



Lahore University of Management Sciences

PHY 305/EE 330 – Electromagnetic Fields and Waves

Spring 2024

Instructor	Adam Zaman Chaudhry
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Office Hours	TBA
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TA	TBA
TA Office Hours	TBA
Course URL	On LMS
Support Services	LUMS offers a range of academic and other services to support students. These are mentioned below, and you are encouraged to use these in addition to in-class assistance from course staff. For a complete list of campus support services available for you click here (https://advising.lums.edu.pk/#supportservices)

Course Teaching Methodology
The course shall be taught in-person.

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 mins
Recitation (per week)	Nbr of Lec(s) Per Week	0	Duration	-
Tutorial (per two weeks)	Nbr of Lec(s) Per Two Weeks	1	Duration	50 mins

Course Distribution	
Core	Physics and EE majors
Elective	
Open for Student Category	All
Closed for Student Category	

COURSE DESCRIPTION
This is the second course in the electromagnetism sequence that is core for all Physics and EE majors. This course begins by assuming the equations of electromagnetism in free space and develops the theory of macroscopic electrodynamics. We then move on to solving for a variety of wave phenomena including plane wave reflection and refraction at interfaces, waveguides and transmission lines, cavity resonators. We develop the potential formulation of electrodynamics next and take a first look at retardation effects. Finally, we discuss the radiation of electromagnetic waves from localized configurations focusing on the dipole and quadrupole and discuss basic concepts of dipole antennas. We develop the potential formulation of electrodynamics and use it extensively throughout.

COURSE PREREQUISITE(S)
MATH102: Calculus II
PHY102: Electricity and Magnetism
MATH210: Introduction to Differential Equations (Recommended)

Learning Outcomes (CLOs)	
1	Apply Maxwell's equations to macroscopic media
2	Apply Maxwell's equations to describe wave propagation in linear media and at planar interfaces
3	Apply Maxwell's equations to waveguides and cavity resonators



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4	Calculate EM phenomena using the potential formulation
5	Apply Maxwell's equations to the case of radiating systems
Grading break up: Component Details and weightages	
Assignments (15%) 5-6: Assignments shall be due within seven days. An N-1 policy shall be implemented for the assignments. Quizzes (20%) 2. Two hour-long quizzes shall be held, the first in week 4/5 and the second in week 11/12. The syllabus for the quizzes shall be made available with the announcement of the same. Mid-Term (25%): A mid-term exam covering topics taught in the first seven weeks will be held towards the end of week 8. The mid-term will be of 90 minutes duration. Final Exam (40%): A three hour comprehensive final exam shall be held on the date specified by the RO.	
Note: I reserve the right to readjust the grading policy by upto 5%.	
Grading Basis (Relative)	
As per departmental policy.	

Examination Detail	
Mid Term Exam	Duration: The exam shall be of 90 minutes duration. The exam will be on-campus. Preferred Date: Friday/Saturday of Week 8. Exam Specifications: The exam will be based on material taught in the first seven weeks. Only simple scientific calculators shall be allowed. The students are also allowed to bring in one cheat sheet (A4 sized) containing formulas they deem useful.
Final Exam	Duration: The exam shall be of 3 hours duration. The exam will be on-campus. Preferred Date: As per ROs schedule. Exam Specifications: The exam shall be comprehensive. Only simple scientific calculators shall be allowed. The students are also allowed to bring in one cheat sheet (A4 sized) containing formulas they deem useful.

Course Overview			
Week#	Topics	Readings	CLOs
1	Polarization and dielectrics with an emphasis on linear media	Ch 3	1
2	Diamagnetism, paramagnetism and ferromagnetism	Ch 4	1
3	The multipole moments as spherical tensors	Handouts	1
4	Conservation laws, momentum, energy and angular momentum for the EM field, field-stress tensor	Ch 8	2
5-6	Electromagnetic waves, polarization, propagation in linear lossless and lossy media, reflection and refraction at planar interfaces	Ch 9/ Handouts	2
7	Goos-Hanchen effect, frustrated total internal reflection	Handouts	2
9-10	Waveguides and cavity resonators, transmission lines	Ch 9/ Handouts	3
11-12	Potential formulation of electrodynamics	Ch 10	4
13-14	Radiation	Ch 11	5

Textbook(s)/Supplementary Readings	
1	Introduction to Electrodynamics , 4 th edn, DJ Griffiths.
2	Electromagnetics and Applications , DH Staelin.
3	Classical Electrodynamics , JD Jackson.
4	Advanced Engineering Electromagnetics , CA Balanis.

Campus supports & Key university policies
Campus Supports



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Students are strongly encouraged to meet course instructors and TA's during office hours for assistance in course-content, understand the course's expectations from enrolled students, etc. Beyond the course, students are also encouraged to use a variety of other resources. (Instructors are also encouraged to refer students to these resources when needed.) These resources include Counseling and Psychological Services/CAPS (for mental health), LUMS Medical Center/LMC (for physical health), Office of Accessibility & Inclusion/ OAI (for long-term disabilities), advising staff dedicated to supporting and guiding students in each school, online resources (<https://advising.lums.edu.pk/advising-resources>), etc. To view all support services, their specific role as well as contact information click here (<https://advising.lums.edu.pk/#supportservices>).

Academic Honesty/Plagiarism

LUMS has zero tolerance for academic dishonesty. Students are responsible for upholding academic integrity. If unsure, refer to the student handbook and consult with instructors/teaching assistants. To check for plagiarism before essay submission, use similarity@lums.edu.pk. Consult the following resources: 1) Academic and Intellectual Integrity (<http://surl.li/gpvwb>), and 2) Understanding and Avoiding Plagiarism (<http://surl.li/gpvwo>).

LUMS Academic Accommodations/ Petitions policy

Long-term medical conditions are accommodated through the Office of Accessibility & Inclusion (OAI). Short-term emergencies that impact studies are either handled by the course instructor or Student Support Services (SSS). For more information, please see Missed Instrument or 'Petition' FAQs for students and faculty (<https://rb.gy/8sj1h>)

LUMS Sexual Harassment Policy

LUMS and this class are a harassment-free zone. No behavior that makes someone uncomfortable or negatively impacts the class or individual's potential will be tolerated.

To report sexual harassment experienced or observed in class, please contact me. For further support or to file a complaint, contact OAI at oai@lums.edu.pk or harassment@lums.edu.pk. You may choose to file an informal or formal complaint to put an end to the offending behavior. You can also call their Anti-Harassment helpline at 042-35608877 for advice or concerns. *For more information: Harassment, Bullying & Other Interpersonal Misconduct: Presentation* (<http://surl.li/gpvwt>)