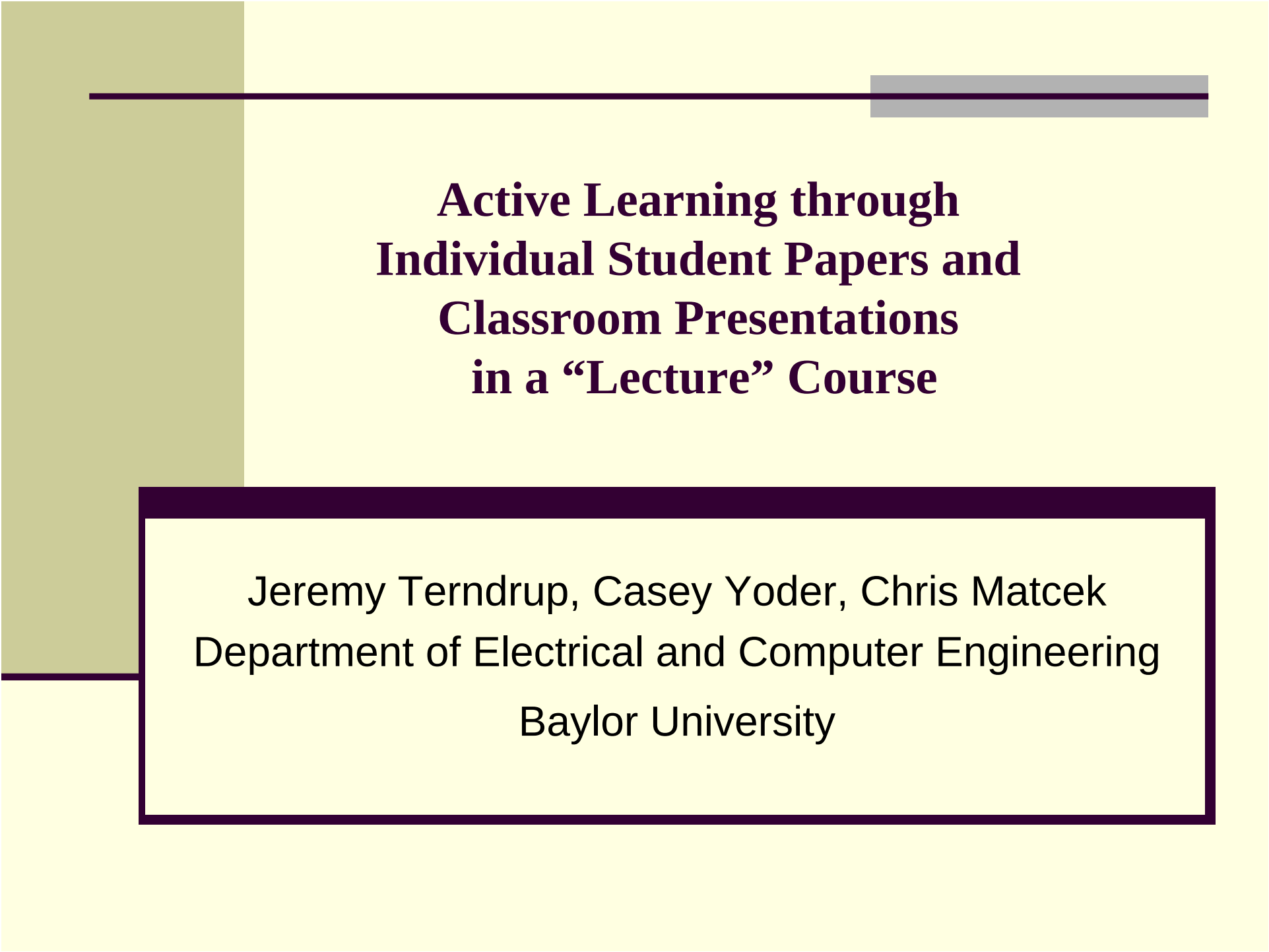




Active Learning through Individual Student Papers and Classroom Presentations in a “Lecture” Course

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Introduction

- EGR 4353 Image Formation and Processing is an elective course for electrical and computer engineering (ECE) majors, offered each fall since 2004.
- We will present the details of the course: how active student involvement enriches –
 - the student interest,
 - the subject variety, and
 - the resulting student learning.

Introduction

- We believe it is important to include some emphasis on imaging systems and components for ECE students in what would otherwise be an image processing course.
- This provides fuller context to better understand --
 - the characteristics of imaging hardware and software, and
 - an appreciation of the physical limitations of the resulting images.

