

SYLLABUS

Date/ Revision	23 May 2015
Faculty	Engineering
Approval	Dean of Engineering Faculty

SUBJECT : BASIC ELECTRIC CIRCUIT 1

1. Identification of Subject:

Name of Subject	:Basic Electrical Circuit 1
Code of Subject	:ELEC-1110
SKS / ECTS	:3/ 5
Semester	:1
Study Program	: B-EE, B-MTE, B-BME
Lecturer	: Dipl.-Ing. Maralo Sinaga

2. Competency

After studying the Electrical Engineering-1 course, the student able to:

- Explain basic electrical concepts, including electric charge, current, electrical potential, electrical power, and energy;
- Apply concepts of electric network topology: nodes, branches, and loops to solve circuit problems, including the use of computer simulation;
- Analyze circuits with ideal, independent, and controlled voltage and current sources;
- Apply Ohm's-, Kirchhoff's current- and voltage-laws to the analysis of DC electric circuits.
- Determine the Thevenin or Norton equivalent of a given linear network that may include passive devices, dependent sources, and independent sources in combination.
- 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.
- Explain the relationship of voltage and current in capacitors, inductors, and mutual inductors.
- Apply Kirchhoff's current and voltage laws to the analysis of AC electric circuits.
- Apply computer mathematical and simulation programs to solve DC and AC - circuit problems.

3. Description of Subject:

The subject introduces the theory, analysis and design of electric circuits, voltage, current, power, energy, resistance, capacitance, inductance. Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem, DC, phasors, operational amplifiers, transfer functions and gain

4. Learning Approach

Approach	: Combination of Expository - inquiry and collaborative
Method	: Discussion, question answer, sample problem, group work
Student Task	: Home work, presentation
Media	: LCD projector, Teaching Aids (components), Simulation SW, film.

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	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	Introduction to Electric Circuit /Basic Concept: Introduction to electric circuit, SI System of Units, Converting Units, Power of Ten Notation, Prefixes, Engineering Notation, and Numerical Results, Circuit Analysis Using Computers and Calculators	Ch1 Part 1.1 and 1.2	
2	Charge, Current, Voltage, Power, and Energy: Atomic Theory Review, The Unit of Electrical Charge: The Coulomb, Current, Voltage, Practical DC Voltage Sources, Measuring Voltage and Current, Switches, Fuses, and Circuit Breakers	Ch1 Part 1.3, 1.4 and 1.5	
3	Circuit elements and Basic Laws : Conductor, Insulator and Semiconductor material, resistivity, Resistance and conductance, Resistance of conductor, wire tables, Resistors, Resistor color codes, Effect of temperature on resistance, Thermistors, varistors, superconductor, problem solving.	Ch1: Part 1.6, 1.7, 1.8 and 1.9 Ch2: 2.1,2.2	Quiz
4	Basic Laws /The Ohm's Law and Kirchoff's Law: Ohm's Law, Voltage Polarity and Current Direction, Power, Power Direction Convention, Energy, Efficiency, Nonlinear and Dynamic Resistances, Computer-Aided Circuit Analysis	Ch2 2.2, 2.3	
5	Basic DC Analysis: 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	Ch2 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	Quiz
6-7	Method of Analysis: Constant-Current Sources, Source Conversions, Current Sources in Parallel and Series, Branch-Current Analysis, Mesh (Loop) Analysis, Nodal Analysis, Delta-Wye (Pi-Tee) Conversion, Bridge Networks, Circuit Analysis Using Computers	Ch3 3.1, 3.2, 3.3, 3.4, 3.5,3.6	

8	MIDTERM SEMESTER BREAK		
9-10	Circuit Theorems: Superposition Theorem, Thévenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Substitution Theorem, Circuit Analysis Using Computers	Ch4 4.1, 4.2, 4.3, 4.4, 4.5, 4.6	Quiz
11-12	Operational Amplifiers (Op-Amps): Ideal Op-Amp, inverting-, Noninverting-, Summing, Difference-Amplifiers, Cascade Op-Amp circuits, Applications.	Ch5 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8	
13	Storage Circuit Elements (Capacitor and Inductors): Capacitors, series and parallel capacitors, Inductors, series and parallel inductors, Applications	Ch6 6.1, 6.2, 6.3, 6.4, 6.5, 6.6	
14-15	AC-Circuits / Sinusoidals and Phasors: Sinusoidal signals, Phasors, Phasors relationships for circuit elements, Impedance and Admittance, Kirchoff's Laws in frequency domain, Applications	Ch 9 9.1, 9.2,9.3 9.4,9.5, 9.6	Quiz
16	Final Exam		

7. Book Reference:

- a) **Main Text Book:** *"Fundamentals of electric circuits 5th Edition, 2013"*, Authors: Charles K. Alexander, Matthew N. O. Sadiku, Publisher: McGraw – Hill Higher Education, ISBN: 978-0-07-338057-5
- b) **Supplement Textbooks:**
- "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