الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

Electronic Circuits Course

Course description

Information

Technology

Engineering

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1. Basic Information:

Course Name	Electronic Circuits
Course Code	BEC401
Asynchronous contact hours in course	15-21
Synchronous contact hours in course	18
Quiz's time	6
Exam Time	**2**
Asynchronous WorkLoad in course	**36**
synchronous WorkLoad in course	**36**
Credit hours of course C	**4**

2. Prerequisites courses:

Course	code
Physics	BPH401

3. Course objectives:

This course aims to show basic concepts of semi-conductors and basic electronic components: The diode, the transistors, their applications, types of amplifiers, the operational amplifier, some digital gates, analog to digital convertors, and digtal to analog ones. The course enables the students to:
First: knowing the basic laws of electric circuits in general (Ohm's law, Kirchoff's laws, …).
Second: Knowing semi-conductors and how electronic components work: Diode, Bipolar Junction Transistors BJT, Metal-Oxyde-Semiconductor Field Effect Transistors MOS FET.

Third: Modeling previous components in Direct Current (DC), and small signals.

Fourth: Using the previous components to design amplifiers, digital gates, interfacing circuits between analog signals and the computers (Analog to Digital convertors ADC, and Digital to Analog Convertors DAC).

4. Intended Learning Objectives:

After successfully completing the course, students should be able to:

- Solve circuits and find the currents of all the branches.
- Model electronic components in Direct Current (DC) and for small signals and in high frequencies.
- Use transistors to design amplifiers.
- Analyze the basic configurations of the amplifiers.
- Analyze some operational amplifier circuits.
- Design pseudo NMOS and CMOS digital gates.

5. Results Assessment:

Chapter No.	Chapter Title	Intended Objectives	Assessment Type				
			Developed content/ Recorded Sessions	Practical Activities (Synchronized Sessions)	Quizzes and Exams	Presentations And Interviews	Reports
CH1	Electric Circuits revision	Comprehension –Analytical Thinking	X	X	X		X
CH2	Laplace transform	Comprehension –Analytical	X	X	X		X

	& Baud Diagrams	Thinking –Tools And Application Hands– On					
CH3	Semi–conductors and PN Diodes	Comprehension –Analytical Thinking	X	X	X		X
CH4	Bipolar Junction Transistor BJT	Comprehension –Analytical Thinking –	X	X	X		X
CH5	Metal–Oxyde–Semiconductor Field Effect Transistor MOS FET	Comprehension –Analytical Thinking –	X	X	X		X
CH6	Transistor's amplifiers	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X
CH7	Operational amplifiers	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X

6. Course content:

Chapter	Subject	Content	Number of theoretical teaching hours	Number of practical teaching hours
CH 1	Electric Circuits revision	1. Basic concepts: Current, voltage, power, impedances, Ohm's law. 2. Optimal and practical current sources and voltage sources. 3. Complex impedances and their parallel and serial connections. 4. Circuit solving: Kirchoff's laws. 5. Superposition. 6. Norton and Thevenin theorems. 7. Exercises.	3	3
CH 2	Laplace transform & Baud Diagrams	1. Basic concepts: Laplace transform and its existence conditions. 2. Laplace transform LT properties: Linearity, LT for derivative function	2	2

		and integral. Time shift and Laplace variable shift. 3. Special functions: Step and unit pulse (Dirac pulse) and their LT. 4. Complex impedances and transfer functions. 5. Baud diagrams. 6. Exercises.		
CH 3	Semi-conductors and PN Diodes	1. Semiconductors and their chemical and quantum characteristics. 2. Doping and semiconductors type P and N. 3. P-N Diode and characteristic curve (I-V). 4. Small signal diode modeling, and at high frequencies. 5. Types of diodes. 6. Diodes applications. 7. Exercises	3	3
CH 4	Bipolar Junction Transistor BJT	1. BJT structure. 2. Transistor effect. 3. Transistor's configurations. 4. BJT Characteristic	4	4

		curves. 5. BJT operating modes 6. Small signal BJT modeling (T model and π model). 7. Small signal high frequency modeling of BJT.		
CH 5	Metal-Oxyde-Semiconductor Field Effect Transistor MOS FET	1. MOS FET structure. 2. Enhanced MOS FET. 3. Depletion MOS FET. 4. Small signal FET modeling (T model and π model). 5. Small signals high frequency modeling. 6. Digital gates using MOS transistors (pseudo NMOS and CMOS). 7. BJT and MOSFET comparison. 8. Exercises.		
CH 6	Transistor's amplifiers	1. Quasient point and BJT biasing: graphical and algebraic solutions. 2. Examples of quasient (operation) point calculation.		

		3. MOSFET quasient point calculation and biasing. 4. General analysis of transistor amplifiers. 5. Single stage BJT amplifier analysis: common emitter CE, common base CB, common collector CC. 6. Single stage MOSFET amplifier analysis: common source CS, common gate CG, common drain CD. 7. Multistage amplifiers. Examples. 8. Amplifiers' frequency response and bandwidth. Effect of internal and coupling capacitors. 9. Exercises.		
CH 7	Operational amplifiers	1. Operational amplifier Op Amp: definition, optimal Op Amp. 2. Op Amp stages: differential amplifier, amplification, level tuning, power amplifier at output stage. 3. Linear Op Amp applications: inverted		

		amplification, adder and subtractor, integrator and differentiator, active filters. 4. Non-linear Op Amp applications: comparator, logarithmic amplifier. 5. Analog to Digital Convertors ADC and Digital to Analog Convertor DAC 6. Exercises.		

7. Practical Section

- **Tools and Labs:**

Tool Name	Descriptions
Words, PowerPoint, Excel, internet	Available Software

- **Repartition of Practical Work by chapters:**

Chapter	Practical Work Type	Explanations
CH1	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	Exercises and homework
CH2	☒ Exercises	Exercises and homework

	☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	
CH3	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	Homework and seminars
CH4	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	Homework and seminars
CH5	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	
CH6	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	

CH7	☒ Exercises ☐ Seminars ☐ Projects ☐ Experiments ☒ Homework ☐ Others	

8. References:

1. SHAHEEN Khaled “Electric Circuits” Damascus university, IT faculty 2000.
2. MASRI Khaled “Semiconductor physics” Damascus university, IT faculty 2000.
3. AL DAKKAK Oumayma “Electronic Circuits” Damascus university, IT faculty 2000.
4. -"Microelectronic Circuits" by SEDRA & SMITH, 5th edition, 2004, Oxford University Press.
5. -"Microelectronic Circuits" by SEDRA & SMITH, 7th edition, 2014, THE OXFORD SERIES IN ELECTRICAL AND COMPUTER ENGINEERING.
6. -"Linear Circuit Analysis" by DeCarlo, LIN, 2nd edition, 2001, Oxford University Press.