ESE 271 ELECTRICAL CIRCUIT ANALYSIS Spring 2011

Instructor: A.H. Zemanian

Room: Light Engineering 201.

Office Hours: Mondays and Wednesdays 8:30 to 10:30 AM.

Textbook: "Electric Circuit Analysis," Third Edition, by Johnson, Johnson, Hilburn, and Scott.

Grading System: There will be three exams during the semester. They will be held on Wednesdays: March 2, March 30, and May 4. In addition, there will be a final exam. Its location and date will be announced later on. Furthermore, every student is required to submit a course portfolio. About 95% of the course letter grade will be based on the exams and about 5% on the portfolio.

A student's score on each exam (including the final exam) will be divided by the class average for it to get a "normalized score" for each exam. Then, the lowest normalized score will be dropped, and the other three scores will be added to get a total normalized score for the student. If a student misses an exam, the score for that exam will be 0. If two or more exams are missed, the total normalized score will become smaller accordingly. Finally, if the student's portfolio is acceptable, 0.15 will be added to the total normalized score to get the course's numerical grade, and a lesser amount will be added if the portfolio is less acceptable. The course's letter grade will be based on a curve obtained from the numerical grades of all the students.

With regard to the portfolio, a set of portfolio problems and exercises will be listed for each assignment. The student should submit an original handwritten solution for each portfolio problem and exercise. (Machine copies will not be acceptable.) The portfolio problems are chosen from the problems listed at the end of each chapter of the textbook, and the portfolio exercises are chosen from within the chapters.

Notice Regarding the Final Grade: The P/NC option is not available on this course (or on any other CSE or ESE course).

Hours and Places for Tutorial Assistance Provided by the Teaching Assistants: These will be announced subsequently.

Handicapped Students: If you have a physical, psychological, medical, or learning disability that may impact on your ability to carry out assigned course work, you are urged to contact the staff in the Disability Support Services Office (DSS) in room 128 of the Educational Communications Center. DSS will review your concerns and determine with you what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary (Adopted by the Undergraduate Council September 12, 2006).

PROBLEM ASSIGNMENTS:

The portfolio problems given at the end of each chapter of the textbook, and the portfolio exercises are taken from within the chapters. Hand these in near the end of the semester on a day to be announced.

Assignment 1:

Basic concepts for resistive circuits; 2 lectures.

Read Chapters 1 and 2.

Portfolio: Probs. 1.15, 2.17, 2.49; Exercise 2.7.1 (page 61), plus another problem to be assigned.

Assignment 2:

Dependent sources and op amps: 3 lectures.

Read Chapter 3.

Portfolio: Probs. 3.9, 3.16, 3.17, 3.23, 3.31.

Assignment 3:

Analysis methods: 6 lectures.

Read Chapter 4 and Appendix A.

Portfolio: Probs. 4.16, 4.17, 4.21, 4.35, 4.39, 4.43, 4.45.

Assignment 4:

Energy storage elements: 2 lectures.

Read Chapter 5.

Portfolio: Probs. 5.6, 5.9, 5.15, 5.27(a); Exercise 5.7.2, (page 195).

Assignment 5:

Phasors: 3 lectures.

Read Chapter 8 and Appendix B.

Portfolio: Probs. 8.13(a), 8.13(d), 8.14(d), 8.27, 8.32, 8.41.

Assignment 6:

AC steady-state analysis: 4 lectures.

Read Chapter 9.

Portfolio: Probs. 9.7, 9.13, 9.19, 9.21.

Assignment 7:

AC steady-state analysis (continued): 3 lectures.

Read Chapter 10.

Portfolio: Probs. 10.4, 10.5, 10.13(c),(d), 10.25, Exercise 10.5.1 (page 428).

Assignment 8:

Piecewise linear functions and delta functions.

Read pages 234-239 and 486-493.

Portfolio: Probs. 6.39, 6.40, 12.12(a), 12.13(a),(d), 12.14(a),(b), 12.19.

Assignment 9:

Integrodifferential equations for circuits: 1 lecture.

Read pages 273-276 and 510-511.

Portfolio: Just write the integro-differential equations for Probs. 7.2, 7.7, 7.41, 7.43; also, do Exercise 12.2.2 (page 495).

Assignment 10:

Laplace transforms: 6 lectures.

Read Chap. 12.

Portfolio: Probs. 12.1, 12.10, 12.27(b), 12.31(a), 12.32(a).

Assignment 11:

Transient circuit analysis: 5 lectures:

Read Chapter 13.

Portfolio: Probs. 13.6, 13.15, 13.29, 13.49, 13.53, two extra problems on convolution.

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Topics for the First Exam

(The numbers are references to pages in the textbook, *Johnson, Johnson, Hilburn, and Scott.*)

Charge and current (pages 5-8), voltage, power, independent sources (9-15).

Kirchhoff's laws (22-29), Resistors, Ohm's law (30-33).

Equivalent circuits (33-35), Series and parallel circuits, voltage and current division (37-48).

Special methods for series-parallel networks.

Thevenin's and Norton's equivalent circuits (48-54).

Dependent sources (80-83).

Practical and ideal operational amplifiers, realizations of dependent sources (83-89, 151-154).

Basic blocks (92-97) and cascade connections of them (97-102).

Matrix methods (793-801).

Linearity, proportionality, superposition (118-127).

Nodal analysis (127-137).

Mesh analysis (138-145).

Mixed methods.

Superposition and power (420-425 gives the AC version of this).

Maximum power theorem (425-427 gives the AC version of this).

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Topics for the Second Exam

(The numbers are references to pages in the textbook, *Johnson, Johnson, Hilburn, and Scott.*)

Capacitors (174-185).

Inductors (185-193).

Complex numbers (Appendix B: 803-809).

Cosinusoids and phasors (317-332).

Current-voltage laws, impedances and admittances (333-342).

Kirchoff's laws and phasor circuits (342-351).

Series and parallel connections of impedances (360-363).

Complex forms of Thevenin's and Norton's theorems (363-366).

AC nodal analysis (366-372).

AC mesh analysis (372-377).

Superposition for circuits with sources of different frequencies (377-380).

Average power (402-408).

Power factor angle (432).

RMS values (409-412).

Complex power (413-420).

Superposition and power (420-425).

Maximum power transfer (425-427).

Circuits with switches; determination of initial conditions (177-180, 187-190).

Continuity of capacitor voltages and inductor currents (193-195).

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Topics for the Third Exam

(The numbers are references to pages in the textbook, *Johnson, Johnson, Hilburn, and Scott.*)

Step functions and piecewise-linear functions (235-239, 486-488).

The delta function and its derivatives (488-493).

Integro-differential equations for RLC circuits (273-276; see also 510-511).

The Laplace transform—the definition and some simple properties (480-484).

Some function-transform pairs (486-493).

Differentiation and integration formulas (493-495).

Some operation-transform properties (496-502).

Kirchhoff's laws in the s-domain (520-525).

Solving integro-differential equations; transients in electrical circuits (509-513).

Transforms of elements with initial conditions (525-529).

Partial fraction expansions (503-509).

Pole locations and stability (534-539).

Initial and final value theorems (539-540).

Transfer functions (530-534).

Convolutions, their transforms, and solving convolution equations (541-549).