Lahore University of Management Sciences

PHY 204 – Electricity and Magnetism

Fall semester 2023

To understand how to navigate course outlines, consult: How to Use a Course Outline (http://surl.li/gpvuw)

Instructor	Rizwan Khalid
Room No.	9-113A
Office Hours	I will announce some specific hours when I will exclusively be in the office for this course. On most other days, an email appointment will be appreciated.
Email	rizwan_khalid@lums.edu.pk
Telephone	042-3560-8361
Secretary/TA	TBD
TA Office Hours	N/A
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 Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 mins
Tutorial (bi-weekly)	Nbr of Lec(s) Per 2 Weeks	1	Duration	75 mins

Course Distribution	
Core	BS EE, BS Physics, BS Chem E
Elective	SSE Elective
Open for Student Category	All LUMS undergraduate students
Close for Student Category	Graduate students

COURSE DESCRIPTION
The course is a first introduction to Electricity and Magnetism. The course will cover Electromagnetism using vector calculus. We will review static and dynamic electric and magnetic fields, as well as their inter-relationships. Students should be able to grasp electromagnetism as one phenomenon, and appreciate and understand Maxwell's equations in free space.

COURSE PREREQUISITE(S)
PHY 101: Mechanics

Learning Outcomes (CLOs)		Cognitive Level
1	Analyze electrostatic and magnetostatic field configurations	Analysis
2	Interpret time-varying electromagnetic fields (induction and waves in free space)	Analysis
3	Analyze basic circuits and circuit elements	Analysis

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Grading break up: Component Details and weightages
Assignments (15%): 5-7. The assignments shall be done in groups of 2 students each. A generous N-X policy shall be implemented. Assignments will normally be handed out on Wednesdays/Thursdays and will be due the following week on Friday at 5pm. Late submissions will be acceptable within two days albeit with a 20% penalty. **Quizzes (20%): Weeks 5, 13.** Quiz 1 tests material taught in the first four weeks, Quiz 2 tests material taught in Weeks 10-12. The quizzes are to be held in 75 minute sessions arranged at mutually agreeable times. An N-1 will be implemented. **Mid Term (25%):** A 75 minute Mid-term exam shall be held in Week 9. It will include all of electrostatics and magnetostatics. **Final Exam (40%):** Three hour comprehensive final exam on date given by the RO.
Grading Basis (Relative)
You will be graded on a normal curve.

Examination Detail		
Midterm Exam	Yes: Oral exam Separate: Duration: 75 minutes Preferred Date: Week 9 Exam Specifications: Based on electrostatics and magnetostatics (CLO1)	
Final Exam	Yes/No: Yes Combine/Separate: Combined Duration: 3 hours Exam Specifications: Comprehensive final exam.	

RELATION TO EE PROGRAM OUTCOMES

EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	CLO Attainment checked in
CLO1	PLO1, PLO2	Cog4	Instruction, Tutorial, Assignments	Midterm, Final
CLO2	PLO1, PLO2	Cog4	Instruction, Tutorial, Assignments	Midterm, Final
CLO3	PLO1, PLO2	Cog4	Instruction, Tutorial, Assignments	Midterm, Final

Campus supports & Key university policies

Campus Supports

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

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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)*

Course Overview		
Week#	Topics	CLOs
1-3	Introduction, vector calculus, Dirac delta function	CLO1
3-4	Electric charge and field, Linear superposition, Gauss's law	CLO1
5-6	Electrostatic potentials, electrostatic energy, capacitance, conductors in electrostatic equilibrium	CLO1
7-8	Magnetostatics, Biot-Savart law, Ampere's law	CLO2
9	Mid-term week, No class.	
10-11	Motional emf, Faraday's law, electromagnetic induction	CLO2
12-13	Basic DC circuits	CLO3
13-14	Maxwell's equations, plane EM waves	CLO2

Textbook(s)/Supplementary Readings		
1	**Introduction to Electrodynamics, 4th ed, David J Griffiths (DJG). Pearson 2013.** Griffiths is the most popular treatment of electrodynamics for the undergraduate student. This course will be mostly based on Griffiths.	
2	**Electricity and Magnetism, EM Purcell and DJ Morin. Cambridge University Press 2013.** This is an excellent treatment of electromagnetism at a level somewhat lower than Griffiths. The discussions in this book are particularly illuminating and nicely complement Griffiths.	
3	**The Feynman Lectures on Physics Vol (II), RP Feynman, RB Leighton and M Sands. Cambridge University Press 2013.** This is an excellent treatment of electromagnetism at a more introductory level. However, Feynman's unique insights make this an excellent companion for this course.	
4	**University Physics with Modern Physics, HD Young and RA Freedman, Pearson 2016.** In case the course text feels daunting, you may first read simplified descriptions from this wonderful introductory text.	

Course Policies	
Late Assignment	20% penalty for submissions that are up to two days late. Assignments not accepted thereafter.
Missed Assignment	Missed assignments shall be catered to by the N-X policy.
Missed Quiz/Exam	Please petition the SSS in case of a missed quiz/assignment.

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Course Readings: Refer to Textbook list above for color coding. [This section will be constantly updated during the course, ensuring that the reading list for the following week is always accessible to you.]		
Lec #	Topics	Readings*
1	Vectors and coordinate transformations, scalar and vector fields, gradient	1.1-1.2, Appendix F, 2.1-2.3
2	Divergence, curl and vector differential identities	1.2, Appendix F, 2.4-2.7
3	Integration of vector fields: line, surface and volume integrals, the fundamental theorem of calculus, divergence theorem	1.3, Appendix F, 3.1-3.3
4	Stokes' theorem, integration by parts, Curvilinear coordinates	1.3-1.4, Appendix F, 3.5-3.7
5	The Dirac Delta function, Helmholtz's theorem	1.5-1.6,
6	Electric charge, Coulomb's law and linear superposition	2.1, 1.1-1.4, 4.1-4.2

* While looking at the readings for Feynman Lectures, please note that Feynman labels his subsections as 2-1 instead of 2.1. I have, however, stuck to the 2.1 notation as I am using 2.1-2.3 to mean all sections between and including sections 2.1 and 2.3.