

SYLLABUS: ELECTRICAL ENGINEERING 2

Date / Revision 15 August 2017 / 15-08-17/ MaS
Faculty Engineering and Lifesciences
Study Programs All Engineering- and Lifesciences Study Programs

SUBJECT: Electrical Engineering 2

1 Basic Information

1.01	Subject Name	Electrical Engineering 2
1.02	Semester	2
1.03	Level	2
1.04	SKS	3
1.05	Mandatory / Curriculum	Mandatory / F-07
1.06	Subject Code	ELEE
1.07	Subject Code	ENG-F- ELEE -2207
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	All Engineering- and Lifesciences Study Programs
1.12	Perquisite	Electrical Engineering 1
1.13	Responsible	Dean of Engineering- and Lifesciences Faculty
1.14	Revision	15-08-2017/MaS

2 Description of Subject

This course is continuation of Electrical Engineering 1 course, where the frequency response of circuit is discussed. The electronics topics will be introduced such as the fundamental of semiconductor diode and transistor, basic logic gates, combinatorial and sequential logic circuit will be introduced. The industrial electrical devices such as transformer, electric-motor, cable, and protection are discussed in the course

3 Objectives

- Introduce passive and active filter characteristics.
- to calculate the ac-power and the power factor correction.
- to learn semiconductor diode, transistor and their properties and applications.
- to learn logic circuit and their applications
- to learn industrial devices and equipment

4 Competency

After having the course, students are expected to:

- Calculate AC power in single- and three- phase systems;
- Determine the power factor compensation of AC-power;
- Describe the concept of semiconductor diode;
- Analyse explain the function of the pn-junction- diode, Zener-diode, and other diode types (LED, Photo diode);
- Analyse and explain the function of Bipolar Junction Transistor (BJT), Field Effect Transistor (JFET, and MOSFET) and their application as a switch and amplifier purposes;
- Explain the application of transistor in Electric-drives (Electric Motor drivers, H-Bridge);
- Explain and apply the basic logic gates in combinatorial circuit as control logic system;
- Use the Boolean Algebra and Karnaugh-Map to simplify the logic function;
- Describe the sequential logic circuit as Flip-Flop and their applications;
- Explain the purposes of electronics-circuit in sensor technology.

5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Circuit simulation using Electronic Workbench Software;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.

6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	05 Points
5.3	Homework / Classwork	05 Points
5.4	Presentation /Simulation	10 Points
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

1	<p>Main Text Book: <i>"Principle and Application of Electrical Engineering- 6th Edition"</i>, Author: Giorgio Rizzoni and James Kearns, Publisher: McGraw Hill Higher Education, ISBN: 9780073529592</p>
2	<p>Supplement Textbooks:</p> <ul style="list-style-type: none"> • <i>"Contemporary Electronics: Fundamentals, Devices, Circuits, and Systems"</i>, Author: Louis Frenzel, Publisher: McGraw Hill Higher Education, ISBN: 9780073373805 • <i>"Circuit Analysis: Theory and Practice, Fifth Edition – 2013"</i>, Authors: Allan H. Robbins and Wilhelm C. Miller, Publisher: Delmar, Cengage Learning, ISBN: 13: 978-1-1332-8100-9 • <i>"Introductory circuit analysis / Robert L. Boylestad. —11th ed, 2007"</i>, Authors: Boylestad, Robert L., Publisher: Pearson Education, Inc, ISBN 0-13-173044-4 • <i>"Fundamentals of electric circuits 5th Edition, 2013"</i>, Authors: Charles K. Alexander, Matthew N. O. Sadiku, Publisher: McGraw – Hill Higher Education, ISBN: 978-0-07-338057-5

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1-2	<p>Reviews AC Circuit Analysis:</p> <ul style="list-style-type: none"> • Review Phasors, AC-Powers and 3-Phases systems • Frequency responses: passive and active filters • Exercises 	Ch4 & 7 Ch-8	
3-4	<p>Semiconductor Theory and Diodes:</p> <ul style="list-style-type: none"> • Semiconductor Fundamentals: Bohr atom model, N-Type and P-Type material, pn-junction diode; • Zener diode, LED and Photo diode • Rectifier circuits: Half wave and Full wave rectifier. • Exercises 	Ch9	
5-6	<p>Bipolar Junction Transistor Circuits :</p> <ul style="list-style-type: none"> • NPN Transistor and PNP Transistor characteristics; • BJT as electronic switch; • BJT as amplifier: Biasing circuits, h-parameter; • Darlington Transistors. • Exercises 	Ch9:	Quiz
7	<p>Field Effect Transistor (J-FET) and MOSFET:</p> <ul style="list-style-type: none"> • JFET characteristics; • MOSFET characteristics; • Other FET types • Applications • Exercises 	Ch10, 11	Quiz
8	MIDTERM SEMESTER BREAK		

9	Field Effect Transistor (J-FET) and MOSFET: <ul style="list-style-type: none"> Review: MOSFET characteristics; Applications Exercises 	Ch10, 11	Quiz
10-11	Power Electronics and Electric Machinery: <ul style="list-style-type: none"> Foundation of Power Electronics: AC-DC Converter, DC-DC Converter, DC-AC Converter, and AC-AC Inverter; introduction to Buck-, Boost-, and Flyback converter; Transformers, DC-Motors-, and AC-Motors; Applications; Exercises 	Ch12	Quiz
12-13	Fundamental of Digital Systems and Combinatorial Logic Circuits: <ul style="list-style-type: none"> Numbering system: Decimal-, Binary-, Octal-, and Hexadecimal number; Boolean Algebra; Basic Logic Gates: AND-, OR-, NOT-, NAND-, NOR-, and EXOR-Gates, Truth Table; Combinatorial Logic Gates: Encoder, Decoders, Multiplexer, Demultiplexer; Simplification of Combinatorial Logic Circuits, Karnaugh-Map. Applications; Exercises 	Ch13	Quiz
14	Sequential Logic Circuits: <ul style="list-style-type: none"> Latches: SR-Latch, D-Latch, gated Latch; Flip-Flops: SR-Flip Flops, D-Flip Flop, JK-Flip Flops, asynchronous input Flip-Flops; Applications: Counters, Timers, other application; Exercises 	Ch14	Quiz
15	Instrumentations Systems: <ul style="list-style-type: none"> introduction to Industrial Sensors: Mechanical-, Thermal-, Fluid-sensors; Instrumentations: Signal Conditioning (Analog and Digital Signal Conditioning); Applications; Exercises. 	Ch15	Quiz
16	Final Examination		