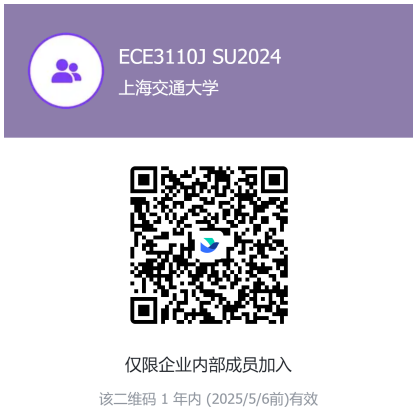
ECE3110J Electronic Circuits

2024 Summer

Instructor: Xuyang Lu	**Email:** Xuyang.Lu@sjtu.edu.cn
Teaching Assistant: Tianrui Dang	**Email:** dtianrui@sjtu.edu.cn
Teaching Assistant: Yuheng Wang	**Email:** wyh2004@sjtu.edu.cn
Teaching Assistant: Jiale Chu	**Email:** cometia0@sjtu.edu.cn
Teaching Assistant: Anlin Ma	**Email:** virtuoso@sjtu.edu.cn
Teaching Assistant: Kezhi Li	**Email:** little_black@sjtu.edu.cn

Canvas Pages: https://jicanvas.com/courses/737

Feishu Group:



Lecture Hours:
18:20-20:00 on Mondays and Wednesdays @ DXY415
14:00-15:40 on Fridays (Weeks 2, 4, 6) @ DXY415
Recitation and TA Office Hours:
15:40-16:40 on Fridays @ DXY415
Office Hours:
By appointment via Feishu.

Course Description:

- **Lecturing**: Explore the dynamics of nonlinear semiconductor devices in this course. Dive into diodes, BJTs, and MOSFETs, emphasizing their principles and applications. Study analog circuits like voltage regulators, rectifiers, amplifiers, and current mirrors. Learn frequency domain analysis for amplifier circuits. Master the essentials for engineering electronic systems. **The lecture will focus on the principles.**
- **Recitation**: Prioritize step-by-step derivations in **practice problems** for circuit analysis.
- **Homework**: provides hands-on circuit analysis techniques using manual calculations with appropriate approximations. Students will learn to perform accurate analyses by hand and compare their results with simulations using PSpice software. Through this comparative approach, students gain a deeper understanding of circuit behavior and validation of theoretical concepts in practical applications.

- **Lab**: Throughout the lab sessions, students will work with essential tools such as power supplies, function generators, oscilloscopes, and multimeters. They will learn how to set up circuits on both simulation software and physical breadboards, understanding the nuances of component placement and connection.

Course Outcomes:

- Construct voltage regulators and rectifiers employing diodes, applying the constant voltage drop model for analysis.
- Assemble single-stage amplifiers utilizing BJTs and MOSFETs. Determine the DC biasing conditions and estimate DC voltage gains and input/output impedances through small-signal analysis.
- Validate hand-calculation results using SPICE simulation at the integrated circuit level, applying appropriate approximations.
- Grasp the concept of frequency domain analysis and conduct first-order frequency analysis of simple circuits.
- Design and analyze analog circuits at the PCB level using simulation tools such as Proteus. Implement circuits on breadboard based on simulation results and utilize oscilloscopes, function generators, and multimeters for circuit analysis.

Tentative Course Outline:

- Diode Device
- Diode Circuit
- BJT Device
- BJT Circuit
- MOSFET Device
- MOSFET Single Stage Amplifiers
- MOSFET Differential Amplifiers
- Frequency Domain Analysis
- MOSFET Current Mirrors

Main References: This is a restricted list of various interesting and useful textbooks that you can refer to during the course.

- Richard C. Jaeger and Travis N. Blalock, *Microelectronic Circuit Design.*
- Behzad Razavi, *Design of Analog CMOS Integrated Circuits.*
- Adel S. Sedra, Kenneth C. Smith, *Microelectronic Circuits.*

Course Schedule:

	Apr		May			Jun				Jul					Aug				Sep	
Monday	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9
Tuesday	30	7	14	21	28*	4*	11*	18*	25	2*	9*	16*	23*	30*	6	13	20	27	3	10
Wednesday	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11
Thursday	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12
Friday	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13
Saturday	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14
Sunday	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15
JI Week			1	2	3	4	5	6	7	8	9	10	11	12	13					
JI Semester	**Spr.**		**Summer Term**													**Summer Brk.**				

- Yellow: Lectures
- Blue: Midterm and final exams
- Red: Lab report due dates
- *: Assignment due dates

Grading Policy:

- Assignments × 9 (18%)
- Labs × 5 (15%)
- Midterm Exam (33%)
- Final Exam (34%)

Lab Session:
Lab manuals will be posted on Canvas in **Week 3, 5, 7, 9, 11**. Please complete the Proteus simulation and other related tasks according to the instructions on Lab Manuals and submit your result in a well-typed report format. Your lab report is due the following week on Saturday at 11:59 a.m. (Noon, not evening.) Details about the labs will be announced further.

Homework Assignments:

- There are 9 homework assignments in total. Assignment will be posted on Canvas on Wednesdays and due the next Tuesday at 11:59 am (Noon, not evening).
- Both hand-written work and typed work is welcomed, but please make sure that the your work is convenient for instructor and teaching assistants to read (which means the pictures or answers of each question should be cleared labeled). All homework assignments should be submitted in **PDF format**.

Course Policy:

- **Honor code**: All students in the class are bound by the Honor Code of the Joint Institute (http://umji.sjtu.edu.cn/academics/academic-integrity/honor-code/). You may not seek to gain an unfair advantage over your fellow students; you may not consult, look at, or possess the unpublished work of another without their permission; and you must appropriately acknowledge your use of another one's work.
- **Late policy**: Every homework and lab reports are encouraged to be submitted before the due date through Canvas. However, we accept the late submission within 24 hours with 25% deduction on the grade of your work. Any late submission that exceeds 24 hours of the due time will not be accepted and the grade for this work will be given an zero. If you have any difficulty in submitting your work, please contact the professor and TAs directly.
- **Homework and Lab**: Students are encouraged to discuss course topics, homework assignments and lab experiments with each other. However, all submissions must represent your own work. Duplicated submission is not allowed and will trigger an honor code violation investigation.
- **Exam**: The rules will be announced prior to each exam. Anyone violating the rule will be given an 'F' as the score.