Birzeit University -Faculty of Engineering
Electrical Engineering Department
ENEE2305-Circuit Analysis II

Dr. Hakam Shehadeh **Course Outline** **2nd Semester 2018-19**

Course number and name: **ENEE 2305 – Network Analysis 2**
Credits and contact hours: Credit: 3 (Lecture: 3, Lab.: 0)
Instructor's or course coordinator's name**: Dr. Hakam Shehadeh**
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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.
3. Leon O. Chua, Charles A. Desoer, and Ernest S. Kuh, "Linear and Nonlinear Circuits ", McGraw-Hill Company, 1987.

Specific course information

• **Description**: Operational amplifier, Circuit analysis and synthesis in Laplace domain, frequency response, frequency selective circuits, passive and active filters analysis and design, two port networks, circuit topology and general circuit analysis, Graph theory and algebraic methods. Using simulation tools for analysis and design of electric circuits.

• **Prerequisites**: ENEE2301: Network Analysis 1 and EE2302 concurrent: Signals and Systems.

Learning Outcomes

Upon the successful completion of this course, a student 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, and 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 Software packages in simulating and synthesizing electric networks.

(ABET) Relationship of course to Electrical Engineering Program Student Outcomes:

- (a) Ability to apply mathematics, science and engineering principles.
- (c) Ability to design a system, component, or process to meet desired needs.
- (e) Ability to identify, formulate and solve engineering problems.

Exams and Grades:

Midterm Exams, **24-3-2019**	35%
Assignment	15%
Quizzes	10%
Final Exam.	40%

Topics

- Operational amplifier.
- Introduction to Laplace transforms.
- Laplace transforms analysis and circuits application.
  - Passive circuits
  - Active circuits

- Network Functions.
  - Definition of a network function.
  - Properties of a network function.
  - Network function of one and two-port circuits.
  - Network function design and synthesis.

- Frequency Selective Circuits.
  - Low-pass filters.
  - High-pass filters.
  - Bandpass filters.
  - Band-reject 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 band pass and band reject filters.

- Two-Port Circuits.
  - The terminal equations.
  - The two-port parameters.
  - Analysis of the terminated two-port circuit.
  - Interconnected two-port circuits.

- Network graphs.
  - The concept of a graph.
  - Cut set and Kirchhoff's current law.
  - Loops and Kirchhoff's voltage law.
  - Node and mesh analysis.

- Loop and Cut-set 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.