

“Light Emitting Diodes and Solid-State Lighting”

Instructor information:

Prof. E. F. Schubert, Rensselaer Polytechnic Institute, Department of Electrical, Computer, and Systems Engineering, 110 Eighth Street, Troy NY 12180, Phone: 518-276-8775, Email: EFSchubert@rpi.edu, Web: <http://www.rpi.edu/~schubert/>

Course materials: Textbook: *Light Emitting Diodes* 2nd edition, 2006. To purchase book, please see home page of instructor, or buy from Amazon. In addition, Sameer Chhajed who will be assisting with this course, has a few copies left that he sells for \$45. Contact information: SameerChhajed@gmail.com

Lecture time and location: Wednesday’s 8:00 AM – 10:50 AM in the Low Center CII 3039

Office hours: Immediately following the lecture, i.e. Wednesday’s 11:00 AM – 12:00 noon in room CII 7111

Description:

Light emitting diodes (LEDs) are devices that are used in a myriad of applications, such as indicator lights in instruments, signage, illumination, and communication. This course covers all aspects of the technology and physics of infrared, visible-spectrum, and white-light-emitting diodes (LEDs) made from III-V semiconductors. It reviews elementary properties of LEDs such as the electrical and optical characteristics, as well as advanced device physics including high-efficiency device designs, light extraction, radiative and non-radiative recombination dynamics, spontaneous recombination in resonant-cavity structures, and packaging. It introduces related areas such as human vision, photometry, colorimetry, and color rendering. Application of infrared and visible-spectrum LEDs in silica fiber, plastic fiber, and free-space communication is discussed. Extensive semiconductor material data, device design data, and analytic formulas governing LED operation are provided. Exercises and illustrative examples are included and an introductory chapter reviews the historical developments and milestones of LED research and development. This course will be of interest to scientists and engineers working on LEDs, and to graduate students in electrical engineering, applied physics and materials science.

Level: The course is intended for graduate students

Pre-requisite:

“Semiconductor Devices and Models 1” or equivalent

“Microelectronics Technology” or equivalent

Basic knowledge of electrical engineering, physics, and chemistry

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Grading:

The final grade is composed of the following contributions: Midterm exam 40 %; Final exam 40 %; Homework 10 %; Project 10 %. The completion of your homework will be verified before the midterm exam and before the final exam.

Mandatory statement on academic dishonesty:

- Cheating on exams (such as copying from your neighbor) constitutes academic dishonesty.
- Turning in homework/reports/term papers as one's own, when they are not, constitutes academic dishonesty.
- A compilation of someone else's production/idea/work in a written or oral report must be attributed to the original source.
- The source of text passages stated in either paraphrased or *ad verbatim* form must be cited.
- Plagiarism is the use of someone else's production/idea/work without crediting the source. Plagiarism constitutes academic dishonesty.
- *Note:* Teamwork during class exercises and homework is allowed. The use of calculators is also allowed.
- *Note:* If something is well known (common knowledge), the original reference does not need to be cited. Example: We can use Newton's second law ($F = ma$) without citing Sir Isaac Newton. We can discuss transistors without crediting William Shockley with the invention of the transistor.

The instructor's penalty for any academic dishonesty in this course is receiving no credit for any disputed work. In addition, a student who commits an act of academic dishonesty may be subject to disciplinary action by Rensselaer Polytechnic Institute.