ECET 33700 – Continuous Systems Analysis and Design
Semester, Spring 2026 CRN 13604

Instructional modality: face-to-face

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Catalog Data: **337 Continuous Systems Analysis & Design Class 2, lab 2, cr. 3 Prereq: ECET 277 or 224 and MA 16020**

This is an advanced course in analog systems analysis that stresses solutions of time and frequency domain problems. Circuit and system analyses using differential equations and Laplace Transform techniques are developed, culminating in active filter design and proportional-integral closed loop motor speed control. Software tools to solve mathematical problems are employed.

Learning outcomes

After completing this course, the student should be able to:

1. Analyze first and second order circuits in the time domain using differential equations. ***{Analysis}***
2. Determine frequency domain functions from time domain functions (Laplace transforms).***{Analysis}***
3. Determine time domain functions from frequency domain functions (Inverse Laplace transforms). ***{Analysis}***
4. Use Laplace transforms to analyze linear systems. ***{Analysis}***
5. Analyze and identify the output response of first-order and second-order systems with regards to gain, time constant, resonance, damping and stability. ***{Analysis}***
6. Use Laplace transforms to analyze the performance of a linear system with proportional-integral (PI) negative feedback. ***{Analysis}***
7. Implement a closed loop control of a linear system using Laplace transforms and a PI controller ***{Synthesis}***
8. Apply the principles of Laplace transforms to filter analysis ***{Analysis}***
9. Design 1st through 6th order active filters and implement the design. ***{Synthesis}***
10. Evaluate the performance of circuits using standard laboratory measurements and simulations. ***{Evaluation}***

Textbook: None. Text and handout materials for each class and lab are on the course Brightspace site.

Bightspace: This is the *major* way information is shared.

Calculator: ti-nspire-cx-cas or cx-ii-cas is *required*. You may borrow one during class, lab, and for homework. But calculators may *not* be shared during the exam. Be *sure* to have access to the **cas** version.

Software: Multisim and Matlab are available in all ECET labs, and *may* be available remotely. But, it is far better to have the educational version of each resident on your own pc. A pc, rather than a Macitosh is preferred. There is a link on the course Brightspace site with URLs and installation instructions.

General Information:

1. Come to class. Students who physically attend the classes do far better than those who plan to watch the live broadcast or view the recordings. There is an in-class-only quiz the first 5 minutes of each class. Your Quiz average counts 10% of your course grade.

2. Take notes - you are responsible for all material covered in class even if it is not in the text, and for assigned material in the text even if not covered in class.

3. Ask specific questions in class first and then if you still have trouble with the same topic come to my office or call me during my office hours. Always bring your work with you. Get help promptly -- don't wait until it is too late.

4. Perfect laboratory attendance is essential.

5. No make-up exams are given. If an exam is missed for valid reasons (see the list below) the final exam score is used for the missed test.

6. Professional conduct is expected of all class members. The highest caliber of mutual respect among all class members, students and instructors alike, is demanded. Harassment of any form is not tolerated. Should you feel that you are the victim of harassment of any form, immediately take the issue to the course instructor, a counselor, or the department head. Appropriate corrective action will be taken, and your privacy will be safe guarded. Safety infractions, academic dishonesty, or behavior problems could lead to dismissal from and failure in the course.

7. You **may** share the computer files which you and your study partner generate to tabulate data gathered during the laboratory period. **All other files** (other *Excel* files, simulation, or word processor files) **may not be shared**,even if you participated in the generation of the work contained in the file. If you are working with someone to produce a file, then you must produce that file again on your own. Any evidence of copied files will be treated as plagerism, (i.e. cheating), will result in a score of 0 for all parties on that assignment, and may be reported to the Dean of Students Office.

8. Safeguard your files by saving often as the file is created. Save the file to *three* separate locations: your USB "thumb" drive, your Purdue career account, and a physically remote (a.k.a. cloud) location. Lost data will *not* be excused.

Homework with Simulations and Quizzes

Most homework exercises are completed on-line using Variate. Brightspace provides the link to the Variate exercise and indicates the due dates and times. Do *not* go directly to Variate. Your score will *not* be sent to the Brightspace Grade Book. Some homeworks include plots and/or supporting simulation solutions. These are submitted as a pdf using the appropriate link in the Brightspace course site. Working together is encouraged on homework. But, each student is to submit their own solutions. Any evidence of *copied* work will be treated as plagerism, (i.e. cheating), will result in a score of 0 on that assignment, and may be reported to the Dean of Students Office.

Late homework will *not* be accepted.

Exams

1. You may use a single page (front and back) with whatever notes you wish on the three one-hour-long exams. These exams are in-person, in-class *only*. Exceptions require documentation submitted and approved *before* the exam. See item 4 below.

2. The final exam is also in-person, in-class *only*. It is comprehensive. You may use two pages (front and back) with whatever notes you wish.

3. There are *no* make-up exams, and no exam scores are dropped. If you miss an exam because of an excused absence (see below), the final exam score will replace the missed score.

