Villanova University
Department of Electrical and Computer Engineering

Course Syllabus
ECE 3530 / 3531 - Analog Electronics II / Analog Electronics II Laboratory
Fall 2020

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Office Hours: See Instructor Access below.

Course Objectives: Fundamentals of operational amplifiers, bipolar junction transistors, field-effect transistors, feedback amplifiers, and frequency response.

Introduction: Electronics is a pillar of the Electrical Engineering curriculum. A solid working knowledge of electronics will be beneficial to any student, even those who later specialize in a different area of Electrical Engineering; because Electronics is the backbone of technology and Electrical Engineers routinely specify, apply, install, and troubleshoot technology (not to mention tinkering with it for fun). I suppose the same can be said for the other core subjects of the junior-year curriculum. Take this opportunity at this stage of your life to immerse yourself in the fundamentals of these core subjects; you will surely benefit from this experience even if you go on to other non-engineering career pursuits.

Prerequisite: Analog Electronics I (ECE 2530) or equivalent.

Textbook: Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 7th edition, Oxford University Press, Copyright © 2015, ISBN: 9780199339136. Note that using an earlier edition of this text is acceptable. (Besides the seventh edition, I also own the first four editions of this textbook and a variety of other excellent references that will be cited in the lecture notes of the course.)

ABET Accreditation Outcomes Addressed in Course: Students should demonstrate:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Grading: The final grade will be determined as follows: Homework - 20%, Examinations (4) - 80%. The scale for the assignment of the final letter grade is the following:

Letter Grade	Numerical Grade	Letter Grade	Numerical Grade
A	92 and above	C+	> 75 to < 80
A–	> 90 to < 92	C	> 70 to < 75
B+	> 85 to < 90	D+	> 65 to < 70
B	> 80 to < 85	D	> 60 to < 65
		F	60 and below

Submission of Assignments. I am requiring that all assignments (both homework and examinations) be submitted to my email address above as a single pdf file. In the past, some students have submitted multiple files for an assignment, each representing a page of the submission, in various formats; and I had to spend considerable time combining them into one file for electronic grading. ***Please be advised that I cannot accept any assignment that does not meet this requirement.***

Late Submission: Late submission of a homework assignment or examination will be assessed a hefty 25% late penalty per day. The primary reason for this policy is to help you keep up with the workload of the course.

Academic Integrity: The College of Engineering is committed to creating an environment of academic integrity and ethical decision-making that we hope is reflected in the actions of our students and graduates. As Villanova students, integrity is central to the University mission. As engineers, our code of conduct requires us to place honor and integrity at the forefront of everything we do. As engineering students, it is expected that you will begin to adopt these values and instill them into your work habits. Students violating the academic integrity policy will receive a zero on that assignment or examination and the violation will be reported to the Associate Dean for Academic Affairs. The Villanova University Academic Integrity Code can be accessed at the following web address:

https://www1.villanova.edu/villanova/provost/resources/student/policies/integrity/code.html

Specific to this course, the following Honor Code Policy will be enforced. Submission for grading implies that you accept and will abide by the following ground rules of the Honor Code Policy.

HONOR CODE POLICY

1. For homework assignments only, you are permitted to collaborate with fellow classmates. However, simply copying and submitting the work of someone else is not permitted and constitutes a breach of academic integrity.
2. For homework assignments and examinations, you are permitted to refer to the course textbook and current-semester lecture notes, handouts, and homework solutions. You are not permitted to reference the solutions manual of the course textbook; nor lecture notes, handouts, homework solutions, and solutions to examinations from previous offerings of this course; nor content from any other source without my prior permission.
3. For homework assignments and examinations, you are not permitted to use software for computing or graphing purposes without my prior permission. You may only use your calculator to perform arithmetic operations.
4. Prior to the submission deadline and thereafter until the return of your graded examination, you are not permitted to discuss, provide, or access support, insider information, or information of any kind regarding the examination from other people, unauthorized documents, unauthorized software, internet, electronic devices, etc.
5. For all assignments, including homework assignments and examinations, you are obligated to report to me any violation of the Honor Code Policy by yourself or by another classmate.
6. The university Class Attendance Policy must be followed when requesting an excuse for absence to an examination. Please use the following link for an excused absence request.

   https://www1.villanova.edu/content/villanova/engineering/students_secure/forms/studentAbsence.html
7. For an examination to be eligible for grading, the student must sign the following statement on the examination: "I have neither given nor received any unauthorized assistance in the completion of this examination."

