



**Department of Physics**  
**College of Science**  
**University of Salahaddin**

**Electricity and Magnetism**

**(First Term and Second Term)**

**(1<sup>th</sup> Year Physics)**

Lecturer's name: **Dr. Nasih Hawramy**

Academic Year: 2022-2023

**Coursebook**

1. Course name	Electricity and Magnetism
2. Lecturer in charge	Dr. Nasih Hama Ghareeb Hma Hawramy
3. Department/ College	College of Science, Physics Department
4. Contact	E-mail: <a href="mailto:nasih.hmasalah@su.edu.krd">nasih.hmasalah@su.edu.krd</a>
5. Time (in hours) per week	Theory: 4.0 (Four only) Practical: 3
6. Office hours	At least 6 h/week
7. Course code	
8. Teacher's academic profile	I have received PhD in physics in October 2015 from Plymouth University, United Kingdom. Currently, my areas of research are Plasmonics, Nanofabrication, nanotechnology, and Biosensors.
9. Keywords	N/A
<b>10. Course overview:</b>	
<p>This course will through throughout the year. During that the students will study many physical aspects of electricity and magnetism. In this one year course students will also study Electric charge, The Electric Field, Electric flux ,Gauss' law ,Electric Potential, Capacitance, Electrical circuits, Magnetism and Maxwell's Equations.</p>	
<b>11. Course objective:</b>	
<p>During this course in Electricity and Magnetism. We will begin with an introduction to vector calculus. We continue with Coulomb's law of electrostatics, the introduction of the electric field and Gauss' Law. We then define electrical potential and we will look at the concepts of work and energy in Electrostatics followed by discussion of conductors, surface charge and electric fields, Electric flux ,Gauss' law ,Electric Potential, Capacitance, Electrical circuits, Magnetism and Maxwell's Equations.</p>	
<b>12. Student's obligation</b>	
<p>Students should attend all the lectures and they may take notes during the lectures. In addition, in class participation would be advantage for them to extend their knowledge and understand the module systematically.</p> <p>Attending the lectures regularly would be a crucial point for the students to consider. If the students missed few lectures, they would have difficulty to get back on the track.</p> <p>Furthermore, all exams and tests done with books closed, and, students have to take at least two compulsory exams with few class test and quizzes during the years of study.</p>	

<p><b>13. Forms of teaching</b></p> <p>During this course, I am using some ways to make the students engage with the lecture like power point slides explanation view, white board in the class and videos and animations to explain the theory of the subject with the explanation in the class. If there were slides that needed more explanation, or, if the slide needed a long, explanation and I thought that the students must know all of that, I would distribute the printed out version of the description on the students to widen their knowledge on the subject.</p>							
<p><b>14. Assessment scheme</b></p> <table border="0"> <tr> <td>Two or Three examinations</td> <td style="text-align: right;">30 %</td> </tr> <tr> <td>For each chapter one Quiz and Homework</td> <td style="text-align: right;">10%</td> </tr> <tr> <td>Final examination</td> <td style="text-align: right;">60%</td> </tr> </table>		Two or Three examinations	30 %	For each chapter one Quiz and Homework	10%	Final examination	60%
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<p><b>15. Student learning outcome:</b></p> <p>Students who took this course of Electricity and Magnetism would be able to understand Electric flux, Gauss' law, Electric Potential, Capacitance, Electrical circuits, perhaps Magnetism and Maxwell's Equations as well.</p>							
<p><b>16. Course Reading List and References:</b></p> <p>The main text books are:</p> <ol style="list-style-type: none"> <li>1. <i>Fundamentals Of Physics Extended, Halliday and Resnick, Jearl Walker, 10<sup>th</sup> Edition 2014 .</i></li> <li>2. <i>Physics for Scientists and Engineers, John W. Jewett, Raymond A. Serway, 6<sup>th</sup> Edition 2004.</i></li> <li>3. introduction to electrodynamics, david j. Griffiths.</li> <li>4. <i>electricity and magnetism, benjamin crowell.</i></li> </ol>							
<p><b>17. The Topics:</b></p> <p><b>First Term</b></p> <p><b><u>Week (1, 2, and 3):</u></b></p> <p>A tentative lecture schedule is:</p> <ul style="list-style-type: none"> <li>• Week 1: Review of Vectors and Vector Fields. Derivatives of a vector field.</li> <li>• Week 2, 3,4 and 5: The Electrostatic Field and Coulomb's Law. Divergence of Electrostatic Fields, Electric charge</li> </ul> <p>1.1 Electromagnetism as a fundamental force of nature  1.2 Coulomb's law  1.3 Conservation and quantization of charge.</p>	<p><b>Lecturer's name</b></p> <p>Dr. Nasih Hama Ghareeb</p>						

