No: ECE 5002

Title: Research Projects in Electrical and Computer Engineering

Credits: 4

Coordinator: Yang Zhao, Professor of Electrical and Computer Engineering
Instructor: Yang Zhao
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Office hours: 2:30-6:00pm Thu.

Pre- and co-requisite: Admitted into A-grade and taking a ECE 4000 level course

Catalog Description:
Individual or team research projects. Literature survey on current topics; proposal for projects; final written report required.

Goals: To apply electrical and computer engineering techniques and methodology to real world problems and product design.

Learning Objectives: At the end of this course, students will be able to:
1. Apply techniques for enhancing engineering creativity or design process
2. Critically read current journal publications and patents and evaluate current status of the technology and designs.
3. Write formal project reports.
4. Make formal project presentations
5. Demonstrate an understanding of current representative technologies and issues in electrical and computer engineering.

Textbook: No

References:
1. Current issues of technical journals
2. US Patents and published applications
3. Course materials in a 4000 level ECE course

Course contents:
Part I: Course contents of a 4000 level ECE course
Part II: Research paper or patent on a current topic related to the ECE 4000 course material. Weekly meeting, weekly progress report, first draft, and final paper. See handout for instructions and format of the paper.

Grading Policy:
Part I: 75%
Part II: 25%
Final grade is the nearest letter grade (with + or -) to your final score.
For example, if you get A in part I and B- in part II, your final grade will be
4x0.75 + 2.7x0.25 = 3.675 → A-

Academic Honesty:
A student cheating will receive an E course grade. Students are required to perform the assignments and write the final report independently.

http://ece.eng.wayne.edu/~patrick/ecewebsite/ABETsyllabus/Syllabus_ECE5002.htm
Outcome coverage:

(a) an ability to apply knowledge of mathematics, science, and engineering. This outcome is covered by the 4000 level course. The contents of the 4000 level course require direct application of mathematical, scientific, and engineering knowledge for signal, device, and system analyses.

(c) an ability to design a system, component, or process to meet desired needs. Students are required to demonstrate proper understanding of the problem issues and selected approaches described in journal papers and patents. They are encouraged to perform comparative studies of examples of design projects and experiments.

(e) an ability to identify, formulate, and solve engineering problems. The contents of the 4000 level course cover this outcome. Since all ECE 4000 level courses requires students to identify, formulate, and solve engineering problem. Studying examples in journal papers and patents further enhances students’ ability in this category.

(f) an understanding of professional and ethical responsibility. Most students in this course are familiar with IEEE ethics guidelines, which are also handled out in this class. Students are asked to pay attention to ethical responsibility embedded in the technical publications by the authors.

(g) an ability to communicate effectively. Students must write a draft report and a final completed report, and make oral presentation by the end the course. Grades are given for writing quality and presentation quality, as well as technical content of the report.

(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context. Students must identify the importance of problems and issues and evaluate potential influence of solutions on technical fields as well as the society.

(i) a recognition of the need for, and an ability to engage in life-long learning. The technical papers and patents to be studied contain broader knowledge than those in textbooks and classroom. Students will realize that continuing education and life-learning is essential in order to solve real world problems. Students are also required to learning additional materials by themselves in order to understand new concepts and solutions in the publications.

(j) a knowledge of contemporary issues. Students are required to read, understand, and assess technical publications no older than three years. Current, representative technologies are studied. Student comprehension of these current topics is evaluated in the final presentation.

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Students are expected to use modern tools in library and on internet to perform literature survey in order to select technical papers. Students also learn research and design methodologies, including theoretical analyses, simulations, and experimental studies, in solving engineering problems.

Prepared By: Y. Zhao, Professor and Chair, Electrical and Computer Engineering

Last Revised: August 31, 2005

ECE 5001 Research paper: This assignment is designed to supplement the topics covered in class by letting you study and present material related to a topic of the course. This exercise will give you some practice in scientific writing.

Getting Started:
Critical reading. Learning scientific writing begins with reading scientific papers. The path to more information on a particular topic often begins with a single recent paper. Focus on the Introduction and Discussion and then read the papers in the reference list. These key papers will lead you to more papers and more information on the topic.

Searching for more information. You might want to look through recent issues of IEEE journals for that first paper. Alternatively, if you know the topic or an author you can start with a general search using tools (e.g., Web of science [online computer file] and Google Scholar) in the WSU library. When you start by following a trail of references from a single paper, you will probably want to search narrowly defined aspects of your topic, in order to make sure you have not missed anything important. If you are interested in new ideas with potential commercial application, you should look at recent patents. US Patent and Trademark Office (www.uspto.gov) has all US patent documents.

Term Paper Format:

Abstract. All term papers should start with an Abstract or Summary.

Introduction. The introduction section can follow a formula or it can be more original. Paragraph 1 usually says something general about the topic. Paragraph 2 says what has been done in the past, or lists the established facts on an issue. Paragraph 3 is your problem statement: What is the main issue to be resolved by the research? It is crucial to make a clear and concise problem statement. The final paragraph of the Introduction often previews the results of a research report, or forecasts the organization of a review article.

Paper form. You may choose to write your term paper in the form of A) a research report, or B) a review article. In either case you will find plenty of examples in IEEE journals.

Plan A: research report. Sections following the Abstract and Introduction are Methods, Results, and Discussion. Whereas most research reports describe only one study, in your term paper, you should combine and synthesize the methods and results of several previous studies in each of these sections.

Plan B: review article. Sections following the Abstract and Introduction are on particular topics and are given short descriptive subtitles. The paper must conclude with a section entitled Conclusions, Future Directions, Implications, or something else intended to bring the issues together. Many review papers can be found in Proceedings of IEEE.

References. All term papers must end with a reference list. Use IEEE Transactions format. The reference list need not be exhaustive; 5-13 papers are appropriate. You should read every paper that you list. Each of these papers should be cited in the text of your term paper. It is essential that all work and ideas mentioned in your term paper be credited to the source. Again, use IEEE journal format for citing previous publications in the body of your term paper.

Figures and tables. You can reproduce Figures and/or tables from the papers on your reference list, as long as they are clearly identified as such. Include a Figure Caption of your own stating the main point and the source of each Figure. One to ten Figures and tables would be appropriate. It might be nice to come up with an original chart, table, or diagram, to help synthesize what you have learned.

Length Requirements:

Oral presentation. Each student should give a 15 minute presentation. Students should use Power Point to present the main point of their paper.

First draft. The first draft should contain all of the major sections of the paper and at least half of the Figures and References. It should be at least 4-6 pages, double-spaced, in 12 pt. font (not counting the Figures or References). Final term paper. This must be 10-30 pages long, double-spaced, in 12 pt. font (not counting the Figure: References). It is expected that the final product will be "polished", i.e., devoid of flaws in grammar and logic.