Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	2023/10/15
	Deans Council Approval Decision Number	265/2024/24/3/2
	The Date of the Deans Council Approval Decision	2024/1/23
	Number of Pages	06

1.	Course Title	Electricity and Magnetism-2
2.	Course Number	0342332
3.	Credit Hours (Theory, Practical)	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.	School/ Center	Science
8.	Department	Physics
9.	Course Level	3rd year
10.	Year of Study and Semester (s)	2025, second semester
11.	Program Degree	BSc
12.	Other Department(s) Involved in Teaching the Course	none
13.	Learning Language	English
14.	Learning Types	☒Face to face learning ☐Blended ☐Fully online
15.	Online Platforms(s)	☒Moodle ☒Microsoft Teams
16	Issuing Date	2025/2/15
17.	Revision Date	2025/2/15

18. Course Coordinator:

Name: Usama al Khawaja

Contact hours: Sunday, Tuesday, Thursday 11:30-12:30

Office number:

Phone number: 22023

Email: u.alkhawaja@ju.edu.jo

19. Other Instructors:

Name: [None] Office number: Phone number: Email: Contact hours:

20. Course Description:

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.

21. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

It is expected from the graduate in Bachelor Degree in Physics Program to be able to:

SO1: Identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of Mathematics and Science and/or technical topics to areas relevant to the discipline.

SO2: Formulate or design a system, process, procedure or program to meet desired needs

SO3: Develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions

SO4: Communicate effectively with a range of audiences in oral or written forms and exhibit ethical and professional values.

SO5: Reflect the impact of technical and/or scientific solutions in economic, environmental, and societal contexts.

SO6: Function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

PILO's	*National Qualifications Framework Descriptors*		
	Competency (C)	Skills (B)	Knowledge (A)
1.	☐	☐	☒
2.	☐	☐	☐
3.	☐	☐	☐
4.	☐	☐	☐
5.	☐	☐	☐
6.	☐	☐	☐

* Choose only one descriptor for each learning outcome of the program, whether knowledge, skill, or competency.

22. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

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 Liénard-Wiechert potentials for a moving point charge.

14. Obtain and explain the mathematical forms of the **E**- and **B**-fields for electric or magnetic dipole radiation, and describe their associated energy flow, intensity, and power.

Course ILOs #	**The learning levels to be achieved**						**Competencies**
	Remember	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**	
1			✓	✓			
2.			✓	✓	✓		
3.		✓	✓				
4.		✓					
5.			✓				
6.			✓	✓			
7.			✓	✓	✓		
8.			✓	✓			

9.		✓					
10.		✓		✓			
11.		✓	✓	✓	✓		
12.			✓				
13.		✓					
14.		✓	✓	✓			

23. The matrix linking the intended learning outcomes of the course -CLO's with the intended learning outcomes of the program -PILOs:

PILO's * / CLO's	1	2	3	4	5	5	Descriptors**		
							A	B	C
1	✓								✓
2	✓						✓		
3	✓						✓		
4	✓						✓		
5	✓						✓		
6	✓						✓		
7	✓						✓		
8	✓						✓		
9	✓						✓		
10	✓						✓		
11	✓						✓		
12	✓						✓		
13	✓						✓		
14	✓						✓		

***Linking each course learning outcome (CLO) to only one program outcome (PLO) as specified in the course matrix.**

****Descriptors are determined according to the program learning outcome (PLO) that was chosen and according to what was specified in the program learning outcomes matrix in clause (21).**

24. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Electrodynamics	1-8	Face to Face	Microsoft Teams	Synchronous	Quiz, 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		1,2,9,10					
	4.2							
	4.3							
5	5.1	Conservation Laws						
	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							

25. Evaluation Methods:

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

Evaluation Activity	***Mark wt.**	**CILO's**					
First Exam	25%	1-8					
Second Exam –If any	25%	1,2,9,10					

Final Exam	50%	1-14					
**Class work							
Projects/reports							
Research working papers							
Field visits							
Practical and clinical							
Performance Completion file							
Presentation/ exhibition							
Any other approved works							
Total 100%							

*** According to the instructions for granting a Bachelor's degree.**

****According to the principles of organizing semester work, tests, examinations, and grades for the bachelor's degree.**

First exam specifications table+

No. of questions/ cognitive level						No. of questions per CLO	Total exam mark	Total no. of questions	CILO/ Weight	CILO no.
Create **%10**	Evaluate **%10**	analyse **10%**	Apply %20	Understand **%20**	Remember %30					
0	0	1	1	1	0	3	25	3	100% [divided equally over the 8 CILOs]	1-8

+ Equal weight to all CILOs 1-8.

Mid-term exam specifications table*

No. of questions/ cognitive level						No. of questions per CLO	Total exam mark	Total no. of questions	CILO/ Weight	CILO no.
Create **%10**	Evaluate **%10**	analyse **%10**	Apply %20	Understand **%20**	Remember %30					
0	0	0	1	1	1	3	25	3	100%	1,2,9,10

									[divided equally over the 4 CILOs]	

Final exam specifications table

No. of questions/ cognitive level						No. of questions per CLO	Total exam mark	Total no. of questions	CILO Weight	CILO no.
Create **%10**	Evaluate **%10**	analyse **%10**	Apply %20	Understand **%20**	Remember %30					
0	0	1	1	0	1	6	50	6	100% [divided equally over the 14 CILOs]	1-14

26. Course Requirements:

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

Textbook, computer, and internet access.

27. 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: 25%, Midterm Exam: 25%, Final Exam: 50%.

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

Microsoft Teams, E-Learning platform, Moodle.

28. References:

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

1. "Introduction to Electrodynamics," David J. Griffiths, 4th Edition, Pearson 2012.

2. "Introduction to Electrodynamics," David J. Griffiths, 3rd Edition, Prentice Hall, New Jersey, 1999 (will be fine but to examples and problems numbers may be different than Ref.1).

B- Recommended books, materials and media:

1. "Classical Electrodynamics (Third Edition)" by John David Jackson, Publication date 1999.

29. Additional information:

Name of the Instructor or the Course Coordinator: Usama Al Khawaja	Signature:	Date: 23/02/2025
Name of the Head of Quality Assurance Committee/ Department	Signature:	Date:
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Name of the Head of Department	Signature:	Date:
……	……..……	……..……
Name of the Head of Quality Assurance Committee/ School or Center	Signature:	Date:
……	……..……	……..……
Name of the Dean or the Director	Signature:	Date:
……	……..……	……..……