

MAE 140: LINEAR CIRCUITS SUMMARY

<http://www-mae.ucsd.edu/research/krstic/schuster/teaching/mae140/mae140.html>

Instructor: Eugenio Schuster

Room 1801, Engineering Building Unit I (EBUI)

Phone: (858) 822-2406

Email: schuster@mae.ucsd.edu

Class Times & Location:	Monday/Wednesday/Friday 8:00 to 9:50 AM, Peter 104 Tuesday/Thursday 5:00 to 5:50 PM, WLH 2207
Course Description:	Steady-state and dynamic behavior of linear, lumped-parameter electrical systems. Kirchoff's laws. RLC circuits. Node and mesh analysis. Operational amplifiers. Dependent sources. Response of first- and second-order systems to impulse and step inputs. Laplace transforms. Design applications in engineering.
Textbook:	"Analysis and Design of Linear Circuits", 3 rd edition by Thomas and Rosa. Available at the UCSD Bookstore. Student Solutions Manual by the same authors (shows how to solve many problems on computers by using MATLAB, Mathcad and Excel) is optional.
Material Covered:	We will work through Chapters 1-4 in order. Chapter 6 will be covered briefly and will be integrated with Chapter 4. We will work through Chapter 9-10 and use the techniques learned in these chapters to solve the kind of circuits presented in Chapter 7. We will do a little work in Chapter 11 and 12 to learn how to design active filters covered in Chapter 14.
Prerequisites:	A grade of C- or better in Math 20D or 21D, and Physics 2B, admission to the Department of MAE (formerly AMES), Structures, or Bioengineering.
Teaching Assistant:	Rafael Vazquez: rvazquez@ucsd.edu (discussion sessions/office hours) Olga Koroleva: olga@ucsd.edu (homework and exam grades)
Office Hours:	Schuster: Monday/Wednesday/Friday 10:00-10:30 AM – 1801 EBUI (or) by appointment – Contact instructor by e-mail. Vazquez: Tu/Th 6:00-7:00 PM – 2207 WLH M 6:00-7:00 PM – 105 EBUII Th 11:00AM – 12:00PM – 105 EBUII or by appointment – Contact TA by e-mail
Syllabus:	Kirchoff's current and voltage laws. Nodal and Mesh Analysis. Equivalent Circuits. Thevenin-Norton theorems. Passive Circuits: Resistive circuits, RLC circuits. Active Circuits: Dependent sources and operational amplifiers. Laplace transform. Transfer functions. Network functions. Frequency response. Bode diagrams. Filter design.

MAE 140: LINEAR CIRCUITS (TENTATIVE) SCHEDULE

Week	Date	Lecture	Topics	Book	HW
Week 1:	06/30	Lecture 1	Course Introduction Circuit Variables Kirchoff Laws/Constraints	Chap 1 Chap 2: 2-1,2-2,2-3	1
	07/02	Lecture 2	Equivalent Circuits Thevenin-Norton	Chap 2: 2-4,2-5,2-6 Chap 3: 3-4,3-5,3-6	1
	07/04	<i>Holiday</i>			
Week 2:	07/07	Lecture 3	Node/Mesh Analysis	Chap 3: 3-1,3-2,3-3	1/2
	07/09	Lecture 4 HW1 due	Dependent Sources Transistors	Chap 4: 4-1,4-2,4-3	2
	07/11	Lecture 5	Operational Amplifiers	Chap 4: 4-4,4-5,4-6,4-7	2
Week 3:	07/14	Lecture 6	Capacitance/Inductance	Chap 6: 6-1,6-2,6-3,6-4	2
	07/16	Lecture 8 HW2 due	Laplace Transform	Chap 9	3
	07/18	Midterm			
Week 4:	07/21	Lecture 9	Laplace Transform S-domain Analysis	Chap 9 Chap 10	3
	07/23	Lecture 10	S-domain Analysis	Chap 10	3
	07/25	Lecture 11 HW3 due	Network Functions Frequency Response	Chap 11: 11-1,11-2,11-6 Chap 12: 12-1,12-2,12-3	4
Week 5:	07/28	Lecture 12	Frequency Response	Chap 12: 12-5	4
	07/30	Lecture 13	Filter Design	Chap 14: 14-1,14-2, 14-3	4
	08/01	Lecture 14 HW4 due	Review		
	08/02	Final			

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COURSE INFORMATION AND POLICIES

1. The numerical grade for the class will be based on homework assignments, one midterm exam, and a final exam, with a distribution as given below:

Final **40%**

Midterm **20%**

Homework **40%**

The midterm test will be scheduled on or about **Friday, July 18 (Peter 104, 8:00AM – 9:50AM)** and the final test will be scheduled on **Saturday, August 2 (Peter 104, 11:30AM – 2:30PM)**.

2. There are **NO** make up tests or assignments. Persons having a medical excuse or chronic medical problem should come and see the instructor.
3. Procedures for the conduct of midterm and the final exam will be explicitly stated before the midterm and the final. The exams are in-class and open-book. No Palm Pilots or laptop computers or other computing devices or calculators capable of communicating with other devices will be permitted during examinations.
4. Assignments and exams must be your **own work!** Cases of copying will be treated as **ACADEMIC DISHONESTY**. For the assignments (only) you can talk with other students, but you must then do the problem yourself.
5. Homework is due at the **beginning** of class on the due date. Assignments handed in after the beginning of class will be treated as late and will not be graded. **PLEASE DO NOT ATTEMPT TO COMPLETE ASSIGNMENTS DURING THE LECTURE. THESE WILL NOT BE GRADED.**

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HOMEWORK GUIDELINES

1. Each assignment will include around 10 problems. Only 5 of them (selected by the instructor) will be graded.
2. Each problem **MUST** begin on a new page and should include the following:
 - (a) A brief statement of the problem including any necessary given information or assumptions you decide to make
 - (b) Figures
 - (c) Mathematical analysis
 - (d) Your final answer with a box drawn around it. This is essential.
3. Be sure to show your work on all homework problems; the answer alone is never responsive, and points will be deducted if important steps are missing from your development. Make liberal use of carefully drawn and labeled diagrams in your homework. Since significant partial work is usually given some credit on homework, it is a sound strategy to hand in what you can do on each homework problem.
4. Homework should be presented on clean paper (8.5 x 11 inches) in a professional manner meaning neat and legible. Work handed in with excessive scratch marks and/or arrows will not be graded.
5. **No homework will be accepted late** (homework is due in class on due dates before class begins). A late entrance into the class does not provide an excuse for handing homework in late. **PLEASE DO NOT ATTEMPT TO COMPLETE ASSIGNMENTS DURING THE LECTURE. THESE WILL NOT BE GRADED.**
6. Assignments will be announced in class, typically one week before the due date. Check the course schedule for homework due dates.
7. Homework will be returned to you within a week. Regrades on homework will be considered for a week after that homework is returned to you.
8. Please discuss problems concerning grading of homework with your TA before you come to the instructor. The instructor will only entertain discussion on homework grades after the TA has had an opportunity to discuss your problems with you and has marked out his decision.
9. Be sure that your name is at the top of every page. Also, **PRINT** your name in block letters, **LAST NAME FIRST.**
10. It must be your **own work!** Cases of copying will be treated as **ACADEMIC DISHONESTY**. You can talk with other students, but you must then do the problem yourself.