

EET 399 – CET Capstone Project & EET 499 – CEN Capstone Project

**Department of Technology
Spring 2008**

Instructor:

Prof. Vigs Chandra, PhD

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Office:

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Class schedule:

EET 399: Section 001, CRN 23240; MW: 6:00 – 7:55 pm, in Room 407/400

EET 499: Section 001, CRN 23241; MW: 6:00 – 7:55 pm, in Room 407/400

Office Hours:

MW: 8 - 10 am, MTWR: 4.30 - 6 pm. If my office door is open at other times I will most likely be available for discussion. Come right in.

Credit hours:

3

Prerequisite:

EET 399: Instructor approval and Sophomore (30– 59 hours) or higher standing. Only for students who are enrolled in the 2-year AS or AAS degree in Computer Electronics.

EET 499: Instructor approval and Senior standing (90 or more hours). Only for students who are enrolled in the 4-year BS degree Computer Electronic Networking.

COURSE DESCRIPTION:

EET 399: A project and research oriented course which serves as a capstone experience for Computer Electronics Technology (CET). The design, implementation, analysis, and troubleshooting of electronic and computer technology related systems, is emphasized.

EET 499: A project and research oriented course which serves as a capstone experience for Computer Electronic Networking (CEN). The design, implementation, analysis, and troubleshooting of networking, computers and electronics technology related systems, is emphasized.

TEXTBOOK:

A. Required:

Publication Manual of the American Psychological Association (5th Edition),
American Psychological Association, ISBN: 1557987912

B. References:

1. Practical Electronics Handbook, 6th Edition; Ian Sinclair & John Dunton; Newnes; ISBN: 0750680717
2. Hardware Hacking Projects for Geeks, 1st Edition; Scott Fullam; O'Reilly Media, Inc.; ISBN: 0596003145
3. Getting Started in Electronics; Forrest M. Mims III; Master Publishing, Inc.; ISBN: 0945053282
4. Build Your Own All-Terrain Robot, 1st Edition; Brad Graham & Kathy McGowan; McGraw-Hill/TAB Electronics; ISBN: 007143741X
5. Electronic Sensor Circuits & Projects; Forrest M., III Mims; Master Publishing, Inc.; ISBN: 0945053312
6. Electronics Projects For Dummies; Earl Boysen & Nancy C. Muir; For Dummies; ISBN: 0470009683
7. Practical Electronics for Inventors, 2nd edition; Paul Scherz; McGraw-Hill/TAB Electronics; ISBN: 0071452818
8. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP; James Lee, Brent Ware, Addison-Wesley Professional; ISBN: 020177061X
9. Wireless Hacks: Tips & Tools for Building, Extending, and Securing Your Network; Rob Flickenger & Roger Weeks; O'Reilly Media, Inc.; ISBN: 0596101449
10. Wi-Fi Toys: 15 Cool Wireless Projects for Home, Office, and Entertainment; Mike Outmesguine; Wiley; ISBN: 0764558943
11. Car PC Hacks; Damien Stolarz; O'Reilly Media, Inc.; ISBN: 0596008716
12. The Practice of System and Network Administration, 2nd Edition: Thomas Limoncelli; Addison-Wesley Professional, Inc.; ISBN: 0321492668
13. Network Warrior; Gary Donahue; O'Reilly Media, Inc. ; ISBN: 0596101511
14. How to License Your Million Dollar Idea: Everything You Need To Know To Turn a Simple Idea into a Million Dollar Payday; 2nd Edition; Harvey Reese; Wiley; ISBN: 0471204013

COURSE OBJECTIVES:

1. To define a technical problem in terms of a project for which solutions can be determined.
2. To demonstrate technical skill while solving problems in areas related to computer systems, network and electrical/electronic circuit design.
3. To perform independent research, as well as work effectively in teams.
4. To systematically organize and plan the completion of a project including conducting research, laboratory experimentation, testing and troubleshooting.
5. To demonstrate an in-depth knowledge in areas related to computer systems, networks, control systems, automation, electrical and electronic systems.
6. To articulate results of the project in the form of written technical reports, oral presentations and demonstrations.

COURSE REQUIREMENTS:

1. Complete and submit all project progress reports and final report in a timely manner.
2. Complete the weekly online capstone journal entries
3. Participate in the group research paper presentation
4. Implement the capstone project and demonstrate it in class on the prescribed date.
5. Maintain a 3-ring binder or folder for organizing class materials.

EVALUATION:

Overview of the capstone project:

You should select a project from an area of the CET/CEN major (*electricity & electronics*, such as PLC based automation; *computer systems*, such as microcontrollers or hardware configurations or data backups; *networks*, such as security or wireless communications) which is of interest to you. It is possible to select topics which bridge these areas as well. Enhancements in the safety or accessibility of existing equipment using novel electronic or computer networking based systems may be considered.

