Course Specifications

University: Benha University  Faculty: Benha Faculty of Engineering

Course specifications
Program(s) on which the course is given: Electrical Engineering technology Dep.
Major or minor element of programs: Major
Department offering the program: Electrical Engineering technology Dep.
Department offering the course: Electrical Engineering technology Dep.
Academic year / Level: Second year
Date of specification approval: 2009

A- Basic Information
Title: Solid-State Physics  Code: E222
Credit Hours: N.A.  Lecture: 3
Tutorial: 1  Practical: 1  Total: 5

B- Professional Information

1 - Overall aims of course

2- Intended learning outcomes of course (ILOs)
a. Knowledge and understanding:
   • Illustrate the concepts of band theory of electrons in solids and the semiconductors and their applications and the contact phenomena.
   • Illustrate the band theory of solids.
   • Define the semiconductors.
   • Define and describe the contact phenomena.

b. Intellectual Skills (Higher Cognitive Skills):
• analyze the nature of the electrons behavior in solids
• Deduce the characteristics of semiconductors.
• Compare between the contacts of different materials.

c. Professional and practical skills:
By the end of this course, the student should be able to:
• Perform many circuits by use basic instruments for different measurements.
• Perform simple Lab experiments.

d. General and transferable skills:
By the end of this course, the student should be able to:
• Work cooperatively and effectively in a group

3- Contents

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary physical theory of semi-conductors (concepts of quantum mechanics- introduction to classical and quantum statistics- crystals- energy levels in crystals).</td>
</tr>
<tr>
<td>No. of Hours</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

<p>| Semiconductors - PN-Junction – diode – biasing – currents - diode models – BJT - FET- MOS |</p>
<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>9</td>
<td>3/3</td>
</tr>
</tbody>
</table>

<p>| Light-emitting and laser diodes - photo-detectors and solar cells – characteristics of dielectric materials and devices – magnetic properties of materials - thermal effects. |</p>
<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>12</td>
<td>4/4</td>
</tr>
</tbody>
</table>

<p>| Circuit applications of diodes (rectifiers-clippers-clampers-Zener diode applications). |</p>
<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>12</td>
<td>4/4</td>
</tr>
</tbody>
</table>

<p>| Total |</p>
<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>42</td>
<td>14/14</td>
</tr>
</tbody>
</table>
4– Teaching and learning methods

4.1- Lectures
4.2- Tutorials
4.3- Practice in Laboratories
4.4- Internet collected information and Self-study projects

5- Student assessment methods

5-1 Written exams (Final and Midterm), assignments and quizzes to assess knowledge and understanding, solving problems skills and interpretation capabilities of physical phenomena.

5-2 Oral exams to assess the abilities of discussing physical concepts

5-3 Practical exam to assess measuring and professional skills

Assessment schedule

Quiz 1 .......................Week No. 4
Midterm .......................Week No. 8
Quiz 2 .......................Week No. 12
Oral and Practical exam...........Week No. 14
Final written exam .............Week No. 15

Weighting of assessments

Final-term examination 60%
Semester work 40%
Total 100%

6- List of references

- Essential books (Text Books):
  - An Introduction to Solid State Physics, R. J. Elliot and A. F. Gibson.
- Recommended Books:
  - Introduction to Solid State Physics, C. Kittle, John Wiley & Sons, Inc.
  - Introduction to Solid State Physics, Dekker.

- Periodicals, Web Sites, etc
  - Materials Science, Semiconductors, Semiconductor Technology, Properties of Solids

7- Facilities required for teaching and learning
   - Lecture rooms – Tutorial section rooms – Experimental Labs - computers – Virtual simulation programs

Course coordinator:

Head of Department: Assoc. Prof. Ghada Amer

Date: