Course Syllabus
Linear Integrated Circuits
CETT 1457

Semester with Course Reference Number (CRN)
Fall 2013 61435

Instructor contact information (phone number and email address)
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HCC Catalog 2011-2013 page 244 link: http://digital.turn-page.com/title/6160

Office Location and Hours
Houston Community College Northeast
555 Community College Drive, Suite 100 STECH, Houston, Texas 77013
Telephone: (713)718-5251 (HCC Mail Code: 1449-337) M-F 12:00PM-5:00 PM

Course Location/Times
Codwell #212 W 5:00PM-10:00PM

Course Semester Credit Hours (SCH) (lecture, lab) If applicable
Credit Hours: 4
Lecture Hours: 3
Laboratory Hours: 3
External Hours:

Total Course Contact Hours
96.00

Course Length (number of weeks)

Type of Instruction
Lecture/Lab
WEB Enhanced

Course Description:
Characteristics, operations, stabilization, testing, and feedback techniques of linear integrated circuits. Applications of computation, measurements, instrumentation, and
active filtering.

**Course Prerequisite(s)**

**PREREQUISITE(S):**

- CETT 1429 or Departmental Approval

**FREQUENT REQUISITES**

- Departmental approval
- College Level Mathematics

**Academic Discipline/CTE Program Learning Outcomes**

1. Students will be able to identify, analyze and solve basic electric/electronics problems by applying knowledge of mathematics, science with modern engineering tools
2. Students will be able to design a system, component or process to meet desired needs within realistic constraints.
3. Students will be able to conduct experiments and analyze and interpret the resulting data
4. Students will demonstrate strong fundamental capability in oral and written communication
5. Students will be able to function effectively both individually and in a multidisciplinary team
6. Students will be able to explain ethical and professional engineering practice in the context of global, economic, environmental and societal realities as well as other contemporary issues

**Course Student Learning Outcomes (SLO): 4 to 7**

1. Analyze circuits (i.e. calculate performance values for different types of circuits)
2. Design inverting and/or non-inverting amplifier with a specific gain using op-amp 741
3. Conduct lab experiments and interpret results
4. Conduct lab experiment as a team and Interpret results
5. Discuss ethics in engineering, latest issues or design on electric/electronics equipment that has strong effect on society global/local, and the need for life-long learning in engineering technology
6. Discuss why respect for diversity is important in a technical field and provide an example of successful design or product that resulted from collaboration of diverse group of professionals at the global level.

**Learning Objectives (Numbering system should be linked to SLO - e.g., 1.1, 1.2, 1.3, etc.)**

**Analyze circuits (i.e. calculate performance values for different types of circuits)**

1. Criteria 1: Analyze comparator. Calculate V\text{utp}, V\text{ltp}, hysteresis, V\text{out}

2. Criteria 2: Analyze amplifier. Determine inverting or non-inverting, calculate inverting Av, non-inverting Av, R\text{in}, R\text{out}, BW, V\text{offset}, power consumption.

3. Criteria 3: Analyze active filter. Determine type of filter, calculate f\text{cu}, f\text{cl}, BW, Av, plot frequency response graph

**Design inverting and/or non-inverting amplifier with a specific gain using op-amp 741 Teamwork Activity**

1. Criteria 1 Draw schematic diagrams correctly and clearly illustrating the circuit design
Criteria 2: Show calculation for Z in, Z out, and closed-loop gain.

Criteria 3: Verify operation of circuit using Multisim Circuit Simulation

Criteria 4: Build the circuit in lab, measure input and output signals of the circuit, and verify achievement of correct gain.

Criteria 5: Produce a lab report for design of op-amp and compare calculated, simulated, and measured values. Show Team member activities including elected team leader and other team member’s responsibilities to complete the project.

Criteria 6: Each team member demonstrates circuit operation to the class.

Conduct lab experiments and interpret results
1. Criteria 1 Using a schematic diagram and directions provided by the instructor, construct a circuit to be studied in the lab exercise.

Criteria 2 Make measurements with lab instruments, and record data so as to evaluate the performance of the circuit being studied.

Criteria 4 Draw schematic diagrams correctly and clearly illustrating the circuit studied and the measurements made.

Criteria 5 Produce a clear and comprehensive written report of activity and findings of the lab exercise, the form and content of which complies with professional standards and practices.

Conduct lab experiments as a team and Interpret results
1. Criteria 1 Using a schematic diagram and directions provided by the instructor, team members construct a circuit to be studied in the lab exercise.

Criteria 2 Make measurements with lab instruments, and record data so as to evaluate the performance of the circuit being studied.

Criteria 3 Draw schematic diagrams correctly and clearly illustrating the circuit studied and the measurements made.

Criteria 4 Produce a clear and comprehensive written report of activity and findings of the lab exercise, the form and content of which complies with professional standards and practices. Show Team member activities including elected team leader and other team member’s responsibilities to complete the project.

