Electrical Systems Analysis I
INEL 3105
Fall 2014

Sec. 020 – Class Meetings: Mon, Wed, Fri, 8:30 am to 9:20am, S-228
Sec. 040 – Class Meetings: Mon, Wed, Fri 10:30am to 11:20am, S-228

Course Catalog Description:

Three credit hours (Engineering Science: 3 credits, Engineering Design: 0 credits). Three hours of lecture per week. Analysis of direct current and alternating current linear electric circuits; laws and concepts that characterize their behavior. Prerequisites: (MATE 3032 or MATE 3184) and INGE 3016. Co-requisites: (FISI 3172 or FISI 3162) and (MATE 3063 or MATE 3185).

Prerequisites by Topic:

Ability to solve a set of simultaneous linear equations. Knowledge of basic matrix notation, algebra, terminology, and operations. Ability to manipulate complex numbers. Knowledge of the concepts of energy, power, electric charge, electric current, electric potential, and electromagnetic fields. Ability to evaluate derivatives and integrals.

Faculty:

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Textbook:

James W. Nilsson & Susan A. Riedel; *Electric Circuits;* 9th Edition (2011); Prentice Hall.

Course Objectives:

The objective of this course is to introduce students to DC and AC electric circuit analysis techniques. Basic circuit elements such as resistors, inductors, capacitors, operational amplifiers, transformers, and dependent and independent sources are introduced. Simplification of electrical circuits is considered using various techniques. Sinusoidal steady-state power calculations and two-port networks are also presented.

Course Outcomes:

After completing the course the student should be able to analyze a DC or an AC electric circuit using the techniques learned in class. The student should be able to simplify electric circuits and obtain their equivalent circuit. In addition, the student should be able to solve circuit problems containing operational amplifiers. The student should be able to perform sinusoidal steady-state power calculations. The student should be able to draw and interpret schematic diagrams of electric circuits and recognize the symbolic representation of the basic circuit elements.

Instructional Strategy:

The course will consist of lectures, discussions and problem solving. In addition, there might be periodic laboratory or computer demonstrations, as well as seminars.

Class Participation & Attendance:

- The success of any course depends on constructive interaction between students and faculty. You are expected to take a proactive role in this process, asking questions, commenting, maintaining alert attention, and otherwise supporting the course objectives.
- Class attendance is compulsory. Students must be present and on time for all class meetings and exams. For each class absence without a valid excuse, 2% will be deducted from your final course grade.
- Making up missed material due to class absences is the sole responsibility of the student.

Additional Course Policies:

- Professional conduct will be expected of all class members. The highest caliber of mutual respect among all class members will be demanded.
- Academic dishonesty, frequent absences, or behavior problems could affect your final grade and may even lead to failure in the course.
- Cellular phones and other communication devices must be turned off during the class period.
- People not officially registered in the course, or pets, will not be allowed in the classroom.
- Apparel must be appropriate.
- A grade of zero will be assigned to any homework that is not turned-in on time.
- All the reasonable accommodations according to the Americans with Disability Act (ADA) Law will be coordinated with the Dean of Students and in accordance with the particular needs of the student.
- Any academic fraud is subject to the disciplinary sanctions described in Articles 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in Articles 1-5 of the Bylaws.

Exams and Quizzes:

- There will be three (3) partial exams during the semester and a comprehensive final exam.
- All exams and quizzes will be closed book and notes.
- There will be no exemptions to taking the final exam.
- If you miss an exam or quiz without either a certified medical excuse or prior instructor approval, a zero will be averaged into your grade.
- Tests missed with certified medical excuse or prior instructor approval will be dealt with individually. The student will have at most two weeks to complete the make up exam. After the two week period (14 days), the student's grade will be zero.
- If you miss the final exam without a valid excuse, a zero will be averaged into your grade.

