Course Specification
(Bachelor)

Course Title:	2-Electronic Circuits
Course Code:	335 CNET - 3
Program:	Bachelor in Computer and Network Engineering
Department:	Department of Electrical & Electronics Engineering
College:	College of Engineering & Computer Science
Institution:	Jazan University
Version:	1.0
Last Revision Date:	23 September 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (Level 6 / Year 3)					
4. Course General Description:					
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.					
5. Pre-requirements for this course (if any)**:**					
ELECTRONIC CIRCUITS 1 (334 CNET - 3)					
6. Co-requisites for this course (if any)**:**					
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7. Course Main Objective(s):					
Upon completion of the course the students will be able to, 1. Explain the basic concepts of OP-AMP and its input modes & parameters. 2. Describe the external characteristics of OP-AMPs and analyze the operation of linear analog circuits using ideal op-amps 3. Design analog active filters given type and customer specifications 4. Analyze the use of OP-AMP in different Oscillator applications. 5. Apply the input and output wave forms of different OP-AMP circuits. 6. Execute experiments to measure and verify Amplifier Circuits. 7. An ability to design and conduct experiments, as well as to analyze and Interpret data.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	---	---
3	Hybrid ● Traditional classroom ● E-learning	---	---
4	Distance learning	---	---

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	26
2.	**Laboratory/Studio**	26
3.	**Field**	---
4.	**Tutorial**	---
5.	**Others (specify)**	8
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Explain** the basic concepts of OP-AMP and its input modes & parameters.	K1	➢ Lectures Classroom discussions	➢ Assignment 1 ➢ Mid-Term Exam Final Exam
1.2	**Describe** the external characteristics of OP-		➢ Lectures Classroom discussions	➢ Assignment 1

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	AMPs and analyze the operation of linear analog circuits using ideal op-amps.	K2		➢ Mid-Term Exam Final Exam
2.0	**Skills**			
2.1	**Design** analog active filters with the required specifications.	S1	➢ Lectures Classroom discussions	➢ Assignment 2 ➢ Final Exam
2.2	**Analyze** the use of OP-AMP in different Oscillator applications.	S5	➢ Lectures ➢ Classroom discussions Labs	➢ Final Exam ➢ Assignment 2 Lab Exam
2.3	**Apply** the input and output wave forms of different OP-AMP circuits.	S2	➢ Lectures/Workshops ➢ Classroom discussions Lab Exercises	➢ Final Exam ➢ Mini Project ➢ Mid-Term Exam ➢ Assignment 2 Lab Exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform** the experiments in team to execute the behavior of OP-AMP.	V1	➢ Lectures ➢ Classroom discussions	➢ Mini Project Lab Exam

C. Course Content

No	List of Topics	Contact Hours
1.	**History of Circuits and Electronics** **Chapter – 1: Introduction to Amplifier** ➢ Definition ➢ Gain Analysis ➢ Voltage Gain ➢ Current Gain ➢ Power Gain ➢ Numerical Examples **Operational Amplifier:** ➢ Introduction ➢ Basic OP-AMP representations ➢ OP-AMP terminals ➢ Internal Circuit of OP-AMP	4T + 4P

	➢ The Ideal OP-AMP ➢ The practical OP-AMP ➢ Internal Block diagram ➢ Basic OP-AMP representations Differential Amplifier input stage	
2.	**Chapter – 2: OP-AMP Input Modes and Parameters** ➢ Differential Mode ➢ Single ended Mode ➢ Inverting Mode ➢ Non-Inverting Mode ➢ Double Ended Mode ➢ Differential Mode ➢ Common Mode ➢ Parameters of OPAMP ➢ Common-Mode Rejection Ratio (CMRR) ➢ Input offset voltage ➢ Input bias current ➢ Input impedance ➢ Output impedance Slew Rate	4T + 4P
3.	**Chapter – 3: Feed Back of OPAMP** ➢ Importance of feedback ➢ Why negative feedback ➢ Comparison of OP-AMP with & without feedback ➢ Inverting feedback & Numerical Examples ➢ Non inverting feedback & Numerical Examples ➢ How to control gain with feedback. ➢ Voltage Follower ➢ Effect of feedback on OPAMP impedances ➢ Effect of Negative Feedback on Bandwidth ➢ Closed-Loop Frequency Response Gain-Bandwidth Product	4T + 4P
4.	**Chapter – 4: Basic OPAMP Circuits** ➢ Summing Amplifiers ➢ Averaging Amplifiers ➢ Integrators ➢ Differentiators ➢ Comparators ➢ Zero-Level Detection ➢ Nonzero-Level Detection ➢ Effects of Input Noise on Comparator Operation	4T + 4P

