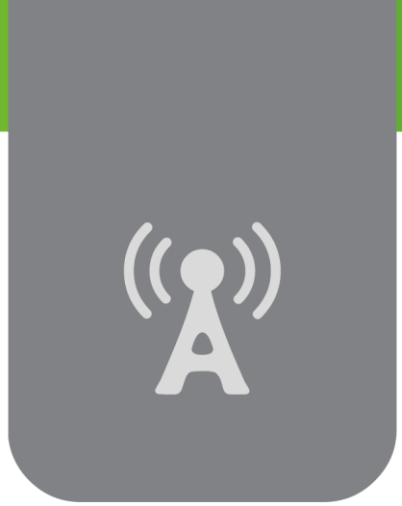

Introduction to Physics

Physics Course Definition File

1. Basic Information:

Course Name	Physics
Course ID	GPH101
Contact Hours (Registered Sessions)	30
Contact Hours (Synchronized Sessions)	18
Mid Term Exam	There is not
Exam	1.5
Registered Sessions Work Load	30
Synchronized Session Work Load	18
Credit Hours	5

2. Pre-Requisites: There is not

3. Course General Objectives:

The objective of this course is to introduce the student to the fundamentals of electrostatics and magnetostatics (whereas electrodynamics is introduced later in the 'Electromagnetic Theory and Transmission Lines' and 'Microwave Engineering' courses). In addition, this course introduces the nature and propagation of light. It concentrates on the definition and properties of the electric and magnetic fields, the basic methods used in determining them, and their recent applications. The student will be familiar, in this course, with the nature of light and the formation of images by thin lenses, in addition to two phenomena in waves: the interference and the diffraction.

4. Intended Learning Outcomes (ILO):

Code	Intended Learning Outcomes
ILO1	Identifying electric charge and Coulomb's law.
ILO2	Identifying the properties of conductors and insulators.
ILO3	Identifying the electric field, its properties and how to calculate it.
ILO4	Identifying electric field lines and the electric dipole.
ILO5	Identifying the electric potential and its relation with the electric field.
ILO6	Identifying capacitors, their connecting types and the notion of capacitance.
ILO7	Identifying the magnetic field, its properties and how to calculate it.
ILO8	Identifying the magnetic induction and the relation between electric and magnetic fields.
ILO9	Understanding the nature of light and its propagation, reflection and refraction, thin lenses
ILO10	Understanding the interference and diffraction phenomena and their applications.

5. Course Syllabus

(18 hours of total synchronized sessions)

- RS: Recorded Sessions; SS: Synchronized Sessions;

ILO	Course Syllabus	RS	SS	Type	Additional Notes
ILO1 ILO2	Electric charging of objects by rubbing, types of electric charge, conductors and insulators, explanation of electric charging, charging by induction, Coulomb's law, theorem of composition.	1.5	0	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO1 ILO2 ILO3	Electric field created by a point charge, theorem of composition, Electric field created by a charged body (ring, disc,	2.5	1.5	☒ Exercises ☐ Assignments ☐ Seminars	

	segment, plane)			☐ Projects ☐ Practices ☐ Others	
ILO3 **ILO4**	Electric field lines, electric dipole, effect of an external field on a dipole, electric field lines of electric dipole, electric field created by an electric dipole.	2.5	1.5	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO2 **ILO3** **ILO4**	Notion of electric flux, Gauss's law, application of Gauss's law, case of conductors at equilibrium.	2.5	1.5	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO2 **ILO3** **ILO4** **ILO5**	Electric potential energy, electric potential, equipotential surfaces, case of conductors, relation between electric field and electric potential.	2.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO2 **ILO3** **ILO4** **ILO5** **ILO6**	Definitions of capacitor and capacitance, planar and cylindrical capacitors, connecting capacitors in series or in parallel, electric energy stored in a capacitor, examples of some capacitors.	2.5	0	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO7	Magnetic forces and the magnetic field and lines, effect of a magnetic field in a moving charged particle and in a wire carrying electric current, magnetic field created by a moving charged particle,	4	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices	

