



Arab Academy for Science, Technology & Maritime Transport  
College of Engineering & Technology  
Electrical & Control Engineering Department

**University/Academy:** Arab Academy for Science, Technology & Maritime Transport  
**Faculty/Institute:** College of Engineering & Technology  
**Program:** B.Sc. Mechanical Engineering

**Form no. (12)**  
**Course Specification**

**1- Course Data**

Course Code: <b>EE 238</b>	Course Title: <b>Electrical Engineering Fundamentals</b>	Academic Year/Level: <b>2<sup>nd</sup> / 4<sup>th</sup></b>	
Specialization: <b>Electronic &amp; Communications Eng.</b>	No. of Instructional Units	Lecture	Tutorial
	<b>3 Credits</b>	<b>2hrs.</b>	<b>2hrs.</b>

**2- Course Aim**

Introducing different electronic devices used in constructing modern electronic circuits: diodes – bipolar junction transistor and field effect transistor. Studying their performance with special emphasis on some practical applications.

**3- Intended Learning Outcome**

<b>a-Knowledge and Understanding</b>	<p><b>K13. Elementary science underlying electronic engineering systems and information technology</b></p> <ul style="list-style-type: none"> <li>- Describe the output of clipping and clamping circuit</li> <li>- List at least two types of Semiconductors, p-n junction, other two-terminal devices, Bipolar junction transistor.</li> <li>- Distinguish between different types of diodes according to their operation and specifications.</li> <li>- Explain the different modes of operation of BJTs and FETs.</li> </ul>
<b>b- Intellectual Skills</b>	<p><b>I11. Select appropriate mathematical and computer-based methods for modeling and analyzing problems</b></p> <ul style="list-style-type: none"> <li>- Detect the output of different diode circuits.</li> <li>- Calculate the gain for different amplifier circuits.</li> <li>- Demonstrate mathematically the operation of simple analog and digital electronic circuits at a level sufficient to make general performance applications.</li> </ul> <p><b>I16. Synthesis and integrate electronic systems for certain specific function using the right equipment</b></p> <ul style="list-style-type: none"> <li>- Design electronic circuits based on a set of requirements.</li> <li>- Design of simple analog and digital circuits which are used for amplification, signal processing and some other applications.</li> </ul>
<b>c- Professional Skills</b>	<p><b>P5. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.</b></p> <ul style="list-style-type: none"> <li>-Verify the amplifier response through computer simulations</li> <li>- Analyze electronic circuits both analytically and graphically.</li> </ul>

<b>d- General Skills</b>	<p>G9. Refer to relevant literature effectively</p> <p>-Verify the physical meaning of the context and its intended practical applications.</p> <p>G5. Lead and motivate individuals.</p> <p>- Propose a construction of an electronic circuit based on a given application.</p>
--------------------------	--

#### 4- Course Content

<ul style="list-style-type: none"> <li>• Types of solids: conductor, insulator, semiconductor.</li> <li>• Conduction and valence bands, energy gap, covalent bond – Semiconductor types –Doping of semiconductors.</li> <li>• Mobility and conductivity in semiconductors (intrinsic and extrinsic) – Hole and electron concentration - Drift current.</li> <li>• Diffusion and drift currents – Built-in voltage in a p-n junction – Depletion layer in a p-n junction.</li> <li>• p-n junction diode - Forward and reverse bias - Diode as a circuit element.</li> <li>• Half wave and full wave rectifier - Smoothing circuits - Clipping circuits - Clamping circuits.</li> <li>• Special diodes: Zener diodes - Light emitting diodes (LEDs) – Photodiodes - Varactor diodes - Solar cells.</li> <li>• Bipolar Junction Transistor (BJT): construction – types – symbol - energy band diagram– operation - dc equivalent circuit.</li> <li>• BJT: dc solution and biasing circuits - bias stability.</li> <li>• BJT: I-V Characteristics of BJT - Load line - Operating point – h-parameters.</li> <li>• BJT: Small signal analysis – ac equivalent circuit – Transistor amplifier - Voltage and current gains.</li> <li>• Field Effect Transistor (FET): (1) Junction FET (JFET): construction – symbol – operation – I-V characteristics - JFET biasing circuits.</li> <li>• Metal oxide semiconductor FET: MOSFET: construction – symbol – modes of operation, I-V Characteristics, small signal analysis</li> <li>• Complementary MOSFET (CMOS): symbol - operation - Logic gates using CMOS.</li> </ul>
---

