INTERNATIONAL UNIVERSITY LIAISON INDONESIA

IULI

SYLLABUS

Date/ Revision	14 September 2016
Faculty	Life Sciences
Approval	Dean of Faculty of Life Sciences

SUBJECT : INDUSTRIAL ELECTRONICS AND LABORATORY

1. Identification of Subject:

Name of Subject	:Industrial Electronics and Laboratory
Code of Subject	:ELEC-1600
SKS / ECTS	:3/ 5
Semester	:1
Study Program	: Food Techology and Chemical Engineering
Lecturer	: Patmah Fatoni, M.Eng

2. Competency

After having the course, students are expected to:

1. Present the learning objectives, focus on problem solving, clearly illustrated examples.
2. Explain the fundamental of electrical, electronic, and electromechanical devices.
3. Identify technology used by home users, small office/home office users, mobile users, power users, and enterprise users.
4. Describe the relationship between electronics and industrial
5. Explain the various branches of electrical engineering and showing some of the interactions branches of electrical engineering,
6. illustrates the pervasive presence of electrical, electronic, and electromechanical devices and systems in a very common application
7. Describe illustrating by means of a practical example how electrical engineering is intimately connected to many other engineering disciplines.
8. Explain basic electrical concepts, including electric charge, current, electrical potential, electrical power, and energy;
9. Apply concepts of electric network topology: nodes, branches, and loops to solve circuit problems, including the use of computer simulation;
10. Analyze circuits with ideal, independent, and controlled voltage and current sources;
11. Apply Ohm's-, Kirchhoff's current- and voltage-laws to the analysis of DC electric circuits.

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TECHNISCHE UNIVERSITÄT ILMENAU

PO Box 150, BSD CPA 15330
Tel. +62 21 50588000
+62 85212318000
info@iuli.ac.id; www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java

12. Determine the Thevenin or Norton equivalent of a given linear network that may include passive devices, dependent sources, and independent sources in combination.
13. Derive relations for and calculate the gain and input resistance of a given Operational Amplifier (Op-Amp) circuit for DC circuits using an ideal operational amplifier model.
14. Explain the relationship of voltage and current in capacitors, inductors, power energy electric and mutual inductors.
15. Apply Kirchhoff's current and voltage laws to the analysis of AC electric circuits.
16. Apply computer mathematical and simulation programs to solve DC and AC - circuit problems.

3. Description of Subject:

This course introduces standard fundamentals of electrical, electronic, and electromechanical devices. The aim of this course is to provide students with information and expand their knowledge about the practical aspects of the application of electronic components, circuits, the relationship of voltage and current in capacitors, inductors, power energy electric.

The subject introduces the theory, analysis and design of electric circuits, voltage, current, power, energy, resistance. The course starts with the introduction to SI-Units and the fundament of DC-Circuit Analysis including the circuit elements, and Basic Law (Ohm's-Law, Kirchoff's Law).

The circuit storage elements (capacitors, inductors) are introduced specifically their current-voltage relationship. The fundamental of AC-Circuit is introduced before the semester end, where the properties of AC-Circuit analysis specifically sinusoidal signals are introduced. The Impedances, Reactance, Admittance of the circuits are calculated by applying the DC-Circuit Analysis and Theorems. The principle of Operational-Amplifier and Op-Amp circuit are also introduced in this course.

4. Learning Approach

Approach	: Lecture handout (PPT), Video Presentation Combination, simulation laboratory
Method	: Lecture, Discussion, Question Answer, Sample Problem, Group Work
Student Task	: Home work, Quiz, Presentation
Media	: LCD projector, Teaching Aids (components), Simulation , Video

5. Evaluation

a)	Absence maximum	: 25%
b)	Participation in discussion	: 5 points
c)	Homework, Classwork	: 5 points
d)	Presentation, Simulation	: 10 points
e)	Daily Quiz	: 20 points
f)	Final Examination	: 60 points
	Total	: 100 points

6. Contents/ Topics of Lecturing:

Week	Topics	Content	Text Book Chapter	Remark
1	**Introduction to Industrial Electronics:**	Introduction to electric circuit, SI System of Units, Converting Units, Power of Ten Notation, Prefixes, Engineering Notation,	Ch1	Lecture, Group discussion, tutorial for

