



Photographer Ben Hattenbach captured a shot of the polar light (also known as Aurora) from Alaska. You can learn more about polar lights from [Wikipedia](#).

# Course Outline: Physics II

*Term: Autumn 2020 :: Credit: 3*

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

## Course Teachers

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## Introduction

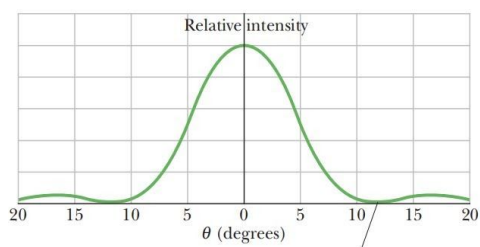
This is an introductory course on Physics. The main topic of the course is diffraction, wave nature of atomic and sub-atomic particles, particle nature of waves, and nuclear physics.

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

- ❑ Explain the diffraction phenomena and apply the laws of diffraction.
- ❑ Explain the 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:

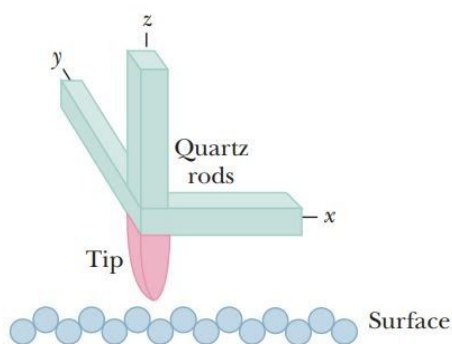


Definition of diffraction, types of diffractions, Condition for minima in single slit diffraction, Condition for maxima in double-slit diffraction. Diffraction grating and X-ray Diffraction, Uses of Xray Diffraction, Condition for maxima in X-ray

diffraction, Bragg's Law. Brief introduction of polarization, the polarization of electromagnetic waves. Use of polarization (Holography, LCD, Sunglasses, etc.).

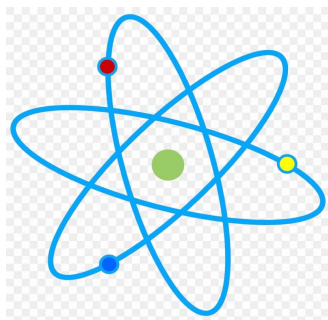
#### The Nature of Light and matter:

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.



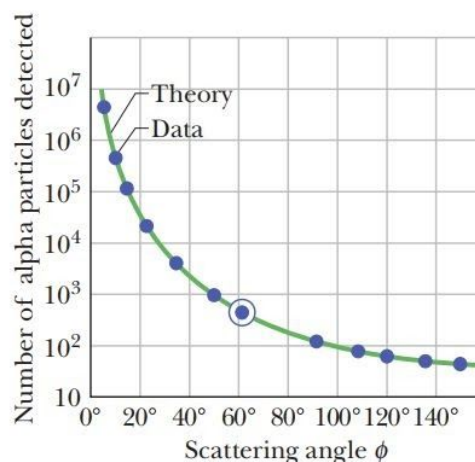
**Figure 38-19** The essence of a scanning tunneling microscope (STM). Three quartz rods are used to scan a sharply pointed conducting tip across the surface of inter-

### 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,



**Figure 42-2** The dots are alpha-particle scattering data for a gold foil, obtained by

Beta Decay, Gamma Ray, Damages caused by Alpha-beta-gamma rays, Radioactive (Carbon) Dating, and Nuclear Reactions.

### Please note:

- Solve all worked out math problems in the text and similar problems from the exercise. Make sure, you use all the information given and write the proper unit.
- The questions in the exams 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.
- 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,

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you are allowed to cooperate. If anyone fails to comply with the rule, s/he will follow the consequences.

### Assessment/Marking Scheme:

We shall use multiple techniques to assess your achievement. The following is a mark distribution for this course.

|                                       |      |
|---------------------------------------|------|
| 1. Class participation and discussion | :10  |
| 2. Group Assignment                   | :20  |
| 3. Quiz (MCQ and short Q/A)           | :30  |
| 4. Mid-term Assignment                | :20  |
| 5. Final Assignment                   | :20  |
| 6. TOTAL                              | :100 |

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

### Generic Skills or soft skills:

The skills listed below are called soft skills and are necessary for every graduate of CSE. 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 and everyone should be aware of them.

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
7. Teamwork and Leadership skills
8. Professionalism
9. Social skills and responsibilities
10. Lifelong Learning skills