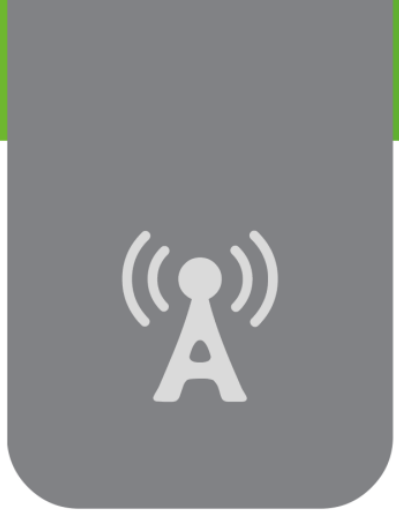

Electronics Course Definition File

Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Electronics
Course ID	CEE202
Contact Hours (Registered Sessions)	30
Contact Hours (Synchronized Sessions)	18
Mid Term Exam	There is not
Exam	1.5
Registered Sessions Work Load	30
Synchronized Session Work Load	18
Credit Hours	5

2. Pre-Requisites:

Course	ID
Electric Circuits	CEE101

3. Course General Objectives:

This course aims to give the students ideas to understand devices and basic Circuits, includes the most fundamental and essential topics for the study of electronic circuits.

The three basic semiconductor devices will be briefly studied: the diode, the MOS transistor, and the bipolar transistor. In each case, we study the device operation, its characterization, and its basic circuit applications.

Since the purpose of electronic circuits is the processing of signals, an understanding is essential of signals, their characterization in the time and frequency domains, and their analog and digital representations. The most common signal-processing function, amplification, and the characterization of amplifiers will be studied.

Besides diodes and transistors, the basic electronic devices, the op amp is, also, studied. Although, the op amp is not an electronic device in the most fundamental sense, the op amp is commercially available as an integrated circuit (IC) package and has well-defined terminal characteristics. Its almost-ideal terminal behavior makes it possible to treat the op amp as a circuit element and to use it in the design of powerful circuits, as we do in this course, without any knowledge of its internal construction.

Most physical systems incorporate some form of feedback. The general structure of the negative-feedback amplifier and the basic principle that underlies its operation will be studied. The advantages of negative feedback will be introduced. The appropriate feedback topology to employ with each of the four amplifier types: voltage, current, transconductance, and transresistance amplifiers will be developed.

We will study an important class of analog circuits: filters and oscillators. Both topics have in common an application or system orientation. They provide dramatic and powerful illustration of the application of both negative and positive feedback.

In the study of electronic systems, the need usually arises for signals of various waveforms—sinusoidal, triangle, square-wave, and so on. The generation of such signals will be done.

This course forms a prerequisite to introduction to communication and signal processing courses at next levels.

4. Intended Learning Outcomes (ILO):

Code	Intended Learning Outcomes
ILO1	Comprehension of basic concepts in electronic circuits concerning electrical signals and signal amplification.
ILO2	Understanding The terminal characteristics of the ideal op. amp., analysing circuits containing op amps, resistors, and capacitors, and recognizing most important applications.
ILO3	Understanding the basics of semiconductors, the diode operation, its characterization, and its basic circuit applications.
ILO4	Understanding the MOS transistor operation, its characterization, and its basic circuit applications.
ILO5	Understanding the BJT transistor operation, its characterization, and its basic circuit applications.
ILO6	Understanding the general structure of the negative-feedback amplifier and the basic principle that underlies its operation.
ILO7	Describing filters by its transfer functions, and classifying filters into different types based on the relative location of their pass-band(s) and stop-band(s). Recognizing a filter transfer function that meets the given specifications, including the use of popular special functions such as the Butterworth and the Chebyshev.
ILO8	Using the tuned transistor amplifiers for radio-frequency (RF) applications.
ILO9	Understanding the basic principles of oscillator circuit that generates sine waves.

5. Course Syllabus (18 hours of total synchronized sessions)

- RS: Recorded Sessions; SS: Synchronized Sessions;

ILO	Course Syllabus	RS	SS	Type	Additional Notes
ILO1	Introduction to Electronics: • Signals • Frequency Spectrum of Signals • Analogue and Digital Signals • Circuit Models for Amplifiers • Voltage Amplifiers and Cascading Amplifiers	3	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 1 (see references list below)
ILO1 ILO2	Operational Amplifiers: • The Ideal Op Amp • The Inverting Configuration • The Noninverting Configuration • The Weighted Summer • Difference Amplifiers • The Inverting Integrator • The Op-Amp Differentiator	5	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 2 (see references list below)
ILO1 ILO3	Diodes and Applications: • Semiconductors • The Diode: Operation and Characteristics • Rectifier Circuits • Circuit Regulator (Zener Diode)	3	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 3 and chapter 4 (see references list below)

