



## **NORTH SOUTH UNIVERSITY**

Department of Electrical & Computer Engineering

**Summer 2022**

- I - Course Code:** EEE/ETE 141
- II - Course Title:** Electrical Circuits I
- III - Credit:** 3 credit hours (3 hours of theory per week)
- IV- Nature:** Major Core Course
- V - Prerequisite:** MAT 120 (Calculus and Analytic Geometry I)
- VI- Lecture Hours:** RA: 11:20 AM-12:50 PM **Section:** 8
- VII- Lecture Venue:** SAC 314

### **VIII- Course Description:**

This course introduces the basic Elements, Parameters, Laws and Methods of DC circuit design and analysis. Definition of Voltage, Current, Resistance, Power, Energy; Ohm's Law, Kirchhoff's Voltage law (KVL); Voltage divider rule, Kirchhoff's Current Law (KCL); Current divider rule; Open and short circuits, Series-Parallel network; Methods for solving such networks, Source conversion; Branch current analysis; Mesh Analysis; Super-Mesh Analysis; Nodal Analysis; Super-Node Analysis; Y-Delta and Delta-Y conversions; Dependent Current Source, Dependent Voltage Source; Superposition Theorem; Thevenin's Theorem; Norton's Theorem; Maximum Power Transfer Theorem; Electric Field; Capacitance; Dielectric strength; leakage current, Transients in Capacitive networks: Charging Phase; Discharge phase; Energy stored by capacitor; Stray capacitance; Capacitors in series and parallel; Magnetic Field; Magnetic flux density, Permeability. Inductor; Faraday's law of electromagnetic induction; Lenz's law; Self-inductance; R-L transient: Storage cycle; Decay phase; Inductors in series and parallel; R-L and R-C circuits with DC inputs; Energy stored by an inductor; Related problems. This course has a separate mandatory laboratory session every week.

### **IX – Course Objectives:**

- a. To introduce basic circuit laws applied in simple DC circuits to compute voltage, current, equivalent resistance and power.
- b. To analyze complex circuits using nodal and mesh methods.
- c. To simplify circuit analysis using various circuit theorems.
- d. To examine the transient analysis of series RC and RL circuits.
- e. To enable the students to build circuits and conduct experiments on it in a laboratory setting.

## Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:

Sl.	CO Description	Weightage (%)
CO1	<b>apply</b> circuit solution principles to analyze DC resistive circuits.	50
CO2	<b>illustrate</b> the transient analysis of series RC and RL circuits.	25
CO3	<b>conduct</b> experiments on DC circuits	25

## Mapping of CO (Course Outcomes)-PO (Program Outcomes):

Sl.	CO Description	POs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CO1	<b>Apply</b> circuit solution principles to analyze DC resistive circuits.	<b>a</b>	Cognitive/ Apply	Lectures, Notes	Quiz, Exam
CO2	<b>Illustrate</b> the transient analysis of series RC and RL circuits.	<b>a</b>	Cognitive/ Understand	Lectures, Notes	Exam
CO3	<b>Conduct</b> experiments on DC circuits	<b>d</b>	Psychomotor/ Manipulation	Lab class	Lab reports, exam

## X – Tentative Course Outline:

Topics	Time Frame	Suggested Activities
<b>Introduction and Series Circuits:</b> Voltage and Current; Resistance; Ohm's Law, Power and Energy, Total resistance of a series circuit; Voltage sources in series, Kirchhoff's Voltage law (KVL); Voltage divider rule.	Lectures 1-3	
<b>Parallel Circuits:</b> Parallel Network, Total resistance and conductance of a parallel circuit, Kirchhoff's Current Law (KCL); Current divider rule; Voltage sources in parallel; Open and short circuits. Dependent Current Source, Dependent Voltage Source.	Lectures 4-6	<b>Quiz-1</b>  Introduction and Series Circuits  Parallel Circuits

<b>Series-Parallel Circuits:</b> Series-Parallel network, Methods for solving such networks, Ladder networks.	Lectures 7-9	Quiz-2 Series-Parallel Circuits
<b>Methods of Analysis:</b> Source conversion; Current sources in parallel, current sources in series; Branch current analysis;	Lectures 10-13	Quiz-3 Methods of Analysis
Mesh Analysis, Super-Mesh Analysis, Nodal Analysis; Super-Node Analysis.		
Y-Delta and Delta-Y conversions; Related problems		
	Lecture 14	<b>Mid-Term Exam</b> <b>Lectures 1-13</b>
<b>Network Theorems:</b> Superposition Theorem; Thevenin's Theorem; Norton's Theorem; Maximum Power Transfer Theorem; Related problems.	Lectures 15-18	
<b>Capacitors:</b> Electric Field; Capacitance; Dielectric strength; leakage current, Transients in Capacitive networks: Charging Phase; Discharge phase; Continuation of transients in Capacitive networks; Energy stored by capacitor; Stray capacitance; Capacitors in series and parallel.	Lectures 19-21	
<b>Inductors:</b> Magnetic Field, Magnetic Flux Density, Permeability, Faraday's law of electromagnetic induction; Lenz's law; Self-inductance; R-L transient: Storage cycle; Related Problems. R-L transient: Decay phase; Inductors in series and parallel; R-L and R-C circuits with DC inputs; Energy stored by an inductor.	Lectures 22-24	
		<b>Final Exam</b> <b>Lectures 10-24</b>

## **XI– Teaching Method:**

Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Class lecture slides will be uploaded on Canvas. White board and multimedia projector will be used for the convenience of the students.

## **XII - Course Requirements**

### **1. Student Attendance**

All students are expected to attend all scheduled classes, study previous assigned chapters or materials, and solve the necessary homework /problems before coming to the class.

80% Attendance is Mandatory to participate in both Mid-Term and Final-Term Exam.

### **2. Class Participation**

Students are expected to participate actively in the class. Performance tests will be taken frequently. Questioning in the class is highly encouraged. Class performance marks will be counted for timely attendance, timely submission of all types of assessments and active class participation.

### **3. Quiz & Exam**

There will be three Quizzes in total and best two Quizzes will be counted for grading. One Mid-Term exam and one Final-Term exam will be taken.

## **XIII -Online group: Canvas**

- Go to <http://www.northsouth.edu/canvas/> and login using your NSU email id and password
- Always check the announcements in the canvas.
- If you do not have NSU Email yet, please get it as soon as possible.

## **XIV – Textbook/ References:**

### **TEXT BOOKS**

[1] Robert L. Boylestad, “Introductory Circuit Analysis”, 11th Edition, Prentice Hall Inc.

[2] Charles K. Alexander & Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, 5th edition, The McGraw-Hill companies.

### **REFERENCE MATERIAL:**

[1] Robert P. Ward, “Introduction to Electrical Engineering”, 3rd Edition, Prentice Hall Inc

[2] David E. Johnson & Johny R. Johnson, “Electric Circuit Analysis”, 2nd Edition, Prentice Hall Inc.

## XV-Evaluation

Class Performance	10%
Assignment	10%
Quiz	20%
Midterm exam	30%
Final term	30%
Total	100%

## XVI- Grading policy

As per NSU grading policy:

Grades	Range
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	60-66
F	0-60

## XVII - Faculty Information

**Faculty Name:** Syeda Sarita Hassan. **Faculty Initial:** SSH1

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**Office Hours:** Email me to get your scheduled time