Course Specifications

University: Benha University 
Faculty: High Institute of Technology

Course specifications
Programme(s) on which the course is given: Mechanical Engineering
Major or minor element of programmes
Department offering the programme: Mechanical Engineering
Department offering the course: Mechanical production Engineering
Academic year / Level : year 2 Mechanical Engineering
Date of specification approval

A- Basic Information

Title: Material Technology                         Code: M262
Credit Hours: -                                    Lecture: 3
Tutorial: 1                                       Practical: 1
Total: 5

B- Professional Information

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

• get a basic idea of materials types, their structure and their phase transition behavior,
• outline the connection of dislocation interaction and the general elastic-plastic and phase transition behavior of materials and strengthening mechanisms,
• understand and interpret basic phase diagrams and know the respective morphology of the alloy,
• understand the deterioration of metallic materials
• understand fundamentals of solidification, and heat treatment
• understand the relationship between structure of materials and alloys and their properties,
• understand fundamentals of non-metallic materials.

Student shall attain the above mentioned objectives through lectures, tutorial for problem solving and laboratory for experiments and microscopic examinations.
2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:

a.1 Understand characteristics and properties of materials relevant to mechanical engineering applications,

a.2 Understand the structure of materials and defects of metals,

a.3 Understand the relationship between materials structure and properties,

a.4 Illustrate a basic idea about materials standard specifications,

a.5 Explain alloying and constitutional diagrams,

a.6 Describe heat treatment and selection of metals and alloys,

a.7 Illustrate a basic idea about non metallic materials.

b. Intellectual skills

b.1 Use the principles of materials science in developing solutions to practical engineering problems.

b.2 Maintain a sound theoretical approach in dealing with new and advancing material technology.

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 engineering materials (Sources, Selection)</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Structure and structural defects of metals</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Phase transformation of metals</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Theory of alloying and constitutional diagrams</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Plastic deformation of metals and Strengthening mechanisms</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Heat treatment of metals and alloys</td>
<td>15</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Deterioration of metallic materials</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Selection of alloys</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Non-metallic materials</td>
<td>10</td>
<td>6</td>
<td>4</td>
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</tbody>
</table>
4– Teaching and learning methods

4.1 - Lectures
4.2 - Problem solving sessions
4.3 - Laboratories

5- Student assessment methods

5.1 Written exam to assess ILO a1, a2, a3, a4, a5, a6,a7, b1
5.2 problem solving to assess ILO b1
5.3 labs to assess ILO b1
5.4 Oral exam to assess ILO b2

Assessment schedule

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Method</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment 1</td>
<td>Written exam</td>
<td>5</td>
</tr>
<tr>
<td>Assessment 2</td>
<td>Written exam</td>
<td>10</td>
</tr>
<tr>
<td>Assessment 3</td>
<td>Oral exam</td>
<td>15</td>
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</table>

Weighting of assessments

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weightage</th>
</tr>
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<tbody>
<tr>
<td>Final-term examination</td>
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<tr>
<td>Semester work</td>
<td>20 %</td>
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<tr>
<td>Practical work</td>
<td>10 %</td>
</tr>
<tr>
<td>Oral exam</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

6- List of references

6.1- Course notes
Course notes of Material Technology

6.2- Essential books (text books)
M. F. Ashby and D. R. H. Jones, An Introduction to Engineering Materials II.
M. F. Ashby, Materials Selection in mechanical design, Elsevier 1999,

6.3- Recommended books
6.4- Periodicals, Web sites

http://en.wikipedia.org/wiki/Materials_science

7- Facilities required for teaching and learning

Lecture rooms
Classrooms for problem solving sessions
Materials laboratory

Course coordinator: Prof. Adel Omar
Head of Department: Prof. Sameh Nada
Date: / /