4. Missing an exam without a valid excuse (see below) will result in a 0% on that exam. Carefully review that impact on your overall grade before risking missing an exam. It is wise to have several backup procedures in place to assure that you do not miss an exam.

Labs: - You *must pass the lab* part of the course to be eligible for a passing grade in the course.

1. Lab activities are indicated on the calendar on the course web site. Precise lab instructions are on the web sites.

2. There are Pre-lab exercises that are to be submitted to your lab instructor at the beginning of your lab period. Incomplete or incorrect answers will delay your beginning the hardware procedures, risking not completing those steps and losing Performance points.

3. The *last* time to receive *full* performance credit is at the end of your scheduled lab period. You *may* use the Open Lab to work on any incomplete lab performance. Up to 50% credit will be awarded by the Grad TA (only) for any performance demonstration *after* your scheduled lab period ends. Once your scheduled lab period for next week begins, you will receive no performance credit for tasks from last week that were left undone. Keep up!

4. The performance and prelab scores are to be recorded by your lab instructor at the end of the lab period.

5. Formal lab reports must conform to the Lab Report Writing Guide, available from the course Brightspace site. Submit a pdf of the report via the course Brightspace site by 8:00am on the following days: Wednesday lab-report 8am Monday Thursday lab-report 8am Tuesday Friday lab-report 8am Wednesday.

6. When you have submitted *three consecutive* lab reports which receive an A or B grade (24-30 out of 30) you will be **exempt from writing any further reports**. Your lab report grade will be the average of the reports submitted.

7. Reports submitted late will receive a 50% penalty on the report portion.

8. All reports must be submitted prior to the beginning of the following week's exercise. Reports will *not* be accepted after the beginning of the following week's lab period.

9. The best way to become good at writing is to write. So, you are *strongly* encouraged to write the report yourself. However, you may use Artificial Intelligence. If you do, include a statement at the very beginning of the report indicating what you wrote and what was AI generated. Also include a citation crediting the AI engine used. There is *no* grade penalty for using AI. But, your writing skills will suffer.

Solo Filter Design Lab Project

The 10^{th}, 11^{th}, 12^{th} and 13^{th} lab periods are dedicated to a solo filter design project. There is *no* report required. All credit for the four lab exercises is awarded based on specification compliance.

Parts

You are responsible for providing all parts used in the course. There is *not* an ECET 337 parts kit from EE in a Box. Most of the parts are available from EE in a Box and are from previous, required courses. However, there are a few exceptions, and you may have lost or damaged the parts you have. It is *critical* that you check your parts now so you can order any that you need, and have them when you need them in lab. The EE parts store may stock R and C, but may not have the L or op amps. Below is a complete list of parts, including URLs for ordering those that you do not have.

Tools & hardware

1 very small straight blade screw driver (for the 4-40 machine screw below)
1 small needle nose plier
1 small diagonal cutter
1 masking tape
1 large breadboard e.g. https://eeinabox.com/shop/ols/categories/breadboards
1 pair safety glasses See the EE in a Box www site

Leads

3 pair banana to minigrabber, a wide variety of colors EE in a Box
2 BNC-mini-grabber cable EE in a Box
1 box prestripped solid awg jumpers of varied length
e.g https://www.amazon.com/Breadboard-Minidodoca-Magnetic-Assortment-Alligator/dp/B0BT82DH1Q/ref=dp_prsubs_d_sccl_3/131-1369479-7450921?pd_rd_w=GkrFh&content-id=amzn1.sym.20285f2e-8a53-4f04-80ac-72a8e70f8611&pf_rd_p=20285f2e-8a53-4f04-80ac-72a8e70f8611&pf_rd_r=QWT2SNE1EQPGRRYSP2HQ&pd_rd_wg=5borm&pd_rd_r=a6d1b8a9-202a-4a24-9685-aca1cce3c68e&pd_rd_i=B0BT82DH1Q&th=1
A variety of 12" leads e.g. https://www.sparkfun.com/products/9385

Resistors

1 kit of standard value 1/4W 5% resistors, such as
https://www.amazon.com/Resistor-Assorted-Resistors-Assortment-Experiments/dp/B07L851T3V/ref=pd_sbs_328_5/145-2841620-8227241?_encoding=UTF8&pd_rd_i=B07L851T3V&pd_rd_r=2af3a37c-d93d-46e2-8652-30545da05f42&pd_rd_w=MiCbx&pd_rd_wg=yVnCn&pf_rd_p=7c0dad87-8a25-4c4f-9349-026039ea6cb3&pf_rd_r=T1VX9284RR23D783136N&psc=1&refRID=T1VX9284RR23D783136N

