

ECEG 341 SYLLABUS - FALL 2024

Overview

This course explores the foundational concepts of electrical and computer engineering through the design and evaluation of embedded computing systems. Concepts explored will include basic electricity and circuits, digital logic, conversion of analog and digital signals, microcontroller programming and debugging, and sensor data analysis.

Prerequisite

CSCI 204 or instructor permission

Corequisite

CSCI 306 (or prerequisite) and ECEG 240L

Instructors

Stewart J. Thomas
Academic East 322
Office & Text: 570-577-1515
E-mail: slt015@bucknell.edu
Office Hours:
[Appointment slots](#) (I'm trying google's
appointment slots, so we'll see how it works.)

Alan Marchiori
Dana 335a
(570) 577-1751
E-mail: amm042@bucknell.edu
Office Hours: [Schedule an appointment](#)

Lecture Meetings

ECEG 341 01 : M, W, F 02:00PM - 02:50PM, ACET 225

Lab Meetings

ECEG 341L 60 : Th 08:00AM - 09:50AM, DANA 305
ECEG 341L 61 : Th 10:00AM - 11:50AM, DANA 305

Course Description

This course emphasizes practical skills in circuit design and digital system development, preparing students to function effectively in multidisciplinary teams and to bridge the gap between the analog and digital worlds.

This course integrates the fundamental principles of analog and digital systems, providing a foundation in both circuit analysis and digital design. We will apply basic circuit laws such as Ohm's law and Kirchhoff's laws to analyze and design analog circuits, while also exploring the digital domain by building and testing digital circuits and systems.

Key topics include the analysis and design of passive circuits and basic electronics devices such as transistors. Students will also delve into digital systems, focusing on combinational and sequential logic, data representation, and the interface between hardware and software. These topics converge into embedded systems which will be introduced, to explore how analog and digital systems interact in modern computing environments.

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

1. Apply basic circuit laws such as Ohm's law and Kirchhoff's current and voltage laws to determine the voltages and currents in a circuit [A1, D1]
2. Calculate the power dissipated or supplied by an electrical component [A1, D1]
3. Build and test an analog circuit using a multimeter or oscilloscope [A6, D2]
4. Design and evaluate a simple digital system appropriately using combinational and digital logic [A1,6 D1,2]
5. Implement a mixed analog/digital embedded system that includes collecting and interpreting sensor data [A2, D2]

Note: A1, A5, A6 refer to ABET student outcomes 1, 5 and 6. See:

<https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2019-2020/#GC2>

D1, D2, D3 refer to Bucknell's ECE departmental student outcomes. See:

<https://www.bucknell.edu/academics/college-engineering/majors-departments/electrical-computer-engineering/abet-accreditation>

Course Materials

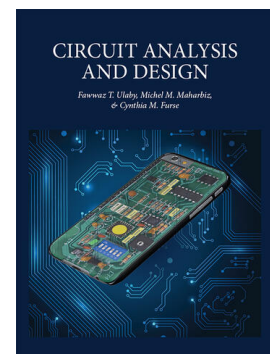
Importantly, there is nothing you need to purchase for this course.

However, the book *Circuit Analysis and Design* by Fawwaz T. Ulaby, Michel M. Maharbiz and Cynthia M. Furse is required for this course. But good news! It is freely available as a PDF download at:

<https://services.publishing.umich.edu/Books/Electrical-Engineering-Textbooks>

(direct link to form: https://docs.google.com/forms/d/e/1FAIpQLScLWwaa-BzbDUvJ_tdWsGDX6wBialALOs1cceMCpFUKZ5qFuA/viewform?usp=sf_link)

If you really want, you can also buy a hard copy for \$75.



We will also be using Analog Discovery 2 (and/or Analog Discovery 3) for data acquisition, RP2040 for embedded system work, and various electronic components. These will be provided to you.

The details

Attendance Policy

Regular attendance in class is expected and in general, you will be responsible for learning any missed material. If you have a reason that you must miss class (such as university excused absence, job interview, society travel, illness) talk to us and let us know. Our general policy is to not accept late assignments, but we also understand that things can come up and emergencies happen. One important note: ***If you are sick, please first talk to Student Health*** who will then work with the Dean of Students (to notify professors, grant flexibility, etc.) to all your professors.

Homework policy

Homework assignments are typically due at the beginning of class. If any due dates are not matching what I said in class (such as what is listed on Moodle, Gradescope, Google Classroom, etc.) let us know. We encourage collaboration on homework—this includes verbal discussion of problems and the use of scratch paper or white boards to discuss concepts and approaches to solving specific problems. Unless specifically authorized in an assignment, don't copy someone else's work. If you have any questions about collaboration or are worried about academic dishonesty, *please ask!* We are here to help you, so please email or come by our offices. Myself or your peers should be your first stop. Don't use monetized cheating-as-a-service products.

