Course number and name: Principles of Thermodynamics
Credits: 6 ECTS (3 US credits)
Credit categorization: Engineering Topic
Instructor: Oriol Pou Ibar phd

Office:
Email: oriol.pou@iqs.url.edu
Office hours:

Textbook:

Required:

Thermodynamics, An Engineering Approach, 9th Edition, by Cengel, Boles and Kanoglu; McGraw Hill, ISBN 978-1-259-82267-4

Recommended supporting material:

Specific Course information:

Brief description:

This course on macroscopic thermodynamics with applications covers conservation of energy for open and closed systems; equations of state and pure substances; first and second law of thermodynamics, including the concepts of internal energy, enthalpy, and entropy as applied to aero-thermal components. Tables of thermodynamic properties, ideal gases, and elements of cycle analysis and applications of different thermodynamic cycles, such as Carnot and Rankine, are discussed.

Prerequisites or co-requisites:

Mathematics, Physics

Required (Required, Elective or Selected Elective)

Course objectives and outcomes:

Course objectives:

1. Understand the role of internal energy, enthalpy, entropy, temperature, pressure and specific volume.
2. Understand the equations that explain the behavior of pure substances
3. Understand the role of thermodynamic cycles, availability and reversibility.

Course outcomes:

Upon successfully completing this course, students will be able to:

- Select appropriate thermodynamics equations to model the system (ABET Student Outcome 1)
- Design to meet given performance specifications system (ABET Student Outcome 2)
- Determine the operating condition and performance system (ABET Student Outcome 1)

List of topics to be covered:

1. Introduction, Basic Principles of Thermodynamics and Intensive properties.
2. Heat and Work
3. Properties of Pure Substances

4. Closed Systems
5. Open Systems
6. Applications of 2nd Law of Thermodynamics
7. Entropy, T/S and P/H Diagram

Time distribution:

Week	Contact hours		Text
1	3	Introduction Basic concept of thermodynamics – units, closed/open systems, Intensive properties	Ch. 1
2	3	Heat and Work	Ch. 2
3	3	Properties of Pure Substance. Ideal gas/Real gas Laws	Ch. 3
4	3	Properties of Pure Substance. Real Gas Laws	Ch. 3
5	3	Midterm Exam 1	Ch. 1-3
		Closed Systems Moving boundary work-closed system Work definition and derivation for different processes	Ch. 4
6	3	Polytropic process. Specific Heat, Internal energy, Enthalpy	Ch. 4
7	3	Open systems	Ch. 5
8	3	Open Systems: compressor, turbine, heat exchanger, valve	Ch. 5
9	3	Midterm Exam 2	Ch. 4-5
		Application of 2nd law of thermodynamics	Ch. 6
10	3	Application of 2nd law of thermodynamics	Ch. 6
11	3	Application of 2nd law of thermodynamics	Ch. 6
12	3	Entropy, T/S and P/H diagram	Ch. 7
12	3	Entropy, T/S and P/H diagram	Ch. 7
13	3	Entropy, T/S and P/H diagram	Ch. 7
		Midterm Exam 3	Ch. 6-7
14	3	Final Exam	Ch. 1-7

Assessment structure:

Methods of Evaluation	Weight	Date/freq.	Description
Midterm exams	20% each	Three per course	3 midterm exams lasting 1,5 hours
Final exam	60%	End of semester	Cumulative exam allowing to recover contents of up to 3 midterm exams
Following up activities	40%	Every Week	Exercises, Quizzes…

HOMEWORK POLICY
Homework is due the week after it is assigned (except when specified). The homework cycle gives an intervening class where students can ask questions. Late assignments will receive a score of 0 points.

CLASS STRUCTURE
Lectures will be the primary source of information. Students are expected to attend every class and to participate in class discussions. Homework assignments will be discussed in class. Students will be expected to work problems in class. You should review the chapters before the lecture.

ACADEMIC INTEGRITY
It is expected that all work done for this class will be in strict compliance with the principles of academic honesty and integrity. Cheating, plagiarism, copying, or dishonesty of any kind is not acceptable according to disciplinary regulation of IQS.

DOCUMENT HISTORY

PREVIOUS REVISIONS
Month, Year. Prof. name.

LAST REVISION
Month, Year. Prof. name.