Potentiometer

1 single turn, linear, 10k e.g. https://www.sparkfun.com/products/9806

Capacitors

1 kit of standard value *film* or *ceramic* capacitors
https://www.amazon.com/Molence-Multilayer-Monolithic-Electronics-Audio-Video/dp/B09WRPHNK8/ref=dp_prsubs_sccl_1/140-7615769-2496153?pd_rd_w=xiVqm&content-id=amzn1.sym.53e0c629-1936-47cb-93a2-c361b12e7d3c&pf_rd_p=53e0c629-1936-47cb-93a2-c361b12e7d3c&pf_rd_r=JGJ7MGKZR3YEVYY8SMT5&pd_rd_wg=ANvx9&pd_rd_r=0e002f68-531a-4484-bb3f-8c9b243a0d4c&pd_rd_i=B09WRPHNK8&psc=1

Inductor

1 33 mH https://www.digikey.com/product-detail/en/abracon-llc/AIUR-16-333K/AIUR-16-333K-ND/5043385

MOSFET logic level N-channel enhancement mode

1 FQP30N06 TO220 https://www.digikey.com/en/products/detail/onsemi/fqp30n06/1055132

IC

5 TL081 op amp DIP https://www.digikey.com/en/products/detail/texas-instruments/TL081BCP/1674522
Or 5 LM741 CP op amp DIP https://www.digikey.com/product-detail/en/texas-instruments/LM741CN-NOPB/LM741CNNS-NOPB-ND/6322
Or 3 TL084 op amp DIP https://www.digikey.com/en/products/detail/texas-instruments/TL084ACN/277427

Microcontroller

Any single board microcontroller that you can program. Examples and seed files will be provided for the Arduino Uno and Mega
e.g. https://www.sparkfun.com/products/11021

Attendance in lecture

You are expected to attend lecture. Each lecture is also available live on-line via Microsoft Teams. A recording of each class is also linked in the Class module in Brightspace. There is an in-class-only quiz the first 5 minutes of each class. Your Quiz average counts 10% of your course grade.

Documented, excused absences

University Service
Document from the Faculty/Director/Coach of Program (must be discussed with instructor *before* the expected absence)

Military Service
Document from the commanding officer with dates (must be discussed with instructor *before* the expected absence)

Illness/Hospitalization
Document from the physician/caregiver indicating that the absence was necessary (must be discussed with the instructor within a week of returning to class)

Legal
Document from the court/police officer indicating date and time of the conflicting event

Bereavement or Religious Committment
Document from the Dean of Students Office and a document from the event

There are no make-up activities for unexcused absences. Resolution of missed activities for excused absences will be arranged on a case-by-case basis by the instructor.

Grief Absence Policy for Students

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family.

Grading policy:

You may access your grades through the course web site on the course's Brightspace site.

Hour Tests (3)	30%	Grades are not curved. There are *no* +/- grades.	
Final Exam	15	90 to 100%	A
Homework	20	80 to 89.99%	B
Lab	25*	70 to 79.99%	C
Quiz	10%	60 to 69.99%	D
TOTAL:	100%	below 60%	F*

*Departmental policy requires that you pass the lab in order to be eligible for a passing grade in the course.

Academic Dishonesty

You **may** share the computer files which you and your lab partner generate to record data gathered during the laboratory period (if you have a lab partner) and other work *specifically assigned* by the instructor as a *team* assignment. **All other files** (other *Excel* files, oscilloscope screen captures, simulations or word processor files) **may not be shared**. Any evidence of copied files will be treated as plagiarism, (i.e. cheating), will result in a score of 0 for all parties on that assignment, and will be reported to the Dean of Students Office.

Any material copied **must** contain a proper citation *immediately* attached to the material. This includes figures provided on the course web site, graphics provided by another student, and any images or text from the internet, including from an Arificial Intelligence engine. Failure to properly cite copied material will be treated as plagiarism, (i.e. cheating) and will result in a score of 0 on that assignment.

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

Fabricated *data*

Data submitted as "measured by the student" or as "extracted from software", but which was, in fact, obtained from someone else, or was created by the author is considered to have been *fabricated*. Data from a simulation which is submitted as "*measured* by the student" is also considered *fabricated*. Submitting such data is a lie and will result in a 0% on the assignment.

Refer to the Student Guide for Academic Integrity.

Academic Dishonesty on homework, simulations, in lab or on a lab report will result in a 0% on that item. A second instance of dishonesty on homework, simulations, in lab or on a lab report will also be reported to the Dean of Students.

Academic Dishonesty on an Examination will result in an F in the course and will be reported to the Dean of Students.

Use of Copyrighted Materials

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally. Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutial respect among its members; encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's nondiscrimination policy can be found at https://www.purdue.edu/purdue/ea_eou_statement.php

Violent Behavior Policy

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

Students with Disabilities

Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University. If you have a disability that requires special academic accommodation, please make an appointment to speak with me within the first two (2) weeks of the semester in order to discuss any adjustments. It is important that we talk about this at the beginning of the semester. It is the student's responsibility to notify the Disability Resource Center (http://www.purdue.edu/drc) *of an impairment/condition that may require accommodations and/or classroom modifications.*

Emergencies

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Class Schedule

The current, official course schedule is available from the course Brightspace site.