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# Orientation to students about Capstone Course ICOM 5047

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# Computer Engineer [CCE]

- Definition
    - Computer engineering is concerned with the design and construction of computers and computer-based systems.
    - It involves the study of hardware, software, communications, and the interaction among them.
  - Computer engineering students study the design of digital hardware systems including communications systems, computers, and devices that contain computers. They study software development, focusing on software for digital devices and their interfaces with users and other devices.
  - CE has a strong engineering flavor.
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# ABET

- Accreditation Board for Engineering and Technology
    - Accreditation assures that a program has met quality standards set by the profession.
  - Changes in ABET
    - Continuous improvement, assessment
  - ABET's mandate: Major design experience
    - Solution: CAPSTONE
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# ABET

- "Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints."
    - Quotation from ABET. Criteria for Accrediting Engineering Programs. Effective for Evaluations During the 2008-2009 Accreditation Cycle.
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# What is Capstone Design?

- Apply the engineering sciences to the design of a system, component or process.
  - Students choose the particular design project with approval of appropriate faculty.
  - Computer Engineering
    - “The solution **must** involve the design **and** implementation of some product containing **hardware** and/or **software** components” [2].
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# Hardware AND Software

- “The solution **must** involve the design **and** implementation of some product containing **hardware** and/or **software** components”
  - ABET requirement for the **UPRM CE** accreditation: **BOTH** Hardware **and** Software components
  - ABET requirement: no new concepts taught in **CAPSTONE**



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# Capstone Project

- Project
    - open-ended problems
    - development and use of design methodology, formulation of design problem statements and specification, consideration of alternative solutions
    - feasibility consideration
    - detailed system descriptions
    - realistic constraints
      - Economic factors, social impact, ethical, environmental, and others
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# Design Experience [2]

- The culminating design experience should provide students with a wealth of learning benefits. The benefits stemming from this experience include:
    - Demonstration of the ability to integrate concepts from several different subjects into a solution
    - Demonstration of the application of disciplines associated with computer engineering
    - Production of a well-written document detailing the design and the design experience
    - Demonstration of creativity and innovation
    - Development of time management and planning skills
    - Self-awareness opportunities provided by an assessment of achievement as part of a final report
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# What do we expect from students before they come to the course?

## ■ Knowledge

### □ Hardware Design

- Architecture
- Programming firmware (micro I)
- Digital Electronics

### □ Software Design

- ER, Use case diagrams, Class diagrams, test cases
- Design patterns

### □ Soft skills

- Presentations, writing, working in teams, time management
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# Seminars

- Project Management
  - Budget Writing
  - Proposals
  - Teamwork
  - Effective Meetings
  - Document and Info. Management
  - Patents
  - Conflict Management
  - Oral Communication
  - Creativity
  - Writing a Report
  - Environmental Impact
  - Ethics
  - Entrepreneurship
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# How are seminars provided?

- Some of the seminars are provided by guest speakers
    - Regularly Invited guests
      - Luis Figarella, Matrix, Patents
      - Rocío Suarez, Environmental Impact
      - Angel Perez, Rock Solid, SE in PR
      - Nestor Figueroa, Nagnoi, Business Intelligence
      - Efrain O'Neill, Ethics
      - Manuel Jimenez, Micro
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# Assessment

- “Happy Hours”
  - Homework
  - Presentations
  - Evaluation sheets
  - Attendance
  - Reports and Documentation
    - Proposal
    - Reports
    - Technical Documentation
    - Code and Schematics
      - Repository
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# Happy Hours

- “Happy Hour”
    - Oral exam, demonstration, more than one evaluator
    - Rubric is based on the project
    - Three HH
      - HH1 – Just after the proposal
      - HH 2 – Every individual components must be finished by HH2
        - Testing sheets
      - HH 3 – Integration
        - Testing sheets
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# Homework and Presentations

- Homework

- Evaluate specific outcomes of the program
  - Example: Ethics, Environmental Impact, etc.
  - Individual assessment

- Presentations

- Presentation skills
  - Formal Dressing Code
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# Attendance

- Attendance list
    - Signed (signing avoids problems)
  - Blog
    - This is a project notebook
    - Attendance to meetings evaluated here
    - Evidence of regularly held meetings
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# Reports and Documentation

- Proposal
    - Project Management Plan
    - Objectives (SMART)
    - Resources Plan
    - Task assignment
    - Gantt
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# Lessons learned

- Groups who start early succeed.
    - Part of the project comes from Micro II and/or SE or DB.
  - Successful groups
    - Everyone contributes.
    - Diverse background and knowledge.
    - Respect each other (not necessarily friends).
  - Students are successful if they are responsible and willing to learn independently.
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# Lessons learned

- Groups that start late have a very hard time.
    - No sleep, health problems.
  - One person can spoil a group.
    - Team players are needed.
  - If students did not learn what they were supposed to learn in five years, capstone becomes daunting....
  - Happy Hours become unhappy when student did not do what he/she was supposed to do.
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# Past Problems with Capstone

- Student took Analog Integrated Circuit Design but he/she wants to design a microprocessor interface....
    - Students should take the appropriate prerequisites or design a project using the Analog IC they designed in the class....
  - Students took databases and SE but did not learn how to design software.....
    - Everyone must know how to design software (fundamental skill).
  - Everybody in the group is software engineer....
    - Wrong. All are a CE.
  - Students cannot agree with his/her partners....
    - Learn how to deal with difficult people. Life is not fair.
  - Student: “It is not my responsibility....”
    - Yes. It is.
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# Questions?

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