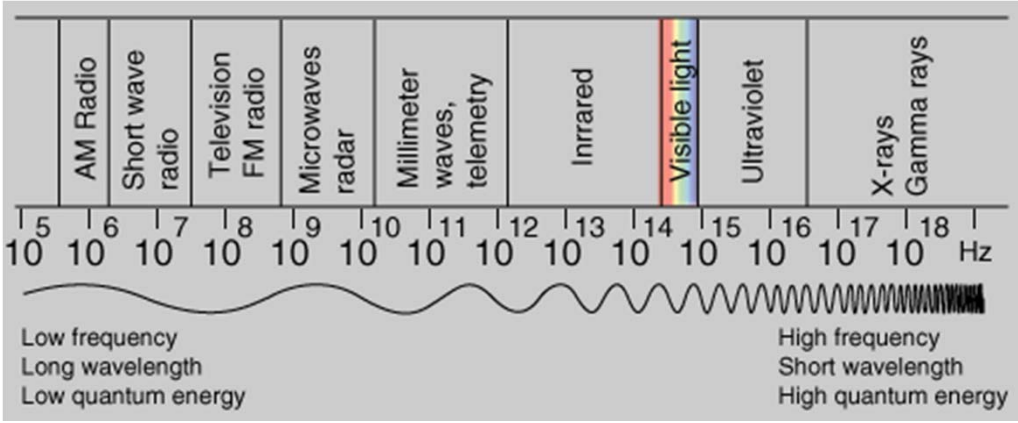
Lect. 1: Introduction

- ***What is light?***

  - Wikipedia: EM radiation of a wavelength visible to human eye



Visible light, Wavelength: 400-700 nm

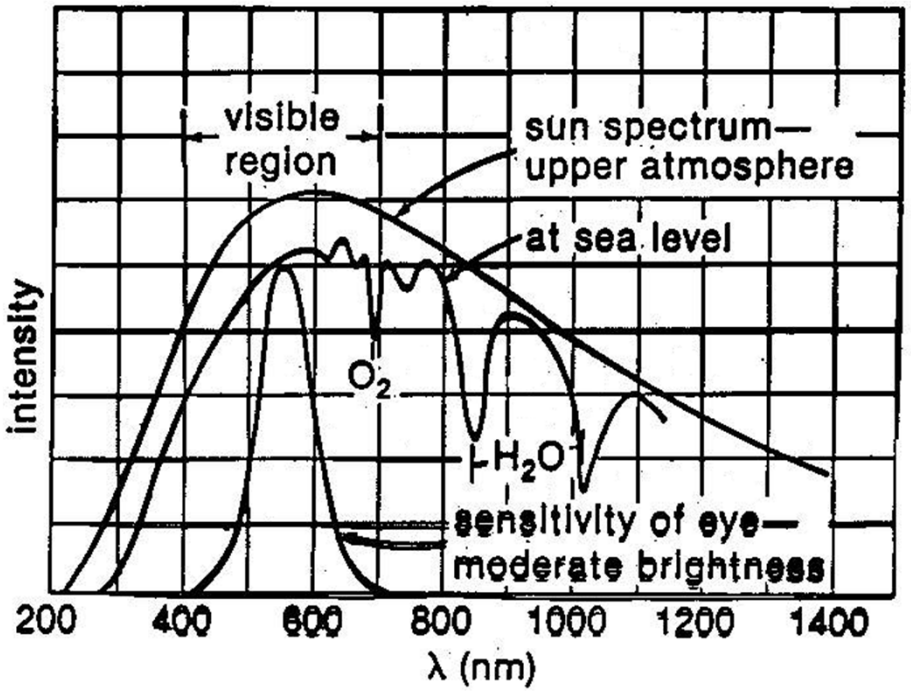
Frequency: 430 – 750 THz

Photon energies: 1.65 - 3.1 eV

Why do we see only what we see?

Lect. 1: Introduction

Why do we see only what we see?



-Light has been the most abundant EM waves for very very long!

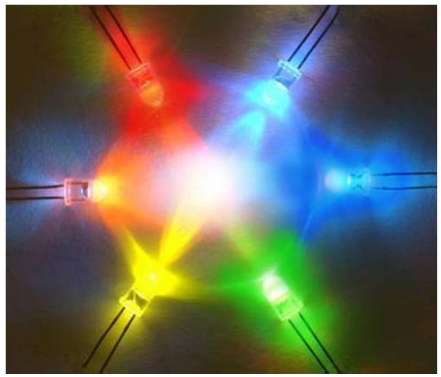
- Why does the sun have above spectrum?