You may seek the guidance of computer electronics faculty members, and use the laboratories in the department to complete your project. The project is meant to be something of a synthesis experience, where you draw on from several courses in the department while generating a topic for independent research and implementation. It is not structured in the regular lecture-laboratory format, rather more as an independent study one. This is a tremendous opportunity for you to develop an integrated research and laboratory type activity in an area of your interest. We hope it will be the most meaningful class you have taken in expanding your knowledge, based on what you want to research and build as part of this course.

Each student will be evaluated as follows:

- Progress reports – 25%
- Group research presentation – 20%
- Final project demonstration & presentation – 25%
- Final project report – 20%
- Weekly capstone journal (online) – 5 %
- Portfolio (binder) – 5%

Progress reports:

- 3 written progress reports are to be submitted. These are intended to serve as steps along the way to help you stay on schedule with regards to the final project.
- After each written progress report has been submitted (on designated Mondays), please stop by my office the next class period for discussions regarding your progress report. This feedback is to stay on track with regards to the timeline for the overall project.
- 1st: Submit a project proposal, with a list of possible topics for your project. For this identify the general area (electricity & electronics, etc.) in which you want to work, and a sub-area within it, such as PLC based automation. If you already have a pretty good idea for the project topic within the sub-areas list it here. Alternatively identify the sub-areas you would like to work in providing as much detail as possible about your interests and experience working that type of technology. Outline the scope of the project here as well. The topic should neither be too broad (attempting to cover too much) nor too narrow. Approval from me is required before proceeding with any implementation. After reviewing the project proposal, for those in which the topic has not been suitably identified, the 1st report has to be revised and resubmitted at the earliest.

- 2nd: Identify at least two technical conference/journal papers related to your project topic and submit annotations (brief paragraph summarizing each paper in your own words) for each. Include how each identified source could be of use in developing your project. In addition, for any one of the articles create a bulleted list of the main points and sub-points. This list will be used for the discussing your research paper with the group and the paper you selected could be the one the group elects to present jointly to the entire class. Books and magazines may also be used as additional sources. This annotated bibliographic information will form a common base of knowledge for use by all students, and will be posted in Blackboard (unless you let me know otherwise). For identifying sources of technical articles, refer to online ECU library databases, <http://www.library.ecu.edu/articles/default.php>, usually selecting 'Academic Search Premier' as the database to search in. An online tutorial video on finding articles is at: http://www.people.ecu.edu/chandrav/Ref/online_search_ECU_libraries.wmv.
- 3rd: Identify progress to date, problems encountered, approximate percentage of project completed, and any ongoing issues. If possible include tentative pricing of the equipment needed to complete the project outside of what is available in the labs.

Group research presentation:

- For the purpose of encouraging sharing of research information related to the broad area your project is in, once each project topic has been decided, groups (of 2-5 students) will be formed around similar themes.
- Individually each student will research and identify at least two paper related to their project topic, and then meet with the rest of the group to share the ideas from these papers.
- Together each group will then select one of the papers from all those individually researched for a group presentation.
- The group presentation should be done preferably using presentation software. A template will be provided. Post your presentation to Blackboard.
- Maintain a record of the technical topics discussed during the group meetings.
- Submit a memorandum summarizing activities of the group in setting up the presentation.

Final project demonstration and presentation:

- A presentation of your individual project is required and will be graded by me, Computer Electronics Faculty members (Prof. Jeff Kilgore, Dr. Ray Richardson, and Prof. Dale Patrick) and CEN advisory committee members.
- The presentation should be organized into a format which is easy for others to understand. A PowerPoint template will be provided. The presentations allow you to discuss the research project and laboratory activity you have developed during the semester. One of its main purposes is to teach others in the class about topics you have been researching and building.
- Plan for a 15 minute or so presentation with a couple of minutes for initial setup time and also for audience questions. Prepare responses for a list of 3-5 possible audience questions.
- Preferably use presentation software, which will also be helpful in creating a 1 page handout summarizing your work for the class. You may alternatively setup a poster presentation and walk the class through each aspect of the poster.
- Professional attire is recommended.
- Discuss your presentation or its outline with me prior to the final in-class presentation.

