

# PHYSICS

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Bachelor Degree:	MATHEMATICS		701G
Course title:	PHYSICS		816
Year/Semester:	1/2ND SEMESTER	ECTS Credits:	6

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## CONTENTS

UNIT 1: The Electric Field and the Electric Potencial:

- o Introduction
- o Coulomb Law.
- o The Electric Field. Electric field lines.
- o Electric field calculation for continuous distributions of charge.
- o Electric field flux. Gauss theorem and applications.
- Electric properties of conductors in a electric field.
- o Electric potential. Equipotential surfaces.
- o Electric potential calculation.
- o Electric potential energy.

## UNIT 2: Insulators. Capacitance.

- o Introduction.
- o Capacitance and capacitors.
- o Networks of capacitors.
- Electric properties of insulators in a electric field.
- o Energy stored in a capacitor.

## UNIT 3: Electric Current and Direct-Current (DC) Circuits

- o Introducction.
- o Electric current.
- o Ohm's Law. Electric resistence.
- o Conductivity and resistence.
- o EMF.
- o Networks of resistences.
- o Direct-current circuits. Kirchhoff's laws.
- o RC direct-current circuits.



#### UNIT 4: Magnetic Field.

- o Introduction.
- o The Lorentz force.
- o Motion of charged particles in electrostatic fields.
- o Lorentz Force on a current-carrying wire
- o Torque on a coil in a magnetic field.
- o The Boit-Savart Law. Applications.
- o Force between current-carrying currents.
- o Ampére's Law. Applications.
- o Magnetism in material.
- o Magnetization.
- o Paramagnetism and Ferromagnetism. Hysteresis.

#### UNIT 5: Magnetic Induction.

- o Introduction.
- o Magnetic flux. Faraday's Law.
- o Lenz' Law. Foucault currents.
- o Motional EMF.
- o Inductance and mutual inductance.
- o Magnetic energy.
- o RL circuits.

## UNIT 6: Alternating-current (AC) circuits.

- o Introduction.
- o .Electric generators and motors.
- o Resistance in AC circuits. RMS value.
- o Inductances and capacitors in AC circuits.
- o Electrical impedance.
- o RL and RC circuits. Phasors.
- o Complex impedance.
- o Series RLC circuit. Resonance.
- o Balance of electric power.
- o The transformer.

## UNIT 7: Maxwell Equations and Electromagnetic Waves.

- o Introduction.
- o Displacement currents.
- o Maxwell equations.
- o Electromagnetic waves. Electromagnetic spectrum.
- o Overview of generation and detection of electromagnetic waves.
- o Electromagnetic wave equation.





## REFERENCES

#### Title:

Physics for Scientifics and Engineers, volume 2. Authors: P. Tipler and G. Mosca Physics: Classical and Modern. Authors: F.J. Keller, W.E. Gettys and M.J. Skove.

# **EVALUATION SYSTEM**

Exam 60%

Online tests 15%

Lab experiments 15%

Solution of exercices in the small classroom group 10%

