

ESE 271: Electrical circuit analysis

Fall 2023

The course is designed to provide the necessary theoretical background for electronic lecture and lab courses like ESE 211, 218, 311, 314, 324, 372, etc. The course covers the following topics: passive circuit elements: resistors, capacitors, inductors. Elements of circuit topology. Kirchhoff's and Ohm's law. Nodal and mesh analysis. Equivalent circuits. Steady-state AC circuits. Phasors. Transient analysis. Fourier and Laplace transforms. Fundamentals of AC power, coupled inductors (transformers). Two-port networks.

Course Designation: Required Course

Text Books: Main: Charles K. Alexander and Matthew N.O. Sadiku "Fundamentals of Electric Circuits", McGraw Hill, ISBN 978-0-007-352955-4

Additional/alternative:

R.E. Thomas, R.J. Rosa, G.J. Toussaint "The analysis and design of linear circuits", 7 th Edition, Willey, ISBN 978-1-119-06558-47

F. T. Ullaby, M. M. Maharbiz, C. M. Furse "Circuits", 3rd edition, National Technology and Science Press, ISBN 978-1-934891-19-3

Prerequisites: MAT 127 or 132 or 142 or 171 or AMS 161; PHY 127 or 132/134 or 142.

Credit Hours: 3

Instructor: **S.Suchalkin**, sergey.suchalkin@stonybrook.edu

Goals: The goal of the course is to develop skills of theoretical circuit analysis and circuit design.

Lectures are given on Mondays and Wednesdays 7:00p.m. – 8:20 p.m. in room 145, first floor of Engineering Building

Office hours Tuesdays and Thursdays 11:00 a.m. – 1:00 p.m., room 253, Light Engineering Building

Exams: there are 2 midterm and 1 noncumulative final exam.

Grading: Homework 10%; Midterm 1 – 25%; Midterm 2 – 30%; Final – 35%.

Topics Covered:

Week 1	Mon Aug. 28	Lecture 1. Basic concepts: current, voltage, power.	
	Wed Aug. 30	Lecture 2. Resistor. Ohm's law. Kirchoff's laws.	
Week 2	Mon Sep. 4	Labor day	
	Wed Sep. 6	Lecture 3. Nodal and mesh analysis	
Week 3	Mon Sept. 11	Lecture 4. Linearity, superposition, circuit theorems.	HW1 is due
	Wed Sept. 13	Lecture 5. Dependent sources and operational amplifiers.	
Week 4	Mon Sept. 18	Lecture 6. Circuits with operational amplifiers.	
	Wed Sept. 20	Lecture 7. Material review.	HW2 is due
Week 5	Mon Sept. 25	Midterm exam 1.	
	Wed Sept. 27	Lecture 8. Capacitors.	
Week 6	Mon Oct. 2	Lecture 9. Inductors.	
	Wed Oct. 4	Lecture 10. RC and RL circuits. Time constants.	
Week 7	Mon Oct. 9	Fall break	
	Wed Oct. 11	Lecture 11. Phasors. Impedance. RLC circuits.	
Week 8	Mon Oct. 16	Lecture 12. AC steady state. Nodal analysis.	HW3 is due
	Wed Oct. 18	Lecture 13. AC steady state. Mesh analysis.	
Week 9	Mon Oct. 23	Lecture 14. First order circuit. Transfer functions. Bode plots.	
	Wed Oct. 25	Lecture 15. Complex power. RMS.	
Week 10	Mon Oct. 30	Lecture 16. Magnetically coupled circuits. Transformers.	
	Wed Nov. 1	Lecture 17. Material review.	HW4 is due
Week 11	Mon Nov. 6	Midterm exam 2.	
	Wed Nov. 8	Lecture 18. Laplace transform.	
Week 12	Mon Nov. 13	Lecture 19. Laplace transform.	
	Wed Nov. 15	Lecture 20. Laplace transform.	
Week 13	Mon Nov. 20	Lecture 21. Circuits in s-domain. Transfer functions.	HW5 is due
	Wed Nov. 22	Thanksgiving break	
Week 14	Mon Nov. 27	Lecture 22. Step and impulse response. Poles. Stable circuits.	
	Wed Nov. 29	Lecture 23. Frequency response function. Bode plots.	
Week 15	Mon Dec. 4	Lecture 24. Resonant filters.	
	Wed Dec. 6	Lecture 25. Two port networks	
Week 16	Mon Dec. 11	Lecture 26. Material review	HW6 is due
Finals	Dec. 12-21	Final exam (non cumulative).	

Student Accessibility Support Center Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or via e-mail at: sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Student Outcomes	contribution
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	3
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	3
3. an ability to communicate effectively with a range of audiences.	1
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	1
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.	1

3-Strongly Supported; 2-Supported; 1-Minimally Supported