

EC334- Analog- and Digital- Circuits Analysis

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2; Lab: 2

COURSE COORDINATOR

Dr. Khaled Shehata

TEXT BOOK

K.M. Soni, Circuits and systems, Kataria & sons, 2008

COURSE DESCRIPTION

Circuit analysis, Laplace transform, two port networks, digital circuits and logic gates.

PREREQUISITE

EC232 & EC233

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to be familiar with circuit synthesis techniques of single and two-port networks. Analysis of networks and electronic circuits using standard packages. Analysis of different logic gates (RTL, DTL, TTL, CMOS)

TOPICS COVERED

- Introduction to course and ILOS
- Source transformation, KVL, Voltage divider, KCL, Current divider, Nodal and Mesh analysis
- Super Position Theorem
- Thevenin's and Norton Theorems.
- Millman's Theorem.
- Maximum power transfer Theorem
- Definitions of Time Response using classical methods, required mathematics and basics
- Initial Conditions in circuits
- Voltage-current relationship
- Laplace Transform and its inverse
- Circuit Analysis by Laplace Transform, Transfer function, Poles, zeros, stability and time response
- Basics: Frequency response, angle and magnitude of a function
- Numerical example on frequency response
- Introduction to Bode plot

- System gain magnitude and phase plot
- Poles or zeros at origin magnitude and phase plot
- Simple poles or zeros magnitude and phase plot
- Quadratic factors magnitude and phase plot
- Steps to sketch the Bode plot
- Definitions and introduction to Two-Port Networks
- Different forms of two-port networks
- Relationship of two port variables
- Open circuit impedance (Z) parameters
- Short circuit admittance (Y) parameters
- Transmission (T) or ABCD parameters
- Inverse transmission (T') parameters
- Hybrid (h) parameters
- Inverse hybrid (g) parameters
- Relation between parameters sets.
- Time response for R-C circuit with presentation of switch.
- Application on Thevenin's and Norton Theorems (AC)
- Finding frequency response of a circuit
- Frequency response of a transfer function, poles, zeros, impulse response, general response (step response as example), bode plot Magnitude and phase.
- Introduction to logic families
- Characteristics of Digital families
- Diode logic and rectifier circuits
- CMOS inverter
- Basic CMOS logic Circuits
- PUN and PDN Technique
- CMOS transmission gate
- RTL and DTL logic gates
- Fundamentals of BJT technology.
- BJT in switching –digital applications
- RTL (inverter –NOR-characteristics)
- DTL(inverter –modified inverter-NAND-NOR-characteristics)
- TTL passive pull-up technique
- TTL NAND gate with active pull up
- totem-pole configuration
- NAND and inverter TTL

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional component Content			
Math and Basic Sciences	Engineering Topics	General Education	Other
	✓		

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course aspects
A	An ability to apply knowledge of mathematics, science, and engineering	a ₁ a ₂
B	An ability to design and conduct experiments, analyze and interpret data.	b ₁ b ₂ b ₃ b ₄
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e ₁ e ₂ e ₃
F	An understanding of professional and ethical responsibility	
G	An ability to communicate effectively	
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
K	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	