

PHYSICS II Course Outline

Term: Autumn 2021

Text Book: Fundamentals of Physics, Halliday, Resnick, and Walker

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Course Learning Outcome: (what students will be able to do after completing the course.)

- ❑ Explain the diffraction phenomena and apply the laws of diffraction.
- ❑ Explain photoelectric effect, Compton scattering, and black body radiation.
- ❑ Explain matter-wave, particle properties of waves, and apply the laws.
- ❑ Describe Heisenberg's uncertainty principle
- ❑ Explain Rutherford's Experiment and the properties of the nucleus.
- ❑ Describe radioactive decay, calculate decay constant, and different modes of nuclear radiation.
- ❑ Students can solve problems with moderate mathematical complexity related to diffraction, wave-particle duality, and nuclear phenomena.

Course content:

Diffraction and polarization:

Definition of diffraction, types of diffractions, Condition for minima in single slit diffraction, Condition for maxima in double-slit diffraction. Diffraction grating and X-ray Diffraction, Uses of X-ray Diffraction, Condition for maxima in X-ray diffraction, Bragg's Law. Brief introduction of polarization, the polarization of electromagnetic waves. Use of polarization (Holography, LCD, Sunglasses, etc.).

The Nature of Light and matter:

Wave properties of Light, Photoelectric effect, Compton Scattering, Thermal Radiation. Stefan-Boltzmann's Law & Wien's Law. Wave-Particle Duality and

Matter Wave (de Broglie wave), Heisenberg's Uncertainty Principle, Wave Function, and Schrodinger's Equation.

Nuclear Physics:

Rutherford's Alpha particle scattering experiment, Nuclear Properties (Nuclear Radii, Nuclear masses, and binding energies), Radioactive decay, Equation for Radioactive Decay, Half-Life, and its equation*, Alpha decay, Conditions for Alpha decay, Beta Decay, Gamma Ray, Damages caused by Alpha-beta-gamma rays, Radioactive (Carbon) Dating and Nuclear Reactions.

Please note:

- ❑ You should solve all relevant math problems that are worked out in the text and similar problems from the exercise.
- ❑ The questions will be simple and will try to find whether you understand the basics. You should write short but to the point answers.
- ❑ You must know the real-life use of every technology discussed in the class. If you derive any formula, make sure you can draw the related graph too.
- ❑ If you solve a mathematical problem, make sure, you use all the information given in the question and write the proper unit.
- ❑ During individual exams, you can't copy or reproduce another person's work as yours nor you can take help from others. However, in group assignments, you are allowed to cooperate. If anyone fails to comply with the above rules, s/he will follow the consequences.

Assessment/Marking Scheme:

Class participation and discussion,	: 40
Quiz, MCQ, and short Q/A	
Group Assignment	: 20
Individual Assignment	: 40
TOTAL	: 100

If you have any questions, please feel free to ask a question in Google Classroom or send an email.

Generic Skills or soft skills:

The skills listed below are called soft skills and are necessary for every graduate of Computer Science or Software Engineering. An employer looks for those skills in a graduate. If you acquire them, they will help you get a good job and maintain a sound profession. They are not related to this course rather related to the whole program B.Sc. (Engg.) in CSE/SE and everyone should be aware of them.

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| 1. Intellectual skills | 2. Practical and Problem-solving skills |
| 3. Scientific and Analytical skills | 4. Entrepreneurship and Innovation skills |
| 5. Communication & IT skills | 6. Values, Ethics and Morality |
| 6. Teamwork & Leadership skills | 7. Professionalism |
| 7. Social skills & responsibilities | 8. Lifelong Learning skills |