Birzeit University
Faculty of Engineering and Technology
Department of Electrical and Computer Engineering
ENEE 2315

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Textbooks:

1. James W. Nilsson and Susan A. Riedel, "Electric Circuits", 10th Edition, Prentice Hall, 2015.
2. R. E. Thomas, A. J. Rosa, and G. J. Toussaint, "The Analysis and Design of Linear Circuits", 6th Edition, Wiley, 2009.

Pre-Requisites by Topic:

1. Network Analysis I.
2. Calculus, Ordinary Differential Equations.

Intended Leaning Outcomes (ILO's):

After completing the course, the students should be able to do the following:

- Solve circuits with ideal operational amplifiers.
- Understand basic operational amplifiers applications.
- Apply the linear network analysis methods in the Laplace domain, (mesh analysis, node analysis, network theorems and circuits transformation).
- Apply the circuit synthesis methods in the implementation of LTI systems (transfer functions).
- Understand two ports elements representation.
- Solve circuits with two ports elements.
- Determine and analyze the frequency response of the systems.
- Analyze different types of analog filters (active and passive).
- Design and implement different types of analog filters.
- Understand the graph representation of electric networks.
- Apply the graph theory concepts in solving electric networks.
- Use PSPICE and MATLAB tools in simulating and synthesizing electric networks.
- Acquire interaction and communication skills.

Exams and Grades:

First and Second Exams	45 %
Activities/Quizzes/Assignments	15 %
Final Exam	40 %

Attendance:

All the students are required to attend the classes. Any student who exceeds the absence limit set by the university will not be allowed to continue in the course.

Course Contents:

- Operational amplifiers and their various applications
- Introduction to Laplace transforms.
- Laplace transforms analysis and circuits application.
- Network Functions.
  - Definition of a network function.
  - Properties of a network function.
  - Network function of one and two-port circuits.
  - Network function design.
- Frequency Selective Circuits.
  - Low-pass filters.
  - High-pass filters.
  - Bandpass filters.
  - Bandreject filters.
- Active Filters Analysis and Design.
  - First-order low-pass and high-pass filters.
  - Op Amp bandpass and bandreject filters.
  - Higher order Op Amp filters.
  - Narrowband bandpass and bandreject filters.
- Two-Port Circuits.
  - The terminal equations.
  - The two-port parameters.
  - Analysis of the terminated two-port circuit.
  - Interconnected two-port circuits.
- Network graphs, Loop and Cut-set Analysis. (If time permits)
  - The concept of a graph.
  - Cut set and Kirchhoff's current law.
  - Loops and Kirchhoff's voltage law.
  - Node and mesh analysis.
  - Fundamental theorem of graph theory.
  - Loop analysis.
  - Cut-set analysis.

References:

1. W. H. Hayt, Jr., J. E. Kemmerly, and S.M. Durbin, "Engineering Circuit Analysis", Sixth Edition, McGraw-Hill, 2002.
2. R. C. Dorf and J. A. Svoboda, "Introduction to Electric Circuits", Seventh Edition, Wiley,2006.
3. C. K. Alexander and M. N. O. Sadiku, "Fundamentals of Electric Circuits", Third Edition, McGraw-Hill, 2006.
4. J. David Irwin, "Basic Engineering Circuit Analysis", Seventh Edition, Wiley, 2001.
5. Leon O. Chua, Charles A. Desoer, and Ernest S. Kuh, "Linear and Nonlinear Circuits ", McGraw-Hill Company, 1987.