Discuss ethics in engineering, latest issues or design on electric/electronics equipment that has strong effect on society global/local, and the need for life-long learning in engineering technology
1. Criteria 1 Produce a clear and comprehensive written report of findings on:
   A-Ethics in engineering
   B-An application of ethics in engineering issue or design on electric/electronics equipment that has strong effect on society global/local (compare good application of ethics to bad ones)
   C-The need for life-long learning in engineering technology

Criteria 2 The report is in a the form and content of which complies with professional standards and practices.

Discuss why respect for diversity is important in a technical field and provide an example of successful design or product that resulted from collaboration of
diverse group of professionals at the global level.
1. Criteria 1: Produce a clear comprehensive written report of findings on why respect for diversity is important in a technical field

Criteria 2: Provide an example of successful design or product that resulted from collaboration of diverse group of professionals at the global level

SCANS

Analyze circuits (i.e. calculate performance values for different types of circuits)
Design inverting and/or non-inverting amplifier with a specific gain using op-amp 741

SCANS and/or Core Curriculum Competencies: If applicable

SCANS
Foundation Skills - Thinking -Problem Solving
Workplace Competencies - Systems -Improves & Designs Systems

Foundation Skills - Thinking -Reasoning
Workplace Competencies - Systems -Monitors & Corrects Performance

Conduct lab experiments and interpret results

Instructional Methods

Web-enhanced (49% or less)

Face to Face

Student Assignments

Analyze circuits (i.e. calculate performance values for different types of circuits)
Tests, and/or quizzes, and/or homework assignments, and/or lab reports

Design inverting and/or non-inverting amplifier with a specific gain using op-amp 741
Projects

Lab Exercises
Homework Exercises
Tests, and/or quizzes, and/or homework assignments, and/or lab reports

Conduct lab experiments and interpret results
Lab Exercises
Building circuits, measuring operating circuit values, and writing lab reports

Conduct lab experiment as a team and Interpret results
Lab Exercises
Demonstrate circuit operation to class as a team or individual student
Discussions
Papers

Write a 3 page report on the topic and discuss results of your findings

Discuss why respect for diversity is important in a technical field and provide an example of successful design or product that resulted from collaboration of diverse group of professionals at the global level.

No assignments selected for this outcome
Student Assessment(s)

Analyze circuits (i.e. calculate performance values for different types of circuits)
Discipline Required SLO-Specific Standard Form Rubrics
Tests, and/or quizzes, and/or homework assignments, and/or lab reports

Design inverting and/or non-inverting amplifier with a specific gain using op-amp 741
Discipline Required SLO-Specific Standard Form Rubrics
Tests, and/or quizzes, and/or homework assignments, and/or lab reports that may include drawing schematic diagrams, building circuits, and measuring operating circuit values

Conduct lab experiments and interpret results
Discipline Required SLO-Specific Standard Form Rubrics
Lab experiment that include building circuits, measuring operating circuit values, and writing lab reports

Conduct lab experiment as a team and Interpret results
Discipline Required SLO-Specific Standard Form Rubrics
Lab experiments that include building circuits, measuring operating circuit values, and writing lab reports

Discuss ethics in engineering, latest issues or design on electric/electronics equipment that has strong effect on society global/local, and the need for lifelong learning in engineering technology
Discipline Required SLO-Specific Standard Form Rubrics
Reports that require internet/library research related to discipline

Instructor's Requirements

Instructor Grading Criteria
Midterm test 30%, Final Test 30%, Lab Experiments/Projects 30%, and Homework Assignments 10% are used to calculate final grade.

Program/Discipline Requirements: If applicable

TAC of ABET - Program Outcomes

- **Outcome a** - an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,
- **Outcome b** - an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,
- **Outcome c** - an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,
- **Outcome d** - an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,
- **Outcome e** - an ability to function effectively on teams,
- **Outcome f** - an ability to identify, analyze and solve technical problems,
- **Outcome g** - an ability to communicate effectively,
- **Outcome h** - a recognition of the need for, and an ability to engage in lifelong learning,
- **Outcome i** - an ability to understand professional, ethical and social responsibilities,
- **Outcome j** - a respect for diversity and a knowledge of contemporary professional, societal and global issues, and
- **Outcome k** - a commitment to quality, timeliness, and continuous improvement.

Course Outcomes: This course addresses the TAC/ABET Criteria 2 outcomes a-c, e-
g, i, k.

a. Exams, quizzes, and lab reports

b. Apply Math to solve problems and use of software

c. Lab exercises and written reports

e. Lab exercises conducted in teams

f. Problem solving on exams and quizzes

g. Written lab reports – schematics, graphs, tabular data

i. Attending class on time and prepared. Completing assignments on time.

k. Attending class on time and prepared. Completing assignments on time.

