



Rowan College
at
BURLINGTON COUNTY

ELECTRICAL ENGINEERING TECHNOLOGY

CODE: EET 232

TITLE: Analog Integrated Circuits

DIVISION: STEM

COURSE DESCRIPTION: This course focuses on the characteristics and applications of analog integrated circuits including operational amplifiers and specialized linear integrated circuits. It investigates circuits including inverting, non-inverting and differential amplifiers, non-linear circuits, active filters, equalizers, oscillators, timers, and power supply regulator IC's. Laboratory experiments cover the course topics and verify lecture theory. Circuit analysis software is used to simulate and verify the laboratory analysis where appropriate.

PREREQUISITE: EET 121

CREDITS: 4 cr.

REQUIRED MATERIALS (CHECK BOOKSTORE FOR LATEST EDITION):

Click on the bookstore for the supplies which you are attending each class.

Rcbc.edu/bookstore

COURSE LEARNING OUTCOMES:

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

1. Identify the characteristics of, analyze and solve problems for analog integrated circuits.
2. Use laboratory equipment to perform measurements and analyze results.
3. Build analog integrated circuits on a protoboard from a schematic
4. Proficiently solder printed circuit boards
5. Use electronic circuit analysis software to draw schematics and/or analyze analog integrated circuits
6. Design and build an analog integrated circuit given specific specifications.
7. Communicate effectively through written reports

GENERAL EDUCATION OUTCOMES IN THIS COURSE:

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| Written and Oral Communication: Communication | * Students will communicate meaningfully with a chosen audience while demonstrating critical thought. |
| Quantitative Knowledge and Skills: Mathematics | * Students will analyze data to solve problems utilizing appropriate mathematical concepts. * Students will translate quantifiable problems into mathematical terms and solve these problems using mathematical or statistical operations. |
| Scientific Knowledge and Reasoning: Science | * Students will understand and employ the scientific method of inquiry to draw conclusions based on verifiable evidence. * Students will demonstrate critical thinking skills in the analysis of scientific data. |
| Technological Competency or Information Literacy: Technology | * Students will demonstrate the skills required to find, evaluate, and apply information to solve a problem. |

CORE COURSE CONTENT:

Lectures

- IC Construction, Operational Amplifier Characteristics, and the Inverting Amp
- The Non Inverting Amp, Negative Feedback, the Voltage Follower, the Summing Amp, the D to A Converter and the Subtracting Amp
- The Differential Amplifier and Common Mode Rejection; DC Bias Current & Voltage Offsets and DC Differential Instrumentation Amplifiers.
- Comparators, Peak Detectors Voice Operated SW (VOX), Photo Transistors & Diodes, Light Activated SW, Relays, Transistor Switches & the Schmitt trigger
- The Integrator, Square & Triangle Wave Generators, & the Differentiator
- The 555 Timer Pulse generation, Rectangular wave oscillators, Voltage Controlled Oscillators, Pulse Width Modulation & Class D Power Amps
- Power Supply Integrated Circuit DC Voltage Regulators, Linear & Switching (PWM)
- Logs & dB, Av in dB, Common Mode Rejection Ratio in dB, and Bode Plots, Frequency Response Calc., & Gain BW Product of Amps, and LPF, HPF, & BPF Using 1 or 2 Stage 1st Order, 6 dB / Octave, Active Filters
- Advanced Active Filters, 2nd Order - 12 dB / Octave – 2 Pole and Higher

Labs

- Look at IC's under a microscope and An Inverting Walkman LM386 IC Power Amp
- A Summing & Non Inverting Microphone LM386 IC Power Amp and Using EWB to analyze a Summing Amp.
- The Glass Diode Digital Thermometer using a DC Differential Instrumentation Amp
- The Voice Activated Switch Kit Soldering Skills Assessment
- Alternate Voice Activated Switch Lab built on a Protoboard
- The Exar 2206 1 Chip Function Generator.
- Use the 555 Timer to build an Analog Frequency to Vout (F to V) Converter to build a Digital Readout Motor RPM, or Auto Tachometer, or Frequency Meter.
- Linear and Switching Regulated DC Supply For Auto Accessories or (Optional) A Switching Step-Up DC Voltage Regulator (3VDC to 18VDC @ 30mA)
- Basic Active Filter Lab
- Advanced Active Filter Lab
- Alarm System Team Capstone System Design project

COURSE ACTIVITIES:

