

**Foundations of Engineering Electromagnetics**

ECE 555 – 001 and – 002

Fall 2021

*Course Outline and Syllabus*

- Lectures:** I will lecture Tu Th 9:30-10:45 AM Dane Smith Hall 132 and an operator will be available to record my lectures. Students are welcome to come to class as there are fewer than 10 students in Sec. 001 and the classroom holds 150 students. The recordings will be posted under **ZOOM Recordings** at the side of the Learn.unm.edu website for this course and available to all students.
- Instructor:** Professor Edl Schamiloglu  
Office: Dean's Office, Centennial 3071; Phone: 505-277-6095  
e-mail: [edls@unm.edu](mailto:edls@unm.edu)
- Office Hours:** By appointment via telephone/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://learn.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 Learn's assignment tool] (30%), midterm exam (30%), and a final project (40%).

**Lecture Schedule\***

<u>Week#</u>	<u>Day</u>	<u>Date</u>	<u>Topic</u>	<u>Text Chapter/Ref.</u>
1	Tu	24 Aug	Preamble – Applied EM@UNM	
	Th	26 Aug	Intro to Linear Analysis	Chapter 1
2	Tu	31 Aug	Inner Product Space	Chapter 1
	Th	02 Sep	Hilbert Space/Operators	Chapter 1
3	Tu	07 Sep	CSB Inequality	Chapter 1
	Th	09 Sep	Method of Moments	Chapter 1
4	Tu	14 Sep	Review of Linear Space	Lecture Notes
	Th	16 Sep	<i>Connections to Quantum Mechanics</i>	Lecture Notes
5	Tu	21 Sep	Complex Analysis I	Lecture Notes
	Th	23 Sep	Complex Analysis II	Lecture Notes
6	Tu	28 Sep	Random Coupling Model	Lecture Notes
	Th	30 Sep	More EM and QM	Lecture Notes
7	Tu	05 Oct	Complex Analysis III	Lecture Notes
	Th	07 Oct	Complex Analysis IV	Lecture Notes
8	Tu	12 Oct	Method of Steepest Descent	Lecture Notes
	Th	14 Oct	<b><i>Fall Break</i></b>	
9	Tu	19 Oct	Sturm-Liouville – First kind	Chapter 2
	Th	21 Oct	Sturm-Liouville – Second kind	Chapter 2
10	Tu	26 Oct	Sturm-Liouville – Third kind	Chapter 2
	Th	28 Oct	Sturm-Liouville – Wrap-up	Chapter 2
11	Tu	02 Nov	<b><i>Midterm Exam</i></b>	
	Th	04 Nov	Go over Midterm Exam Solutions – Discuss Final Project	
12	Tu	09 Nov	Spectral Rep. Meth. SLP1/SLP2	Chapter 3
	Th	11 Nov	Spectral Rep. Meth. SLP1/SLP2	Chapter 3
13	Tu	16 Nov	Spectral Rep. Meth. SLP3	Chapter 3
	Th	18 Nov	Spectral Rep. Meth. SLP3	Chapter 3
14	Tu	23 Nov	Spectral Rep. Meth. and GF's	Chapter 3
	Th	25 Nov	<b><i>Thanksgiving Holiday – No Class</i></b>	
15	Tu	30 Nov	EM Sources – Sheet Source	Chapter 4
	Th	02 Dec	EM Sources – Line Source	Chapter 4
16	Tu	07 Dec	No Class – work on Final Project	
	Th	09 Dec	No Class – work on Final Project**	

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**\*\* Final project will be due at noon on Friday, December 17, 2021**



## ENGINEERING

Updated 07/06, 2021

**Accommodations:** In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.

UNM is committed to providing courses that are inclusive and accessible for all participants. As your instructor, it is my objective to facilitate an accessible classroom setting, in which students have full access and opportunity. If you are experiencing physical or academic barriers, or concerns related to mental health, physical health and/or COVID-19, please consult with me after class, via email/phone or during office hours. You are also encouraged to contact Accessibility Resource Center at [arcsrvs@unm.edu](mailto:arcsrvs@unm.edu) or by phone 277-3506.

**[Sample credit-hour statement:** This is a three credit-hour course. Class meets for three 50-minute sessions of direct instruction for fifteen weeks during the Fall 2019 semester. Students are expected to complete a *minimum* of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.]

### **Title IX:**

*Note: UNM encourages all faculty and TAs to include a Title IX statement on the syllabus and reminds all faculty, TAs, and GAs that per university policy APPM 2740 they are mandatory reporters to the Title IX Coordinator at the Office of Equal Opportunity of reports of gender discrimination, including sexual harassment, sexual misconduct and sexual violence per APPM 2740 [http://policy.unm.edu/university-policies/2000/2740.html#reporting\\_misconduct](http://policy.unm.edu/university-policies/2000/2740.html#reporting_misconduct).*

*The Office of the Provost and EVP for Academic Affairs recognizes that instructors may seek choice in the syllabus language used to address Title IX. Below is a standard statement as well as alternative statements proposed by UNM Faculty for a Sexual Assault Free Environment (SAFE).*

**Standard Title IX statement:** In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education (see <https://www.ed.gov/news/press-releases/us-department-education-launches-new-title-ix-resources-students-institutions-historic-new-rule-takes-effect>) requires that any report of gender discrimination that includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (<https://oeo.unm.edu>). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>

**Alternative Valid Title IX statements** suggested by UNM Faculty for a Sexual Assault Free Environment are available here: <https://facultysafeunm.wordpress.com/title-ix-syllabus-statements/>. Please note that these alternative statements may be used on the syllabus. However, faculty, TAs and GAs are mandatory reporters of reports of Title IX violations, regardless of the syllabus language used.

**Citizenship and/or Immigration Status:** All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website: <http://undocumented.unm.edu/>.

**Support in Receiving Help and in Doing What is Right:** I encourage students to be familiar with services and policies that can help them navigate UNM successfully. Many services exist to help you succeed academically and to find your place at UNM, see [students.unm.edu](https://students.unm.edu) or ask me for information about the right resource center or person to contact. UNM has important policies to preserve and protect the academic community, especially policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH C09). These are in the *Student Pathfinder* (<https://pathfinder.unm.edu>) and the *Faculty Handbook* (<https://handbook.unm.edu>) Please ask for help in understanding and avoiding plagiarism or academic dishonesty, which can both have very serious disciplinary consequences.