	magnetic field created by a wire carrying electric current (Biot-Savart law), calculation of the magnetic field created by simple current distributions (segment, infinite straight line, ring).			☐ Others	
ILO7	Circulation of a magnetic field, Ampere's law, application of Ampere's law in some simple cases (infinite straight line, cylindrical bobine), flux of magnetic field, magnetic dipole,	4	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO7 **ILO8**	Faraday's law, Lens's law, induced electric field, mutual inductance and self-inductance, magnetic energy sored in a bobine.	2.5	1.5	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO9	Nature and propagation of light, reflection and refraction, total reflection, optical fiber, dispersion of light	1.5	0	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO9	Definition of thin lens, convergent and divergent lenses, law of lenses, formation of images in lenses, applications.	2	1.5	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO10	Interference of light and its conditions, case of two sources, diffraction of light, diffraction of Fraunhofer, application:	2	1.5	☒ Exercises ☐ Assignments ☐ Seminars	

	diffraction grating.			□ Projects □ Practices □ Others	

6. Assessment Criteria (Related to ILOs)

ISC	Interactive Synchronized Collaboration		Ex	Exams		Rpt	Reports
PF2F	Presentations and Face-to-Face Assessments		PW	Practice Work			

ILO Code	ILO	Intended Results	Assessment Type				
			ISC	PW	Ex	PF2F	Rpt
ILO1	Identifying the electric charging by rubbing and by induction, types of electric charge, Coulomb's law and its application, theorem of composition	Electric charge Columb's law, theorem of composition	X		X		
ILO2	Properties of insulators and conductors, electric field near the surface of a conductor in equilibrium and electric field inside it.	In insulators the charge is local and can not move from point to another, whereas in conductors it can move.	X		X		
		In conductor at equilibrium: the charge is distributed on the outer surface only.					

		E near the surface of a conductor at equilibrium is perpendicular at that surface outside the conductor and E−0 inside it.					
ILO3	Definition of E, calculation of E created by a point charge, by a set of charges or by a charged object (ring, infinite line), Gaus's law and its application	Determination of E created by a set of chargesor by a ring or by a line Flux of E Gauss's law and its application in some cases (sphere, infinite straight line, cylinder)	X	X	X		
ILO4	E lines, and electric dipole	Draw the E–lines in case of a point charge (+ or −) Define the electric dipole and its electric moment Draw the E–lines in case of	X	X	X		

		a dipole E created by a dipole					
ILO5	Electric potential (V) created by a point charge or by a set of charges or by a charged object (ring, line, between two plane), equipotential surfaces, relation between E and V	V created by a point charge	X	X	X		
ILO6	Forming a solid background for the understanding of wave propagation, antennas and microwave engineering.	Calculate the capacitance C of a planar and cylindrical capacitors, relation between C and the dielectric constant, capacitors in series and in parallel.	X	X	X		
ILO7	Magnetic Field B-lines, B created by a ring, a cylindrical solenoid and by a toroidal solenoid, Ampere's law and its application in the case of an infinite straight line.	Draw B-lines in some cases (ring, straight line, cylindrical solenoid, toroidal solenoid), B created by a ring, a cylindrical	X	X	X		

		solenoid and by a toroidal solenoid, Ampere's law and its application in the case of an infinite straight line.					
ILO8	Notion of magnetic induction, direction of induced current, Faraday's law and Lens's law.	Application of Faraday's law and Lens's law	X	X	X		
ILO9	Nature of light and its propagation, reflection and refraction of light, law of Descartes, definition of thin lens, types of lenses, image formation by a thin lens, application: the telescope.	Light has a dual nature (wave and particle), Descartes's law and its application, total reflection, and its application in fiber optics, convergent and divergent lenses, object–image relationship in thin lenses and its application, the telescope	X	X	X		
ILO10	Identifying the two phenomena: interference and diffraction of light, diffracting grating.	Explanation of interference of light and its	X	X	X		

		conditions, optical path, diffraction of light and its types, fringes of interference and fringes of diffraction, diffraction grating					

7. Practice Tools:

Tool Name	Description
Simulation of electric field and potential	https://phet.colorado.edu/en/simulation/charges-and-fields
	http://www.flashphysics.org/electricField.html
Simulation of thin lenses	https://phet.colorado.edu/en/simulation/geometric-optics

8. Main References

1. "University Physics", 13th edition, by HUGH D. YOUNG and ROGER A. FREEDMAN, Pearson Education, Inc, 2012 (Chapters 21, 22, 23, 24, 27, 28,29, 30, 33, 34, 35 and 36)
2. "Physics for Scientists and Engineers", 7th Edition, by Raymond A. Serway and John W. Jewett, Thomson Brooks/Cole, 2004 (Chapters 23, 24, 25, 29, 30, 31, 32, 35, 36, 37 and 38)

9. Additional References

http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html