Grading Policy & Exam Dates:

Grading		**Letter Grades**	
3 Partial Exams (20% each)	60%	100 – 90	A
Final Exam	30%	89 – 80	B
Quizes and Hwks	10%	79 – 70	C
Total	100%	69 – 60	D
		59 – 0	F

Exam Dates

Exam 1: Monday, Sept 15
Exam 2: Miercoles, Oct 15
Exam 3: Monday, Nov 12
Final Exam - As scheduled by the University Registrar's Office

Course Outline & Schedule:

Topics	Textbook Reference	Lectures	Recommended Problems
The International System of Units, Circuit Analysis: An Overview, Voltage and Current, The Ideal Basic Circuit Element, Power and Energy	**Chapter 1**	1	1.7, 1.9, 1.11, 1.14, 1.18, 1.19, 1.26, 1.28, 1.29, 1.30
Voltage and Current Sources, Ohm's Law, Kirchhoff's Laws, Analysis of a Circuit Containing Dependent Sources	**Chapter 2**	2	2.1, 2.4, 2.6, 2.7, 2.9, 2.11, 2.13, 2.15, 2.17, 2.18, 2.20, 2.21, 2.23, 2.26, 2.27, 2.30, 2.32
Resistors in Series, Resistors in Parallel, The Voltage Divider and Current Divider Circuits, Voltage Division and Current Division, Measuring Voltage and Current, Measuring Resistance – The Wheatstone Bridge, Delta-to-Wye Equivalent Circuits (Exam 1)	**Chapter 3**	2	3.1, 3.3, 3.4, 3.6, 3.10, 3.13, 3.14, 3.17, 3.18, 3.20, 3.25, 3.27, 3.30, 3.31, 3.32, 3.33, 3.34, 3.43, 3.49, 3.50, 3.53, 3.56, 3.60
The Node-Voltage Method, The Mesh-Current Method, Source Transformations, Thévenin and Norton Equivalents, Maximum Power Transfer, Superposition	**Chapter 4**	6	4.1, 4.2, 4.6, 4.9, 4.11, 4.13, 4.15, 4.17, 4.20, 4..24, 4.27, 4.29, 4.33, 4.34, 4.37, 4.40, 4.45, 4.51, 4.55, 4.59, 4.61, 4.63, 4.64, 4.66, 4.67, 4.73, 4.77, 4.79, 4.85, 4.91, 4.94, 4.97
Op-Amp Models, Fundamental Op-Amp Circuits (Exam 2)	**Chapter 5**	2	5.1, 5.2, 5.3, 5.5, 5.6, 5.8, 5.12, 5.14, 5.16, 5.21, 5.26, 5.29, 5.39, 5.41, 5.42
The Inductor, The Capacitor, Series-Parallel Combinations of Inductance and Capacitance	**Chapter 6**	1	6.1, 6.2, 6.5, 6.8, 6.10, 6.14, 6.17, 6.19, 6.20, 6.21, 6.26, 6.27
Sinusoids, Sinusoidal and Complex Forcing Functions, Phasors, Phasor Relationships for Circuit Elements, Impedance and Admittance, Phasor Diagrams, Basic Analysis Using Kirchhoff's Laws, Analysis Techniques	**Chapter 9**	2	9.1, 9.4, 9.11, 9.12, 9.13, 9.14, 9.16, 9.25, 9.27, 9.30, 9.32, 9.33, 9.36, 9.39, 9.42, 9.44, 9.48, 9.52, 9.55, 9.61, 9.64, 9.66, 9.68
Mutual Inductance, The Ideal Transformer (Exam 3)	**Chapters 6 and 9**	2	6.40, 6.41, 6.43, 6.44, 6.46, 6.48, 6.49, 9.75, 9.77, 9.78, 9.81, 9.83
Instantaneous Power, Average Power, Maximum Average Power Transfer, Effective or RMS Values, Power Factor, Complex Power, Power Factor Correction	**Chapter 10**	2	10.6, 10.7, 10.16, 10.19, 10.21, 10.29, 10.30, 10.32, 10.34, 10.46
Two-Port Networks: Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Parameter Conversions, Interconnection of Networks (Exam 4)	**Chapter 18**	2	18.2, 18.3, 18.5, 18.7, 18.10, 18.12, 18.14, 18.21, 18.24, 18.26, 18.29, 18.38, 18.40