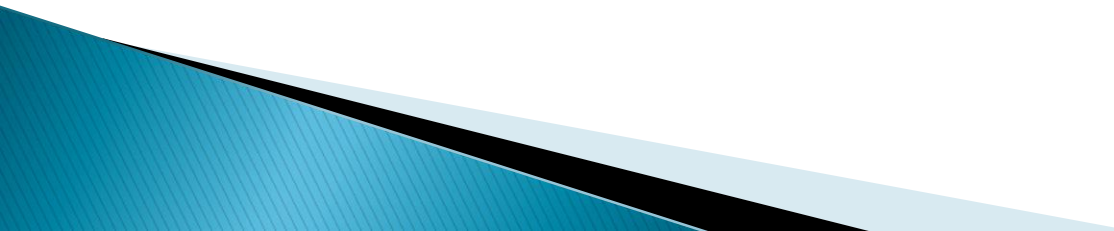


PHY 203- PHYSICS III

Introduction to Modern Physics



BOOKS

Optics:

Physics II For Scientists And Engineers (Textbook)

Authors : Serway ve Beichner

Chapters: 35-38

Optics

Author : Eugene Hecht

Modern Physics:

Physics III For Scientists And Engineers (Textbook)

Authors : Serway ve Beichner

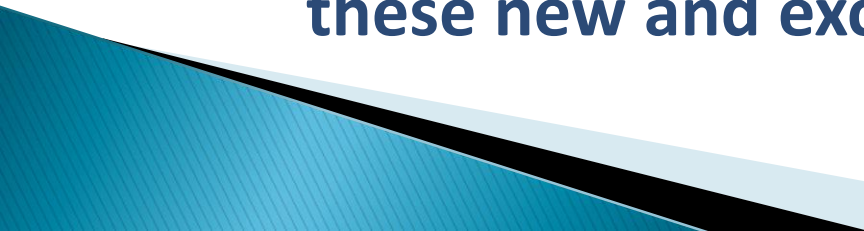
Chapters: 39-42

Modern Physics for Scientists and Engineers

Authors : S. T. Thornton ve A. Rex

Chapters: 1-10

Modern Physics is Physics of 20th Century

- 19th century physicists thought they had it all together.
 - There were a lot of surprises for them.
 - Modern physics is the story of these surprises.
 - Modern physics is the physics that changed the world.
 - The aim of this class is to introduce you to these new and exciting topics.
- 

What are the differences between classical physics and modern physics?

Classical physics:

Physics developed before 1895.

Deals with matter that can be seen and energy.

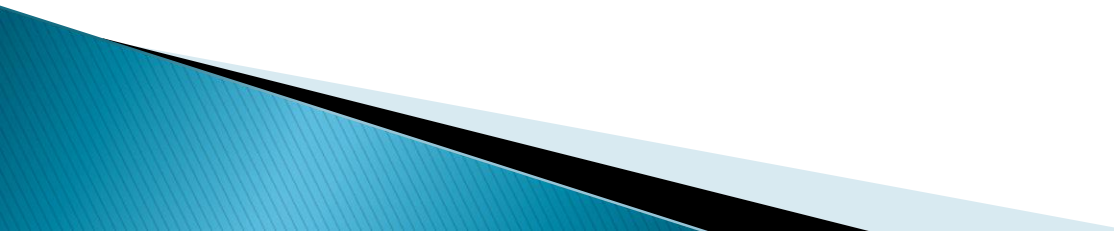
There are a lot of inventions based on classical physics such as automobiles, electric generation, CD players, space crafts, ABS breaks etc.

Modern physics:

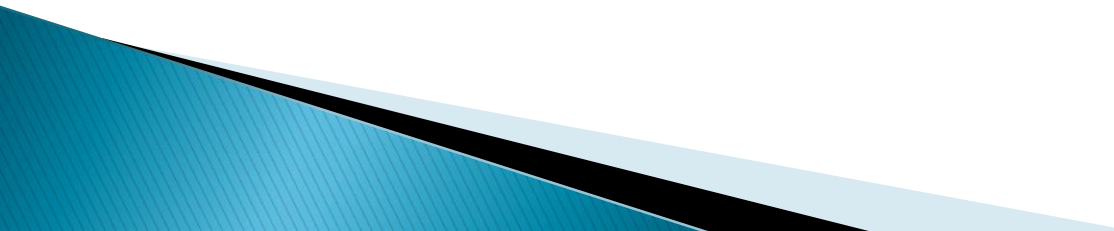
Physics developed after 1895.

Deals with very small and very big objects and energy.

What are the subjects of classical physics?

