 

**Engineering thermodynamics (ame 2710)   
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**Course Content**

Basics concepts; Energy transfer; First law of thermodynamics; Second law of thermodynamics; Entropy; Carnot and reversed Carnot cycles; Rankin cycle; Vapor compression refrigeration cycle. Gas power cycles Availability; Ideal gas mixtures; Gas-vapor mixtures; Basics of Combustion; Laboratory experiments concerning energy transfer, combustion, Basic vapor power Cycles. Working of gas turbine as a jet engine and a power plant.

Pre-requisites: PHYS 1220 Co-requisites: AME 3810

**Recommended books:** *THERMODYNAMICS An Engineering Approach, 8th Ed.,* by Y.A. Cengel and M.A. Boles, McGraw-Hill, Boston, MA.

**Course Assessment Method**

**No. Assessment Task Percentage**

1. Homework 5%
2. Quizzes 10%
3. Lab 15%
4. Midterm 30%
5. Final Exam 40%

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| **Schedule of Topics to be Covered** | | |
| Topics | No of Weeks | Contact hours |
| Introduction and Basic Concepts | 1.5 | 4.5 |
| Types of Energy Transfer, and General Energy Analysis and properties of substances | 1.5 | 4.5 |
| Systems and control volumes-mass and energy interactions | 1.5 | 4.5 |
| Study and application of laws of thermodynamics | 2 | 6 |
| Carnot theorem and the concept of entropy | 1.5 | 4.5 |
| Application of first and second law to vapour and gas power cycles | 2 | 6 |
| Rankine cycle and Brayton cycle with regeneration and reheat | 1 | 3 |
| Fuels and combustion | 1 | 3 |
| Gas turbine power plants | 1 | 3 |
| Jet propulsion | 1 | 3 |
| Total number of weeks and contact hours per semester | 14 | 42 |

**Course Objectives**

1. Demonstrate an understanding of basic concept of thermodynamics including closed and open systems, thermodynamic properties, states and cycles.
2. Identify work and heat interactions.
3. Determine the thermodynamic properties of pure substances using property tables and the ideal gas equation.
4. Apply the principles of conservation of mass and energy applied on both closed and open systems.
5. Understand the second law of thermodynamics, the concepts of irreversibility, Carnot cycle, and Carnot principles.
6. Understand the concept of entropy and evaluate the entropy change of pure substances including ideal gases.
7. Identify the concept of reversible work and isentropic efficiency.
8. Understanding the Carnot theorem and its importance
9. Understanding Gas turbine cycle
10. Knowledge of fuels and combustion
11. Knowledge of the working of gas turbine power plants and jet propulsion

**Course Learning Outcomes**

1. Identify different energy resources (renewable and traditional) and recognize the impact of energy usage on environment.
2. Analyse the performance of vapour power cycles and identifying methods for improving its performance.
3. Analyse the performance of gas power cycles and identifying methods for improving its performance.
4. Apply engineering principles to analyse and improve processes and systems to accomplish desired objectives.
5. Engage in life-long learning.

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| **Assignment and Quizzes’ Policy** | |  |  |  |  | | --- | --- | --- | --- | | No. | Assessment task | Date due  (Academic Week) | Proportion of Final Assessment | | 1 | Assignments ( Home-works) | After every topics | 5% | | 2 | Quizzes (4) | 3rd, 5th, 9th & 11th | 10% | | 3 | Midterm Exams (2 Midterm Exam) | 6th, 10th | 30% | |