Course Code	Course Title	ECTS Credits
MENG-262	Thermodynamics II	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-260
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	2nd or 3rd	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

Thermodynamics II builds on Thermodynamics I and its main objectives are to:

- Further elaborate on the concept of entropy and its relevance to cyclic processes;
- Introduce exergy and its utility in optimising thermodynamic systems;
- Clarify how thermodynamic property tables are obtained;
- Develop an understanding of thermodynamic systems involving mixtures of substances;
- Explore the role of gas-vapour mixtures in the context of air-conditioning;
- Detail chemical reactions and chemical & phase equilibria;
- Familiarize attendees with statistical thermodynamics;
- Outline the basis of non-equilibrium thermodynamics;
- Investigate various physical phenomena.

Learning Outcomes:

Upon completion of the course students are expected to:

- Gain a better appreciation of the specifics of entropy in common engineering processes;
- Understand the concept of exergy and how it can be applied to maximise useful work;
- Comprehend the functions of vapour power cycles and cogeneration units;
- Become familiar with the fundamental relations used to derive common thermodynamic properties;
- Familiarise with the use and applications of mixed composition of gases;
- Be able to characteristics of combustion and the aspects of chemical and phase equilibria;
- Know the use of statistical mechanics;
- Appreciate the complexities of non-equilibrium thermodynamics;

- Understand different coupled phenomena.

Course Contents:

Course syllabus comprises:

- Applications of the Second Law of Thermodynamics & peculiarities of entropy;
- Isentropic efficiencies of steady-flow devices and topics of special interest;
- Definition of entropy and reversible work of various systems;
- Exergy destruction and exergy balance of closed and control volume systems;
- Performance of gas power cycles, the Carnot cycle, assumptions & simplifications;
- Vapour power cycles and the Second Law, the Rankine power cycle, reheat and regenerative vapour power cycles;
- Obtaining thermodynamic relations of various thermodynamic properties;
- Relationships between c_v, c_p, du, dh and ds and the Joule-Thomson coefficient;
- Mixture compositions and properties of distinctive components;
- Obtaining the mass fraction, mole fraction and volume fraction of mixtures;
- Fuels and combustion, balanced reaction equations, stoichiometric air-fuel ratio, enthalpy of combustion and flame temperature;
- Reacting systems, exhaust gas analysis, phase equilibrium, Gibbs phase rule, dissociation, enthalpy of reaction, calorific value of fuels;
- Kinetic theory of gases, molecular collisions, equipartition of energy;
- Classical non-equilibrium thermodynamics, local equilibrium hypothesis, entropy production;
- Thermoelectric effect and thermodynamics of fuel cells.

Learning Activities and Teaching Methods:

Lectures, in-class exercises, examples

Assessment Methods:

Problem sheets, mid-term, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Granet I. and Bluestein M.	Thermodynamics and Heat Power, 8th Ed.	CRC Press	2015	978-1-4822-3856-3

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Struchtrup H.	Thermodynamics and Energy Conversion	Springer	2014	978-3-662-43715-5
Lemons S. D.	A Student's Guide to Entropy	Cambridge University Press (CUP)	2014	978-1-107-65397-9
Blundell J. S. and Blundell M. K.	Concepts in Thermal Physics, 2nd ed.	Oxford University Press	2010	9780199562107