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Course Syllabus

1	**Course title**	Electricity and Magnetism-2
2	**Course number**	0342332
3	**Credit hours**	3
	Contact hours (theory, practical)	3 hours weekly (theory)
4	**Prerequisites/corequisites**	Electricity and Magnetism-1 (0302331)
5	**Program title**	B.Sc. in Physics
6	**Program code**	02
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Physics
10	**Course level**	3rd year
11	**Year of study and semester(s)**	2023-2024 Spring semester
12	**Other department(s) involved in teaching the course**	
13	**Main teaching language**	English
14	**Delivery method**	☒ Face to face learning ☐ Blended ☐Fully online
15	**Online platforms(s)**	☐Moodle ☐ Microsoft Teams ☐Skype ☐Zoom ☐ Others
16	**Issuing/Revision Date**	

17 Course Coordinator:

Name: Noureddine Chair	Contact hours: (10:00-12:00) Sunday Tuesday Thursday
Office number: 013	Phone number: 22023
Email: n.chair@ju.edu.jo	

18 Other instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19 Course Description:

As stated in the approved study plan.

Electrodynamics: electromotive force; Faraday's law; Maxwell's equations; potential formulations; energy and momentum; electromagnetic waves: The wave equation; electromagnetic waves in nonconductors and conductors; dispersion; electromagnetic radiation; electrodynamics and special relativity.

20 Course aims and outcomes:

A- Aims:

Providing students with a deep and rigorous understanding of Electricity and Magnetism that is appropriate for further studies or work in physics and technology

B- Students Learning Outcomes (SLOs):

For purposes of mapping the course SLOs to the physics program SLOs, at the successful completion of the physics program, graduates should acquire:

SLO (1) Master professionally a broad set of knowledge concerning the fundamentals in the basic areas of physics: Quantum Mechanics, Classical Mechanics, Electrostatics and Magnetism, Thermal Physics, Optics, Theory of Special Relativity, Mathematical Physics, Electronics.

SLO (2) Apply knowledge of mathematics and fundamental concepts in the basic areas of physics to identify and solve physics related problems.

SLO (3) Utilize computers and available software in both data collections and data analysis.

SLO (4) Utilize standard laboratory equipment, modern instrumentation, and classical techniques to design and conduct experiments as well as to analyze and interpret data.

SLO (5) Develop a recognition of the need and ability to engage in life-long learning.

SLO (6) Demonstrate ability to use techniques, skills, and modern scientific tools necessary for professional practice.

SLO (7) Communicate clearly and effectively in both written and oral forms.

SLO (8) Apply proficiently team-work skills and employ team-based learning strategies.

SLO (9) Apply professional and ethical responsibility to society.

Upon successful completion of this course, students will be able to:

Program SLOs

Course SLOs

	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1. Apply advanced mathematical techniques and methods in solving electromagnetic problems and understand and explain the physical meanings of final solutions.	✓	✓							
2. Use symmetries to simplify solutions of electromagnetic problems.									
3. Recognize that the various electromagnetic topics discussed in this course are elements of a coherent theory of electromagnetism described by Maxwell's equations.	✓	✓							
4. Understand Ohm's law and compute motional or Faraday-induced electromotive forces for a variety of situations.	✓	✓							
5. Use Faraday's Law to determine induced electric fields and the Maxwell-Ampère law to determine induced magnetic fields.									
6. Relate mutual (*M*) and self-inductance (*L*) to magnetic flux and induced electromotive force and currents and determine *M* and *L* for configurations with sufficient symmetry.	✓	✓							
7. Set up appropriate boundary conditions on the **E**- and **B**-fields and the auxiliary fields **D** & **H** at the interface of two different media.	✓	✓							
8. Calculate energy contained in electromagnetic fields from energy densities.	✓	✓							
9. Understand the continuity equation, Maxwell stress tensor, and conservation laws for charge, momentum, and energy in electromagnetic systems.									
10. Explain the physical significance of Poynting's theorem and use the Poynting vector **S**, along with the energy density, to solve problems involving the transfer of energy through electric and magnetic fields.	✓	✓							
11. Use Maxwell's Equations to derive the electromagnetic wave equations in free space and in matter, and obtain and work with their plane wave solutions, and describe their propagation in a single medium as well as their reflection and transmission at the interface of different media; and demonstrate knowledge of absorption and dispersion of EM waves.	✓	✓							
12. Solve boundary value problems for EM waves to describe their propagation in waveguides and transmission lines.									
13. Recognize the significance of gauge transformations and understand the concept of retarded time and compute scalar and vector potentials as well as **E**- and **B**-fields using the retarded time formalism for simple cases, including the special case of LiénardWiechert potentials for a moving point charge.									

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✓ ✓ ✓ ✓

✓ ✓

✓ ✓

14. Obtain and explain the mathematical forms of the **E**- and **B**-fields for electric or magnetic dipole radiation, and describe their ✓ ✓

21. Topic Outline and Schedule:

Week	Lecture	Topic	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Electrodynamics	1-8	**(Face to Face)**	Microsoft Teams	Synchronous **Lecturing**	First, Midterm Exam, Final Exam	Introduction to Electrodynamics By David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999 (or any later edition).
	1.2							
	1.3							
2	2.1							
	2.2							
	2.3							
3	3.1							
	3.2							
	3.3							

4	4.1	Conservation Laws	1,2,9,10					
	4.2							
	4.3							
5	5.1							
	5.2							
	5.3							
6	6.1							
	6.2							
	6.3							
7	7.1	Electromagnetic Waves	1,2,11,12					
	7.2							
	7.3							
8	8.1							
	8.2							
	8.3							
9	9.1							
	9.2							

	9.3							
10	10.1	Potentials and Fields	1,2,13					
	10.2							
	10.3							
11	11.1							
	11.2							
	11.3							
12	12.1							
	12.2							
	12.3							
13	13.1	Radiation	1,2,14					
	13.2							
	13.3							
14	14.1							
	14.2							
	14.3							
15	15.1							
	15.2							
	15.3							

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22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First Exam	20%	Electrodynamics, Conservation Laws	1-10	8th week	Paper Exam
Second Exam	30%	Electromagnetic Waves	1,2,11,12	13th week	Paper Exam
Final Exam	40%	All	1-14	16th week	Paper Exam

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

Textbook, computer, and internet access.

24 Course Policies:

A- Attendance policies:

Students are expected to attend all classes. Absence should not exceed 15%.

B- Absences from exams and submitting assignments on time:

Exam makeups will be arranged for students with valid absence excuses.

C- Health and safety procedures:

Students are required to abide by all mandated health and safety procedures.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

Cheating, plagiarism, and misbehavior will be dealt with according to University regulations.

E- Grading policy:

First Exam: 20%, Second Exam: 30%, Final Exam: 40%.

F- Available university services that support achievement in the course:

Microsoft Teams, E-Learning platform.

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25 References:

A- Required book(s), assigned reading and audio-visuals:

"Introduction to Electrodynamics," David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999 (or any later edition).

B- Recommended books, materials and media:

YouTube, Internet sources, Physics Labs

"Introduction to Electrodynamics," David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999 (or any later edition).

26 Additional information:

Name of Course Coordinator: Noureddien Chair Signature: Date:
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------