Temperature of sun at the surface: about 5,500 deg C

Lect. 1: Introduction

- ***Why study light in EEE?*** Many applications

LED: Light Emitting Diode



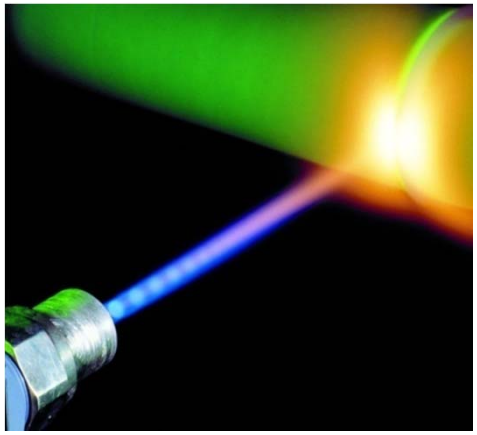
LEDs have much better efficiency and longer life time

Expected to replace all lighting systems, eventually

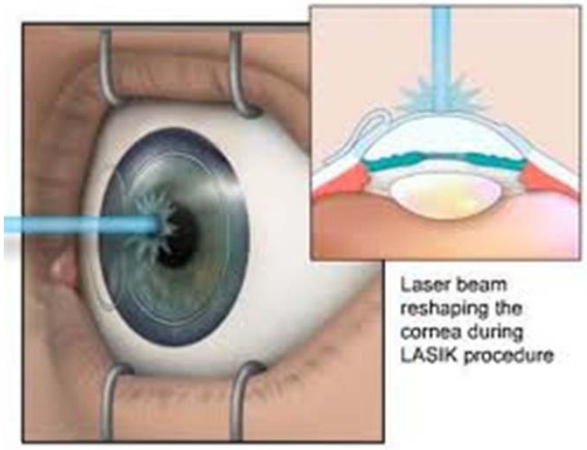
Lect. 1: Introduction

- ***Why study light in EEE?*** Many applications

LASER: Light Amplification by Stimulated Emission Radiation



