Applied Physics 

PHY-106

**Semester fall 2022**

**Instructor Information**

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**Course Information**

Class Days & Timing &Location As per University Time table

**Course Description**

Applied Physics is an introductory course covering basic concept of electricity and magnetism. Electromagnetism is one of the four fundamental forces of nature, and is at the basis of almost any kind of device that we use on a daily basis. The course introduces electrostatics, magneto static and Maxwell’s equations and their applications to physical problems.

**Objectives**

• **Gain deeper understanding of Electricity and Magnetism:** Consolidate the understanding of fundamental concepts in Electricity and Magnetism more rigorously as needed for further studies in physics, engineering and technology.

• **Advance skills and capability for formulating and solving problems:** Expand and exercise the students’ physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problems.

**LEARNING OUTCOMES**

Having successfully completed this course, students will be able to demonstrate knowledge and understanding of:

• The use of Coulomb's law and Gauss' law for the electrostatic force

• The relationship between electrostatic field and electrostatic potential

• The use of the Lorentz force law for the magnetic force

• The use of Ampere's law to calculate magnetic fields

• The use of Faraday's law in induction problems

**TEXTS AND SUPPORTING MATERIALS**

1. **Fundamentals of Physics (Extended), 10th edition, Resnick and Walker**

2. Narciso Garcia, Arthur Damask, Steven Schwarz., “Physics for Computer Science Students”, Springer Verlag, 1998University Physics, Freedman. Young. 10th and higher editions.

**Policies**

**General Policies**

• Attendance is expected and failure to attend regularly will have an adverse impact on your grade. 100% attendance is strongly recommended for this course. • Almost all the lectures/assignments will be followed by a quiz related to the lecture/assignment, and will be part of the assignment grade.

• We may have extra Quizzes that can be announced and graded separately. • Interactive class sessions are preferred. Therefore, class participation will be much appreciated as well as graded.

**Academic Dishonesty**

Academic dishonesty will not be tolerated. Copying materials from other sources (your peers, books, internet) without proper referencing and acknowledge of the source is a serious offense and will be dealt with severely.

**Assignments**

• You are required to submit the homework as an individual. You will be graded also on degree of active, prepared participation, rather than problem-solving success only. • Assignments are important and deadlines will be strictly adhered to.

**Grading**

There will be five in-class quizzes, a Midterm Exam and a Final

Exam. Grades for the course will be based on the following

Weighting:

|  |  |
| --- | --- |
| Assignments | 15% |
| Quizzes | 10% |
| Presentation | 20% |
| Midterm | 20% |
| Final Exam | 30% |
| Viva | 5% |

Students must complete each component of the assessment to the satisfaction of the course instructor, and achieve an overall mark of **at least 40%** in order to pass the course. All components of the above assessment are compulsory, and must be completed in order to obtain a pass grade. Students are expected to perform satisfactorily in each item.

**Tentative Lecture Plan**

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| --- | --- | --- |
| **Lectures** | **Topics** | **Text Book\*** |
|  | **Electrostatics** |  |
| **1 – 4** | **Electric force and its applications and related problems**  • Introduction  • Electric Charge, Particles, Atoms, Removal of electrons • Conductors, semiconductors, insulators, Superconductors • Conservation of charge and Examples  • Charge quantization Examples  • Coulombs Law | **Chapter 21** |
| **5– 7** | **Electric Field**  • Electric fields  • Different charge configurations  • Superposition principle  • Point charge and lines of force.  • Ring of charge and related examples  • Disk of charge and related examples  • A point charge in an electric field,  • Dipole in a n electric field and related examples | **Chapter 22** |
| **8- 11** | **Flux and Gauss’s Law**  • The flux of vector field,  • The flux of electric field, Gauss ‘Law,  • Application of Gauss’ Law, related examples  • Spherically symmetric charge distribution, related examples • A charge isolated conductor | **Chapter 23** |
| **12-14** | **Electric potentials**  • Electric potential energy  • Electric potentials  • Calculating the potential from the field and related problem • Potential due to point and continuous charge distribution • Potential due to dipole, equipotential surfaces  • Calculating the field from the potential | **Chapter 24** |
| **15** | **Revision, Problem discussion** |  |
| **Mid Term Exam** | | |
|  | **Magnetism** |  |
| **17 – 18** | **Current**  • Electric current  • Current density  • Drift velocity  • Relationship with Electric field and Current density | **Chapter 26** |

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| --- | --- | --- |
|  | • Introduction to Resistance and Resistivity  • Conductivity and related examples  • Ohm’s law and its applications with examples |  |
| **19-23** | **Magnetic Fields**  • Introduction to magnetic fields  • The Hall effect and related examples  • The magnetic force on a current  • The Biot- Savart law and related examples  • Line of B  • Amperes’ s Law and related examples  • Faraday’s experiments, Faraday’s Law of Induction and related examples  • Lenz’s law  • Problems | **Chapter 28-**  **29** |
| **24-27** | **The basic equation of electromagnetism**  • Induced Magnetic field,  • The displacement current,  • Reflection and Refraction of light waves,  • Total internal reflection,  • Two source interference,  • Double Slit interference, related problems,  • Interference from thin films,  • Diffraction and the wave theory, related problems, |  |
| **28-29** | **Problem discussion, Revision** |  |

\*Fundamentals of Physics (Extended), 10th edition, Resnick and Walker