CMPE226 - Electronics for Computer Engineers

Department:
Computer Engineering

Program Name: Computer Engineering	**Program Code:** 25	
Course Number: CMPE226	**Credits:** 4 Cr	**Year/Semester:** 2022-2023 Spring

☒ Required Course ☐ Elective Course (click on and check the appropriate box)

Prerequisite(s):
MATH241 Linear Algebra and Ordinary Differential Equations

Catalog Description:
Circuits, currents and voltages, power and energy, Kirchhoff's current and voltage laws. Circuit elements and circuits. Resistive circuits: resistance in series and parallel, resistive network analysis by series and parallel equivalents. Thevenin equivalents. Superposition. Inductance and capacitance, practical capacitor and inductors. Transformer, basic diode diode concepts, zener diode, ideal diode model, rectifiers and waveshaping. Basic amplifier concepts, Bipolar Junction Transistors: Current and Voltage relationship, common emitter characteristics.

Course Web Page:
http://cmpe.emu.edu.tr/courses/cmpe226

Textbook(s):
Floyed, T.L., Electronics Fundamentals: Circuits, Devices, and Applications, *8*th Edition, Prentice Hall, 2010.

Indicative Basic Reading List :
Hambley, A.R., Electrical Engineering: Principles and Applications, Prentice-Hall.
Terrel, D., Electronics for Computer Technology, Thomson, 2000.

Topics Covered and Class Schedule:
(4 hours of lectures per week)

Weeks 1-2	Voltage, current and resistance: Electrical charge, voltage, current, resistance, the electrical circuit. Ohm's law, energy, and power: Application of Ohm's law, energy and power, power in an electric circuit.
Weeks 3 -4	Series circuits: resistors in series, total series resistance, current in a series circuit, Kirchhoff's voltage law, voltage dividers. Parallel circuits: Resistors in parallel, total parallel resistance, voltage in a parallel circuit, Kirchhoff's current law, current dividers.
Weeks 5-6	Series parallel circuits: Identifying series parallel relationships, analysis of series-parallel resistive circuits, voltage dividers with resistive loads, Thevenin's theorem, the maximum power transfer theorem, superposition theorem.
Weeks 7-9	Introduction to alternating current and voltage: The sinusoidal waveform, sinusoidal voltage sources, voltage and current values of sine waves, angular measurement of a sine wave, the sine wave formula, analysis of AC circuits. Capacitors: The basic capacitor, series capacitors, parallel capacitors, capacitors in DC circuits, capacitors in ac circuits. (Midterm Exam)
Weeks 10-12	RC Circuits: Sinusoidal response of RC circuits, Impedance and phase angle of series RC circuits, analysis of series RC circuits, analysis of parallel RC circuits, analysis of parallel-series RC circuits. Inductors: The basic inductor, series and parallel inductors, inductors in DC circuits, inductors in AC circuits. RL Circuits: Sinusoidal response of RL circuits, impedance and phase angle of series RL circuits, analysis of series RL circuits, impedance and phase angle of parallel RL circuits, analysis of parallel RL circuits, analysis of series-parallel RL circuits.
Weeks 13-15	RLC Circuits: Impedance and phase angle of series RLC circuits, analysis of series RLC circuits, parallel RLC circuits. Transformers: The basic transformer, step-up and step-down transformers. Diodes and Applications: Introduction to semiconductors, the diode, diode characteristics, diode rectifiers, power supplies, clippers. Transistors: DC operation of bipolar junction transistors (BJT), The BJT as a switch. (Final Exam).

Laboratory Schedule:
(2 hours of laboratory per week)

week 4	Resistor networks
week 5	Superposition theorem
week 6	Thevenin's theorem
week 7	Capacitive and inductive circuit at AC
week 10	Semiconductor diode
week 11	Half wave rectification
week 12	Realization of AND and OR gates using diodes

Course Learning Outcomes:

On successful completion of the course, the student is expected to be able to:

(1) Ability to apply knowledge of KVL, KCL, Superposition, Thevenin's theorems in DC circuits and ability to analyze the AC circuits.
(2) Ability to solve basic electrical and electronic circuits.
(3) Ability to use the digital multimeter, oscilloscope, function generator and power supply.
(4) Apply fundamental principles in electric circuit theory.
(5) Use Ohm's law, KVL, KCL, Superposition and Thevenin's theorems to analyse DC resistive circuits.
(6) Identify RMS value, frequency and period of AC waveforms.
(7) Use phasor concept to analyse AC circuits that include RC, RL and RLC.
(8) Analyse diodes, clipper circuits, transformers and rectifiers.
(9) Use circuit theory knowledge to analyse common-emitter connected transistor circuits.

	Method	**No**	**Percentage**
Assessment	Midterm Exam I	1	35%
	Final Examination	1	55%
	Labs	7	10 %

Contribution of Course to Criterion 5

Credit Hours for:
Mathematics & Basic Science : 0
Engineering Sciences and Design : 4
General Education : 0

Relationship of Course to Program Outcomes

The course has been designed to contribute to the following program outcomes:
1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Prepared by: Prof.Dr. Hasan Kömürcügil	**Date Prepared:** 22 February 2023

NOTES: **1)** Only one makeup exam will be given for the midterm or final at the end of the semester that will cover all the topics listed above. **The student MUST submit a written report to the course instructor, stating their excuse, within 3 days of that examination.**
2) If you miss both midterm and final exams and did not submit any written report, you will get an "NG" grade.