



## Course Specifications

<b>Course Title:</b>	Electronic Circuits 2
<b>Course Code:</b>	214 CNET - 3
<b>Program:</b>	Bachelor in Computer and Network Engineering
<b>Department:</b>	Computer and Network Engineering
<b>College:</b>	College of Computer Science and Information Technology
<b>Institution:</b>	Jazan University

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## A. Course Identification

<b>1. Credit hours:</b> 3
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> Level – 6 / Year – 2
<b>4. Pre-requisites for this course (if any):</b> ELECTRONIC CIRCUITS 1 (112 CNET - 3)
<b>5. Co-requisites for this course (if any):</b> None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	52	100
2	Blended	--	--
3	E-learning	--	--
4	Distance learning	--	--
5	Other	--	--

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	22
3	Tutorial	--
4	Others (specify)	8
	<b>Total</b>	<b>52</b>

## B. Course Objectives and Learning Outcomes

<p><b>1. Course Description</b></p> <p>This course introduces knowledge of how to design and build simple and smart electronic circuits by proper selection of its external components and ICs. It establishes the definition and the need for Amplification. The main contents are: Introduction to Amplifier, OP-AMP Input Modes and Parameters, Feed Back, basic OP-AMP circuits, Active Filters and Oscillators.</p>
<p><b>2. Course Main Objective</b></p> <p>Upon completion of the course the students will be able to,</p> <ol style="list-style-type: none"> <li>1. Explain the basic concepts of OP-AMP and its input modes &amp; parameters.</li> <li>2. Describe the external characteristics of OP-AMPs and analyze the operation of linear analog circuits using ideal op-amps</li> <li>3. Design analog active filters given type and customer specifications</li> <li>4. Analyze the use of OP-AMP in different Oscillator applications.</li> <li>5. Apply the input and output wave forms of different OP-AMP circuits.</li> <li>6. Execute experiments to measure and verify Amplifier Circuits.</li> <li>7. An ability to design and conduct experiments, as well as to analyze and interpret data.</li> </ol>

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	<b>Explain</b> the basic concepts of OP-AMP and its input modes & parameters.	K1
1.2	<b>Describe</b> the external characteristics of OP-AMPs and analyze the operation of linear analog circuits using ideal op-amps.	K2
2	<b>Skills :</b>	
2.1	<b>Design</b> analog active filters with the required specifications.	S1
2.2	<b>Analyze</b> the use of OP-AMP in different Oscillator applications.	S5
2.3	<b>Apply</b> the input and output wave forms of different OP-AMP circuits.	S2
3	<b>Values:</b>	
3.1	<b>Perform</b> the experiments in team to execute the behavior of OP-AMP.	V1

### C. Course Content

No	List of Topics	Contact Hours
1	<b>Chapter – 1: Introduction to Amplifier</b> <ul style="list-style-type: none"> <li>➤ Definition</li> <li>➤ Gain Analysis <ul style="list-style-type: none"> <li>➤ Voltage Gain</li> <li>➤ Current Gain</li> <li>➤ Power Gain</li> </ul> </li> <li>➤ Numerical Examples</li> </ul> <b>Operational Amplifier:</b> <ul style="list-style-type: none"> <li>➤ Introduction</li> <li>➤ Basic OP-AMP representations</li> <li>➤ OP-AMP terminals</li> <li>➤ Internal Circuit of OP-AMP</li> <li>➤ The Ideal OP-AMP</li> <li>➤ The practical OP-AMP</li> <li>➤ Internal Block diagram</li> <li>➤ Basic OP-AMP representations</li> <li>➤ Differential Amplifier input stage</li> </ul>	4T+4P
2	<b>Chapter – 2: OP-AMP Input Modes and Parameters</b> <ul style="list-style-type: none"> <li>➤ Differential Mode <ul style="list-style-type: none"> <li>➤ Single ended Mode <ul style="list-style-type: none"> <li>➤ Inverting Mode</li> <li>➤ Non-Inverting Mode</li> </ul> </li> <li>➤ Double Ended Mode <ul style="list-style-type: none"> <li>➤ Differential Mode</li> <li>➤ Common Mode</li> </ul> </li> </ul> </li> <li>➤ Parameters of OPAMP <ul style="list-style-type: none"> <li>➤ Common-Mode Rejection Ratio (CMRR)</li> <li>➤ Input offset voltage</li> <li>➤ Input bias current</li> <li>➤ Input impedance</li> <li>➤ Output impedance</li> <li>➤ Slew Rate</li> </ul> </li> </ul>	4T+4P

