Course Specifications

University: Benha University  Faculty: Benha Faculty of engineering

Course specifications
Programme(s) on which the course is given  Mechanical Power Engineering
Major or minor element of programmes  N.A.
Department offering the programme  Mechanical Engineering
Department offering the course  Mechanical Engineering
Academic year / Level  Third year
Date of specification approval  October 2009

A- Basic Information
Title: Fluid and Heat Machinery Technology  Code: M 302
Credit Hours: N.A.  Lecture: 3
Tutorial: 1  Practical: 1  Total: 5

B- Professional Information
1 - Overall aims of course
This course aims to give the student an introduction to the fluid and heat machinery technology. The course classifies the machines according to their principles of operation into positive displacement machine and turbomachines. Through the course, the students will be familiar with the components of each component. The course also gives an introduction on heat transfer. The student will be familiar with the modes of heat transfer with simple application for the one dimensional heat transfer. The student will acquire basic information on heat exchangers which start from the classifications to the basic types. Finally the course aims to give the student a brief introduction the renewable energy recourses and energy storage systems.
2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:

Through this course, the student will be able to

a.1 Understand the difference between positive displacement machines and turbomachines
a.2 Describe different compressors types
a.3 Explain the main components of gas turbines
a.4 Explain the main components of pumps
a.5 Demonstrate knowledge of heat transfer definition and terminology, including heat flux, thermal conductivity, and heat transfer coefficients
a.6 Describe the fundamentals of heat exchangers, including the different types and their operation and applications.
a.7 Illustrate different recourses of renewable energy

b. Intellectual skills

Through this course, the student will be able to

b.1 Differentiate between different types of machines
b.2 Analyze gas turbine circuits
b.3 Specify the difference between compressor blades and turbine blades
b.4 Solve basic problems of one dimensional steady heat conduction.

c. Professional and practical skills

c.1 Select between different types of fluid machines
c.2 Specify the specifications of pumps
c.3 Make proper pump selection

d. General and transferable skills

d.1 Obtain information from different resources
d.2 Write scientific reports
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>Introduction to fluid and heat machinery</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Compressors (types, compressed air systems, selection)</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Gas turbines (conditions for maximum specific work, efficiency, components characteristics, introduction to velocity diagram)</td>
<td>15</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Pumps (classification of pumps, hydrodynamic pumps, pump selection, pumping system, performance characteristics, cavitation in pumps, net positive suction head)</td>
<td>15</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Introduction to renewable energy sources (Thermal solar energy, P .V. systems, bio-mass, wind energy, biomass)</td>
<td>10</td>
<td>6</td>
<td>4</td>
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<tr>
<td>Energy storage</td>
<td>5</td>
<td>3</td>
<td>2</td>
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<tr>
<td>Introduction of heat transfer (conduction heat transfer, one dimensional steady state conduction, introduction to convection heat transfer, radiation of heat transfer)</td>
<td>5</td>
<td>3</td>
<td>2</td>
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<tr>
<td>Heat exchangers (double pipe heat exchanger, shell and tube heat exchangers, and cross-flow heat exchangers)</td>
<td>10</td>
<td>6</td>
<td>4</td>
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<tr>
<td>Total</td>
<td>75</td>
<td>45</td>
<td>30</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
5.1 Class work to assess the discussion of the technical reports assignments

Assessment schedule

Assessment 1 (mid-term exam) Week 12
Assessment 3 (oral exam) Week 15
Assessment 4 (Final exam) Week 16
Weighting of assessments

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Mid-term examinations</td>
<td>20%</td>
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<tr>
<td>Final-term examination</td>
<td>60%</td>
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<tr>
<td>Oral examination</td>
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<tr>
<td>Practical examination</td>
<td></td>
</tr>
<tr>
<td>Semester work</td>
<td>10%</td>
</tr>
<tr>
<td>Other types of assessment</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Any formative only assessments

6- List of references

6.1- Course notes
Lecture notes

6.2- Essential books (text books)

6.3- Recommended books
Gas turbine engines, Saravanamutto, Rogers, Cohen

6.4- Periodicals, Web sites, ... etc

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

Course coordinator: Assoc. Prof. Hesham El-Batsh
Head of Department: Prof.Dr. Sameh Nada
Date: 30/6 /2009