

# Physics 623 Syllabus

## Spring 2025

Lecture in 2120 Chamberlin, TR 1:00 – 2:15 pm

Labs in 3119A Chamberlin, Wed. 2:25-5:25 pm and 7:00-10:00 pm

### Instructors:

Dan McCammon

Office hours: 4-5pm Mondays (tentative) in 6207/6242 Chamberlin + phone or email

6207 Chamberlin Hall

Phone: (608) 262-5916

Email: [mccammon@physics.wisc.edu](mailto:mccammon@physics.wisc.edu)

Mitch McNanna

Office hours: 4-5 pm Tuesdays in the lab room 3119A Chamberlin

6246 Chamberlin Hall

Email: [mcnanna@wisc.edu](mailto:mcnanna@wisc.edu)

Course homepage: <https://www.physics.wisc.edu/courses/home/spring2025/623/>

**Text and References are on reserve in the Physics/Astronomy Library**

**Text: “The Art of Electronics” by Horowitz and Hill, Cambridge 3rd Ed.**

**Useful General References (pdf’s available on course website):**

#### Alternative texts:

“[Introduction to Modern Electronics](#)”, J. C. Sprott (Wiley) [**recommended supplement**]

“All About Circuits” on-line open source text: <http://www.allaboutcircuits.com/textbook>

“Basic\_Engineering\_Circuit\_Analysis”, Irwin&Nelms

“Electronic circuits-fundamentals and applications”, Tooley - 5th ed

“Fundamentals-of-electric-circuits”, Alexander-5th-ed

#### Other references:

“The Art and Science of Analog Circuit Design”, Jim Williams

“Troubleshooting\_Analog\_Circuits”, Pease

“Learning the Art of Electronics A Hands-On Lab Course”

### Evaluation:

50% Laboratory (understanding, skills development, **notebook**, prelabs)

50% Lecture: Exams (70%), homework (30%)

Final has double weight of a midterm. Will drop your lowest midterm or half the weight of the final.

Scale: 90<sup>+</sup>=A, 80<sup>+</sup>=AB, 70<sup>+</sup>=B, 60<sup>+</sup>=BC, 50<sup>+</sup>=C, 40<sup>+</sup>=D. No curve. Everyone can get an A. Study together. Come to office hours, these are used as a discussion session. Please don’t skip any labs.

Makeups are freely given — if you miss a lab due to research activities or illness, please see the instructor as soon as possible

The homework is assigned two ways. Each week for the laboratory, there is a worksheet that you must complete and turn in before starting the lab. Some weeks, this is extensive enough that it constitutes the homework for that week (and will count on your homework grade as well). Other weeks, homework problems will be assigned on Thursday in class and due the following Thursday in class.

## Physics 623 Lectures and Labs — Spring 2025

Week	Date (TR)	Lecture Topic	Lab (W)	Laboratory	Text reference
1	Jan. 21	Linear Circuit Theory	Jan. 22	Introduction-Scope*	Ch. 1
	Jan. 23	Transmission Lines & more LCT			Handout
2	Jan. 28	Semiconductor circuit elements	Jan. 29	Transmission Lines*	Ch. 1
	Jan. 30	Transistor Amplifiers			Ch. 2
3	Feb. 4	Difference Amplifier	Feb. 5	Transistor Amplifier	Ch. 2
	Feb. 6	Negative Feedback			Ch. 4
4	Feb. 11	Op-amps I	Feb. 12	Difference Amplifier	Ch. 4
	Feb. 13	Op-amps II			Ch. 4
5	Feb. 18	<b>MIDTERM EXAM</b>	Feb.19	Operational Amps	
	Feb. 20	Fourier Transforms			Handout
6	Feb. 25	Noise I	Feb. 26	Operational Amps	Ch. 8
	Feb. 27	Noise II			Ch. 8
7	Mar. 4	Lock-in amplifiers	Mar. 5	Johnson Noise	Ch. 8.14
	Mar. 6	Lock-in applications			Ch. 8.14
8	Mar. 11	Oscillators and positive feedback	Mar. 12	Phase Detector	Ch. 7
	Mar. 13	Digital Logic			Ch. 10
9	Mar. 18	Digital Circuits I	Mar. 19	Oscillators	Handout
	Mar. 20	Integrated Circuits			
March 24-28		<b>Spring Break</b>			
10	Apr. 1	<b>MIDTERM EXAM</b>	Apr. 2	Digital Circuits	
	Apr. 3	Phase Locked Loops			Ch. 13.13
11	Apr. 8	DACs and ADCs	Apr. 9	Phase Locked Loops	Ch 13.1-13.12
	Apr. 10	DACs and ADCs			Ch 13.7-13.8
12	Apr. 15	Circuit Simulation	Apr. 16	DAC & ADC	
	Apr. 17	FPGA I			Appendix J - Handouts
13	Apr. 22	FPGA II	Apr. 23	Circuit Simulation	Ch. 11
	Apr. 24	Modulation and communication			Handout
14	Apr. 29	Digital computers	Apr. 30	FPGA I	Handout
	May 1	Review			
<b>exam code 1</b>					

\*Read Appendix “O” on oscilloscopes in Horowitz & Hill. Also scope tutorials and manuals on course website.