SYLLABUS:

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

SUBJECT: Electronic Devices and Circuits 1

1 Basic Information

1.01	**Subject Name**	**Electronic Devices and Circuits 1**
1.02	**Semester**	3
1.03	**Level**	*1*
1.04	**SKS**	2
1.05	**Mandatory / Curriculum**	*D-02*
1.06	**Subject Code**	ECE1
1.07	**Subject Code**	BME-D-ELEC-117
1.08	**Year**	2017 (7)
1.09	**Quality Control**	Final Test, OFSE, see evaluation
1.10	**Limitations**	Min 12 and Max 32 students in one class
1.11	**Combined with**	Electrical Engineering, Mechatronics
1.12	**Pre-requisite**	Engineering Mathematics, Electrical Engineering and Lab, Physics and Lab
1.13	**Responsible**	Dr. Tutun Nugraha
1.14	**Revision**	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.

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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 Engineeering 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
	Total	100 Points

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7 Text Book and Reference

1	**Main Text Book:** 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
2	**Supplement Textbooks:** "Foundations of Analog and Digital Electronic Circuits", Author: Anant Agarwal and Jeffrey H. Lang, Publisher: Elsevier; ISBN: 1558607358.

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1	**Basic Concepts/Review:** • System of Units • Charge and Current • Voltage • Power and Energy • Circuit Elements • Applications	Ch-1	1 x 2 x 50 minutes
2	**Basic Law/Review:** • Ohm's Law • Nodes, Branches, and Loops • Kirchhoff's Laws • Series Resistors and Voltage Division • Parallel Resistors and Current Division • Wye-Delta Transformation	Ch-2	1 x 2 x 50 minutes
3, 4	**Methods of Analysis:** • Nodal Analyses • Nodal Analyses with Voltage Sources • Mesh Analyses • Mesh Analyses with Current Sources • Nodal and Mesh Analyses by inspection • Nodal versus Mesh Analyses • Application : DC Transistor Circuit	Ch-3	2x 2 x 50 minutes
5, 6	**Circuit Theorems :** • Introduction • Linearity Property • Superposition • Source Transformation • Thevenin's Theorem • Norton's Theorem	Ch-4	2x 2x 50 minutes

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	• Derivations of Thevenin's and Norton's Theorems • Maximum Power Transfer • Verifying Circuit Theorem • Application		
7,	**Operational Amplifiers (part 1):** • Introduction • Operational Amplifiers • Ideal Op Amp • Inverting Amplifier • Noninverting Amplifier • Summing Amplifier • Difference Amplifier • Cascaded Op Amp Circuits • Op Amp Circuit Analysis	Ch-5	1 x 2 x 50 minutes
	Midterm break		
9	**Operational Amplifiers (part 2):** • Introduction • Operational Amplifiers • Ideal Op Amp • Inverting Amplifier • Noninverting Amplifier • Summing Amplifier • Difference Amplifier • Cascaded Op Amp Circuits • Op Amp Circuit Analysis	Ch-5	1 x 2 x 50 minutes
10, 11	**Capacitors and Inductors:** • Introduction • Capacitors • Series and Parallel Capacitors • Inductors • Series and Parallel Inductors	Ch-6	2x 3 x 50 minutes
12,13, 14	**First-Order Circuits:** • Introduction • The Source-free *RC* Circuit • The Source-free *RL* Circuit • Singularity Functions • Step Response of an *RC* Circuit • Step Response of an *RL* Circuit • First-order Op Amp Circuits • Transient Analysis	Ch-7	3 x 2 x 50 minutes
15	Review/Evaluation		1 x 3 x 50 minutes
16, 17	**Final Examination**		

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