	➢ Reducing Noise Effects with Hysteresis Output Bounding	
5.	**Chapter – 5: Active Filters** ➢ Definition: ➢ Filter ➢ Active Filter ➢ Basic Filter Responses ➢ Filter response characteristics ➢ Filter types ➢ Active Low Pass Filters ➢ The Sallen Key Low pass filter ➢ Active High pass Filters ➢ The Sallen Key Low pass filter ➢ Active Band pass filters ➢ Two pole band pass filter ➢ Active Band Stop Filter ➢ State Variable Band Stop Filter ➢ Critical Frequency and Roll-Off Rate Butterworth response	4T + 4P
6.	**Chapter – 6: Oscillators** ➢ Definition ➢ Feedback Oscillators ➢ Positive feedback ➢ Conditions of Oscillations ➢ Resonant Circuit ➢ Start-Up Conditions ➢ Oscillator Types ➢ Oscillators with RC Feedback Circuits ➢ A lead-lag circuit and its response curve. ➢ The Wien-Bridge Oscillator ➢ The Phase-Shift Oscillator ➢ Oscillators with LC Feedback Circuits ➢ Colpitt's oscillator ➢ Clapp oscillator ➢ Crystal-Controlled Oscillators ➢ The Piezoelectric Effect ➢ Relaxation Oscillators ➢ A Practical Triangular-Wave Oscillator ➢ The 555 Timer ➢ Internal Diagram ➢ The 555 Timer As An Oscillator	6T + 6P

	➢ Relevant tools, standards, and/or engineering constraints ➢ Mixed-signal circuit design ➢ Design parameters and issues ➢ Circuit modeling and simulation method	
7.	Revision and exam Discussion	2T + 2P
8.	Lab Exam + Final Exam	2T + 2P
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-Term Exam	7th - 8th week	20%
2	Assignment	5th week	10%
3.	Mini-Project	11th week	10%
.4	Lab Exam	13th week	20%
5.	Final Exam	14th week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Electronic Devices (Electron Flow Version), Thomas L Floyd, 10th edition, Pearson, 2018, ISBN-13: 9780137556755
Supportive References	Electronic Principles, Albert Malvino and David Bates and Patrick Hoppe,9th Edition, McGraw Hill, 2021, ISBN10: 1259852695, ISBN10: 1259852695
Electronic Materials	https://sdl.edu.sa/SDLPortal/en/Publishers.aspx. https://circuitdigest.com/electronic-circuits https://www.engineersgarage.com/electronic-circuits www.discovercircuits.com/list.htm
Other Learning Materials	---

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom equipped with projector, whiteboard, and sufficient seating arrangements. Lab with required devices and Kits for each student.

Items	Resources
Technology equipment (projector, smart board, software)	Circuit Maker 2.0
Other equipment (depending on the nature of the specialty)	---

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct : Course evaluation survey form
Effectiveness of Students assessment	HOD / committee nominated by HOD	Direct : Random re-checking of evaluated answer sheets
Quality of learning resources	Track leaders / CRC	Direct: Review meetings and star rating with suggestions for further modification and improvements.
The extent to which CLOs have been achieved	Course Teachers / QAU	Direct: CLO assessment template that is further verified at course coordinator, Track leader and QAU level.
Other	---	---

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**ENGCSEEE2411**
DATE	**10/10/24**