ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computer Engineering
COURSE SYLLABUS
Electrical Networks Analysis I

1. CODE AND NUMBER OF CREDITS

CODE	**FIEC01735**	
NUMBER OF CREDITS : 5	**Theoretical:** 5	**Practical: 0**

2. COURSE DESCRIPTION

The course covers the analysis of power grids in steady state DC and AC single phase or three-phase both. The analysis is that given a circuit, calculate the voltages, currents and powers in any of its elements, for which we study different methods, laws and theorems applied to simple circuits and subsequently complex initially.

The course is vocational and therefore applicable in all technical matters of engineering careers IFAC.

The skills recommended by the student are: general knowledge of linear algebra, vector analysis and physics C.

During course development problems sessions are held, and in addition to each exam, jobs are submitted and take short lessons. Also encourages student participation in class.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	**ICF01131 PHYSICS C**
CO-REQUISITES	

4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE

CORE TEXT	1. William H. Hayt Jr. – Jack E. Kemmerly – Steven M. Durbin, "Análisis de Circuitos en Ingeniería", séptima edición 2007, McGraw Hill.
REFERENCES	1. David e. Johnson – John L. Hilburn – Johnny R. Johnson – Peter D. Scott, "Análisis Básico de Circuitos Eléctricos" , quinta edición 1996, Prentice Hall. 2. J. David Irwin," Análisis Básico de Circuitos en Ingeniería" , 6TH edition 2010, Limusa Wiley. 3. Richard C. Dorf, ames Svoboda, "Circuitos Eléctricos", 5th edition 2003, Alfaomega.

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:

1. Correctly interpret diagrams and symbols in an electrical circuit.
2. Apply properly referenced polarity and direction elements that act as source and load.
3. Correctly apply the methods, laws and theorems taught in the course to analyze electrical circuits.
4. Calculate voltage, current and power in DC circuits and AC.
5. Ensure proper implementation of power factor improvement of a power network and understand the advantages that this represents for the operation of the network.
6. Calculate the equivalent electrical network mediantes the Thevenin and Norton theorems.
7. Analyze magnetically coupled circuits.
8. Analyze and evaluate phase circuits operating advantages over single-phase circuits.

6. COURSE PROGRAM

I. VARIABLES, COMPONENTS AND LAWS IN THE ELECTRICAL NETWORK THEORY. (7.5 hours)

- Physical variables in power systems.
- Variables of interest in the theory of electrical networks.
- References to measure voltages and currents: polarity, direction, combined references.
- Characterization of the physical components: source, resistor, inductor and capacitor.
- Laws of electrical network theory

II. SIMPLE NETWORK ANALYSIS CURRENT. (10 hours)

- Definition and reduction of elements in series.
- Definition and reduction of parallel elements.
- Dividers voltages and currents.
- Terms redundant.
- Transforms sources.
- Sources controlled.
- Transformations delta - star and star - delta.

III. GENERALIZED METHOD OF ELECTRICAL NETWORK ANALYSIS WITH APPLICATION CURRENT. (10 hours)

- The method of branch currents.
- The method of the stresses at the nodes; supernodes.
- The method of mesh currents; supermesh

III. NETWORK THEOREMS AND DC. (5 hours)

- Superposition theorem.
- Thevenin theorem.
- Norton theorem.
- Theorem maximum power transfer.

V. ANALYSIS SINUSOIDAL STABLE. (10 hours).

- Features exciter sinusoidal function.
- complex sinusoidal exciter function.
- Concept of phasor and phasor transformation.
- complex Ohm's Law.
- phasor Relations inductors, capacitors and resistors.
- Impedance and admittance and its components
- Reductions impedances and admittances in series and in parallel. Impedance diagrams.
- Nets and knots in stable sinusoidal analysis.
- Overlay theorems, Thevenin and Norton into alternating current.
- phasor diagrams.

VI. POWER AND ENERGY IN AC POWER. (7.5 hours)

- Effective Values voltages and currents.
- Instantaneous power.
- Average Power.
- Active power and power factor.
- Reactive power.
- Power Triangles.
- Apparent power and power complex.
- Improving the power factor.
- Maximum power transfer.

VII MAGNETIC COUPLING AND COUPLED CIRCUITS. (10 hours)

- magnetic coupling coefficient.
- mutual inductance.
- magnetic Ohm's Law.
- Magnetically coupled circuits.
- Ideal Transformer.

THREE PHASE CIRCUITS VIII. (10 hours)

- Balanced three-phase circuits.
- Generation phase.
- balanced three-phase loads.
- Reduction phase.
- Power balanced three-phase loads.
- unbalanced three-phase circuits.
- Three phase power measurement.

7. WORKLOAD: THEORY/PRACTICE

Number of sessions per week: 2
Number of hours per session: 2.5
Total number of hours of classes per week: 5

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

Electrical Network Analysis I is a basic course in the formation of future Electrical Engineers.
The knowledge acquired by the student are applicable to all technical matters of engineering programs offered by the IFAC.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) An ability to apply knowledge of mathematics, science and engineering.	High	3,4,5,6,7,8	Solve systems of equations and matrices, both in real and complex. Have knowledge of basic physics.
b) An ability to design and conduct experiments, and to analyze and interpret data	Medium	3,4,5,6,7,8	Analyze and interpret data and results according to different circuits.
c) An ability to design a system, component or process to satisfy realistic constraints.			
d) An ability to function on multidisciplinary teams.	Low	3,4,5,6,7,8	Working in groups to solve problems of power grids.
e) An ability to identify, formulate and solve engineering problems.	Medium	1,2,3,4,5,6,7, 8	Able to apply the knowledge gained in this course into other courses in his career as well as certain aspects of their future careers.
f) An understanding of ethical and professional responsibility.			
g) An ability to communicate effectively.	Medium	3,4,5,6,7,8	Clearly express the procedure chosen for analyzing a power grid as well as the conclusions reached after analysis.
h) A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.			
i) A recognition of the need for, and an ability to engage in life-long learning.	Low	5,6,7,8	Find and Read updated information sources.
j) A knowledge of contemporary issues.			
k) An ability to use the techniques, skills, and modern tools necessary for engineering practice.	Medium	4,5,6,7,8	Simulation tools use electrical circuitry to verify the solution obtained through conventional methods
l) Capacity to lead, manage and undertake projects.			

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	X
Tests	X
Homework/tasks	
Projects	
Laboratory/Experiments	
Class participation	
Visits	
Other	

11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION

Created by	Mag. Hernán Gutiérrez Vera
Date	05 SEPT 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Mrs. Leonor Cajecdo G.	NAME: Eng. Marcos Mendoza
SIGNATURE:	SIGNATURE: ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA
Date of approval by the Directive Council: 2013-537 2013-10-7	

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-12-343
DATE:	2013-12-12