Course Description and Outline

- EGR 4353 Image Formation and Processing
- The course introduces image formation systems used for medical diagnostics, remote sensing, industrial inspection, etc.
- Image processing topics include image enhancement, analysis and compression which students learned through class assignments and their projects.

Course Description and Outline

- EGR 4353 Image Formation and Processing
- It is important that the course consider the hardware of imaging systems because knowledge of the imaging system is essential to the understanding the resulting images.
- The course is scheduled in a traditional “lecture” format since the equipment necessary for a laboratory is currently not available (in this case, as 43 fifty-minute scheduled sessions per semester).

Course Description and Outline

- The textbook is Digital Image Processing, by Rafael C. Gonzalez and Richard E. Woods.
- It has a great first chapter, loaded with actual imaging applications and organized by the spectral range of operation of the systems.
- Traditional classroom instruction accounts for half of the course grade:
 - Textbook readings
 - Homework assignments
 - Two midterm tests and final exam

Individualization/Active Learning Component

- The most significant part of the course is the individual student-selected imaging investigations.
- Written papers and oral presentations on three distinct topics are required of each student.
- These three papers allow the different interests of each student to be accommodated.

Individualization/Active Learning Component

- The specific subject of each paper is student self-selected (subject to instructor approval).
- The first paper is on some specific imaging system or component, from technical and commercial literature.
- The second paper is on some topic from a published, peer-reviewed, research paper.
- The third paper is on a modest original image processing project by the student.

Individualization/Active Learning Component

Presentation One – Imaging systems and components literature (technical, commercial) 15%

Resources 1%

Subject 1%

Draft 1%

Report 6%

Presentation 6%

Table 1: Grade scale for active learning component

Individualization/Active Learning Component

- Presentation Three – Original student project
20%

Topic/scope/progress	3%
Written report	18%
Oral presentation	9%

Instructor's Observations

- A smaller elective class allows individual attention and interaction for project selection and instructor feedback.
- It is at least as much work to oversee and evaluate the papers and presentations as it would be to prepare and present lectures in a traditional lecture course.

Instructor's Observations

- Having 5 or 6 students in the class (2002, 2004, and 2005) allowed presentations to be completed in two class periods for each set of presentations.
- Having 11 students (2006), however, required three class periods for each of the three presentations.
- Enrollment over 12 students would require some course schedule changes.

Individual Student Evaluation of the Course

- Student 1 –
- EGR 4353 helped its students by practicing three of our least favorite activities, namely, research, writing, and presentation skills. The only way to improve these skills is to practice them.
- As the semester went on, though, the amount of time between projects and tests was less and less.
- We had 23 days until the first paper/presentation, then 33 days until the next, and just 13 days to complete the last project (not including Thanksgiving break).

Individual Student Evaluation of the Course

- Student 2 - The class began the same as others, but the syllabus looked really busy: 3 papers, 3 presentations and 3 tests. However, as the class developed, I realized that I would be doing a good deal of learning outside the classroom. This learning came in the form of research, learning how to use image processing functions on MATLAB, and learning how to correctly present relevant topics from the papers in class for presentations.

Individual Student Evaluation of the Course

- Student 2 – I and some of the other students in the class were not used to this style of teaching in the classroom that yielded time to discussing outside projects.
- I heard things like “this teacher isn’t teaching us any of the material,” but then I would reply that “he was teaching us to teach ourselves the information.”

Individual Student Evaluation of the Course

- Student 3 - I feel that the way this course was taught, with the three presentations and papers, was helpful to me in that it allowed me to focus on areas of my interest and, since each student was interested in something different, I was able to still be exposed to other areas that were a part of the course. Unfortunately, I also felt that by individualizing the three presentations, some of the deeper learning was lost because each student spent their time focused on only one area. Time was a factor in that the research that went into writing the paper and putting a presentation together was compressed due to the demands of other classes. Sometimes I felt a lot of pressure to get papers and presentations finished.

Overall Student Evaluation of the Course

- On the standard University course evaluations, all students stated that they learned a great deal from this course.
- Some students thought that the style of presentation was not effective, and exams were not a good measure of students' knowledge.

Conclusion

- This paper has described some aspects of EGR 4353 Image Formation and Processing.
- Half of the overall course grade is derived from the structure of individualized material and on the appeal and effectiveness of the active student learning.