E7 214 Jan 3:0

Optoelectronic Devices

Instructor

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Teaching Assistant

None
Email: --

Department: ECE

Course Time: Tue, Thu 2:00 - 3:30 PM

Lecture venue: ECE department

Detailed Course Page: https://www.sites.google.com/site/varunr196/blank/e7-214

Announcements

Brief description of the course

The aim of this course is to provide students with an understanding of various semiconductor and non-semiconductor based optoelectronic devices (light emitters, detectors, modulators etc.). The expected outcomes from the course are: (i) understand the basic working mechanism of the devices, (ii) understand the governing equations to be able to perform calculations to characterize the performance of the devices and, (iii) have the practical knowledge and an understanding of the trade-offs when using these devices in their respective applications. This course will cover the following topics: introduction to Optoelectronic integrated circuits (OEICs), various components and applications, quick refresher into semiconductors and Electromagnetics at optical frequencies, optical processes in semiconductors, light sources (LEDs, various semiconductor lasers), light detectors (PMTs, photo-diodes, APDs), sensor arrays (CCD,CMOS), Noise processes in light detection and generation, photo-voltaic devices and light modulators (electro-optic, Franz-Keldysh/ Stark effect, acousto-optic and magneto-optic effects).

Prerequisites

Basic Maths (Calculus) course

Undergraduate Electromagnetics and Semiconductos course

Syllabus

This course will cover the following teaching modules: introduction to Optoelectronic integrated circuits (OEICs), various components and applications, quick refresher into semiconductors and Electromagnetics at optical frequencies, optical processes in semiconductors, light sources (LEDs, various semiconductor lasers), light detectors (PMTs, photo-diodes, APDs), sensor arrays (CCD,CMOS), Noise processes in light detection and generation, photo-voltaic devices and light modulators (electro-optic, Franz-Keldysh/ Stark effect, acousto-optic and magneto-optic effects). A detailed course syllabus is given below.

Course outcomes

(i) understand the basic working mechanism of the devices, (ii) understand the governing equations to be able to perform calculations to characterize the performance of the devices and, (iii) have the practical knowledge and an understanding of the trade-offs when using these devices in their respective applications.

Grading policy

Midterm exam: 30%, Project presentation & report: 35%, Final exam: 35%

Assignments

Homework assignments given from time to time. These were not evaluated.

Resources

[2] Photonics: Optical Electronics in Modern Communications, Amnon Yariv & Pochi Yeh

[3] Fundamentals of Photonics, B.E.A. Saleh & M.C. Teich

[4] Building Electro-optical systems and making it all work, P.C.D. Hobbs

[5] Class notes