EE6500

Integrated Optoelectronics Devices & Circuits
January-May 2015

B.K. Das, Associate Professor
Dept. of EE, IIT Madras
Chennai - 600 036, India
bkdas@ee.iitm.ac.in
http://www.ee.iitm.ac.in/mems/iolab/
+91 44 2257 4459 (5495)

Course Description: In this course, students will learn background theory, working principle, technology of various integrated optoelectronic devices and circuits for optical interconnect applications. It is mainly designed for postgraduate students studying in various streams like Microelectronics, Communication Systems, Photonics and Optical Engineering. However, undergraduate students can also take this course after completing basic courses covering EM Fields and Semiconductor Devices.

Course Content:
(i) Introduction: Generic Optical Systems and Fundamental Building Blocks; (ii) Basics of Semiconductor Optoelectronics: Elemental and Compound Semiconductors; (iii) Electronic Properties and Optical Processes in Semiconductors; (iv) P-N Junction Theory, LEDs and Photodetectors; (v) Heterostructures, Confinement of Electron Waves, Optical Waveguides and Guided Modes; (vi) Semiconductor Optical Amplifiers and Fabry-Perot Lasers; (vii) Coupled Mode Theory, DBR and DFB Lasers; (viii) Silicon Photonics: Integrated Optical Passive and Active Components; (ix) Tunable Filters, Delay-Lines and Switching Circuits in SOI Platform; (x) CMOS Technology: Electrical vs. Optical Interconnects

Note: There will be compulsory mini-projects (group-wise/individual) on new optoelectronic device/circuit/system design - which will be mentored by research scholars working in the area of silicon photonics.

Credit Hours: 4

Reference Books:

- **Semiconductor Optoelectronic Devices**
  Author(s): Pallab Bhattacharya (Pearson Education Inc.)

- **Photonics - Optical Electronics in Modern Communications**
  Author(s): A. Yariv and P. Yeh (Oxford University Press)

- **Silicon Photonics - Fundamentals and Devices**
  Author(s): M. Jamal Deen and P.K. Basu (John Wiley & Sons Ltd.)

Grade Distribution:

Assignments	10%
Mini-Project	15%
Quiz-I	15%
Quiz-II	15%
Final Exam	45%

Letter Grade Distribution:

$>= 90.00$	S
80.00 - 89.99	A
70.00 - 79.99	B
60.00 - 69.99	C
50.00 - 59.99	D
40.00 - 49.99	E
00.00 - 39.99	U

Course Policies:

- **General**

  - Computers are not to be used unless instructed to do so.
  - Quizzes and exams are closed book, closed notes.
  - **No makeup quizzes or exams will be given.**

- **Grades**

  - Grade in the **C** represents performance that **meets expectations**; Grade in the **B** represents performance that is **substantially better** than the expectations; Grade in the **A & S** range represent work that is **excellent**.

- **Labs and Assignments**

  - Students are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor, tutor, or lab assistant.
  - **No late assignments will be accepted under any circumstances**.

- **Attendance and Absences**

  - Attendance is expected and will be taken each class. You are allowed to miss **1** class during the semester without penalty. Any further absences will result in point and/or grade deductions.
  - Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee's responsibility to get all missing notes or materials.

Academic Honesty Policy Summary:
Introduction

In addition to skills and knowledge, IIT Madras aims to teach students appropriate Ethical and Professional Standards of Conduct. The Academic Honesty Policy exists to inform students and Faculty of their obligations in upholding the highest standards of professional and ethical integrity. All student work is subject to the Academic Honesty Policy. Professional and Academic practice provides guidance about how to properly cite, reference, and attribute the intellectual property of others. Any attempt to deceive a faculty member or to help another student to do so will be considered a violation of this standard.

Instructor's Intended Purpose

The student's work must match the instructor's intended purpose for an assignment. While the instructor will establish the intent of an assignment, each student must clarify outstanding questions of that intent for a given assignment.

Unauthorized/Excessive Assistance

The student may not give or get any unauthorized or excessive assistance in the preparation of any work.

Authorship

The student must clearly establish authorship of a work. Referenced work must be clearly documented, cited, and attributed, regardless of media or distribution. Even in the case of work licensed as public domain or Copyleft, (See: http://creativecommons.org/) the student must provide attribution of that work in order to uphold the standards of intent and authorship.

Declaration

Online submission of, or placing one's name on an exam, assignment, or any course document is a statement of academic honor that the student has not received or given inappropriate assistance in completing it and that the student has complied with the Academic Honesty Policy in that work.

Consequences

The instructor may impose a sanction on the student that varies depending upon the instructor's evaluation of the nature and gravity of the offense. Possible sanctions include but are not limited to, the following: (1) Require the student to redo the assignment; (2) Require the student to complete another assignment; (3) Assign a grade of "0" to the assignment; (4) Assign a final grade of "U" for the course. Multiple violations of this policy will result in a referral to the Conduct Review Board for possible additional sanctions.

Data for Research Disclosure:

Any and all results of in-class and out-of-class assignments and examinations are data sources for research and may be used in published research. All such use will always be anonymous.