

Synergy Between ABET EC 2000 and Capstone Senior Design Projects

Keith E. Holbert
Arizona State University

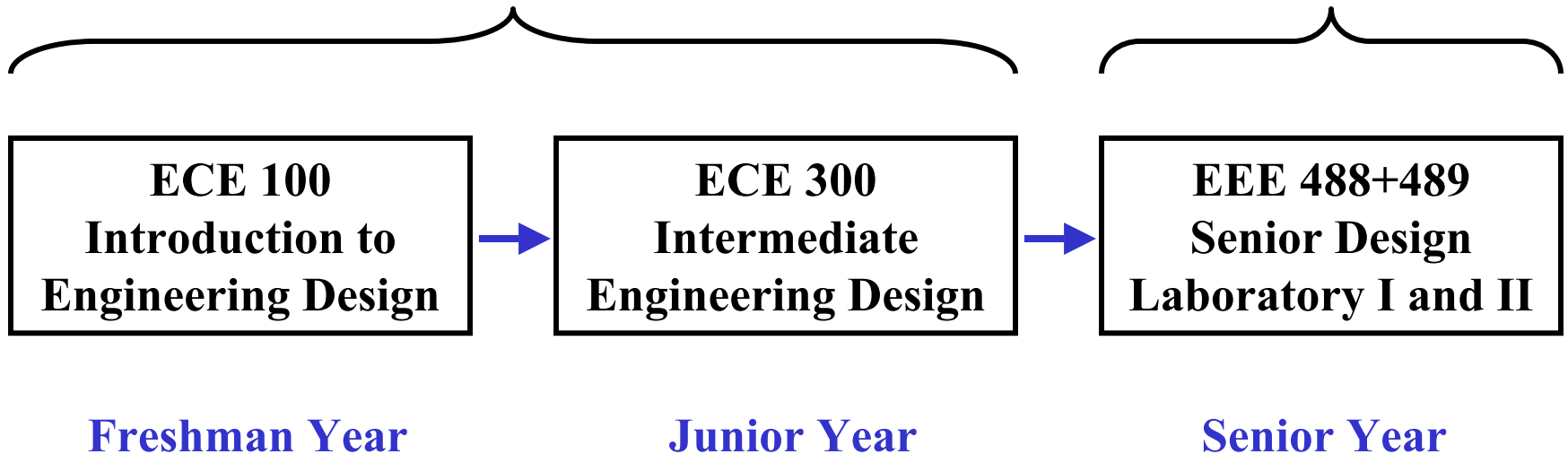
IEEE PES 2003 General Meeting

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ASU Engineering Design Sequence

**Mixed Classes of All Engineering Majors:
Helps to insure EC 3(d), “an ability to
function on multi-disciplinary teams”**

**Electrical Engineering
Majors Only**



ASU Capstone Design Course

- Effective Fall 2001, became a two-semester course of 2 credit hrs each (it was a one-semester 3-hr course from 1989 to 2001)
- Students may start sequence in fall or spring
- All electrical engineering majors in the same class

Senior Design Laboratory

Semester 1 (EEE 488)

- Problem definition
- Specifications
- Background research
- Design concept
- Feasibility study
- Proposal generation
- Parts ordering

Semester 2 (EEE 489)

- Simulation
- Implement/construct
- Evaluate/benchmark
- Analyze & refine
- Other considerations
- Document
- Demonstration

Course Organization

- *Course Coordinator* gather project ideas from faculty and industry sponsors; meets with students as entire class weekly; moves with students to second semester; grades the written reports and oral presentations
- *Faculty Advisors* propose unique projects; typically advising a single design team; meets with design group weekly for the year

Student Design Teams

- 3 to 4 student members per team
- Same team composition for the full year
- The team prepares most written reports (technical memos, proposal and final design report) as a group
- The team presents as a group but each individual speaks for (exactly) 5 mins