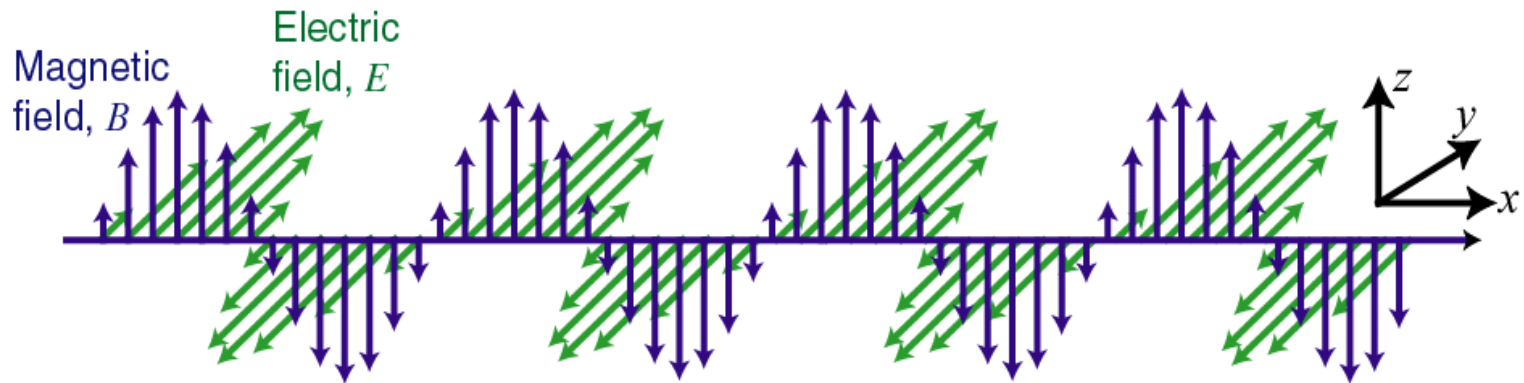
- ▶ Classical physics of 1890s
 - Mechanic-Galileo, Newton
 - Electromagnetism-Maxwell
 - Thermodynamics
 - ▶ Kinetic theory of gases
 - ▶ Waves and particles
 - ▶ Conservation principles and fundamental forces
 - ▶ Atom theory
- 

Subjects of this lectures?

- ▶ Nature of light and optics
 - ▶ Relativity
 - ▶ Introduction to quantum physics
 - ▶ Quantum mechanics and atom physics
- 

Light is an electromagnetic wave.

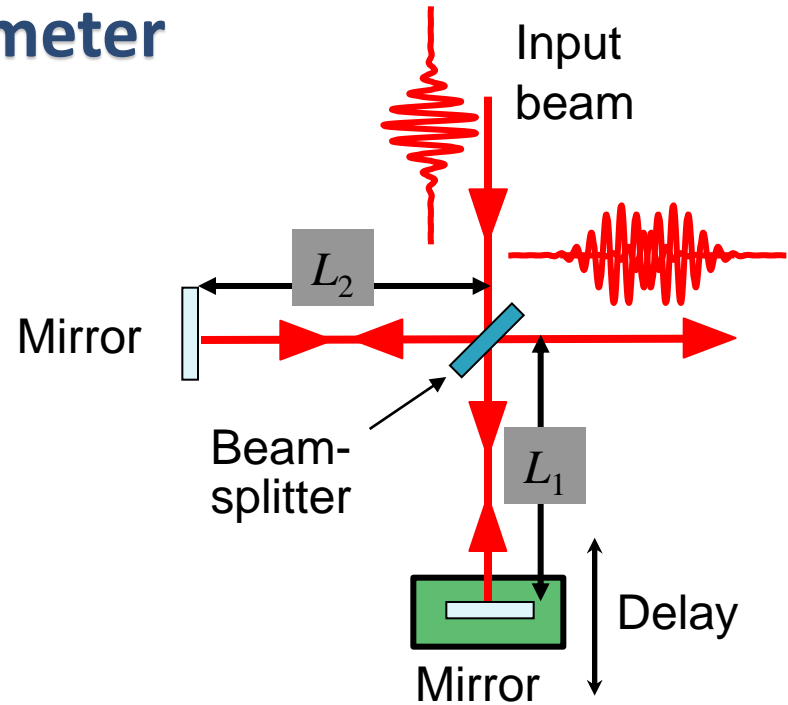
- The electric (E) and magnetic (B) fields are in phase.