Collaboration on exams in any form is strictly forbidden. You may not share notes, homework, laboratory assignments, textbooks, or any other materials with any other individuals — even if they were your laboratory or homework partner. During the exams, you may not discuss any ECEG 341 materials nor access Internet resources.

Remember, according to the Honor Code, it shall be the responsibility of the student, when in doubt, to ask the instructor what is or is not academic dishonesty.

Examinations

Two exams and a quiz are currently scheduled. Exam 1 will be **Friday 13 September**. A node-voltage quiz will be on **Friday 27 September**. Exam 2 will be on **Friday 11 October** (day before Fall Break). All are scheduled during the class meeting.

For the final exam, we will follow Bucknell's final exam schedule ... which is probably already posted. However, we will not follow the final exam slot being used for a final exam, and instead will use this time for final project presentations and demonstrations.

Wireless Policies

Please remember that using your [mobile; watch; device; distracting sites] during class is distracting to your classmates and draws attention away from the information being discussed. If you have an emergency and must talk/text on your mobile, please step quietly into the hall before doing so. Otherwise, please wait until after the class period is over. I will hold myself to the same standard as you.

Class Cancellation

Notifications of class cancellations will be made to your Bucknell email with as much advance notice as possible. It will be both posted on the LMS and sent to your Bucknell e-mail address. If you don't check your Bucknell e-mail account regularly or have it set-up to be forwarded to your preferred e-mail account, you may not get the message. Please check the LMS and your Bucknell e-mail before coming to class.

Grading

Weighting of various course parts are as follows:

Quizzes, Activities, Participation	30%
Laboratory Assignments	25%
Final Project	25%
Exams	20%
<i>TOTAL</i>	<i>100%</i>

Grading Policy

The following percentages will guarantee the grade shown

A	93 - 100	[Superior Achievement]
A-	90 - 93	
B+	87 - 90	
B	83 - 87	[High Pass]
B-	80 - 83	
C+	77 - 80	

C	73 - 77	[Pass]
C-	70 - 73	
D	60 - 70	[Low Pass]
F	< 60	[Failing Work]

There may be adjustments in letter grade based on your effort and improvement, but the above numbers represent guaranteed minimums. Additionally, you will not receive a passing grade (D or above) if you do not have a passing lab average (D or above).

Your instructors will make every effort to promptly return all graded work to you (usually by the next scheduled class). Projects, exams, and larger assignments will take longer (typically 1 week). All grades will be published on the LMS. If you think you find a grading error, you may request a regrade. Regrade requests must be received no later than 72 hours after the assignment/exam is returned. It is possible for the new grade to be lower than the original grade. In all cases, the most recent grade is used (not the highest grade). If you would like to discuss your grade at any time, please contact us for a meeting.

Use of AI

In this course, the use of Artificial Intelligence (AI) tools and resources is encouraged to enhance learning and understanding. However, students must use these tools ethically and responsibly. AI can be a powerful aid in coding, debugging, and conceptual understanding, but it should not be a substitute for personal effort and academic integrity. AI tools **will not be available for exams**, including the final. In general, AI is a great starting point for your learning, but is not an end.

Guidelines for the ethical use of AI tools and resources:

1. **Academic Integrity:** Any work submitted must be the student's own. While AI can assist in learning and problem-solving, all submitted work should reflect individual effort. Plagiarism or reliance on AI to complete assignments without proper understanding will not be tolerated and may result in disciplinary action.
2. **Proper Attribution:** When AI tools are used, proper attribution must be given. If AI resources provide specific code snippets, solutions, or significant assistance, this should be clearly noted in the submission, including the prompts used.
3. **Learning Enhancement:** AI can be a valuable tool for exploring new concepts, generating ideas, and improving coding skills. Students are encouraged to use AI to experiment and learn, but they should also strive to understand the underlying principles and logic behind the AI-generated content.
4. **Limitations of AI:** Students should be aware that AI tools have limitations and may not always provide accurate or optimal solutions. Critical thinking and independent verification of AI-generated content are essential to ensure correctness and understanding.
5. **Written Work:** AI tools may be used to create drafts and revise written work. However, AI-generated text should not be used verbatim. Students must critically review, edit, and revise any AI-generated content to ensure it is accurate, coherent, and aligns with the assignment requirements. The final submission should reflect the student's own understanding and effort.

Using AI-generated text without proper revision or personal contribution is unacceptable and will be considered a violation of academic integrity.

Access and Accommodation statement

Any student who needs an accommodation based on the impact of a disability should contact the Office of Accessibility Resources OAR@bucknell.edu, 570-577-1188 or complete the Disability Accommodation Request form (https://bucknell-accommodate.symplicity.com/public_accommodation/). The OAR will coordinate reasonable accommodations for students with documented disabilities.

