**COURSE INFORMATION SHEET**

**(For Theory Based Course)**

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| **Session:** | Fall-2023 |
| **Course Title:** | Applied Physics |
| **Course Code:** | MS-111T |
| **Credit Hours:** | 3 |
| **Semester:** | 1st |
| **Pre-Requisites:** | None |
| **Instructor Name:** | Rabiya Tahir |
| **Email and Contact Information:** | [ratahir@ssuet.ed](mailto:ratahir@ssuet.ed)u.pk |
| **WhatsApp Group** | Applied Physics CS fall 2023 |
| **Office Hours:** | *9:00 am – 5:00 pm* |
| **Mode of Teaching:** | Synchronous/Asynchronous/ Hybrid/Blended |

**COURSE OBJECTIVE:**

The objective of Applied Physics course is to know the basic laws, definitions, concepts, theories of Physics in engineering fields. The course taught to cover several branches of Physics in detail such as Electrostatic, Electromagnetism, Semi-Conductors, Magnetic properties of materials, Waves and Oscillation, and Light. Furthermore, this course will give theory and practical understanding of the above-mentioned branches

**COURSE OUTLINE:**

Properties of electric charge, Conservation of charge, Quantization of charge, Coulomb’s law Electric field, Electric field due point charge, Infinite line of charge, Ring of charge, Disk of Charge, Dipole of an electric field, Electric dipole moment, Electric flux, Gauss’s law and it’s applications, spherical symmetric charge distribution. Electric potential, Potential difference, Potential due to dipole, Equipotential surfaces. Capacitors, Parallel plate capacitor, Capacitance with Dielectric, Energy stored in charged capacitor, energy density, Electric current, Ohm’s Law, Conductivity and resistivity. Biot Savart Law, Lines of Magnetic field, Two parallel conductors, Ampere’s law and it’s applications, Magnetic field of Solenoid and Toroid. Faraday’s law of induction, Lenz’s law, Motional emf, Equations for electromagnetism. Magnetic properties of matter: Ferro, Para and diamagnetism, Hall’s effect. Waves and oscillation. Theory of light, Interference, Conditions of Interference, Superposition of waves, Young Double Sit experiment, Interference by thin films, slit diffraction. Diffraction, Fraunhafer & Fresnel diffraction, Polarization, Polarization sheet and Double refraction. Conduction of Electrons in a Metal, Semiconducting materials Semiconductor Physics and Devices: Conduction of Electrons in Semi conducting materials, Free electrons & holes N-type, P type Semi-conductors. Energy gap (Band) PN Junctions, Biasing, Characteristics curve of PN Diode. Zener diode and it’s characteristic curve, Bipolar Junction Transistor (BJT) & it’s characteristic, Saturation point, cutoff point, Q

point. Transistor as an amplifier and as switch, Junction Field Effect Transistor (JFET) & it’s characteristics as an amplifier

**COURSE LEARNING OUTCOMES (CLOs) and its mapping with Program Learning Outcomes (PLOs):**

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| --- | --- | --- | --- |
| **CLO No.** | **Course Learning Outcomes (CLOs)** | **PLOs** | **Bloom’s Taxonomy** |
| 1 | **Use** analytical approach for diverse concepts of Electrostatic and Magnetism. | PLO\_2  (Problem Analysis) | C3  (Applying) |
| 2 | **Describe** the concept of semiconductor devices and properties of magnetic materials. | PLO\_1  (Academic Education) | C2  (Understanding) |
| 3 | **Develop** comprehensive knowledge of Wave and Oscillation | PLO\_1  (Academic Education) | C3  (Applying) |

**RELATIONSHIP BETWEEN ASSESSMENT TOOLS AND CLOs:**

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| --- | --- | --- | --- |
| **Assessment Tools** | **CLO-1 (39)** | **CLO-2 (28)** | **CLO-3 (33)** |
| **Quizzes** | 5.12% (2) | 14.28% (4) | 12.12%(4) |
| **Assignments** | 5.12% (2) | 14.28% (4) | 12.12% (4) |
| **Midterm Exam** | 76.92% (30) | - | - |
| **Final Exam** | 12.82% (5) | 71.42% (20) | 75.75% (25) |

**GRADING POLICY:**

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| --- | --- |
| **Assessment Tools** | **Percentage** |
| Quizzes | 10% |
| Assignments | 10% |
| Midterm Exam | 30% |
| Final Exam | 50% |
| **TOTAL** | **100%** |

**Recommended Book:**

***Textbook:***

* Resnick, Halliday and Krane ***“Physics***” Volume II,

5th Edition,

Published by John Wiley & Sons. 2010

ISBN NO. 9780471401940

<https://books.google.com.pk/books?id=hAZ-DwAAQBAJ&pg=PR5&dq=ebooks+free+download+PHYSICS+HALLIDAY&source=gbs_selected_pages&cad=2#v=onepage&q&f=false>