Material Processing



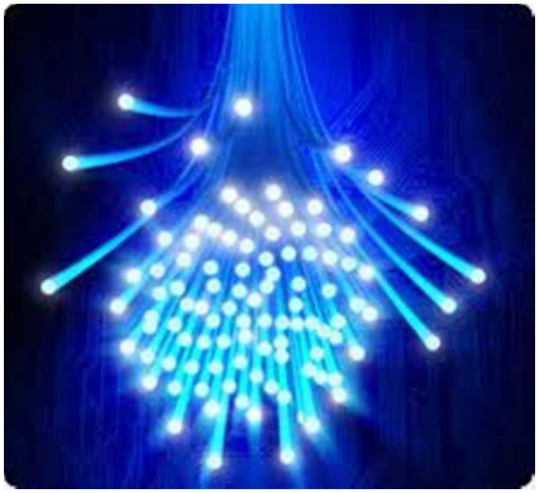
Laser Surgery

Hologram

Lect. 1: Introduction

- ***Why study light in EEE?*** Many applications

Optical Fiber Communication

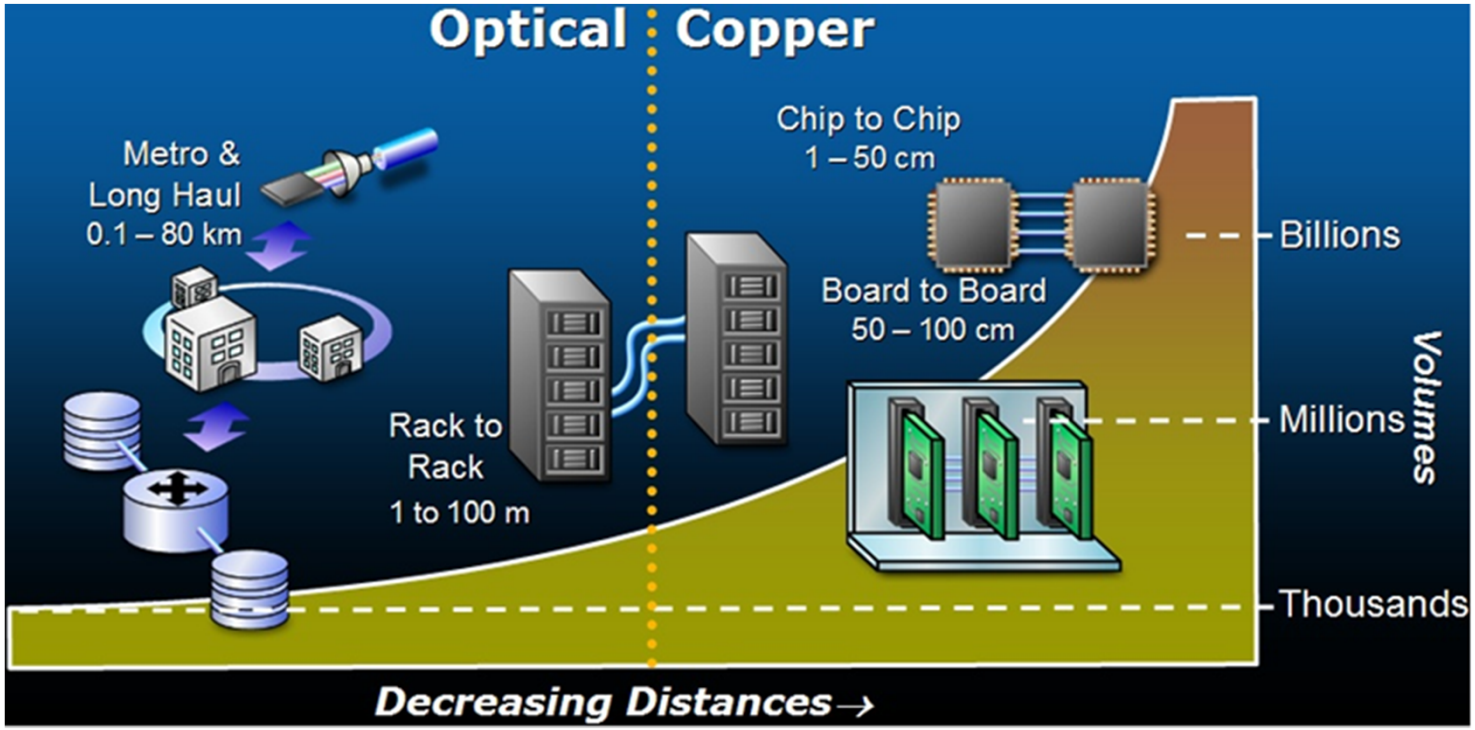


Light can travel inside fiber with very small loss

Key technology for internet revolution!

Lect. 1: Introduction

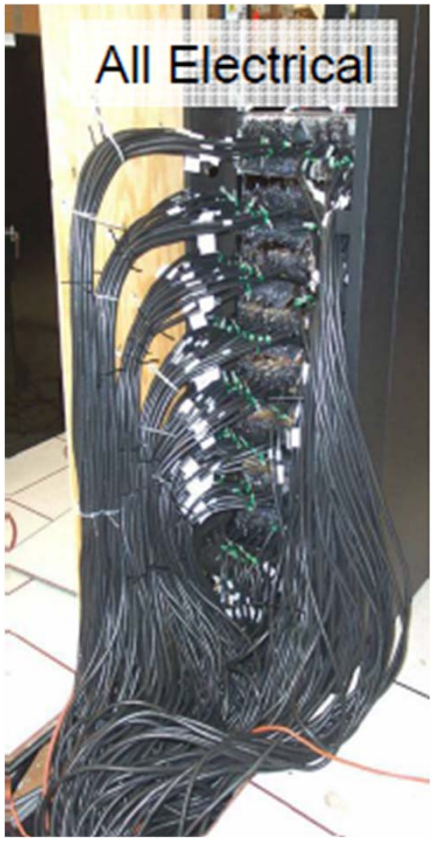
- ***Why study light in EEE?*** Many applications

