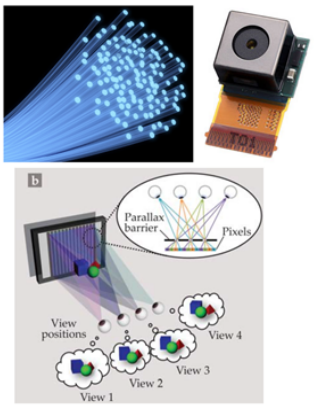
EE535 / EE400: Applied Nanophotonics (SLN: 13457)

Phys 576: Selected topic in experimental physics

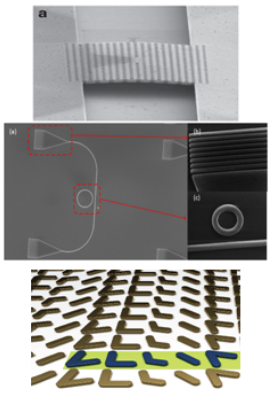
Course Instructor: Arka Majumdar (arka@uw.edu)

Course offered: Spring, 2021 (Mon, Wed 12:30-2:20pm); 4 credits

Spanning the entire history of human civilization light has remained one of the most important media for information and knowledge transfer, starting with the lighting of fire to alert people of imminent danger in pre-historic era. Understanding the property and behavior of light is crucial for realms beyond just data and knowledge transfer. It is well-known that high speed internet, novel display, and ubiquitous optical sensors, including cameras rely on photonic technologies. Apart from these, numerous other technologies like solar cell, bio- and chemical sensing and medical imaging depend heavily on optics.



Optics is used in fiber optical network, camera and display



Novel nanophotonic devices provide remarkable capability for light manipulation

Feedback from last years:

This course made me realize how important it is to really think about how the application of the physics to a specific technology or device might change and if the application to that technology or device is even feasible.

The examples of practical challenges with designs and experiments. Discussing these topics was extremely interesting, as much of this is not clearly stated in literature. Except for courses like this, similar information is very difficult to find.

Today, we are in a remarkable position to manipulate light in the most innovative manner. We have optical devices with nano-meter scale features, where the light propagation fundamentally changes. With nanoscale confinement of light, one can study quantum optics in solid-state systems. This opens up advanced avenues of exploration for a variety of applications. These devices enable integrated photonics, novel quantum optics and new functionalities like negative refraction of light and superlensing. In this course, you will learn about such nanoscale photonic devices, via literature survey, problem solving and numerical simulations. We will also introduce a new module this year, where your designed devices will be fabricated and tested in Majumdar Lab at ECE.

Prerequisite: Familiarity with electromagnetics, quantum mechanics and solid-state devices will be helpful. Programming (either with MATLAB or Python) will be required for the class.