

Foundations of Engineering Electromagnetics

ECE 555 – 001 and – 002

Fall 2024

Course Outline and Syllabus

- Preamble:** Please see the important information beginning on page 3 of this Syllabus.
- Lectures:** I will lecture Tu Th 9:30-10:45 AM Dane Smith Hall 132 and the lectures will be recorded. The recordings will be posted under **Media Gallery** at the side of the <http://canvas.unm.edu> website for this course and available to all students.
- Instructor:** Professor Edl Schamiloglu
Office: 323C ECE Building; Phone: 505-277-4423
e-mail: edls@unm.edu (preferred method of communication)
- Office Hours:** MW 10-11 AM, ECE 323C or by phone/Zoom
- Prerequisites:** ECE 360 or equivalent (undergraduate electromagnetics)
- Textbook:** **Required:** D.G. Dudley, *Mathematical Foundations for Electromagnetic Theory* (IEEE Press, New York, NY, 1994) (ISBN-13: 978-0780310223). We will cover Chapters 1-4. Supplemental material will also be provided.
Recommended: L. Sevgi, *Electromagnetic Modeling and Simulation (IEEE Press Series on Electromagnetic Wave Theory)* (IEEE Press/John Wiley and Sons, New York, NY, 2014) (ISBN-13: 978-1118716182). This reference will be useful for the final project.
- Course Website:** <http://canvas.unm.edu>. You will need your UNM NET ID to access this page if you are registered for the course.
- Catalog Description:** Mathematical foundations for engineering electromagnetics: linear analysis and method of moments, complex analysis and Kramers-Kronig relations, method of steepest descent, Green's functions, spectral representation method and electromagnetic sources.
- Course Objectives:** This course is a prerequisite to ECE 561, although students admitted in the Spring semester can take this after completing ECE 561. Topics covered: Mathematical foundations for engineering electromagnetics: linear analysis and method of moments, complex analysis (including the method of steepest descent), Kramers-Kronig relations, Green's functions, spectral representation method, and electromagnetic sources.
- Grading:** 7 problem sets [every two weeks, to be scanned and uploaded to Canvas's assignment tool] (30%), midterm exam (30%), and a final project (40%). Final grades will be assigned as follows:
| 100 A+ | 90-99 A | 80-89 B | 70-79 C | <70 F |
(Note: These are not raw scores, they are based on the curved scores for Exams)

**Lecture Schedule***

<u>Week#</u>	<u>Day</u>	<u>Date</u>	<u>Topic</u>	<u>Text Chapter/Ref.</u>
1	Tu	20 Aug	Preamble – Applied EM@UNM	Sit back and listen
	Th	22 Aug	Intro to Linear Analysis	Chapter 1
2	Tu	27 Aug	Inner Product Space	Chapter 1
	Th	29 Aug	Hilbert Space/Operators	Chapter 1
3	Tu	03 Sep	CSB Inequality	Chapter 1 (Dr. Elfrgani)
	Th	05 Sep	Method of Moments I	Chapter 1 (Dr. Elfrgani)
4	Tu	10 Sep	Random Coupling Model	Lecture Notes
	Th	12 Sep	Method of Moments II	Chapter 1 (Dr. Elfrgani)
5	Tu	17 Sep	Complex Analysis I	Lecture Notes
	Th	19 Sep	Complex Analysis II	Lecture Notes
6	Tu	24 Sep	<i>Connections to Quantum Mechanics</i>	Lecture Notes
	Th	26 Sep	More EM and QM	Lecture Notes
7	Tu	01 Oct	Complex Analysis III	Lecture Notes
	Th	03 Oct	Complex Analysis IV	Lecture Notes
8	Tu	08 Oct	Method of Steepest Descent	Lecture Notes
	Th	10-11 Oct	Fall Break	
9	Tu	15 Oct	Sturm-Liouville – First kind	Chapter 2
	Th	17 Oct	Sturm-Liouville – Second kind	Chapter 2
10	Tu	22 Oct	Sturm-Liouville – Third kind	Chapter 2
	Th	24 Oct	Sturm-Liouville – Wrap-up	Chapter 2
11	Tu	29 Oct	Midterm Exam	
	Th	31 Nov	Go over Midterm Exam Solutions – Discuss Final Project	
12	Tu	05 Nov	Spectral Rep. Meth. SLP1/SLP2	Chapter 3
	Th	07 Nov	Spectral Rep. Meth. SLP1/SLP2	Chapter 3
13	Tu	12 Nov	Spectral Rep. Meth. SLP3	Chapter 3
	Th	14 Nov	Spectral Rep. Meth. SLP3	Chapter 3
14	Tu	19 Nov	Spectral Rep. Meth. and GF's	Chapter 3
	Th	21 Nov	EM Sources – Sheet Source	Chapter 4
15	Tu	26 Nov	EM Sources – Line Source	Chapter 4
	Th	28 Nov	Thanksgiving Holiday – No Class	
16	Tu	03 Dec	No Class – work on Final Project	
	Th	05 Dec	No Class – work on Final Project**	

** I will miss several lectures due to travel. I will post my lecture slides and provide instructions for guided study for these missed classes. Or Dr. Ahmed Elfrgani will lecture on my behalf. The final project will be due at noon on Friday, December 13, 2024.



FALL 2024 ADDITIONAL SYLLABUS INFORMATION

Accommodations: UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center (<https://arc.unm.edu/>) at arcsrvs@unm.edu or by phone at 505-277-3506.

Title IX: The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center (<https://loborespect.unm.edu>), the Women's Resource Center (<https://women.unm.edu>), and the LGBTQ Resource Center (<https://lgbtqrc.unm.edu>). If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see <https://policy.unm.edu/university-policies/2000/2740.html> and CEEO's [website](#).

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights.

Student Support: **Confidential** services for students are available at [LoboRESPECT Advocacy Center](#), [Women's Resource Center](#), and the [LGBTQ Resource Center](#). The [Women's Resource Center](#) supports all students, including those who are pregnant or are parents. UNM's lactation stations are marked on the [UNM campus map](#).

Instructor Support: Information about how to handle disclosures and provide a referral is available on the [Title IX Coordinator page](#). Seek help from your Associate Dean or Dean of Instruction and the Title IX coordinator. [Ombuds Services](#) offers [workshops that include handling disclosures of sexual harassment](#). UNM representatives participate in [Action Collaborative on Preventing Sexual Harassment in Higher Education](#).

Credit-hour statement: This is a three credit-hour course. Class meets for three 50-minute sessions/two 75-minute sessions of direct instruction for fifteen weeks during the Fall 2024 semester. Please plan for a *minimum* of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.