Subject to Modification

PHYSICS 3420 – ELECTRONICS
Syllabus Spring 2024

Dr. David Shiner (shiner@unt.edu)
Office: Physics 326 Phone: 565-3874.
Office Hours: Tu 11:00-12:00 or by appointment

Lecture: TuTh 9:30-10:50 , Language Rm 217
Recitation: Th 11-11:50 , Language Rm 313
Lab: W 1:00-3:50 or Th 1:00-3:50, Physics Room 208

Textbooks

Required: *Microelectronic Circuits,* by Sedra, Smith, Carusone and Gaudet (8th edition, Oxford University Press, 2019), ISBN: 978-0190853464. There is an electronic version that can be purchased for a 6 month period (see Oxford Univ. Press Website: https://global.oup.com/ushe/product/microelectronic-circuits-9780190853464?cc=us&lang=en).

Recommended: *Introductory Electronics for Scientists and Engineers*, by Simpson (2nd edition, Allyn and Bacon 1987), ISBN 0-205-08377-3

Prerequisites: Physics 1420/1440 or 2220/2240 (2nd semester of university physics) and Math 1710 (Calculus I).

Content: Analog and digital electronics, applications for instrumentation and diagnostic techniques. Direct and alternating current circuits and measurements. Fundamentals of semiconductor devices; uses of diodes; transistors as switches and circuit elements; building blocks of digital electronics; memory and storage devices; schematic computer structures; feedback and operational amplifiers; interfacing of instrumentation and computers. Labs on basic circuits, instrumentation and measurement.

Objective To gain an appropriate proficiency in analog and digital electronics; to learn the language and concepts of electrical engineering necessary for the professional scientist.

Laboratory The required laboratory component of this course meets once a week, every week for 15 weeks of the semester. The lab is in room 208 of the Physics Building, from 1-3:50 p.m Wednesday or Thursday. The laboratory instructor is Aaron Richardson aaronrichardson2@my.unt.edu and Jeffrey Pound jeffreypound@my.unt.edu.

Homework Assignments will be given on an approximately weekly schedule. Please feel free to discuss and work together with others on these problems if you wish. What is important is that you make a good faith effort on each problem set, that you upload your own written work, and that you eventually understand how to do the problems. The uploaded problem sets will be graded simply pass/not pass. Exams will be largely based on the homework. If all your homework is passed, your low exam score will be dropped, and if all your homework is passed, your final exam score can replace your exam scores if better.

Office Hours My office is on the third floor of the physics building (rooms 324/326/328), phone number is 565-3874, email is shiner@unt.edu. Office hour is Tu 11:00 – 12:00 or by appointment.

Grading No extra credit is available. Pop quizzes will be given during the semester, lab grading detailed in lab.

Course Grade Exams: 20% Labs: 40% Quizzes: 10% Discussion: 10% Final Exam: 20%

Final Thought: *We want to create a welcoming classroom and lab for all. If you ever feel like this is not the case, please stop by my office and let's talk about how things could be improved.*

You are responsible for modifications to this syllabus and any other information presented in class.

Student absences (including tardiness) will be treated in accordance with UNT policy, Student Attendance and Authorized Absences

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (http://www.unt.edu/oda). You may also contact ODA by phone at (940) 565-4323.

UNT's policy on Academic Dishonesty can be found at: http://www.vpaa.unt.edu/academic-integrity.htm
Drop information is available in the schedule of classes at: http://essc.unt.edu/registrar/schedule/scheduleclass.html
The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you on-line at the end of the semester and will provide you with an opportunity to provide feedback to your course instructor. SPOT is considered to be an important part of your participation in this class.

Date	Day	Subject (Chapter)	Assignment	Due
Jan. 16	Tu	Signals and Amplifiers (Ch. 1)	Ch. 1: E1.8, E1.21, 1.1a, 1.2a, 1.3a, 1.10,	
18	Th	"	1.23, 1.41, 1.44, 1.45a, 1.51, 1.60, 1.69	
		Exp.: Orientation/Equipment & Kirchhoff I		
23	Tu	Operational Amplifiers (Ch. 2)	Ch. 2: 2.2, 2.9, 2.15, 2.24, 2.48,	**Ch. 1 Due**
25	Th	"	2.65, 2.81, 2.91, 2.94, 2.108	
		Exp.: Equipment & Kirchhoff II		
30	Tu	Semiconductors (Ch. 3)	Ch. 3: 3.1 (T=125 C only), 3.4, 3.7, 3.14,	**Ch. 2 Due**
Feb. 1	Th	"	3.20, 3.23, 3.30	
		Exp.: RC Filters		
6	Tu	Diodes (Ch. 4)	,	**Ch. 3 Due**
8	Th	"		
		Exp.: LC Res and Soldering (Lab report)		
13	Tu	Bipolar Transitors, BJTs (Ch. 6)		
15	Th	"		
		Exp.: Diodes		
20	Tu	MOS Field Effect Transistors (Ch. 5)		
22	Th	"		
		Exp.: Operational Amplifiers		
27	Tu	Transistor Amplifiers (Ch. 7)		
29	Th	"		
		Exp.: BJT DC Behavior (Lab report)		
Mar. 5	Tu	"		
7	Th	**EXAM 1: Chapters 1-6**		
		Exp.: BJT AC Behavior		
12	Tu	Spring Break		
14	Th	"		
19	Tu	Building Blocks of IC Amplifiers (Ch. 8)		
21	Th	Diff. and Multistage Amplifiers (Ch. 9)		
		Exp.: MOSFET Circuits		
26	Tu	CMOS Digital Logic Circuits (Ch. 16)		
28	Th	"		
		Exp.: AM Radio		
Apr. 2	Tu	"		
4	Th	Memory and Clocking Circuits (Ch. 18)		
		Exp.: Logic Gates		
9	Tu	"		
11	Th	"		
		Exp.: SR Flip-Flop (Lab Report)		
16	Tu	Digital Design (Ch. 17)		
18	Th	"		
		Exp.: Digital Circuits		
23	Tu	"		
25	Th	Sources of Noise in Electronics		
		Exp.: Microprocessor Control		
30	Tu	**EXAM 2: Chapters 7, 8, 9, 16-18**		
May 2	Th	Review		
		Exp.: LabView Control		

Comprehensive Final Exam: Thursday, May 9, 2024, 8:00 a.m. - 10:00 a.m.