

## SYLLABUS:

**Date / Revision** 23 May 2015 / 02 May 2017 / PP  
**Faculty** Life Sciences (LS)  
**Study Program** Biomedical Engineering (BME)

## SUBJECT: Electronic Devices and Circuits 2

### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Electronic Devices and Circuits 2</b>
<b>1.02</b>	<b>Semester</b>	4
<b>1.03</b>	<b>Level</b>	2
<b>1.04</b>	<b>SKS</b>	2
<b>1.05</b>	<b>Mandatory / Curriculum</b>	D-02
<b>1.06</b>	<b>Subject Code</b>	ECE2
<b>1.07</b>	<b>Subject Code</b>	BME-D-ELEC-117
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, OFSE, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	Electrical Engineering, Mechatronics
<b>1.12</b>	<b>Pre-requisite</b>	Engineering Mathematics, Electrical Engineering and Lab, Physics and Lab
<b>1.13</b>	<b>Responsible</b>	Dr. Tutun Nugraha
<b>1.14</b>	<b>Revision</b>	15-05-2017/pp

### 2 Description of Subject

Electronic devices and circuits EDC is in the core of departmental subjects required for all undergraduates in Electrical Engineering including Biomedical Engineering. The course introduces the fundamentals of DC Circuit and Advanced Circuit Analysis. Topics covered include: basic concept of electronics, electronic basic Laws, method of analysis, Circuit Theorems, Operational Amplifiers, Capacitors and inductors, First and Second Order Circuit, Laplace Transform and Fourier Transform. Design and exercises are also significant components of the course.

### 3 Objectives

This course is split into two courses (part 1 and part 2) beign given in semester 3 and 4. This courseis the continuation of the basic electrical Engineering and lab courses given in 1st and 2nd semester, as well as some aspects of fundamentals given in physics & lab asl given in the 1stand 2nd semester. This course will prepare the students for the more advanced course in electrical/biomedical Engineering including some applied courses given in th eupcoming semester.

### 4 Competency

**After having the course, students are expected to (part 1 and 2):**

- Understand basic concept of electronic circuit
- Understand basic electronic laws
- Develop an understanding of how to use Kirchhoff's current and voltage law
- Recognize Thevenin's and Norton's theorems and know how they can lead to greatly simplified circuits
- Comprehend how real operational amplifier function
- Know how to create integrators using capacitors and op amps
- Understand solutions to unforced, first-order linear differential equations
- Develop a better understanding of the solution of general second order differential equations
- Understand the Laplace transform
- Understand how to perform circuit analysis using Laplace transform
- Understand the trigonometric Fourier series and know-how to determine the Fourier series with a variety of periodic function.
- Know how to use the Fourier transform in the analysis of circuits.

### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/preseantations

### 6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	5 Points
5.3	Homework / Classwork	-
5.4	Presentation /Simulation	15 Points
5.5	Daily Quiz	20
5.6	Final Examination	60 Points
	<b>Total</b>	<b>100 Points</b>

**7 Text Book and Reference**

<b>1</b>	<p><b>Main Text Book:</b> Main Text Book: Fundamental of Electric Circuits. Authors:, Christopher K. Alexander and Matthew N.O. Sadiku, Publishers: McGRAW- HILL, 2016. ISBN: 9781259251320 Estimated book price: Rp 317000</p>
<b>2</b>	<p><b>Supplement Textbooks:</b> “Foundations of Analog and Digital Electronic Circuits”, Author: Anant Agarwal and Jeffrey H. Lang, Publisher: Elsevier; ISBN: 1558607358.</p>

**8 Content / Topics of Lecture**

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1,2	<p><b>Second-Order Circuits:</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Finding Initial and Final Values</li> <li>• The Source-Free Series <i>RLC</i> Circuit</li> <li>• The Source-Free Parallel <i>RLC</i> Circuit</li> <li>• Step Response of a Series <i>RLC</i> Circuit</li> <li>• Step Response of a Parallel <i>RLC</i> Circuit</li> <li>• General Second-Order Circuits</li> </ul>	Ch-8	1 x 2 x 50 minutes
3,4	<p><b>Introduction to Laplace Transform :</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Definition of the Laplace Transform</li> <li>• Properties of the Laplace Transform</li> <li>• The Inverse Laplace Transform</li> <li>• The Convolution Integral</li> <li>• Application to Integro-differential equations</li> </ul>	Ch-15	1 x 2 x 50 minutes
5,6,7	<p><b>Application to Laplace Transform :</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Circuit Element Models</li> <li>• Circuit Analysis</li> <li>• Transfer Functions</li> <li>• State Variables</li> <li>• Applications                             <ul style="list-style-type: none"> <li>▪ Network Stability</li> <li>▪ Network Synthesis</li> </ul> </li> </ul>	Ch-16	2x 2 x 50 minutes
8	<p><b>Midterm Break</b></p>		

9, 10, 11	<p><b>The Fourier Series:</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Trigonometric Fourier Series</li> <li>• Symmetry Considerations</li> <li>• Circuit Applications</li> <li>• Average Power and RMS Values</li> <li>• Exponential Fourier Series</li> <li>• Fourier Analysis <ul style="list-style-type: none"> <li>▪ Discrete Fourier Transform</li> <li>▪ Fast Fourier Transform</li> </ul> </li> <li>• Applications</li> </ul>	Ch-17	2x 2x 50 minutes
12, 13, 14	<p><b>Fourier Transform:</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Definition of the Fourier Transform</li> <li>• Properties of the Fourier Transform</li> <li>• Circuit Applications</li> <li>• Parseval's Theorem</li> <li>• Comparing the Fourier and Laplace Transforms</li> <li>• Applications</li> </ul>	Ch-18	1 x 2 x 50 minutes
15	Review/Evaluation		1 x 3 x 50 minutes
16, 17	<b>Final Examination</b>		