

مختصر توصيف المقرر

:(Course Information)

معلومات المقرر *

اسم المقرر:	كهر ومغناطيسية 1
رقم المقرر:	فيز 2212
اسم ورقم المتطلب السابق:	فيز 2032
اسم ورقم المتطلب المرافق:	--
مستوى المقرر:	الرابع
الساعات المعتمدة:	3 (0+0+3)
Module Title:	Electromagnetism 1
Module ID:	PHYS 2212
Prerequisite:	PHSY 2032
Co-requisite:	--
Course Level:	Fourth
Credit Hours:	3 (3+0+0)

Module Description

وصف المقرر :

Review of vector Operations and algebra, Linear and rotational transformation of vectors, Review of vector differential calculus: (gradient, the divergence, the curl, product rules, Second Derivatives), Review of integral Calculus: (linear, surface, and volume integrals), Curvilinear Coordinates: (spherical, polar and cylindrical coordinates).

Coulomb's law, The electric field, Continuous charge distributions, Divergence and curl of electrostatic fields, Field lines and flux, Gauss's law and its applications, Electric potential, The potential of a localized charge distribution, The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution, Properties of conductors and induced charges, Surface charge and the force on a conductor, Capacitors, Poisson's equation, Laplace's equation in one, two and three dimensions. The Method of images and induced surface charge and calculating force and energy, Multipole expansion and approximate potentials at large distances. The monopole and dipole terms

The electric field of a dipole, Polarization, Field of a polarized object, Induced dipole and dielectrics, Polar molecules, Bound charges, The field inside a dielectric and the electric displacement, Force and energy in dielectric systems.

Magneto-statics and the Lorentz law, Magnetic fields and magnetic forces, The Biot-Savart law, The magnetic field of a steady current, The divergence and curl of the magnetic field, Ampere's law and its applications, Magnetic vector potential, Magnetic fields in matter and the magnetization, Magnetic materials: (diamagnetic, paramagnetic, ferromagnetic),

Torques and forces on magnetic dipoles, Effect of magnetic field on atomic orbits, The field of a magnetized object, Bound currents, The magnetic field inside matter and the auxiliary field, Ampere's law in magnetized materials.

Module Aims

أهداف المقرر :

1	To build the fundamental knowledge of vector algebra, differential and integral calculus so that students can apply the fundamental theorem for divergence and curl in appropriate electromagnetism problems.	1
2	To develop an understanding in electrostatic properties and related concepts for stationary charges, conductors and capacitors.	2
3	To elaborate the problem-solving skills in electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential.	3
4	To extend an understanding of the magnetic field for steady currents and moving charges and develop problem calculating skill in magnetic properties of simple current distributions using Biot-Savart and Ampère's laws.	4
5	To discuss electromagnetic induction and related concepts and teach calculations using Faraday and Lenz's laws.	5

Learning Outcomes:

مخرجات التعليم:

1	Students will be accomplished in the fundamental Concepts of Vector Algebra, Vector Calculus, electrostatics and magneto-statics.	1
2	Students will be able to apply the mathematical tools such as vectors, Line, Surface, Volume Integrals, Gauss theorem and Stock's theorem in solving Electric force, electric field, Electric flux, Magnetic field, magnetic flux and other electromagnetic related problems.	2
3	Students can be aware of the concepts behind specific electromagnetism problems and solve it in the right way.	3
4	Students can visualize and apply the problem-solving techniques related to electromagnetism.	4
5	Students can compile a report related to electromagnetism in a written form and will be able to present orally using appropriate scientific methods.	5

Course Contents:

محتوى المقرر:

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	Review of vector Operations and algebra, Linear and rotational transformation of vectors, Review of vector differential calculus: (gradient, the divergence, the curl, product rules, Second Derivatives
6	2	Review of integral Calculus: (linear, surface, and volume integrals), Curvilinear Coordinates: (spherical, polar and cylindrical coordinates).
6	2	Coulomb's law. The electric field, Continuous charge distributions, Divergence and curl of electrostatic fields, Field lines and flux, Gauss's law and its applications, Electric potential. The potential of a localized charge

		distribution. The work done to move a charge. The energy of a point charge distribution. The energy of a continuous charge distribution.
6	2	Properties of conductors and induced charges, surface charge and the force on a conductor, Capacitors, Poisson's equation, Laplace's equation in one, two and three dimensions.
6	2	The Method of images and induced surface charge and calculating force and energy, Multipole expansion and approximate potentials at large distances, the monopole and dipole terms The electric field of a dipole, polarization, field of a polarized object, Induced dipole and dielectrics, polar molecules, bound charges, the field inside a dielectric and the electric displacement, Force and energy in dielectric systems.
6	2	Magneto-statics and the Lorentz law, Magnetic fields and magnetic forces, The Biot-Savart law, The magnetic field of a steady current, The divergence and curl of the magnetic field
6	2	Ampere's law and its applications, Magnetic vector potential, Magnetic fields in matter and the magnetization, Magnetic materials: (diamagnetic, paramagnetic, ferromagnetic),
6	2	Torques and forces on magnetic dipoles, Effect of magnetic field on atomic orbits, The field of a magnetized object, Bound currents, The magnetic field inside matter and the auxiliary field, Ampere's law in magnetized materials.

Textbook and References:

الكتاب المقرر والمراجع المساندة:

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
5 th edition	prentice Hall publication	David J. Griffiths	Introduction to Electrodynamics
سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
4 th edition	Mc Graw Hill education	Joseph and Mahmood Nahvi	Schaum's Outline of Electromagnetics
0195387759	Oxford University Press	Matthew N. O. Sadiku	Elements of Electromagnetics