Course activities vary from course to course and instructor to instructor. Below is a listing of some of the activities students can anticipate in this course:

- ▶ Writing assignments: students will analyze current issues in the field using current articles from the popular press as well as library research including electronic resources databases.
- ▶ Speaking assignments: students will present research individually or in groups using current technology to support the presentation (e.g., PowerPoint presentation); students will participate in discussions and debates related to the topics in the lessons. Discussions may also focus on cross-cultural and legal-ethical dilemmas as they relate to the course content.
- ▶ Simulation activities: Trends and issues will analyzed for their ethical as well as social or legal significance. Students might role-play common situations for classmates to analyze. Current news articles may be used to generate discussion.
- ▶ Case Studies: Complex situations and scenarios will be analyzed in cooperative group settings or as homework assignments.
- ▶ Lectures: This format will include question and answer sessions to provide interactivity between students and instructor.

▶ Speakers: Representatives from various related fields may be invited to speak.

▶ Videos: Related topics will provide impetus for discussion.

EDUCATIONAL TECHNOLOGY:

Rowan College at Burlington County advocates a technology enhanced teaching and learning environment. Advanced technological tools may be used in any course section to facilitate instruction. Many of our sections are web-enhanced, which means that some of your work will be submitted or completed online. Web enhancements may include on-line materials, grade books, testing and quizzes and assignment submission. Many students enjoy the flexibility and convenience that these online enhancements have provided, however if you have concerns about the technology involved, please speak to your instructor immediately.

STUDENT EVALUATIONS:

The student will be evaluated on the degree to which student learning outcomes are achieved. A variety of methods may be used such as tests, quizzes, class participation, projects, homework assignments, presentations, etc.

See individual instructor's course handouts for grading system and criteria (point value for each assessment component in course, e.g. tests, papers, presentations, attendance etc.), number of papers and examinations required in the course, and testing policy including make ups and/or retests.

GRADING STANDARD:

- A Mastery of essential elements and related concepts, plus demonstrated excellence or originality.
- B+ Mastery of essential elements and related concepts, showing higher level understanding.
- B Mastery of essential elements and related concepts.
- C+ Above average knowledge of essential elements and related concepts.
- C Acceptable knowledge of essential elements and related concepts.
- D Minimal knowledge of related concepts.
- F Unsatisfactory progress. This grade may also be assigned in cases of academic misconduct, such as cheating or plagiarism, and/or excessive absences.

For other grades, see the current ROWAN COLLEGE AT BURLINGTON COUNTY catalog.

COLLEGE POLICIES:

The current college catalog and student handbook are important documents for understanding your rights and responsibilities as a student in the RCBC classroom. Please read your catalog and handbook as they supplement this syllabus, particularly for information regarding:

- ▶ Academic Integrity Code
- ▶ Student Conduct Code
- ▶ Student Grade Appeal Process

OFFICE OF STUDENT SUPPORT AND DISABILITIES SERVICES:

RCBC welcomes students with disabilities into the college's educational programs. Access to accommodations and support services for students with learning and other disabilities is facilitated by staff in the Office of Student Support (OSS). In order to receive accommodations, a student must contact the OSS, self-identify as having a disability, provide appropriate documentation, and participate in an intake appointment. If the documentation supports the request for reasonable accommodations, the OSS will provide the student with an Accommodation Plan to give to instructors. Contact the Office of Student Support at 609-894-9311, ext. 1208 or visit the website at: www.rcbc.edu/studentsupport

ADDITIONAL SUPPORT/LABS:

RCBC provides academic advising, student support personal counseling, transfer advising, and special accommodations for individuals with disabilities free to all students through the Division of Student Services. For more information about any of these services, visit the Laurel Hall on the Mt. Laurel Campus, or call (609) 894-9311 or (856) 222-9311, then dial the desired extension:

- Ext. 1557 Academic Advisement and Counseling
- Ext. 1803 Special Populations
- Ext. 2737 Transfer Center

Or visit the following websites:

Academic Advising www.rcbc.edu/advising
Student Support Counseling www.rcbc.edu/counseling
Transfer Center www.rcbc.edu/transfer

RCBC offers a free tutoring for all currently enrolled students. For more information regarding The Tutoring Center call Extension 1495 at (609) 894-9311 or (856) 222-9311 or visit the Tutoring Center Website at www.rcbc.edu/tutoring

Reviewed: 05/2020, CAR