

EE 209 Fundamentals of Electrical and Electronics Engineering

Spring 2005 – Section 3

Instructor:

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Other Section Instructors:

Dr. Muammer Ermiş (Sec 01), Dr. Nevzat Yıldızoğlu (Sec 02)

Assistants:

To be announced.

Course Purpose:

The purpose of this course is to give a concise and working knowledge of basic Electrical and Electronics Engineering topics to non-EE engineering students. The course aims to introduce you to topics of some core courses in EE on circuits and systems, electrical power and electric machinery. By the end of this course, you will hopefully have enough background to navigate your further search when faced with an electrical engineering problem in your field.

Reference Books:

- "Electric Circuit Analysis", D.E. Johnson and J.R. Johnson and J.L. Hilburn
- "Schaum's Outline Series of Electric Circuits, J.A. Edminister. TK454 E46 1997

Course Objectives:

By the end of this course, you will be able to do the following:

- **Introduction:** Define what basic electrical engineering is about. Work with SI units. Define quantities such as charge, current, voltage, energy and power. Discriminate between passive and active elements, dependent and independent sources. Define circuit analysis and design. Define passive sign convention.
- **Resistive Circuits:** Define resistive circuits and Ohm's law. Apply Kirchoff's Current and Voltage Laws to solve for electrical quantities in resistive circuits. Observe voltage and current division. Define and use basic electrical measurement tools.
- **Operational Amplifiers:** Define Op-Amps and observe what they can help you with. Solve electrical circuits with ideal Op-Amps and resistive elements.
- **Nodal and Mesh Analysis:** Analyze electrical circuits using formal analysis techniques. Apply nodal analysis and mesh analysis to an electrical circuit. Define and use super-nodes and super-meshes. Apply formal analysis to Op-Amp circuits.
- **Network Theorems:** Define and use network theorems that facilitate electrical circuit analysis and design. Define and apply linearity and superposition properties for a system. Apply Thevenin and Norton's Theorems to simplify and solve a circuit.

- Define when a maximum power transfer can be achieved. Apply source transformations to simplify analysis.
- **Energy Storage Elements:** Define the terminal properties of ideal capacitors and inductors. Find the energy stored in these elements. Solve for parallel and series connection of capacitors and inductors. Solve for transient response of circuits involving one energy storage element.
 - **Sinusoidal Steady-State Analysis:** Define transient and steady-state response of an electrical circuit. Define the properties of sinusoidal excitation. Analyze the behavior of a circuit under sinusoidal excitation. Use complex numbers to solve for steady-state circuits. Define and use phasor representation in combination with Kirchoff's laws. Define impedance and admittance. Perform nodal and mesh analysis.
 - **AC Steady-State Power:** Define and compute instantaneous and average power. Define where superposition applies in power computations. Define and compute complex power and power factor. List power factor considerations. Define the basic properties of transformers. Analyze simple transformer circuits. List safety considerations for
 - **Electric Machines:** Define the general principles of electromechanical energy conversion and electric machines. Define components of electrical machines and the principles of torque generation. Define characteristics and preferred applications of AC and DC motors. Define torque-speed characteristics for electric machines.
 - **Diodes and Transistors.** Define the basic properties of semiconductor diodes and transistors. Solve simple diode application circuits.

Evaluation and Grading:

The course will have 2 midterms and a final as well as homework assignments and short quizzes. The grading will be conducted as follows:

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| • 1st midterm exam | %25 |
| • 2nd midterm exam | %30 |
| • Final exam | %35 |
| • Homework & Quiz | %10 |

Examinations are planned as closed book and notes and will emphasize basic concepts and drill problem solving skills. Homework assignments will be collected at the beginning of the class and will not be accepted late.

Ethic Behavior:

You are considered as future professionals in engineering and highest ethical standards are presumed. It is expected that each student will present his/her own work. Disappointing behavior, if detected, will be dealt with accordingly.