Please meet with us to discuss any accommodations you are using so that we can best support your learning. You must notify us prior to the examinations if you are planning to use any accommodations since this often requires some room scheduling and calendar shuffling. If it is only a day or two before the exam, there's often very little or nothing I can do to help you should you need more time, an extra room, etc. We're more than happy to work with you, but we need to take care of things in advance due to room scheduling and timing.

Diversity and Inclusion statement

The Department of Electrical and Computer Engineering is committed to our students, staff, and faculty. You are a valued, respected, and essential member of our community regardless of race, ethnicity, or nationality, gender, gender expression or sexual orientation, religion or belief system, economic status, or ability. We are together a community of learners who strive to offer a safe environment for learning, growth, inquiry, and the respectful sharing of ideas for all. By virtue of joining this community, all members commit to welcome others in the same manner.

We have a moral and professional obligation to always treat each other with respect and dignity, even when we disagree. We will not tolerate mistreatment or disrespect of persons for any reason. We all have to express this obligation through two actions:

- Actively contribute to creating an inclusive, collaborative learning environment.
- Take action to correct injustice when others do not.

Engineers investigate and solve problems that affect people and we must hold paramount the unquestioned support and value of all persons. The difficult work of engineering can only be done when we belong to and feel safe as members of a supportive community.

Your suggestions to help the ECE Department meet this commitment are encouraged and appreciated. If something occurs in class that makes you feel uncomfortable, please talk to me about it. If you are not comfortable doing that please talk to your other instructors, the department chair Stu Thompson (mst008@bucknell.edu), and Associate Dean Terri Norton (trn005@bucknell.edu). You may also file a bias incident report (<https://www.bucknell.edu/life-bucknell/health-wellness-safety/bias-incident-policy>). This report may be filed anonymously if you so choose. The ECE Department commits to supporting students expressing concerns and/or reporting bias to empower them in any follow-up actions and to ensure that they are protected from repercussions of any kind.

Student Mental Health Statement and Resources

In this classroom and on Bucknell's campus we support mental health efforts. Any student who is struggling and believes this may impact their performance in the course is encouraged to contact their Associate Academic Dean or the Dean of Students at 570-577-1601 for support. Furthermore, please approach me if you are comfortable in doing so. This will enable me to provide resources and support. If immediate mental health assistance is needed, call the Counseling & Student Development Center at 570-577-1604 (24/7).

You are also encouraged to register for a Togetherall account to access peer to peer, mental health support, complete self-paced courses on a wide range of topics, or check out the catalog of articles and activities focused on investing in mental health and wellness.

Bucknell University Expectations for Academic Engagement

Courses at Bucknell that receive one unit of academic credit have a minimum expectation of 12 hours per week of student academic engagement (on average). Student academic engagement includes both the hours of direct faculty instruction (or its equivalent) and the hours spent on out of class student work.

Honor Code

The [Bucknell University Honor Code](#) states that

1. *I will not lie, cheat, or steal in my academic endeavors.*
2. *I will forthrightly oppose each and every instance of academic dishonesty.*
3. *I will let my conscience guide my decision to communicate directly with any person or persons I believe to have been dishonest in academic work.*
4. *I will let my conscience guide my decision on reporting breaches of academic integrity to the appropriate faculty or deans.*

In choosing to remain in this course, we are also choosing to uphold this honor code. Just as students have faith the faculty act justly and fairly, so I have faith that you will act accordingly.

"Students are responsible for knowing what constitutes academic misconduct and for asking their professors for clarification whenever they have questions."

--- from [Bucknell Honor Code, FAQs for students](#)

Exams may be take-home, and are often unproctored. In these cases, I will ask that you sign a statement on the exam stating that the Honor Code was upheld. If you have any questions regarding what constitutes academic dishonesty, it is your responsibility to ask. More information on policies and procedures relating to the Honor Code and academic dishonesty can be found at <https://www.bucknell.edu/academics/current-students/academic-responsibility>.

ECE Lab Policy User Agreement

To gain access to the ECE labs, you will need to read and electronically sign the ECE lab User Agreement. To use NI CDS (Multisim/Ultiboard), you will need to sign the Student Install Agreement.

Please sign the policy agreement before coming to lab.

ECE Lab User Agreement

<https://forms.gle/P4ohhFsqSPtJ25vi8>

Schedule At-A-Glance

This is an overview of the topics we will cover in the course.

Overview (week 1)	Course Intro; Finite State Machine; Computation essentials
Analog Systems (weeks 2-3)	Circuit representation and concepts; Ohm's Law; Kirchoff's Laws;
Circuit Analysis (weeks 4-5)	Equivalent circuits; Combining resistors; Node-voltage analysis
Logic Abstraction (weeks 6-7)	Logic Gates; Boolean Algebra; Combinational Logic; Sequential Logic; Flip flops
Embedded Systems (weeks 8-12)	Micropython/C SDK; Digital communication; Sensor interfacing; Actuator control; Mini-project
Final Project (weeks 13-16)	Final project --- Build a system together;