Course Specifications

University: Benha University  Faculty: High Institute of Technology

Course specifications
Programme(s) on which the course is given  Electrical Engineering
Major or minor element of programmes  Minor
Department offering the programme  Electrical Engineering
Department offering the course  Mechanical Engineering
Academic year / Level  2008-2009 / Level 2 - Semester 1
Date of specification approval  June, 2009

A- Basic Information

Title: Mechanical Engineering  Code: M 051
Credit Hours:  Lecture:  2
Tutorial:  1  Practical:  1  Total:  4

B- Professional Information

1 - Overall aims of course
By the end of the course the students will be able to:

✓ Demonstrate knowledge of fluid properties, fluid statics, thermodynamics, energy and its conservation laws, fundamentals of heat transfer.
✓ Define and solve problems in thermodynamics and heat transfer related to electrical applications.
✓ Getting familiar with analogy of thermal system to electrical systems.
✓ Predict necessary flow and geometrical parameters necessary for cooling of electrical systems.
✓ Getting familiar with thermal power stations for electric power generations.

2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:
   a.1 Define fluid properties, fluid static's, pressure and flow measurements, flow discharge and conservation laws.
a.2 Understand thermodynamics laws for energy conservations and energy transformations.

a.3 Gaining the ability to apply energy conservations to all electrical and mechanical equipment.

a.4 Understand the concept of thermal efficiency and coefficient of performance of engines and devices.

a.5 Understand the different techniques that can be used for cooling of an electrical systems.

a.6 Estimations the area required for cooling a surface of electrical equipment.

b. Intellectual skills

b.1 Solve basic problems for static fluid mechanics, thermodynamics and heat transfer.

b.2 Apply energy conservations on all electrical and mechanical equipment.

b.3 Estimation of thermal efficiency of different equipment.

b.4 Calculate the heat losses and heat transfer in electrical equipments

b.5 Know how to maintain effective cooling of electrical equipment.

c- Professional and practical skills

c.1 Use appropriate measuring parameters of system/ equipment performance

c.2 Perform energy and heat balance on systems and equipment

c.3 Efficient cooling of electrical equipment

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 and problems solving

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>Elements of Fluid Mechanics:</td>
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<tr>
<td>Fundamental concepts, Definition of a fluid, Dimensions and units, Fluid Properties, pressure and pressure measurements, fluid static’s, flow discharge, mass conservations, steady flow</td>
<td>4</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Concepts and definitions of Thermodynamics: thermodynamics and energy, thermodynamics systems, work and heat, forms of energy, enthalpy, property and state of a system, thermodynamic process, thermodynamic cycle</td>
<td>2</td>
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<td>2</td>
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<tr>
<td>Properties of Pure Substances: pure substances, phases of pure substances, phase-change process, properties diagram for phase change processes, properties table.</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<tr>
<td>First Law of Thermodynamics for a Closed System: First law of thermodynamics undergoes a process, other forms of first law, specific heats and ideal gas thermodynamics relations</td>
<td>4</td>
<td>2</td>
<td>4</td>
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<tr>
<td>First Law of Thermodynamics for Open System: Conservation of mass, conservation of energy, steady flow, thermodynamics analysis of some steady flow devices (nozzles and diffusers, turbines and compressors, boilers and condensers, steam power stations)</td>
<td>4</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Second Law of Thermodynamics: Thermal energy reservoir, heat engine, second law of thermodynamics statements, refrigeration and heat pumps</td>
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<tr>
<td>Introduction to Heat Transfer: What is heat transfer, modes of heat transfer (conduction, convections, radiations), general equations of conductions.</td>
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<td>2</td>
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<td>One Dimensional Steady State Heat Conduction: without heat generation, with heat generation, plan wall, cylindrical wall</td>
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<td>2</td>
<td>4</td>
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<td>Extended Surfaces and Heat Exchangers: Extended surfaces, Heat Exchangers</td>
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</table>
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 of fluid static's, thermodynamics and heat transfer
   5.2 Oral exam to assess the skills of analysis and discussion,
   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)
   Assessment 4 (Oral Exam) week 15
   Assessment 4 (Final Written Exam) week 16

Weighting of assessments
   Assessment 1 (Written Exam) 10 %
   Assessment 2 (Written Exam) 10 %
   Assessment 3 (Class Work) 15 %
   Assessment 4 (Oral Exam) 5 %
   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. Sameh Nada
Head of Department: Dr. Sameh Nada
Date: / /