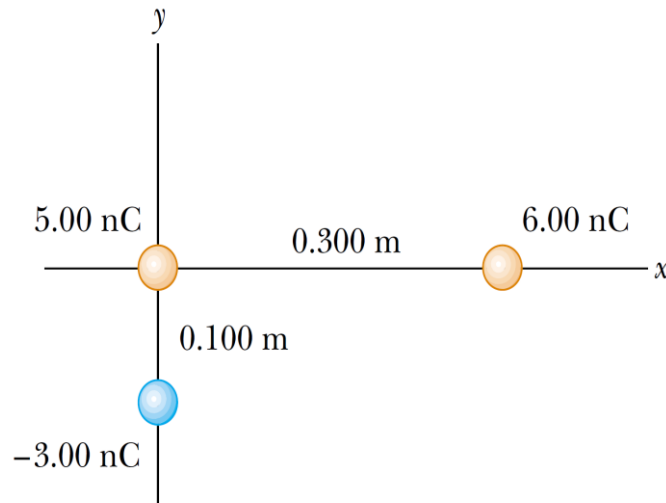
<ul style="list-style-type: none"><li>• Week 6, 7, 8 and 9 : The Electric Field</li><li>2.1 Electric field calculations for charge distributions of high symmetry</li><li>2.2 Electric flux</li><li>2.3 Gauss' law</li> <li>• Week 10, 11 and 12: Electric Potential</li><li>3.1 Equipotential surfaces</li><li>3.2 Calculation of potential due to c charge distributions of high symmetry</li></ul> <h2 style="text-align: center;">Second Term</h2> <ul style="list-style-type: none"><li>• Week 13, 14, 15 and 16: Capacitance</li><li>4.1 Combinations of capacitors</li><li>4.2 Energy storage in capacitors</li><li>4.3 Dielectrics</li><li>Electrical circuits</li><li>5.1 Series and parallel circuits</li><li>5.2 Kirchhoff's rules</li> <li>• Week 17, 18, 19 and 20: Magnetism</li><li>6.1 Force on a current-carrying conductor</li><li>6.2 Torque on a current loop</li><li>6.3 The magnetic dipole</li><li>6.4 Magnetic flux</li> <li>• Week 21, 22, 23 and 24: Sources of Magnetic Fields</li><li>7.1 The Biot-Savart law</li><li>7.2 Ampere's law</li><li>7.3 Magnetic force on a current-carrying wire</li> <li>• Week 25 and 26: Electromagnetic Induction</li><li>8.1 Faraday's law</li><li>8.2 Lenz's law</li> <li>• Week 27 and 29: Maxwell's Equations</li></ul> <p><b>Week 30:</b> { Ж Examination. }</p>	
<p><b>19. Examinations (sample) :</b></p>	

<p><i>College of Science</i> <i>Department of physics</i></p>	<p>First Stage Physics Electricity and Magnetism</p>	<p>Type: B Time: 3 Hours</p>
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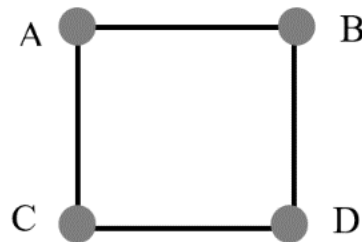
1) Three point charges are arranged as shown in the Figure.

Find the resultant force on the 5.00 nC charge.

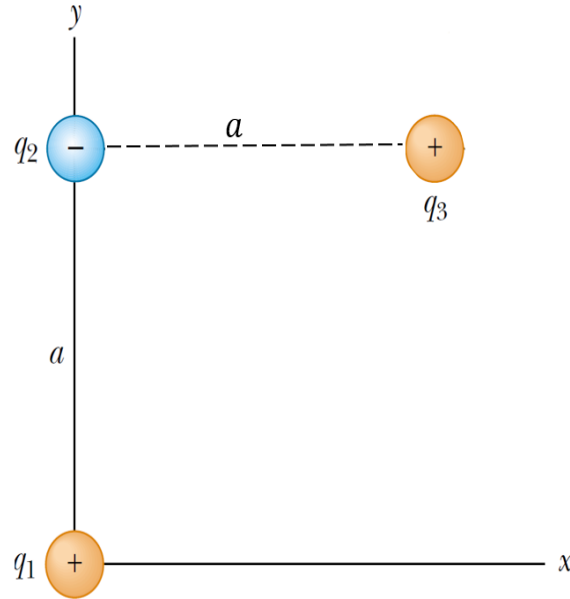
(5 marks)



2) Four charges  $q_1$ ,  $q_2$ ,  $q_3$  and  $q_4$  of magnitudes  $-2 \mu\text{C}$ ,  $+2 \mu\text{C}$ ,  $-2 \mu\text{C}$ , and  $+2 \mu\text{C}$  are arranged at the corners of a square ABCD (side length  $4.0 \text{ cm}$ ). What is the net force exerted on charge at B by the other three charges? (5 marks)



3) Consider three point charges located at the corners of a right triangle as shown in Figure , where  $q_1 = q_3 = 5\mu\text{C}$  and  $q_2 = -5\mu\text{C}$  . Find the resultant force exerted on  $q_3$  . (5 marks)



4) When a charge is created in an electroscope using another charged object that touches it is termed charging by: a) friction b) contact c) projection d) induction

(1 marks)

5) If an ebonite rod and a glass rod are brought together after being rubbed with fur, which of the following will happen? (1 marks)

- a) nothing
- b) they will attract each other
- c) they will repel each other
- d) they will first be attracted but when they touch they will then repel each other

6) Object **A** has a negative charge. Object **A** is repelled by object **B**. Object **B** is repelled by object **C** and attracted to object **D**. What are the charges on objects **B**, **C**, & **D**? (1 marks)

- a) B, C, & D are all negative
- b) B & C are negative, & D is positive
- c) B is negative, & C & D are positive
- d) B & D are positive, & C is negative

7) Metal ball **A** has a charge of **-8**, and metal ball **B** has a charge of **-2**. What will be the charges on the balls after they come in contact while remaining insulated from their surrounds?

(1 marks)

- a) A +2, B +8      b) A +2, B -4      c) A -5, B -5      d) A -8, B +6

8) A balloon is rubbed on carpet and assumes a charge. The balloon will only stick to:

- a) a metal door      b) a car roof      c) a refrigerator door      d) a wooden cabinet

(0.5 marks)

9) The Law of Static Electricity states all the following except: (0.5 marks)

- a) Both unlike and like charges attract
- b) Like charges repel
- c) Opposite charges attract
- d) Neutral objects are attracted to charged objects

GOOD LUCK

**Dr. Nasih Hama Gareeb**

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