Course Specifications

University: Benha University
Faculty: High Institute of Technology

Course specifications
Programme(s) on which the course is given
1. Mechanical Power Engineering
Major or minor element of programmes
Major
Department offering the programme
Mechanical Engineering
Department offering the course
Mechanical Engineering
Academic year / Level
2008-2009 / Level 3 - Semester 1
Date of specification approval
June, 2009

A- Basic Information
Title: Thermodynamics
Code: M 321
Credit Hours:
Lecture: 4
Tutorial: 1
Practical: 1
Total: 6

B- Professional Information
1 - Overall aims of course
By the end of the course the students will be able to:
✓ Demonstrate knowledge of thermodynamics concepts and cycles of various
engineering professions like thermal power stations, refrigeration, air conditioning
and internal combustion engines.
✓ Demonstrate knowledge on second law efficiency and how to maximize the
performance of thermodynamics systems.
✓ Define and solve problems in thermodynamics cycles of thermal power stations,
refrigeration and air conditioning and internal combustion engines.

2- Intended learning outcomes of course (ILOs)
a. Knowledge and understanding:
a.1 Define thermodynamics cycles of thermal power stations including air standard
cycles and vapour cycles.
a.2 Getting familiar with thermodynamic cycles of refrigeration system.
a.3 Understand thermodynamics analysis of air conditioning systems.
a.4 Understand of gas mixtures and its thermodynamics relations.
a.5 Understand the basic of combustions and enthalpy of formation.
a.6 Gaining the ability to apply first and second law of thermodynamics to any thermal system

b. Intellectual skills
b.1 Analysis of any thermal system from thermodynamics point of view.
b.2 Apply second law efficiency on any thermal system.
b.3 Estimation and enhancement techniques of thermal efficiency of any thermal system.

c- Professional and practical skills
c.1 Use appropriate measuring parameters of system performance
c.2 Perform energy and heat balance on systems and equipment
c.3 Getting familiar with the components of thermal power stations and heat engines
c.4 Getting familiar with the components of refrigeration and air conditioning system

d- General and transferable skills
d.1 Write reports in accordance with the scientific guidelines
d.2 Present data on a scientific way
d.3 Analysis of data of thermodynamics cycles
d.4 Discuss results and obtain conclusions
d.5 Work successfully as a part of a team

3- Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Law Analysis of Engineering Systems: Availability, max work potential, second law efficiency, second law analysis of closed system, second law analysis of steady flow system, second</td>
<td>8</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Law analysis of unsteady flow system, second law analysis of daily life.</td>
<td>12</td>
<td>3</td>
<td>6</td>
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<tr>
<td>Gas Power Cycle: Carnot gas cycle, air standard assumptions, overview of reciprocating engine, Otto cycle, Diesel cycle, Brayton cycle, Brayton cycle with regeneration, Brayton cycle with intercooling, reheating and regeneration, ideal jet propulsion cycle, Second law analysis of gas power cycle.</td>
<td>16</td>
<td>4</td>
<td>8</td>
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<tr>
<td>Vapour and Combined Power Cycle: Carnot vapour cycle, Rankine cycle, deviation of actual vapour power cycle, increasing efficiency of Rankine cycle, ideal reheat Rankine cycle, ideal regenerative Rankine cycle, second law analysis of vapour power cycle, cogeneration, binary vapour cycle, combined gas-vapour power cycles.</td>
<td>8</td>
<td>2</td>
<td>6</td>
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<tr>
<td>Refrigeration Cycles: refrigerators and heat pumps, reversed Carnot cycle, ideal vapour compression Carnot cycle, actual vapour compression Carnot cycle, innovative vapour compression refrigeration system, gas refrigeration cycle.</td>
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<td>1.5</td>
<td>3</td>
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<tr>
<td>Gas Mixtures: composition of gas mixtures, mass and mole fractions, behavior of gas mixtures, ideal and real gases, properties of gas mixtures</td>
<td>4</td>
<td>1.5</td>
<td>3</td>
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<tr>
<td>Gas-Vapour Mixtures and Air Conditioning: dry and atmospheric air, specific and relative humidity, dew point temperature, Psychrometric chart, air conditioning process.</td>
<td>4</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>Chemical Reactions: Fuels and combustion, theoretical and actual combustion process, enthalpy of formation and enthalpy of combustions, first law analysis of reacting system.</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
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4– Teaching and learning methods

4.1- Lectures
4.2- Tutorials and discussion sessions
4.3- Laboratories
5- Student assessment methods

5.1 Written exams to assess the understanding of the concepts and the ability to solve problems thermodynamics.
5.2 Oral/Practical exam to assess the skills of analysis and discussion related to thermodynamics and thermodynamics experiments,
5.3 Class work to assess the discussion of the technical reports assignments

Assessment schedule

Assessment 1 (Written Exam) Week 5
Assessment 2 (Written Exam) week 10
Assessment 3 (Class Work) weeks 1 to Week 15 (Continuous)
Oral/Practical Exam Week 15
Assessment 4 (Final Written Exam) week 16

Weighting of assessments

Assessment 1 (Written Exam) 6 %
Assessment 2 (Written Exam) 6 %
Assessment 3 (Class Work) 8 %
Oral/Practical Exam 20
Final Written Exam 60 %
Total 100 %

6- List of references

6.1- Course notes
Lecture notes
6.2- Essential books (text books)


6.3- Recommended books

6.4- Periodicals, Web sites, ... etc

7- Facilities required for teaching and learning
Teaching facilities (whiteboard, presentation board, data show)
Laboratory

Course coordinator: Dr. Mohamed Saied
Head of Department: Dr. Sameh Nada
Date: //