 | 3 |
| Experiment 2: Film and drop wise condensation | 1 | 3 |
| Experiment 3: Heating, humidification | 1 | 3 |
| Experiment 4: Cooling & Dehumidification | 1 | 3 |
| Experiment 5: Central heating system | 1 | 3 |
| MID EXAM Material included [Exp. 1, 2, 3,4 and 5] | 1 | 3 |
| Experiment 6: Air-conditioning, refrigeration cycle | 1 | 3 |
| Experiment 7: Weather station & solar collector | 2 | 6 |
| Experiment 8: Four stroke engine | 1 | 3 |
| Experiment 9: Emission analysis of SI engine | 1 | 3 |
| Design of an experiment | 3 | 9 |
| Total | 15 | 45 |

*Contact hours include lectures, quizzes and exams

Specific Outcomes of Instruction (Course Learning Outcomes):

A student who successfully fulfills the course requirements will be able to:

1. Be familiar and with different types of boiling heat transfer and measure the heat flux and the convective heat transfer coefficient. [a,b,d,i]
2. Measure the heat flux and the convective heat transfer coefficient during condensation. [a,b,d,i]
3. Investigate the sensible heating and study the humidification of moist air. [a,b,d,i]
4. Investigate the cooling and dehumidification process of moist air [a,b,d,i]
5. Demonstrate the hot water heating system and identify all its components and compare between different types of radiators. [a,b,d,i]
6. Demonstrate the refrigeration cycle as a part of the air-conditioning systems and calculate the coefficient of performance for both refrigerates and heat pumps. [a,b,d,i]
7. Tabulate and evaluate the radiation energy and study solar collectors performance. [a,b,d,i]
8. to demonstrate the components of spark ignition engine and Study the full load performance of a single cylinder four stroke spark ignition engine of an internal combustion engine . [a,b,d,i]
9. Calculate the equivalence ratio of mixture and determine its type. [a,b,d,i]
10. Design and build a device to run an experiment in Thermal science field. [a,b,d,e,g,k]
11. Write and present reports. [d,g,k]

Grading Plan:

Reports: 30 points
Midterm Exam: 30 points Wed. 11/12/2020
2:00-3:30
Final Exam: 40 points TBA

Student Outcomes (SO) Addressed by the Course:

| # | Outcome Description | Contribution |
|---|---|--------------|
| General Engineering Student Outcomes | | |
| (a) | Ability to apply mathematics, science and engineering principles. | L |
| (b) | Ability to design and conduct experiments, analyze and interpret data. | H |
| (c) | Ability to design a system, component, or process to meet desired needs. | |
| (d) | Ability to function on multidisciplinary teams. | M |
| (e) | Ability to identify, formulate and solve engineering problems. | |
| (f) | Understanding of professional and ethical responsibility. | |
| (g) | Ability to communicate effectively. | L |
| (h) | The broad education necessary to understand the impact of engineering solutions in a global and societal context. | |
| (i) | Recognition of the need for and an ability to engage in life-long learning. | L |
| (j) | Knowledge of contemporary issues. | |
| (k) | Ability to use the techniques, skills and modern engineering tools necessary for engineering practice. | L |
| H=High, M= Medium, L=Low | | |

Prepared by:

Dr. Mohammad Tarawneh

Date: 11. Oct. 2020