INEL 3105 ELECTRICAL SYSTEMS ANALYSIS I

Course catalog description:

Three credit hours. Three hours of lecture per week.

Analysis of direct current and alternating current linear electric circuits; laws and concepts that characterize their behavior.

Prerequisite or co requisite:

MATE 3032 or MATE 3184. Co-requisites: (FISI 3172 or FISI 3162) and (MATE 3063 or MATE 3185).

Prerequisite by topics:

Ability to solve a system of linear equations using determinants. Knowledge of the physical significance of resistance, conduction, inductance, and capacitance. Ability to evaluate derivatives and integrals. Differential equations.

Textbook:

J. David Irwin; John Wiley, *Basic Engineering-Circuits Analysis, 8th Edition*, Addison Wesley.

Course objectives:

The objective of this course is to introduce students to electric circuit analysis techniques, including the Kirchhoff's Laws. Basic circuits elements such as, transformer, operational amplifiers, resistors, inductors, capacitors, dependent and independent sources are introduced. Simplification of electrical circuits is considered using various techniques, including Thevenin's and Norton's theorems. Single-phase circuits power analysis and first-order linear circuit analysis techniques 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 problem containing operational amplifiers. The student should be able to perform sinusoidal steady-state power calculations and to analyze first order RC, RL, and RLC circuits. The student should be able to draw and interpret schematic diagrams of electric circuits and recognize the symbolic representation of the basic circuit elements.

Topics covered and time dedicated:

Circuit variables and units.	2 lectures
Circuit elements, Kirchhoff's laws.	5 lectures
Resistive circuits.	4 lectures
Techniques of circuit analysis.	10 lectures
The ideal operational amplifier and its inverting and non-inverting configurations.	3 lectures
Inductance (L), Capacitance (C) and Mutual Inductance (the transformer in the time domain).	4 lectures
The phasor and the frequency domain.	6 lectures
Power; instantaneous, average (P), reactive (Q), complex (S) and power factor (pf). Maximum power transfer.	3 lectures
RC, RL and RLC circuits.	5 lectures
Exams	3 lectures

Class/laboratory schedule

Three hours of lecture per week.

Contribution of course to meeting the professional component:

Engineering Science: 3 credits

Engineering Design: 0 credits

Relationship of course to program objectives:

	Objective				
	1	2	3	4	5
Contribution		X	X		

Relationship of course to program expected outcomes:

	Outcome										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Contribution	X	X			X	X	X				