**STATEMENT ON OUTCOMES h, i, j, and k:**

You are encouraged to become an active member of professional societies (national, regional, and local chapters) related to your chosen profession. As a member, you will normally receive trade, magazine, journal, and newsletter subscriptions thereby allowing you to maintain, in general, a connection with your profession.

Whenever applicable, outside speakers will be invited to discuss relevant developments and events that relate to lifelong learning, quality, timeliness, continuous improvement, global issues, and societal and environmental concerns. This practice represents a means for keeping technically current and aware of changes and challenges in all aspects of your profession.

**Assessment:** Quizzes, Exams, Final exam, and Lab reports are used for assessment. Written reports of each lab assignment tests ability of student to construct physical circuit from schematic and use of instruments to measure circuit operational variables. Also tests student’s ability to evaluation circuit through comparison of measured values with calculated or theoretical values. Report demonstrates student’s use of professional standards and practices in the presentation of data, graphs, and schematics.

Students are required to use Multisim software for electronic circuit simulation.

Course general sample topics by week (topics may be re-arranged or modified as deemed necessary by instructor for specific semester)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURE TOPIC</th>
<th>READING</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>OP-AMP</td>
<td>CH.12</td>
<td>Lab</td>
</tr>
<tr>
<td>2-3</td>
<td>OP-AMP Comparator</td>
<td>CH.13</td>
<td>Lab</td>
</tr>
<tr>
<td>4</td>
<td>OP-AMP Differentiator</td>
<td>CH.13</td>
<td>Lab</td>
</tr>
<tr>
<td>5</td>
<td>OP-AMP Integrator</td>
<td>CH.13</td>
<td>Lab</td>
</tr>
<tr>
<td>6</td>
<td>Special Purpose Op-Amp Circuit</td>
<td>CH14.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Active Filter</td>
<td>CH.15</td>
<td>Lab</td>
</tr>
<tr>
<td></td>
<td>Course Description</td>
<td>Chapter</td>
<td>Lab/Non-Lab</td>
</tr>
<tr>
<td>----</td>
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</tr>
<tr>
<td>8</td>
<td>Mid-Term Exam</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Active Filter</td>
<td></td>
<td></td>
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<tr>
<td>10-11</td>
<td>Oscillator</td>
<td>CH.16</td>
<td>Lab</td>
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<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>13</td>
<td>The 555 Timer</td>
<td>CH.16</td>
<td>Lab</td>
</tr>
<tr>
<td>14</td>
<td>Phase-Locked Loop</td>
<td>CH17.</td>
<td>Lab</td>
</tr>
<tr>
<td>15</td>
<td>Voltage Regulator</td>
<td>CH.18</td>
<td>Lab</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam</td>
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**HCC Grading Scale:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Points per Semester Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100-90</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>89-80</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>79-70</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>69-60</td>
<td>1</td>
</tr>
<tr>
<td>59 and below = F</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>FX (Failure due to non-attendance)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>IP (In Progress)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>W (Withdrawn)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>I (Incomplete)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>AUD (Audit)</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

IP (In Progress) is given only in certain developmental courses. The student must re-enroll to receive credit. COM (Completed) is given in non-credit and continuing education courses.

**FINAL GRADE OF FX:** Students who stop attending class and do not withdraw themselves prior to the withdrawal deadline may either be dropped by their professor for excessive absences or be assigned the final grade of "FX" at the end of the semester. Students who stop attending classes will receive a grade of "FX", compared to an earned grade of "F" which is due to poor performance. Logging into a DE course without active participation is seen as non-attending. Please note that HCC will not disperse financial aid funding for students who have never attended class.

Students who receive financial aid but fail to attend class will be reported to the Department of Education and may have to pay back their aid. A grade of "FX" is treated exactly the same as a grade of "F" in terms of GPA, probation, suspension, and satisfactory academic progress.

To compute grade point average (GPA), divide the total grade points by the total number of semester hours attempted. The grades "IP," "COM" and "I" do not affect GPA.

*Health Sciences Programs Grading Scales may differ from the approved HCC Grading Scale. For Health Sciences Programs Grading Scales, see the "Program Discipline Requirements" section of the Program's syllabi.*

**Instructor Grading Criteria**

Midterm test 30%, Final Test 30%, Lab Experiments/Projects 30%, and Homework Assignments 10% are used to calculate final grade.

**Instructional Materials**

HCC Policy Statement:

Access Student Services Policies on their Web site:  
http://hccs.edu/student-rights

EGLS3 -- Evaluation for Greater Learning Student Survey System

At Houston Community College, professors believe that thoughtful student feedback is necessary to improve teaching and learning. During a designated time near the end of the term, you will be asked to answer a short online survey of research-based questions related to instruction. The anonymous results of the survey will be made available to your professors and department chairs for continual improvement of instruction. Look for the survey as part of the Houston Community College Student System online near the end of the term.

Distance Education and/or Continuing Education Policies


Access CE Policies on their Web site:  http://hccs.edu/CE-student-guidelines