#### 5- Teaching and Learning Methods

<ul style="list-style-type: none"> <li>- Lectures</li> <li>- Tutorials</li> <li>- Reports &amp; sheets</li> <li>- Seminars</li> </ul>
---

#### 6-Teaching and Learning Methods for Students with Special Needs

<ul style="list-style-type: none"> <li>- Lectures</li> <li>- Tutorials</li> <li>- Reports &amp; sheets</li> <li>- Laboratories</li> <li>- Seminars</li> </ul> <p><u>Academic Support:</u>            An academic supervisor for handicapped students is appointed.            Constant follow up should be done for handicapped students after each assessment to evaluate their academic level of achievement</p>
--

**7- Student Assessment:**

<b>a- Procedures used:</b>	<ul style="list-style-type: none"> <li>• Written Examinations</li> <li>• Oral Examinations</li> <li>• Practical Examinations</li> <li>• Class Activities (Assignments, etc -----)</li> <li>• Final Examination</li> </ul>												
<b>b- Schedule:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Assessment 1</td> <td style="width: 50%;">7<sup>th</sup> Week Written Exam</td> </tr> <tr> <td>Assessment 2</td> <td>12<sup>th</sup> Week Written Exam</td> </tr> <tr> <td>Assessment 3</td> <td>Practical Examination</td> </tr> <tr> <td>Assessment 4</td> <td>16<sup>th</sup> Week Final Written <b>Exam</b></td> </tr> </table>	Assessment 1	7 <sup>th</sup> Week Written Exam	Assessment 2	12 <sup>th</sup> Week Written Exam	Assessment 3	Practical Examination	Assessment 4	16 <sup>th</sup> Week Final Written <b>Exam</b>				
Assessment 1	7 <sup>th</sup> Week Written Exam												
Assessment 2	12 <sup>th</sup> Week Written Exam												
Assessment 3	Practical Examination												
Assessment 4	16 <sup>th</sup> Week Final Written <b>Exam</b>												
<b>c- Weighing of Assessment:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">7<sup>th</sup> Week Examination</td> <td style="width: 50%;">30 %</td> </tr> <tr> <td>12<sup>th</sup> Week Examination</td> <td>20 %</td> </tr> <tr> <td>Final-term Examination</td> <td>40 %</td> </tr> <tr> <td>Practical Examination</td> <td>5 %</td> </tr> <tr> <td>Semester Work</td> <td>5 %</td> </tr> <tr> <td>Total</td> <td>100%</td> </tr> </table>	7 <sup>th</sup> Week Examination	30 %	12 <sup>th</sup> Week Examination	20 %	Final-term Examination	40 %	Practical Examination	5 %	Semester Work	5 %	Total	100%
7 <sup>th</sup> Week Examination	30 %												
12 <sup>th</sup> Week Examination	20 %												
Final-term Examination	40 %												
Practical Examination	5 %												
Semester Work	5 %												
Total	100%												

**8- List of References:**

<b>a- Course Notes</b>	
<b>b- Required Books (Textbooks)</b>	Rissoni, Giorgio, "PROCESS CONTROL INSTRUMENTAION TECHNOLOGY", Mcgraw-Hill.5ED.2007
<b>c- Recommended Books</b>	<ul style="list-style-type: none"> <li>• B Carlson, "Circuits, Engineering Concepts and Analysis of Linear Electric Circuits", John Wiley, 2000</li> <li>• R.L. Boylestad, "Introductory Circuit Analysis", Merril, London, 1994.</li> <li>• W. J. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Int. Edition, 1986.</li> <li>• D. E. Johnson, J. R. Johnson and J.L. Hilburn, "Electric Circuit Analysis", Prentice Hall, N. J. 1992. course objectives</li> </ul>
<b>d- Periodicals, Web Sites, ..etc.</b>	

**Course coordinator:**

**Program Manager:**