* Resnick, Halliday and Krane ***“Physics***” Volume I and II,

5th Edition,

Published by John Wiley & Sons. 1992

<http://www.mediafire.com/file/5cvz8b5zzrjv40b/Physics_-_Halliday_Resnick_Krane_-_%25285th_Edition%2529.pdf/file>

***Reference Books:***

* Serway Raymond, W. Jewett John

***“Physics for Scientist and Engineers with Modern Physics***”,

9th Edition,

Publisher: Physical Sciences: Mary Finch Publisher,

Physics and Astronomy: Charlie Hartford

2014, 2010, 2008 by Raymond A. Serway

<https://jsnegroup.net/data/GENERALPHYSICS(2)-Book_9thedition-Bookphy1019th-civilianteam.pdf>

**LECTURE PLAN**

**Course Title: Applied Physics**

**Course Code: MS-111 (T)**

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| --- | --- | --- | --- | --- |
| **Week No.** | **Week Dates** | **Topics** | **Required Reading** | **Key Date** |
| **1** | 3-10-2023  5-10-2023 | Properties of Electric charge, Coulomb’s Laws, Electric field, Infinite line of charge, Numerical | Book: Halliday Resnik, V2  Chap: 25:  Pg: 567-576  Chap: 26:  Pg: 587-600 |  |
| **2** | 10-10-2023  12-10-2023 | Ring of charge. Electric dipole.  Gauss’s Law and its applications, | Book: Halliday Resnik, V2  Chap: 27  Pg: 611-617 |  |
| **3** | 17-10-2023  19-10-2023 | Electric potential, Potential difference, equipotential surface. Numerical | Book: Halliday Resnik, V2  Chap: 27  Pg: 611-617 | Assignment # 1 |
| **4** | 24-10-2023  26-10-2023 | Capacitor, capacitance with dielectric, Energy stored in a capacitor, Numerical | Book: Halliday Resnik, V2  Chap 35  785,770 | Quiz # 1 |
| **5** | 31-10-2023  2-11-2023 | Electric current, Ohm’s Law,  Conductivity and resistivity. Faraday’s Law, Lenz’s Law | Book: Halliday Resnik, V2  Chap:29  Pg:663-668  Chap: 34  Pg: 775-779 |  |
| **6** | 7-11-2023  9-11-2023 | Biot Savart Law, Lines of magnetic field, two parallel conductors. | Book: Halliday Resnik, V2  Chap: 33  Pg: 749-756 |  |
| **7** | 14-11-2023  16-11-2023 | Ampere’s Law & its applications. Numerical Equations for electromagnetism, | Book: Halliday Resnik, V2  Chap: 33  Pg: 757-762 | Assignment # 2 |
| **8** | 21-11-2023  23-11-2023 | Magnetic properties of materials, Para & Diamagnetism, Ferromagnetism, Hall’s effect. | Book: Halliday Resnik, V2  Chap:35  Pg: 801-808 |  |
| **9** | **Midterm Examination**  **(4-12-2023 to 9-12-2023)** | | | |
| **10** | 28-11-2023  30-11-2023 | Waves and oscillations. SHM oscillators and numerical | Book: Halliday Resnik, V2  Chap:17  Pg: 373-381 |  |
| **11** | 5-12-2023  7-12-2023 | Theory of light,  Interference and its condition Superposition of waves, Young double slit experiment,  Interference Numerical | Book: Halliday Resnik, V2  Chap: 41  Pg:941-946 |  |
| **12** | 12-12-2023  14-12-2023 | Diffraction, Fraunhofer & Fresnel Diffraction, Single slit diffraction Numerical | Book: Halliday Resnik, V2  Chap: 42  Pg:963-966 | Quiz # 2 |
| **13** | 19-12-2023  21-12-2023 | Reflection and Refraction of light waves, Total internal reflection.  Polarization, polarization sheet and double refraction | Book: Halliday Resnik, V2  Chap: 44  Pg:999-1004 | Assignment # 3 |
| **14** | 26-12-2023  28-12-2023 | Semi-Conductor, energy gap (Band)  N-type, P-type semiconductors, P-N Junction, Biasing, Characteristic curve of diode | Book: Halliday Resnik, V2  Chap: 49  Pg:1103-1113 |  |
| **15** | 2-1-2024  4-1-2024 | Zener diode and it’s characteristic curve, | Book: Halliday Resnik, V2  Chap: 49  Pg:1114-1116 | Quiz # 3 |
| **16** | 9-1-2024  11-1-2024 | BJT and it’s characteristic, Saturation point, cutoff point, Q point | Book: Halliday Resnik, V2  Chap: 49  Pg:1114-1116 |  |
| **17** | 16-1-2024  18-1-2024 | BJT as an amplifier and as switch,  JFET and its characteristics | Book: Halliday Resnik, V2  Chap: 49  Pg:1117-1120 |  |
| **Final Examination**  **(29-1-2024 to 10-2-2-2024** | | | | |

**Instructor Name:Rabiya Tahir**