

# Physics 623 Syllabus

## Spring 2021

Lectures online:

<https://us.bbcollab.com/guest/1a033ddec94f4fc480cc7ceef1e0acc9>

Labs in Chamberlin 4128 Wed. 2:25-5:25 pm and 7:00-10:00 pm; Thurs. 2:25-5:25 pm

link to instructor for labs:

<https://uwmadison.zoom.us/j/99030321259?pwd=WEJsUnlkVld4K29TaFlhcGp1SEtZdz09>

### Instructor:

Dan McCammon

Office hours: 4:00-5:00 Mondays in 6207 Chamberlin

Phone: (608) 262-5916

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

link for office hours (available at all other times for study groups):

<https://uwmadison.zoom.us/j/96364711699?pwd=MzV0ckRnT3hnSDhhWHhkMIJjTU94QT09>

Robert McDermott

Office hours: following lecture or by appointment

Phone: (608) 320-4912

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

Course homepage: <http://www.physics.wisc.edu/courses/home/spring2021/623/>

### Text and References are on reserve in the Physics Library

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

### Useful General References:

"Introduction to Modern Electronics", C. Sprott (Wiley) [**Physics 321 Textbook**]

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

"Electronics with Discrete Components", E. J. Galvez (Wiley, 2013)

"Introductory Electronics for Scientists and Engineers", R.E.Simpson, (Allyn and Bacon) 2nd Ed.

"Electronics for the Physicist", C.F.G. Delaney (Ellis Horwood)

"Principles of Electronics", L.R. Fortney (Harcourt Brace Jovanovich)

"Basic Electronics for Scientists", James J. Brophy, (McGraw-Hill) 5th Ed.

### Evaluation:

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

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

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 should complete and turn in before starting the lab. Some weeks, this is extensive enough that it constitutes the 'homework' for that week. Other weeks, homework problems will be assigned on Thursday in class and due the following Thursday in class.

## Physics 623 Lectures and Labs — Spring 2021

Week	Date (TR)	Lecture Topic	Lab	Laboratory	Text reference
1	Jan. 26	Linear Circuit Theory	Jan. 27	Introduction*	Ch. 1
	Jan. 28	Transmission Lines & more LCT	Jan. 28		Handout
2	Feb. 2	Semiconductor circuit elements	Feb. 3	Transmission Lines*	Ch. 1
	Feb. 4	Transistor Amplifiers	Feb. 4		Ch. 2
3	Feb. 9	Difference Amplifier	Feb. 10	Transistor Amplifier	Ch. 2
	Feb. 11	Negative Feedback	Feb. 11		Ch. 4
4	Feb. 16	Op-amps I	Feb. 17	Difference Amplifier	Ch. 4
	Feb. 18	Op-amps II	Feb. 18		Ch. 4
5	Feb. 23	Fourier Transforms	Feb. 24	Operational Amps	Handout
	Feb. 25	Noise I	Feb. 25		Ch. 8
6	Mar. 2	Noise II	Mar. 3	Operational Amps	Ch. 8
	Mar. 4	Lock-in amplification	Mar. 4		Ch. 8.14
7	Mar. 9	Lock-in applications	Mar. 10	Johnson Noise	Ch. 8
	Mar. 11	Oscillators and positive feedback	Mar. 11		Ch. 7
8	Mar. 16	<b>MIDTERM EXAM</b>	Mar. 17	Phase Detector	
	Mar. 18	Digital Logic	Mar. 18		Ch. 10
9	Mar. 23	Digital Circuits I	Mar. 24	Oscillators	Handout
	Mar. 25	Digital Circuits II	Mar. 25		
10	Mar. 30	Integrated Circuits	Mar. 31	Digital Circuits	Ch. 13.13
	Apr. 1	Phase Locked Loops	Apr. 1		Ch. 13.13
11	Apr. 6	Circuit simulation	Apr. 7	Phase Locked Loops	Ch 13.1 – 13.12
	Apr. 8	DACs and ADCs	Apr. 8		
12	Apr. 13	DACs and ADCs	Apr. 14	Circuit Simulation	Ch 13.7-13.8
	Apr. 15	FPGA I	Apr. 15		Handouts-App. J
13	Apr. 20	FPGA II	Apr. 21	DAC & ADC	Ch. 11
	Apr. 22	Modulation and communication	Apr. 22		Handout
14	Apr. 27	Digital computers	Apr. 28	FPGA I	Handout
	Apr. 29	Review	Apr. 29		
	<b>May 5</b>	<b>FINAL EXAM: 12:25-2:25 pm</b>			

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