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		and Numerical Results, Circuit Analysis Using Computers and Calculators		exercise, Group Work 3 x 50 minutes
2	**Fundamental of Electric Circuits**	• Features of Network and Circuits • Charge, Current, and Kirchhoff's Current Law • Voltage and Kirchhoff's Voltage Law • Power and The Passive Sign Convention • Circuit Elements and Their i-v Characteristics • Resistance and Ohm's Law • Practical Voltage and Current Sources Measuring Devices	Ch2	Lecture, Group discussion, tutorial for exercise, video tutorial and Quiz 3 x 50 minutes
3	**Basic Laws /The Ohm's Law and Kirchoff's Law** **Basic DC Analysis**	• Ohm's Law • Series Circuits • Kirchhoff's Voltage Law, Resistors in Series • Voltage Sources in Series • Interchanging Series Components • The Voltage Divider Rule • Circuit Ground • Voltage Subscripts • Internal Resistance of Voltage Sources, • Voltmeter Design • Ohmmeter Design • Ammeter Loading Effects • Circuit Analysis Using Computers	Ch3	Lecture, Group discussion, tutorial for exercise, Group Work 3 x 50 minutes And Homework
4	**Resistive Electric Circuits**	• Network Analysis • The Node Voltage Method • The Mesh Current Method • Node and Mesh Analysis with Dependent Sources • The Principle of Superposition	Ch3	Lecture, Group discussion, tutorial for exercise, Group Work 3 x 50 minutes And Homework
5	**AC Network Analysis**	• Energy-Storage (Dynamic) Circuit Elements • The Ideal Capacitor • Energy Storage in Capacitors • The Ideal Inductor • Energy Storage in Inductors • Time-Dependent Signal Sources • Why Sinusoids? • Average and RMS Values	Ch4	Lecture, Group discussion, tutorial for exercise, Group Work 3 x 50 minutes Homework
6	**AC Network Analysis (Solution of Circuits Containing Dynamic Elements)**	• Forced Response of Circuits Excited by Sinusoidal Sources • Phasors and Impedance Euler's Identity • Phasors • Superposition of AC Signals	Ch4	Lecture, Group discussion, tutorial for exercise, Group Work

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		• Impedance • The Resistor, The Inductor & The Capacitor • Admittance • AC Circuit Analysis Methods • AC Equivalent Circuits		3 x 50 minutes And lab work simulation Quiz
7	**Student Presentations**	• Presenting the assessment based on chosen topic. • Each student has to present in 10 minutes their topic taken from the Textbook or Internet in front of their class mate.		
8	**MIDTERM SEMESTER BREAK**			
9	**Transient Analysis**	• Solution of Circuits Containing Dynamic Elements • Transient Response of First-Order Circuits • Natural Response of First-Order Circuits 187 • Forced and Complete Response of First-Order Circuits • Continuity of Capacitor Voltages and Inductor Circuits • Complete Solution of First-Order Circuits	Ch 5	Lecture, Group discussion, tutorial for exercise, Video lecture, Group Work 3 x 50 minutes Homework
10	**Transient Analysis**	• Transient Response of First-Order Circuits • Deriving the Differential Equations for Second-Order Circuits • Natural Response of Second-Order Circuits • Overdamped Solution • Critically Damped Solution • Underdamped Solution • Forced and Complete Response of Second-Order Circuits	Ch5	Lecture, Group discussion, tutorial for exercise, Video lecture, Quiz 3 x 50 minutes

11	**Frequency Response and System Concepts**	• Sinusoidal Frequency Response
		• Filters
		  ○ Low-Pass Filters
		  ○ High-Pass Filters
		  ○ Band-Pass Filters
		• Decibel (db) or Bode Plots
		• Complex Frequency and the Laplace Transform
			Ch6	Lecture, Group discussion, tutorial for exercise, Group Work, Video lecture
				3 x 50 minutes
				And Homework

12	**AC Power**	• Power in AC Circuits • Instantaneous and Average Power • AC Power Notation • Power Factor • Complex Power & Power Factor, Revisited • Transformers • The Ideal Transformer • Impedance Reflection and Power Transfer	Ch7	Lecture, Group discussion, Video lecture, tutorial for exercise, 3 x 50 minutes Homework
13	**AC Power**	• Three-Phase Power	Ch7	Lecture, tutorial video

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		• Balanced Wye Loads & Balanced Delta Loads • Residential Wiring; Grounding and Safety • Generation and Distribution of AC Power		for exercise, and lab work simulation and Quiz 3 x 50 minutes
14	**Review**	**Wrap up the whole semester course / Review the semester**		
15	**FINAL EXAMINATION**			

7. Book Reference:

a) Main Text Book: *"Principle and Application of Electrical Engineering- 6th Edition"*, **Author**: Giorgio Rizzoni and James Kearns, **Publisher**: McGraw Hill Higher Education, ISBN: 9780073529592 Estimated book price: Rp 450.000, -

b) Supplement Textbooks:

- *"Contemporary Electronics: Fundamentals, Devices, Circuits, and Systems"*, **Author**: Louis Frenzel, **Publisher**: McGraw Hill Higher Education, ISBN: 9780073373805
- *"Circuit Analysis: Theory and Practice, Fifth Edition – 2013"*, **Authors:** Allan H. Robbins and Wilhelm C. Miller, Publisher: Delmar, Cengage Learning, **ISBN**: 13: 978-1-1332-8100-9
- *"Introductory circuit analysis / Robert L. Boylestad.—11th ed, 2007"*, **Authors**: Boylestad, Robert L., Publisher: Pearson Education, Inc, **ISBN** 0-13-173044-4

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