The Hong Kong University of Science and Technology
UG Course Syllabus Template

Course Title: Energy Conversion
Course Code: MECH3300
Number of credits: 3
Pre/Co-Requisites: MECH2310
Instructor: Prof. Qiye ZHENG
Email: qiyezheng@ust.hk

Course Description:

Course Structure: Lecture: 2 days per week, 1.5 hours each; Tutorial: 1 day every two week, 1 hour
Methods of instruction: lectures, discussions, projects

Course Topics:

1. Review of Thermodynamics
2. Gas Power Cycles
3. Exergy
4. Jet Propulsion Cycle
5. Thermodynamic property relations
6. Vapor and Combined Power Cycles
7. Refrigeration cycles
8. Gas–vapor mixtures and air-conditioning

Course Objectives:

1. To deepen the students' understanding of the thermodynamic principles and concepts that govern the energy conversion processes in various engineering applications
2. To enable the students to analyze and evaluate the practical power and refrigeration cycles used in different energy conversion systems
3. To develop the students' skills and creativity in understanding and improving energy conversion systems that meet the desired performance and efficiency criteria while minimizing the environmental impact

Intended Learning Outcomes (ILO):

By the end of this course, students should be able to:

1. Select and define the appropriate control volume for analyzing different energy systems in classic power and refrigeration cycles, and determine the energy interactions across the control volume boundary in terms of heat, work, and mass flow.
2. Explain and calculate the exergy or the maximum useful work that can be obtained from a given specified state, and identify the sources of irreversibility and exergy destruction in energy conversion processes.
3. Apply and justify the assumptions and simplifications needed to formulate the thermodynamic models of classical power and refrigeration cycles.
4. Solve and interpret the thermodynamic performance of various energy conversion systems using the mass, energy, and entropy balances, and evaluate the effects of operating conditions and environmental impact on the efficiency for realistic energy conversion systems.

Methods of instruction: Lectures, discussions, individual project

Assessments

Assessment Task	Contribution to Overall Course grade (%)
1. Mid-Term	30%
2. Homework	25%
3. Term visual essay	10%
4. Final examination	35%

Required Texts and Materials

Textbook:

Thermodynamics-An Engineering Approach

Authors: Yunus Cengel and Michael Boles

Publisher: McGraw-Hill Education

Reading materials:

Thermodynamics of Heat Engines | Wiley Online Books

Author(s): Bernard Desmet

Publisher: Wiley (2022)