האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Electricity and magnetism for Odyssey program - 77099

Last update 15-08-2018

HU Credits: *6*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *Young Scientist*

Academic year: *0*

Semester: *Yearly*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Michal Sahaf*

Coordinator Email: *michal.sahaf@gmail.com*

Coordinator Office Hours: *By appointment*

Teaching Staff:
Dr. Jorge Palacio

Course/Module description:
This class teaches the basic concepts related to electromagnetic fields, interactions between electric charges, and an introduction to electric circuits and waves

Course/Module aims:
The students will acquire knowledge of the main concepts and equations governing electromagnetism.

Learning outcomes - On successful completion of this module, students should be able to:
On successful completion of this module, students should be able to: Solve problems in electromagnetism

Attendance requirements(%):
85

Teaching arrangement and method of instruction:

Course/Module Content:
Introduction - The forces of nature, basic principles of electricity and magnetism.

Electro-Statics:
1. Coulomb's Law, units and dimensions, charge distribution, superposition.
2. Electric field and flux - Gauss' Law (integral and differential form)
3. Gauss' Law (integral form) and divergence
4. Potential and Energy - Electrostatics, the rotor (curl), and conservative forces.
5. Poisson and Laplace equations - uniqueness and boundary conditions.
6. Conductivity - the image method.
7. Capacitance - placed in series or parallel, energy.
8. Electrostatic dipoles, the multipole expansion, forces, moment.
9. Dialectric materials and macroscopic polarization - the connection to the microscopic dipole, susceptibility, fields in polarized matter, the displacement field.

Currents and Magneto-Statics:

10. Current - current density and continuity, Darode model and resistance, Ohm's law, power, different configurations of resistors, Kirchhoff's laws.
11. Lawrence's force, the force between two wires, a charge in a a uniform magnetic field, the Hall effect.
12. Magnetism as a relativistic effect.
13. Bio-Savart's law, Ampere's law, vector potential, a current loop and the magnetic dipole.

Electrodynamics:
14. Inductance (self and mutual), RLC circuits, differential equations, transient response, impedance, the solution after a long time.
15. Displacement current.
16. Magnetic Materials.
17. A summary of Maxwell's equations - the differential and integral forms.
18. Electromagnetic waves - plane waves and stationary waves, energy flux and vector Poynting

Required Reading:
None

Additional Reading Material:
E. M. Purcell, Electricity and Magnetism, Berkeley physics Vol. 2, 2nd ed.

Grading Scheme:

Additional information:
None