Instructor Access: ***Please do not hesitate to call my cell at (610) 888 – 7030 any day before 10:00 PM.*** If unavailable, please leave a brief message with a return phone number and I will call you back as soon as possible.

Outline: The following is an outline of topics for the course. ***Note that the student is responsible for completing and comprehending the entire reading assignment and for consulting with the instructor if there is any question concerning the reading assignment, since the examinations may include other topics not listed in the outline below nor covered in the lectures.*** Please note that the reading assignments below correspond to the 7th edition of our textbook. Since chapter numbers may be different for other editions, be sure to confirm the reading assignment with the instructor if you are using a different edition.

TOPIC	READING ASSIGNMENT	DURATION
The Operational Amplifier - The Ideal Op-amp - Ideal Op-amp Analysis - Op-amp Powering - Op-amp Power Dissipation - Op-amp Applications - Ideal and Practical Integrator Circuits - Ideal and Practical Differentiator Circuits	Entire Chapter 2	1 week
BJT Amplifiers - The BJT as an Amplifier - Biasing Circuits - Small-signal Equivalent Circuit Models - Analysis of Basic Single-stage Configurations - Graphical and Analytical Methods to Determine Maximum Swing	All BJT Content of Chapter 7 Review Entire Chap. 6	2 weeks
Exam 1: The Operational Amplifier and BJT Amplifiers		
Field Effect Transistors - Junction FETs	Entire Chapter 5	2 weeks

- Enhancement-type MOSFETs
- Depletion-type MOSFETs
- Biasing Circuits
- The CMOS Inverter and CMOS Logic Gates

FET Amplifiers All FET Content of Chapter 7 1.5 weeks
- The FET as an Amplifier
- Small-signal Equivalent Circuit Models
- Analysis of Basic Single-stage Configurations
- Graphical and Analytical Methods to Determine Maximum Swing

Exam 2: Field Effect Transistors and FET Amplifiers

Feedback Amplifiers Sections 11.1 to 11.6 3 weeks
- Properties of Negative Feedback Amplifiers
- Analysis of Ideal Feedback Amplifier Topologies
- Feedback Analysis Method Applied to Practical Feedback Amplifier Topologies
- Feedback Analysis Method Applied to Practical Feedback Amplifier Circuits

Exam 3: Feedback Amplifiers

Frequency Response Entire Chapter 10 and Sections 11.7 to 11.10 4 weeks
- Low Frequency Response of Basic Amplifier Configurations
- The Method of Short Circuit Time Constants
- High Frequency Transistor Models
- Miller's Theorem
- High Frequency Response of Basic Amplifier Configurations
- Method of Open Circuit Time Constants
- Effect of Feedback on Amplifier Frequency Response
- Stability in Feedback Circuits
- Frequency Compensation

Exam 4: Frequency Response

Laboratory Assignments:

The laboratory assignments are intended to provide both hands-on construction and design experience with practical analog electronic circuits. The evaluation of each laboratory assignment is based on the Grading Matrix below. The grade of the Construction Assignment is based on **Neatness of Construction** and **Performance of Operation**. The grade of the Design Assignment is based on **Quality of Written Documentation** and **Quality of Oral Presentation**. For the overall grade of the laboratory assignment, the grades of the Construction Assignment and Design Assignment are equally weighted. You are permitted to collaborate with fellow classmates; however, simply copying and submitting the work of someone else is not permitted and constitutes a breach of academic integrity.

	Excellent 4 points	Good 3 points	Acceptable 2 points	Poor 1 point	Unacceptable 0 point	
Construction Assignment						
Design Assignment						
					Total Points	_____ / 8 pts

Students with Disabilities: It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability, please contact me to make an arrangement. If you have a non-physical disability, you must register with the Learning Support Office by contacting (610) 519 - 5176 or at learning.support.services@villanova.edu as soon as possible. Registration is necessary to receive an accommodation.

The Office of Disability Services collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The ODS provides Villanova University students with physical disabilities the necessary support to successfully

complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact and register with Gregory Hannah, advisor to students with disabilities, at (610) 519 - 3209 or visit the office on the second floor of the Connelly Center.

Student Code of Conduct: Students are expected to act in a professional and respectful manner to their fellow students, faculty, and staff. Students should become acquainted with and understand the responsibilities set forth in the Student Handbook, especially those in the sections on Policy and Regulations. Adherence to University regulations is expected and required for successful completion of the program of studies. Enforcement within the classroom of policies regarding classroom behavior is the responsibility of the faculty member. All other discipline problems are to be referred to the Dean of Students.