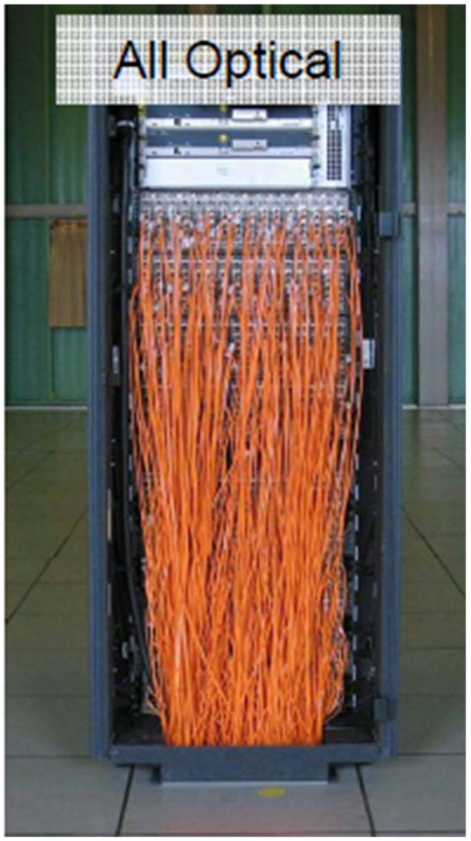


Lect. 1: Introduction

- ***Why study light in EEE?*** Many applications

Data center for cloud computing





Lect. 1: Introduction

- *Why study light in EEE?*

Many applications in Information Technology

Information Transmission: Optical Communication/Interconnect

Information Display: LCD, LED, Hologram

Information Storage/Recovery: CD, DVD, Hologram

Medical Applications: Surgery, Imaging,

What are we going to do in this course?

Lect. 1: Introduction

● Goals:
Learn the basic properties of light and
devices that control its property for useful applications

● Teaching Staffs
- Lecturer: Prof. Woo-Young Choi (최우영)
Room: B625, Tel: 02-2123-2874
Email: wchoi@yonsei.ac.kr, Web: tera.yonsei.ac.kr

- T.A.'s: Minkyu Kim (김민규): minkyu226@gmail.com
Room: B629, Tel: 02-2123-7709

● Class Hours
- Lecture: Mon. 2:00-3:50 pm, Wed. 1:00-1:50 pm at A669

● Prerequisite: Sufficient knowledge in Electromagnetic Waves
Electromagnetics II (전자기2) strongly recommended

Lect. 1: Introduction

● Textbook:
Class notes (Available in PDF before lecture at tera.yonsei.ac.kr)

References:
- *Optoelectronics and Photonics* by Kasap
- *Fundamentals of Photonics* by Saleh and Teich

● Grades
- 3 Tests: 25 points x 3 times = 75 points
- Design Projects: 15 points
- Attendance and homework: 10 points
  (- 1.0 for absence, -0.25 for being late, No homework: -1.0)

Lect. 1: Introduction

- **Lunch Meeting**:

Students are encouraged to participate in lunch meetings with fellow students and professor. Lunch meetings will be held on Wed. from 12:00 - 12:40 in my office. Sign-up sheets will be available. We can have free conversation on the course, future career plans, etc. Sandwiches and drinks will be provided. A sign-up sheet will be available soon.

Lect. 1: Introduction

- Class Schedule

  - Part 1: Lightwave

  - Part 2: Waveguides

  - Part 3: Optoelectronic Devices

Lect. 1: Introduction

- Class Schedule (Tentative and subject to changes)

  - Part 1: Lightwave

Lect. 1: Introduction
Lect. 2: Light as EM waves
Lect. 3: Light propagation in medium
Lect. 4: Dielectric interface
Lect. 5: Total internal reflection
Lect. 6: Interference
Lect. 7: Multiple dielectric interference
Lect. 8: Interferometers
Lect. 9: Diffraction
Lect. 10: Diffraction Gratings

Test 1: 9/30 (Friday) 7:00 – 9:00 pm

Design Project 1 due on 10/26

Lect. 1: Introduction

- Class Schedule (Tentative and subject to changes)

  - Part 2: Waveguides

Lect. 11: Metallic waveguide
Lect. 12: Dielectric waveguide I
Lect. 13: Dielectric waveguide II
Lect. 14: Waveguide devices I
Lect. 15: Waveguide devices II
Lect. 16: Optical fiber
Lect. 17: Dispersion in optical fiber

Test 2: 11/7 (Monday) During the class

Design Project 2 due on 11/30

Lect. 1: Introduction

- Class Schedule (Tentative and subject to changes)

-Part 3 : Optoelectronic Devices

Lect. 18: Light as a particle
Lect. 19: Interaction between light and matter
Lect. 20: Optical pumping
Lect. 21: LED
Lect. 22: Laser
Lect. 23: Semiconductor laser
Lect. 24: Single-mode semiconductor laser
Lect. 25: Photodetectors
Lect. 26 - 30 : Additional topics in optoelectronics if time is available

Test 3: 12/9 (Friday) 7:00 – 9:00 pm

Design Project 3 due on12/28