ECE 135  Design, Build, Operate Optoelectronic Links

Spring, 2005
Class Meetings: T Th 1:15 – 2:30 pm
Class Room: CIEMAS 2547
Labs: CIEMAS 2547 and Hudson 174

Instructors:  Professor Martin A. Brooke, Ph.D.
Professor Nan Marie Jokerst, Ph.D.
Office:  CIEMAS 3581 (Brooke), CIEMAS 3589 (Jokerst) Engineering Annex Building
Office Hours:  M, Tu 10:30-11:30 am
Telephone: 660-5503 (Jokerst), 660-5504 (Brooke)
Email: nan.jokerst@duke.edu, martin.brooke@duke.edu

Note: Use [ECE 135 SP 05] as the beginning of the subject line in your email to Brooke/Jokerst to assure that we address your message. Please copy email to both Brooke and Jokerst.

Capstone Design Topic: Design, Build, and Operate a Gbps Optoelectronic Link

Course Organization and Content:

1. Students are assigned to groups of 3-4 students
2. Each group will submit two written reports during the semester. One is a cumulative final report, the other a midterm report. Group grades will be given for these reports.
3. Each group will make a presentation each week during the semester. Individual students give each of these presentations, and individual grades will be given for these presentations. Group progress will also be assessed by these presentations.
4. There will be one written exam during the semester. Individual grades will be given for the exam.

Grading:

1. Written Group Reports: 25% each (total 50%)
2. Oral presentations: 30%
3. Written Examination: 20%

Notes:

1. Class attendance is very important, especially when the groups are presenting. Each student is allowed one unexcused absence. Other absences must be excused by the Professors. Unexcused absences beyond the first will result in a negative impact in the student’s grade.

2. All students in a group are expected to participate fully. Evaluations will be utilized to identify the level of participation of group members. Report grades for an individual may differ from the group report grades if participation levels are highly nonuniform.
Each group consists of 3-4 students. Work to be performed includes (faculty resource person in parentheses):

- Group management plan (division of labor, risk mitigation, task schedule (2 board fabs may be possible), budget proposal) (NJ)
- Background study of Gigabit Ethernet standard (MB)
- Background study of VCSELs and PDs (NJ)
- Background study of Maxim Receiver and Transmitter boards (MB)
- Implement and electrically test a provided Receiver board (MB)
- Design an optical link module board with optical throughput budget – the goal is Gb Ethernet compliant (NJ)
- Order VCSELs and PDs for the Gb Ethernet Receiver and Transmitter (Transceiver) (NJ)
- Design the optical path with alignment tolerance estimates (NJ)
- Design a Gb Ethernet Optical Transceiver circuits with on-board PD and VCSEL on one board, the goal is to use a single 5V power supply (MB)
- Order components for the Transceiver boards (NJ)
- Design a Gb Ethernet Optical Transceiver printed circuit board (MB)
- Lay out and submit for fabrication the Gb Ethernet Optical Transceiver printed circuit boards (MB)
- Assemble the Gb Ethernet Optical Transceiver printed circuit boards (i.e., solder) (MB, NJ)
- Test the Gb Ethernet Optical Transceiver Boards with optical loopback and then electrical loopback options (MB, NJ)
- Measure the alignment tolerance of the Gb Ethernet Optical Receiver on the Transceiver Board (NJ)
- Analyze Gb Ethernet Optical Transceiver test results; compare measurements to theoretical estimates (MB, NJ)

Classtime Schedule:

- Tuesdays: Lectures and lab time
- Thursdays: Student presentations and lab time

Student Presentation Details:

- Each group will present once per week, and the students will rotate giving presentations so that each student presents at least twice during the semester.
- Each presentation will be 10-15 min of presentation, with up to 10 min of questions.
- Each presentation must include the following information: Status of the project, including latest accomplishments, plans for next phase of the work. Include drawings, graphs, and photos!

Report and Exam Schedule:

- Examination: February 22, 2005, during class time.
- First report due March 25, 2005, 5 pm. Reports must be posted to the group website by the due date time. No late reports accepted.
- Second report due April 27, 2004, 5 pm. Reports must be posted to the group website by the due date time. No late reports accepted.

Report Details:

- 24-26 pages typed, 12 point, 1.5 spacing between lines, 1 inch margins, on 8.5 x 11 inch paper, including figures. Figures should be integrated into the text.
- Report content should address the progress to date on the topics listed above.
- Report content should include:
  - A deep level of technical content (Scientific American level or higher).
  - An in-depth discussion of progress and analysis of the work performed.
  - An explanation of any delays or problems with the project.
  - Proper citations for references and figures, particularly in the background section. Please do not copy any text from published material – read, express in your own words, and cite the references.
- Report content will be judged on:
  - Progress on listed topics.
  - Technical content, including analysis of data.
  - Grammar and clarity of writing.
- Every team member will receive the grade assigned to the team report.
- No late reports will be accepted.