ILO1 ILO3 ILO4	MOS Field-Effect Transistors: • Device Structure and Physical Operation • Current-Voltage Characteristics • Biasing in MOS Amplifier Circuits • Small-Signal Equivalent-Circuit Models • Discrete-Circuit MOS Amplifiers: • The Common-Source (CS) Amplifier, The Common-Gate (CG) Amplifier, and The Source Follower	4.5	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 5 (see references list below)
ILO1 ILO3 ILO5	BJT Transistors: • Device Structure and Physical Operation • Current-Voltage Characteristics • Biasing in BJT Amplifier Circuits • Small-Signal Equivalent-Circuit Models • Discrete-Circuit BJT Amplifiers: The Common-Emitter (CE) Amplifier, The Common-Base (CB)	4.5	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 6 (see references list below)

	Amplifier, and The Emitter Follower				
ILO1 ILO2 ILO6	Feedback Amplifiers: • The General Feedback Structure • Some Properties of Negative Feedback: Gain Desensitivity, Bandwidth Extension, Interference Reduction, and Reduction in Nonlinear Distortion • The Four Basic Feedback Topologies: Voltage Amplifiers, Current Amplifiers, Transconductance Amplifiers, and Transresistance Amplifiers	3	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 10 (see references list below)
ILO1 ILO2 ILO7	Filters: • Filter Transmission, Types, and Specification • The Filter Transfer Function • Butterworth and Chebyshev Filters • First-Order and Second-Order Filter	3	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 16 (see references list below)
ILO1 ILO4 ILO5	Tuned Amplifiers: • The Basic Principle • Inductor Losses	2	1.5	☒ Exercises ☒ Assignments ☐ Seminars	An example of a typical coverage is found in

ILO8	• Use of Transformers • Amplifiers with Multiple Tuned Circuits			☐ Projects ☐ Practices ☐ Others	"Microelectronic Circuits": chapter 16 (see references list below)
ILO1 ILO4 ILO5 ILO9	**Oscillators**: • Basic Principles of Sinusoidal Oscillators • Op Amp–RC Oscillator Circuits • Generation of Square and Triangular Waveforms	2	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Microelectronic Circuits": chapter 17 (see references list below)

6. Assessment Criteria (Related to ILOs)

ISC	Interactive Synchronized Collaboration		Ex	Exams		Rpt	Reports
PF2F	Presentations and Face-to-Face Assessments		PW	Practice Work			

ILO Code	ILO	Intended Results	Assessment Type				
			ISC	PW	Ex	PF2F	Rpt
ILO1	Identify the key concepts in electronic circuits such as signal, analogue and digital signals, analogue to digital conversion, amplifier and signal amplifications		X	X	X		
ILO2	Understanding the op-amps, inverting and noninverting configurations, weighted summer, difference		X	X	X		

	amplifier, integrators and differentiators						
ILO3	Understanding the diode operation, its characterization, and its basic circuit applications.		X	X	X		
ILO4	Understanding the MOS transistor operation, its characterization, and its basic circuit applications		X	X	X		
ILO5	Understanding the BJT transistor operation, its characterization, and its basic circuit applications		X	X	X		
ILO6	The study of general structure of the negative-feedback amplifier and the basic principle that underlies its operation. The advantages of negative feedback. The appropriate feedback topology to employ with each of the four amplifier types.		X	X	X		
ILO7	Study the filter characterization, types, specification, and implementation.		X	X	X		
ILO8	Using tuned transistor amplifiers for radio-frequency (RF) applications.		X	X	X		
ILO9	Understanding the generation of sine wave, square and triangular waveforms.		X	X	X		

7. Practice Tools:

Tool Name	Description
PSpice .(optional)	A circuit to be analyzed using PSpice is described by a circuit description file, which is processed by PSpice and executed as a simulation. PSpice creates an output file to store the simulation results, and such results are also graphically displayed within the OrCAD EE interface.(optional).

8. Main References

"Microelectronic Circuits", by Adel S. SEDRA and Kenneth C. SMITH, 6th edition 2013, Oxford University Press.

9. Additional References

"Electronic Devices and Circuit Theory", by Robert L. BOYLESTAD and Louis NASHELSKY, 11th edition 2012, Pearson-Prentice Hall.

"Microelectronic Circuit Design", by Travis N. BLALOCK and Richard C. JAEGER, 4rd edition 2011, McGraw-Hill.

"Microelectronic Circuit Analysis and Design", by Donald NEAMEN, 4rd edition 2009, McGraw-Hill.

"Introduction to Electronic Circuit Design" by Richard SPENCER and Mohammed GHAUSI, 1st edition2002, Pearson-Prentice Hall.

"Microelectronics" by Jacob MILLMAN, 1988, McGraw-Hill.6. "Microelectronics" by Jacob MILLMAN, 1988, McGraw-Hill.