Course Specifications

University: Benha University  Faculty: High Institute of Technology

Course specifications
Programme(s) on which the course is given: Production Engineering
Major or minor element of programme: N.A.
Department offering the programme: Production Engineering
Department offering the course: Mechanical Power Engineering
Academic year / Level: Third Year
Date of specification approval: 30 / 6 / 2009

A - Basic Information

Title: Thermo-fluid Machinery  Code: M 331
Credit Hours: N.A.  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:
- Improve the thermal efficiency of a steam power station
- Improve the thermal efficiency of a gas turbine
- Demonstrate knowledge of heat transfer definition and terminology, including heat flux, thermal conductivity, and heat transfer coefficients
- Demonstrate knowledge of conduction and equivalent resistance formulas, convection and use of the overall heat transfer.
- Acquire the fundamentals of heat exchangers, including the different types and how they operate. Applications.
- Demonstrate knowledge of internal combustion engines including engine terminology, air standard Otto cycle, air standard Diesel cycle, air standard Dual cycle
- Acquire the fundamentals of Hydraulic machines, including the different types and how they operate. Applications.

2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:
   a.1 - Methods of improving the thermal efficiency of a steam power station.
   a.2 - Methods of improving the thermal efficiency of a gas turbine.
   a.3 - Demonstrate knowledge of heat transfer definition and terminology, including heat flux, thermal conductivity, and heat transfer coefficients
   a.4 - Demonstrate knowledge of conduction and equivalent resistance formulas, convection and use of the overall heat transfer.
   a.5 - Acquire the fundamentals of heat exchangers, including the different types and how they operate. Applications.
   a.6 - Demonstrate knowledge of internal combustion engines including engine terminology, air standard Otto cycle, air standard Diesel cycle, air standard Dual cycle
   a.7 - Acquire the fundamentals of Hydraulic machines, including the different types and how they operate. Applications.

b. Intellectual skills
   b.1 - Analyze problems, conclude solutions and demonstrate creative thinking.
   b.2

c- Professional and practical skills
   c.1 – Deal with different used tables and charts.
   c.2

d- General and transferable skills
   d.1
   d.2
### 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 thermo-fluid machinery.</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Gas turbine power plants- Closed cycle gas turbine (Joule cycle)- Open cycle gas turbine (Brayton cycle)- Gas turbine relations- Condition maximum specific output power- actual cycle- Isentropic efficiency- Infinitesimal efficiency cycle- Inter cooling- Reheating compound cycles- Regenerative cycles.</td>
<td>18</td>
<td>12</td>
<td>6</td>
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<tr>
<td>Steam power station- Steam cycles- Methods of improving steam cycle performance- Reheating cycles- Regenerative cycle.</td>
<td>18</td>
<td>12</td>
<td>6</td>
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<tr>
<td>Introduction of heat transfer.</td>
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<tr>
<td>Conduction heat transfer, one dimensional steady state conduction.</td>
<td>18</td>
<td>12</td>
<td>6</td>
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<tr>
<td>Convection heat transfer.</td>
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<td>Introduction to convection heat transfer.</td>
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<td>Radiation of heat transfer..</td>
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<td>Heat exchanges</td>
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<td>4</td>
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<tr>
<td>Combustion and internal combustion engines.</td>
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<td>4</td>
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<td>Compressors</td>
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<td>4</td>
<td>2</td>
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<tr>
<td>Hydraulic machines</td>
<td>12</td>
<td>8</td>
<td>4</td>
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<tr>
<td>Fans and ventilation.</td>
<td>6</td>
<td>4</td>
<td>2</td>
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<td><strong>Total</strong></td>
<td><strong>102</strong></td>
<td><strong>68</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>

### 4– Teaching and learning methods

- **4.1- Lectures**
- **4.2- Laboratories**
- **4.3- Tutorial and discussion sessions**

### 5- Student assessment methods

- **5.1 - Written exams.**: to assess the understanding of the scientific background
5.2 - Class activities: reports discussion and assignments

**Assessment schedule**

- First assessment: Week 4
- Mid-term exam.1: Week 5
- Mid-term exam.2: Week 10
- Second Assessment: Week 11
- Final examination: Week 15

**Weighting of assessments**

- Assignments: 5 %
- Oral examination: 20 %
- Mid-term examinations (two exams): 15 %
- Final-term examination: 60 %
- Total: 100 %

6- List of references

6.1- Course notes
   - Thermo-fluid Machinery Notes

6.2- Essential books (text books)

6.3- Recommended books

4- Periodicals, Web sites, … etc

7- Facilities required for teaching and learning

- Laboratories
- Teaching Aids (white board)

**Course coordinator:** Dr. Samia Naser El Deen Abed

**Head of Department:** Assoc. Prof. Dr. Sameh Abed El Wahed

**Nada**

**Date:** 30 / 6 / 2009