



Syllabus

Electricity and magnetism for Odyssey program - 77099

Last update 15-08-2018

HU Credits: 6

Responsible Department: Physics

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. Dielectric 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, Drude model and resistance, Ohm's law, power, different configurations of resistors, Kirchhoff's laws.*
- 11. Lorentz's force, the force between two wires, a charge in a uniform magnetic field, the Hall effect.*
- 12. Magnetism as a relativistic effect.*
- 13. Biot-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.

Course/Module evaluation:

End of year written/oral examination 70 %

Presentation 0 %

Participation in Tutorials 0 %

Project work 0 %

Assignments 10 %

Reports 0 %

Research project 0 %

Quizzes 20 %

Other 0 %

Additional information:

None