3	<b>Chapter – 3: Feed Back of OPAMP</b> <ul style="list-style-type: none"> <li>➤ Importance of feedback</li> <li>➤ Why negative feedback</li> <li>➤ Comparison of OP-AMP with &amp; without feedback</li> <li>➤ Inverting feedback &amp; Numerical Examples</li> <li>➤ Non inverting feedback &amp; Numerical Examples</li> <li>➤ Control gain with feedback.</li> <li>➤ Voltage Follower</li> <li>➤ Effect of feedback on OPAMP impedances</li> <li>➤ Effect of Negative Feedback on Bandwidth</li> <li>➤ Closed-Loop Frequency Response</li> <li>➤ Gain-Bandwidth Product</li> </ul>	4T+4P
4	<b>Chapter – 4: Basic OPAMP Circuits</b> <ul style="list-style-type: none"> <li>➤ Summing Amplifiers</li> <li>➤ Averaging Amplifiers</li> <li>➤ Integrators</li> <li>➤ Differentiators</li> <li>➤ Comparators</li> </ul>	4T+4P
5	<b>Chapter – 5: Active Filters</b> <ul style="list-style-type: none"> <li>➤ Definition: <ul style="list-style-type: none"> <li>➤ Filter</li> <li>➤ Active Filter</li> </ul> </li> <li>➤ Basic Filter Responses</li> <li>➤ Filter response characteristics</li> <li>➤ Filter types <ul style="list-style-type: none"> <li>➤ Active Low Pass Filters <ul style="list-style-type: none"> <li>➤ The Sallen Key Low pass filter</li> </ul> </li> <li>➤ Active High pass Filters <ul style="list-style-type: none"> <li>➤ The Sallen Key Low pass filter</li> </ul> </li> <li>➤ Active Band pass filters <ul style="list-style-type: none"> <li>➤ Two pole band pass filter</li> </ul> </li> <li>➤ Active Band Stop Filter <ul style="list-style-type: none"> <li>➤ State Variable Band Stop Filter</li> </ul> </li> </ul> </li> <li>➤ Critical Frequency and Roll-Off Rate <ul style="list-style-type: none"> <li>➤ Butterworth response</li> </ul> </li> </ul> <b>Oscillators</b> <ul style="list-style-type: none"> <li>➤ Definition</li> <li>➤ Feedback Oscillators <ul style="list-style-type: none"> <li>➤ Positive feedback</li> <li>➤ Conditions of Oscillations</li> <li>➤ Resonant Circuit</li> <li>➤ Start-Up Conditions</li> </ul> </li> </ul>	6T+6P
	Final Exam	4T+4P
<b>Total</b>		52