Final project report:

- An individually written detailed report, approximately 10-15 pages in length (excluding title and appendices), with appropriate bibliographical references [in American Psychological Association (APA) format <http://nutsandbolts.washcoll.edu/apa.html>], is required.
- In general your project should have the following organization:
 - A title page
 - An executive summary or abstract summarizing in a paragraph or so the technical problem and your proposed solution. Include a heading 'Keywords' and list 3-5 keywords related to your project.
 - Introduction, including motivation for the problem. Refer to any relevant background information obtained from your list of references over here. Include applications from industry where similar ideas are being used or which prompted your design; also list alternate designs you considered initially, emphasizing the design which was finally chosen.
 - Specifics of the technical problem your project is trying to solve, including assumptions, and the precise scope of the problem (in-scope specifications).
 - Suggested solutions and your specific problem solving methodology. If possible illustrate with a sample example. Use illustrations liberally. Provide proper citations for any figures taken from other sources, including those taken from the Web. This is the main part of the paper and be as detailed as possible without including any trivial information. If special testing procedures or equipment is involved make a note of it here as well.
 - Project schedule – list the major blocks (tasks) and sub-tasks that had to be completed, designating key tasks as project milestones, along with a schedule of how long each task took to complete.
 - Operational testing – include the procedure used for operating and testing the design in order to determine whether it conforms with the in-scope specifications
 - Results discussing your observations - include simulation and calculated results, along with any graphs or tables showing the trends observed. Also, include information about any technical problems which arose during the course of the project, as well as how you solved them. Offer possible explanations for any portion of the project which did not work as planned.
 - Conclusions – state whether the completed project meets the in-scope specifications and project objectives. State the significance of the project and if possible compare it to similar commercially available systems. Include how this project can be extended further. Reiterate how your project solves the stated problem.
 - References. A bibliography section listing at least 5 - 10 references in APA format.
 - Appendices. Include photographs of the project, any manufacturer datasheets, detailed program listing, 'HOWTO' (a step-by-step operating procedure), oscilloscope plots, program code, list of the materials and equipment used as applicable.
- Spell-check your report. Possibly have a friend or family member read over your paper for typographical errors, and overall organization.
- A special note on using of text from web sources – please make every attempt to paraphrase the author rather than quoting verbatim. While it is tempting to cut-and-paste information from outside sources please refrain from doing so, except while using appropriate citations.
- If the project involves ideas which could be of benefit to a wider technical audience consider publishing your paper in a national (such as NAIT, the National Association of

Industrial Technology) or international conference (IEEE). This will be helpful for students later seeking admission to graduate school. We will be glad to work with you on any such endeavor. Such local, regional and nation presentation puts our department in the spotlight.

Weekly Capstone Journal (online):

- Since the class does not meet on every assigned class period it is important to designate specific days of the week which you will be able to set aside for working on the capstone project. Maintain detailed weekly entries in the Journal (online Blog) section of Blackboard. These will be viewable only by the specific student and the instructor.

Portfolio:

- Maintain a 3-ring binder containing written documentation regarding your project.
- Organize the binder into sections related to online information sheet and weekly capstone journal, progress reports, reference material such as technical papers reviewed, technical brochures, correspondence with product vendors, a copy of the final presentation, project report, etc.
- Include a notes copy in the binder where you have recorded your ideas and jottings related to the project, with dates. Entries can be penciled in and arranged in chronological order.
- Your portfolio will also be evaluated for completeness at the time of the final project presentation.

Note: Resources of the computer electronics Laboratories (Basic Electricity, Microprocessors, PLCs, Networking) will be available for students while working on the capstone project, during the EET399/499 designated class periods.

Also, faculty members of the computer electronic networking program have kindly agreed to serve as “consultants” to your capstone project. You may discuss your project, initial ideas and working strategies with them. Their contact information is given Technology faculty is given:

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|--|---|---|
| <ul style="list-style-type: none">• Prof. Jeff Kilgore
☎: (859) 622-1204
Email: jeff.kilgore@eku.edu
Office: Whalin 402 | <ul style="list-style-type: none">• Dr. Ray Richardson
☎: (859) 622-1200
Email: ray.richardson@eku.edu
Office: 327 | <ul style="list-style-type: none">• Prof. Dale Patrick
☎: (859) 622-1198
Email: dale.patrick@eku.edu
Office: Whalin 200B |
| <ul style="list-style-type: none">• Dr. Tim Ross
☎: (859) 622-3232
Email: tim.ross@eku.edu
Office: Whalin 302 | <ul style="list-style-type: none">• Dr. Steve Fardo
☎: (859) 622-1184
Email: steve.fardo@eku.edu
Office: Whalin 301B | |

Attendance Policy:

There are only eight in-class meetings planned including two days for the final presentations. Please plan to attend all these sessions. After the first unexcused absence, each unexcused absence will cause four percent deduction from the overall percentage. Your grade will be an automatic F if you have more than four (4) unexcused absences.

Grades:

100-90%	=	A	69.9-60%	=	D
89.9-80%	=	B	Below 60%	=	F
79.9-70%	=	C			

Mid-term grades will be made available to students by Saturday, March 8, 2008.

Monday, Jan. 21, 2008 - Last day to register for or add/drop full-semester classes.

End of Add/Drop period: Last day to drop a course without a “W” appearing on the university transcript, last day to register for or add additional full-semester courses. Last day to convert “Pass/Fail” or “Audit” classes to a normal grade and credit option.