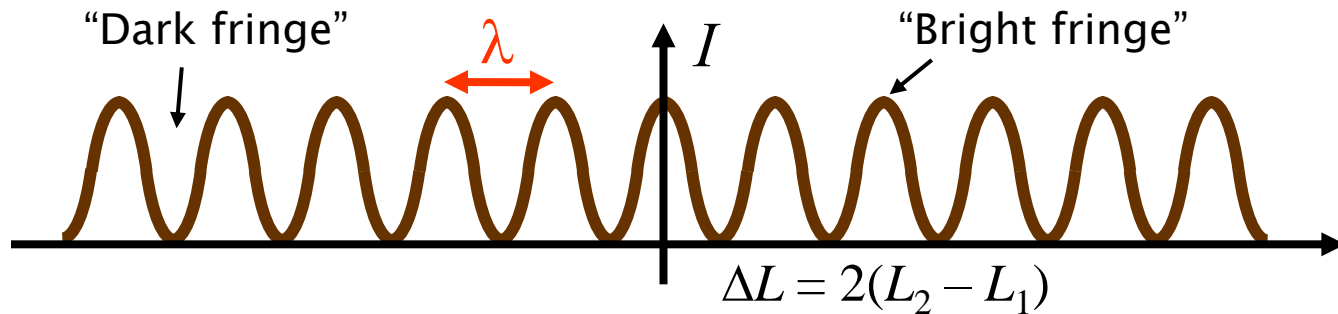
The electric field, the magnetic field, and the propagation direction are all perpendicular.

The Michelson Interferometer

- The Michelson Interferometer deliberately interferes two beams and so yields a sinusoidal output intensity vs. the difference in path lengths.



Fringes (in delay)



What did Michelson & Morley change?

Before the experiment of Michelson-Morley it was thought that classical physics was enough to explain every physical phenomena?

After the experiment it was obvious that classical physics could not explain the followings:

- 1- Matter moving with very high speed
- 2- Matter with big scales (gravitational forces)
- 3- Matter with small scales (atoms, electrons, etc.)

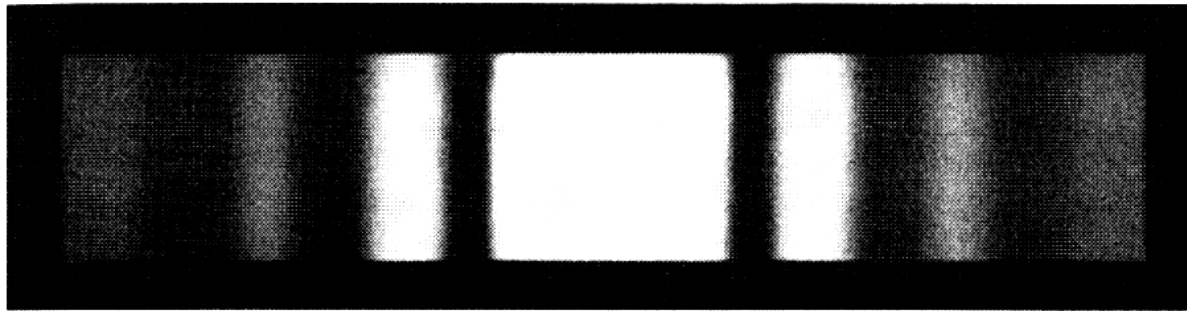
New theories were needed to explain these problems:

- 1) Spetial relativity solved the first problem
- 2) General relativity solved the second problem
- 3) Quantum mechanics solved the third problem

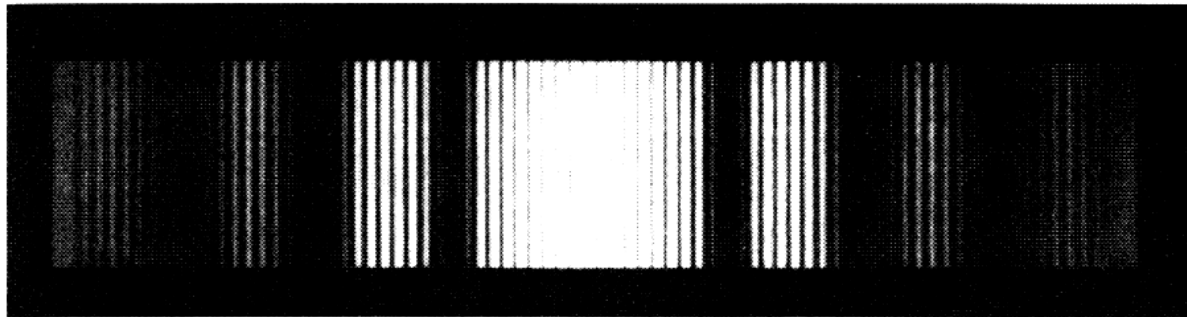
Diffraction from one- and two-slit screens

- Diffraction patterns

One slit



Two slits



As a summary these are the subject of this class:

- ▶ Nature of light and optics
 - ▶ Relativity
 - ▶ Introduction to quantum physics
 - ▶ Quantum mechanics and atom physics
- 