Online Study Topics
<ul style="list-style-type: none"> <li>➤ Comparators               <ul style="list-style-type: none"> <li>➤ Zero-Level Detection</li> <li>➤ Nonzero-Level Detection</li> <li>➤ Effects of Input Noise on Comparator Operation</li> <li>➤ Reducing Noise Effects with Hysteresis</li> <li>➤ Output Bounding</li> <li>➤ Oscillator Types                   <ul style="list-style-type: none"> <li>➤ Oscillators with RC Feedback Circuits</li> <li>➤ Oscillators with LC Feedback Circuits</li> <li>➤ Crystal-Controlled Oscillators</li> <li>➤ Relaxation Oscillators</li> <li>➤ The 555 Timer</li> </ul> </li> </ul> </li> </ul>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	<b>Explain</b> the basic concepts of OP-AMP and its input modes & parameters.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom discussions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment 1</li> <li>➤ Mid-Term Exam</li> <li>➤ Final Exam</li> </ul>
1.2	<b>Describe</b> the external characteristics of OP-AMPs and analyze the operation of linear analog circuits using ideal op-amps.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom discussions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment 1</li> <li>➤ Mid-Term Exam</li> <li>➤ Final Exam</li> </ul>
<b>2.0</b>	<b>Skills</b>		
2.1	<b>Design</b> analog active filters with the required specifications.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom discussions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment 2</li> <li>➤ Final Exam</li> </ul>
2.2	<b>Analyze</b> the use of OP-AMP in different Oscillator applications.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom discussions</li> <li>➤ Lab</li> </ul>	<ul style="list-style-type: none"> <li>➤ Final Exam</li> <li>➤ Assignment 2</li> <li>➤ Lab Exam</li> </ul>
2.3	<b>Apply</b> the input and output wave forms of different OP-AMP circuits.	<ul style="list-style-type: none"> <li>➤ Lectures/Workshops</li> <li>➤ Classroom discussions</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Final Exam</li> <li>➤ Mini Project</li> <li>➤ Mid-Term Exam</li> <li>➤ Assignment 2</li> <li>➤ Lab Exam</li> </ul>
<b>3.0</b>	<b>Values</b>		
3.1	<b>Perform</b> the experiments in team to execute the behavior of OP-AMP.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom discussions</li> </ul>	<ul style="list-style-type: none"> <li>➤ Mini Project</li> <li>➤ Lab Exam.</li> </ul>

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments / Mini Project	4 <sup>th</sup> Week	20%
2	Midterm Exam	6 <sup>th</sup> Week	20%
3	Lab Exam	11 <sup>th</sup> Week	20%
4	Final Theory Exam	12 <sup>th</sup> Week	40%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

### Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Department have an arrangement for “Academic Counseling and Support” for each student. The academic advising committee nominates faculty members as “Student Academic Advisor” every semester. These “Academic Advisors” are responsible for student counseling and advising to a group of fix number of students (around 15 students) and maintaining students’ files. At the beginning of semester and at time of course registration all students take counseling from Academic Advisor according to his previous grades and coverage of pre-requisite course and follow-up.

Also students with GPA below 2.00 are remained under deep observation and continuous meetings with respective course teachers about their performance are arranged to help and support the students. The course teacher is to be associated with this course provide a proper guidance for students who are looking to focus on their future career based on their intellectual interests, identify better opportunities related to this course and connections in their academic fields.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>Electronic Devices (Electron Flow Version), Thomas L Floyd, 10th edition, Pearson, 2018, ISBN-13: 9780137556755</li> </ul>
<b>Essential References Materials</b>	<ul style="list-style-type: none"> <li>Electronic Principles, Albert Malvino and David Bates and Patrick Hoppe, 9th Edition, McGraw Hill, 2021, ISBN10: 1259852695, ISBN10: 1259852695</li> </ul>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li><a href="https://sdl.edu.sa/SDLPortal/en/Publishers.aspx">https://sdl.edu.sa/SDLPortal/en/Publishers.aspx</a>.</li> <li><a href="https://circuitdigest.com/electronic-circuits">https://circuitdigest.com/electronic-circuits</a></li> <li><a href="https://www.engineersgarage.com/electronic-circuits">https://www.engineersgarage.com/electronic-circuits</a></li> <li><a href="http://www.discovercircuits.com/list.htm">www.discovercircuits.com/list.htm</a></li> </ul>
<b>Other Learning Materials</b>	---

## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom equipped with projector and whiteboard and sufficient seating arrangements. Lab with required devices and Kits for each student.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Circuit Maker 2.0
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	---

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Sufficiency of resources and facilities for students	Students	Course evaluation survey form
Effectiveness of teaching / learning process	Students	Course evaluation survey form
Effectiveness of teaching / learning process	CRC / QAU / HOD	Course reports / result analysis
Quality of learning Resources	Track leaders / CRC	Review meetings and star rating with suggestions for further modification and improvements
Verifying standards of student achievement / evaluation	HOD / committee nominated by HOD	Random re-checking of evaluated answer sheets
Achievement of course learning outcomes	Course Teachers / QAU	CLO assessment template that is further verified at course coordinator, Track leader and QAU level.

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	
<b>Reference No.</b>	
<b>Date</b>	