Friday, March 21, 2008 - Last day to “withdraw” with a “W” from a full-semester class or from the University

Tuesday, May 13, 2008 – Final grades available online through ECU Direct

Student in the College of Business & Technology (CBT), including CEN/CE majors enrolled in EET452 are required to register for and attend the CBT Professional Skills Conference, Friday, April 4, 2008. While registering juniors should select BTS 300-001, CRN# 25842, and seniors should select BTS 400-001, CRN# 25844.

STATEMENT OF DISABILITY:

ADA

If you are registered with the Office of Services for Individuals with Disabilities, please make an appointment with the course instructor to discuss any academic accommodations you need. If you need academic accommodations and are not registered with the Office of Services for Individuals with Disabilities, please contact the office on the third floor of the Student Services Building, by email at disabilities@ecu.edu or by telephone at (859) 622-2933 V/TDD. Upon individual request, this syllabus can be made available in alternative forms.

☺ The work you do in this class, and the grade you earn, should reflect your personal abilities, and accomplishments. Individual progress and project reports are required from each student. I encourage you to discuss your project with other students. However any work you submit must be your own.

☺ Any suggestions for improving the content or presentation of the course are most welcome.

Course Calendar

EET399/499: Capstone Project in CET/CEN

- *Most Wednesday* class (6 – 8 pm) class meetings are *open-lab* hours. You may use any of the laboratory facilities by getting prior approval from the faculty member supervising the laboratory.
- *Final project demonstration and presentation* to be held *Mon., April 28* and *Wed., April 30*.
- *Final project report* is due by *noon, Friday, May 9* (Finals week)

Week	Date	Due Dates
1	<u>M, Jan. 14</u>	<u>In-class meeting</u> Syllabus
	W, Jan. 16	Complete online information and online journal entries by the weekend
2	M, Jan. 21	<i>Holiday – Martin Luther King</i>
	W, Jan. 23	Complete online journal entry by the weekend
3	<u>M, Jan. 28</u>	<u>Written progress report 1</u> Project proposal, select topic title and outline scope of the project
	W, Jan. 30	Complete online journal entry by the weekend

Week	Date	Due Dates
4	<u>M, Feb. 4</u>	<i>In-class meeting</i> Oral report – project title and outline Organize similar projects into groups. Exchange group address information Using online EKU library resources for researching technical information
	W, Feb 6	Complete online journal entry by the weekend
5	M, Feb 11	Group meetings (online/phone/lab). Maintain list of topics discussed.
	W, Feb 13	Complete online journal entry by the weekend
6	M, Feb 18	Written progress report 2 – Summary of at least two technical conference/journal papers (3 preferred), related to your project topic
	W, Feb 20	Complete online journal entry by the weekend
7	M, Feb 25	Group meetings (online/phone/lab). Maintain list of topics discussed.
	W, Feb 27	Complete online journal entry by the weekend
8	<u>M, Mar. 3</u>	<i>In-class meeting</i> Group PowerPoint presentation of mutually agreed upon research topic Submit summary of group meeting notes
	W, Mar. 5	Complete online journal entry by the weekend
9	M, Mar. 10 – F, Mar. 14	<i>Holiday – Spring Break</i>
10	<u>M, Mar. 17</u>	<i>In-class meeting (Tentative)</i> Guest speaker (Mr. Hank Gevedon, Proto Place, Inc.) - Patenting your project
	<u>W, Mar 19</u>	<i>In-class meeting (Tentative)</i> Field-trip to Hummel Planetarium – Electronic Control Center and show Complete online journal entry by the weekend
11	M, Mar. 24	
	W, Mar. 26	Complete online journal entry by the weekend
12	M, Mar. 31	Written progress report 3 – Identify progress to date, problems encountered and resolved, approximate percentage of project completed
	W, Apr. 2	Complete online journal entry by the weekend
	F, April 4	Professional skills conference
13	M, Apr. 7	
	W, Apr. 9	Complete online journal entry by the weekend
14	<u>M, Apr. 14</u>	<i>In-class meeting</i> – Information regarding presentations including those in the college of Business & Technology Capstone presentation Deciding order of final project presentations Discussion regarding preparation of the final project report
	W, Apr. 16	Complete online journal entry by the weekend
15	M, Apr. 21	(optional) Draft of final project report
	W, Apr. 23	Complete online journal entry by the weekend
16	<u>M, Apr. 28</u>	<i>In-class meeting</i> 1 st set of presentations along with student portfolios
	<u>W, Apr. 30</u>	<i>In-class meeting (Wed.)</i> 2 nd set of presentations along with student portfolios Apr. 20 (3:30 – 5:30 pm, Wed) – CB&T Capstone presentations
17	M, May 5 – F, May 9	<i>Finals Week</i> No Final Final project reports due by noon, Friday