

SYLLABUS

Date/ Revision	03 July 2015
Faculty	Engineering
Approval	Dean of Engineering Faculty

SUBJECT : BASIC ELECTRIC CIRCUIT 2

1. Identification of Subject:

Name of Subject	: Basic Electrical Circuit 2
Code of Subject	: ELEC-1120
SKS / ECTS	: 3 / 5
Semester	: 2
Study Program	: B-EE, B-MTE, B-BME
Lecturer	: Dipl.-Ing. Maralo Sinaga

2. Competency

After studying the Basic Electrical Circuit -1 course, the student:

- able to apply Kirchhoff's current and voltage laws to the analysis of AC electric circuits;
- will become proficient in the use of algebra, calculus, and linear algebra to describe and analyze AC electric circuit problems.
- able to calculate AC-Power in a single-phase and three-phase system and able to compensate the reactive-power;
- become familiar with the operation of transformers.
- Able to construct passive and active filter circuits and analyse/evaluate their performance to specified performance levels.
- The student will be able to understand the behavior of passive transient circuit elements through the use of differential and integral equation models, and will become skilled in analyzing circuits with passive transient elements.
- The student will become proficient in the solution of the damped harmonic oscillator differential equation, and its application to RLC circuits.
- The student will become proficient in the analysis electrical-circuit by using Laplace-Transformation and Fourier series.

3. Description of Subject:

This course is the continuation of ELEC-1110 into AC circuit analysis using complex numbers and phasors. Topics include: magnetism, inductance, reactance, impedance, power, resonance, filters, Fourier series, transformers and dependent sources. Includes network analysis using Thevenin, Norton, mesh, and nodal techniques. Computer analysis of AC circuits is introduced. Concurrent lab applies theory and develops competence in measuring ac-voltage, ac-current, time, frequency, phase, and frequency response, using the dual-trace oscilloscope, multimeters, and swept frequency function generator.

The concepts covered in this course will be used in higher level courses and, more importantly, throughout the career of alumnae as an engineer. Major topics of the course include complex numbers, real and complex functions, signal representation, elementary matrix algebra, solutions to linear systems of equations, linear differential equations, Laplace transforms used for solving linear differential equations, Fourier series and transforms and their uses in solving ELEC problems.

4. Learning Approach

Approach	: Combination of Expository - inquiry and colaborative
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	Review of sinusoidal and Phasors: <ul style="list-style-type: none"> Review of sinusoidal signals, instantaneous-, average- and effective-value; Review of complex-number calculation and Phasors; Review of Circuit Analysis and Theorems; Exercises 	Ch 9, 10	
2-3	AC Power Analysis: <ul style="list-style-type: none"> Instantaneous-, average (real)-, apparent-, and reactive-power; Power factor, power-triangle, complex-power; conservation ac-power and power factor correction; Exercises 	Ch11	
4	Three Phase Circuits: <ul style="list-style-type: none"> Balanced three phase voltages, Balanced wye-wye connection, Balanced wye-delta connection; Balanced delta-wye connection, Balanced delta-delta connection; Power in balanced system; Unbalanced three phase system Exercises 	Ch12:	Quiz
5-6	Magnetically coupled Circuits and Transformers: <ul style="list-style-type: none"> Self-inductance and mutual-inductances; 	Ch13	

	<ul style="list-style-type: none"> • Energy in coupled circuit; • Linear transformer and ideal transformer; • Three phase Transformers; • Exercises 		
7	Frequency Responses: <ul style="list-style-type: none"> • Transfer Functions, • The Decibel scale and Bode Plots; • Resonance circuits: RLC – Series and RLC – Parallel resonance; • Passive filters (LPF, HPF, BPF and BSF/BRF); • Exercises 	Ch14	Quiz
8	MIDTERM SEMESTER BREAK		
9	Frequency Responses (Cont'd): <ul style="list-style-type: none"> • Active Filters (LPF, HPF, BPF and BSF/BRF); • Frequency responses simulation using Software; • Exercises 	Ch14	
10-11	First order Circuits: <ul style="list-style-type: none"> • The source free RC and RL – circuits; • The Ordinary Differential Equation (ODE) and solutions; • Initial- and Final-value; • Step response of an RC and RL circuits; • Circuit simulation and transient Analysis; • Applications and Exercises 	Ch7	
12-13	Second Order Circuits: <ul style="list-style-type: none"> • Finding the initial- and final-values; • The source free series RLC–circuits; • The source free parallel RLC–circuits; • Step response of an series RLC - and parallel RLC-circuits; • The Ordinary Differential Equation (ODE) and solutions; • Circuit simulation and transient Analysis; • Applications and Exercises 	Ch8	Quiz
14-15	Advanced circuit Analysis: <ul style="list-style-type: none"> • Laplace Transform and its application; Fourier series : Trigonometric Fourier series; • Exponential Fourier series; • Exercises 	Ch15, Ch16	
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