Technical Reporting – Semester 1

Week	Item	Grade
3	Resume (individual)	5%
5	Written Progress Report (team)	5%
7	Oral 5-min Presentation (mixed)	5%
9	Written Progress Report (team)	5%
11	Oral 5-min Presentation (mixed)	5%
13	Semester Summary (individual)	10%
15	Design Proposal (team)	15%

Technical Reporting – Semester 2

Week	Item	Grade
3	Written Progress Report (team)	5%
5	Oral 5-min Presentation (mixed)	5%
8	Written Progress Report (team)	5%
11	Oral 5-min Presentation (mixed)	5%
13	Semester Summary (individual)	5%
15	Poster Session & Demo (team)	10%
16	Final Design Report (team)	15%

Student Grades Based On:

1. Technical assessment of group design (50%)
 - Technical advisor predominantly grades technical work (30% of total grade)
2. Technical communication: written reports and oral presentations (50%)
 - Course coordinator assigns 20% of technical grade and all of the communication part
3. Contribution of individual to the team (weighting factor)
 - Students rate other team members, which has helped to insure individual accountability

Senior Design Prize



Industry judges select the winning team, which receives: \$100/member; trophy; and their names and faculty sponsor on plaque

ABET EC2000 Criterion 4

“Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political.”

Project/Course Connections to ABET EC2000

- (a) apply knowledge of math, science and engineering
- (b) design & conduct experiments
- (c) design a system, component, or process
- (e) identify, formulate & solve engr. Problems
- (f) understand professional & ethical responsibility
- (j) knowledge of contemporary issues
- (k) use the techniques, skills, & modern engineering tools

Assessment (Student Survey)

- Students complete a web-based survey at the end of the second semester
- Example question addressing ABET Criterion 4

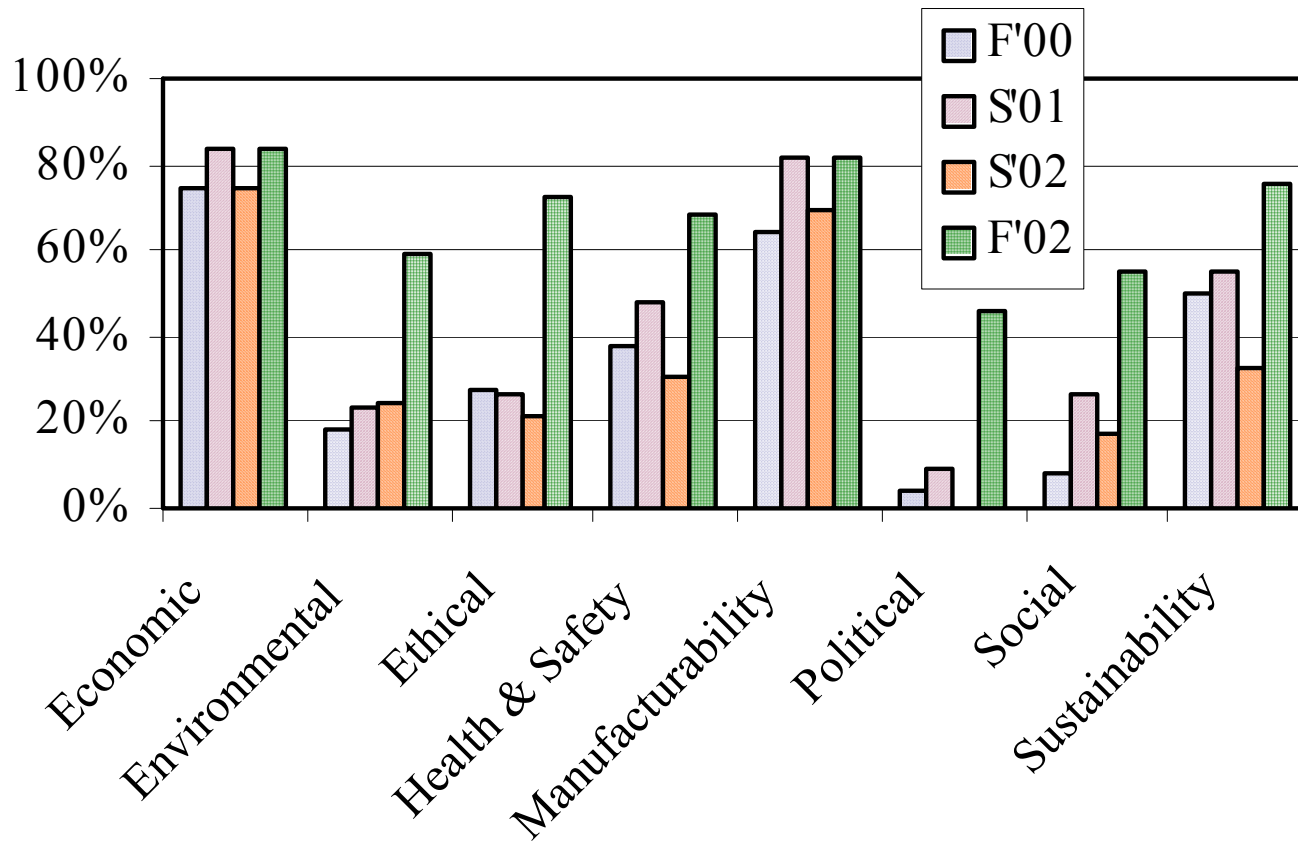
The following questions concern your particular EEE 488-489 **Design Project**:

19

**My Design Project included the following considerations:
(Check ALL that apply)**

- Economic
- Environmental
- Ethical
- Health and Safety
- Manufacturability
- Political
- Social
- Sustainability

Design Project Consideration of Other Factors

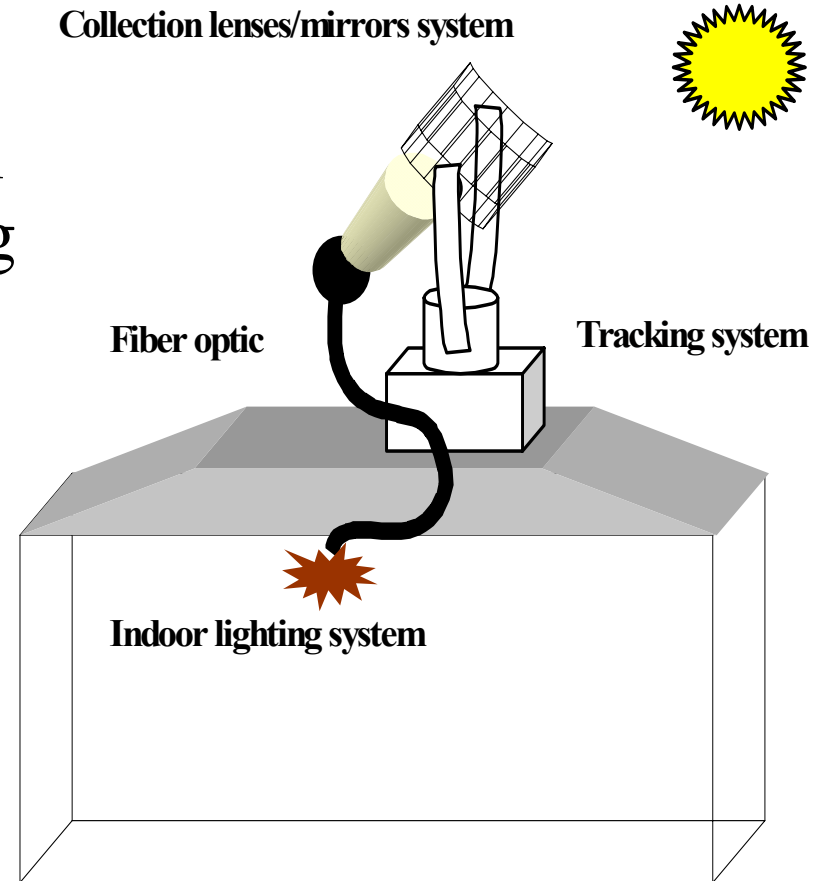


Power Related Design Projects

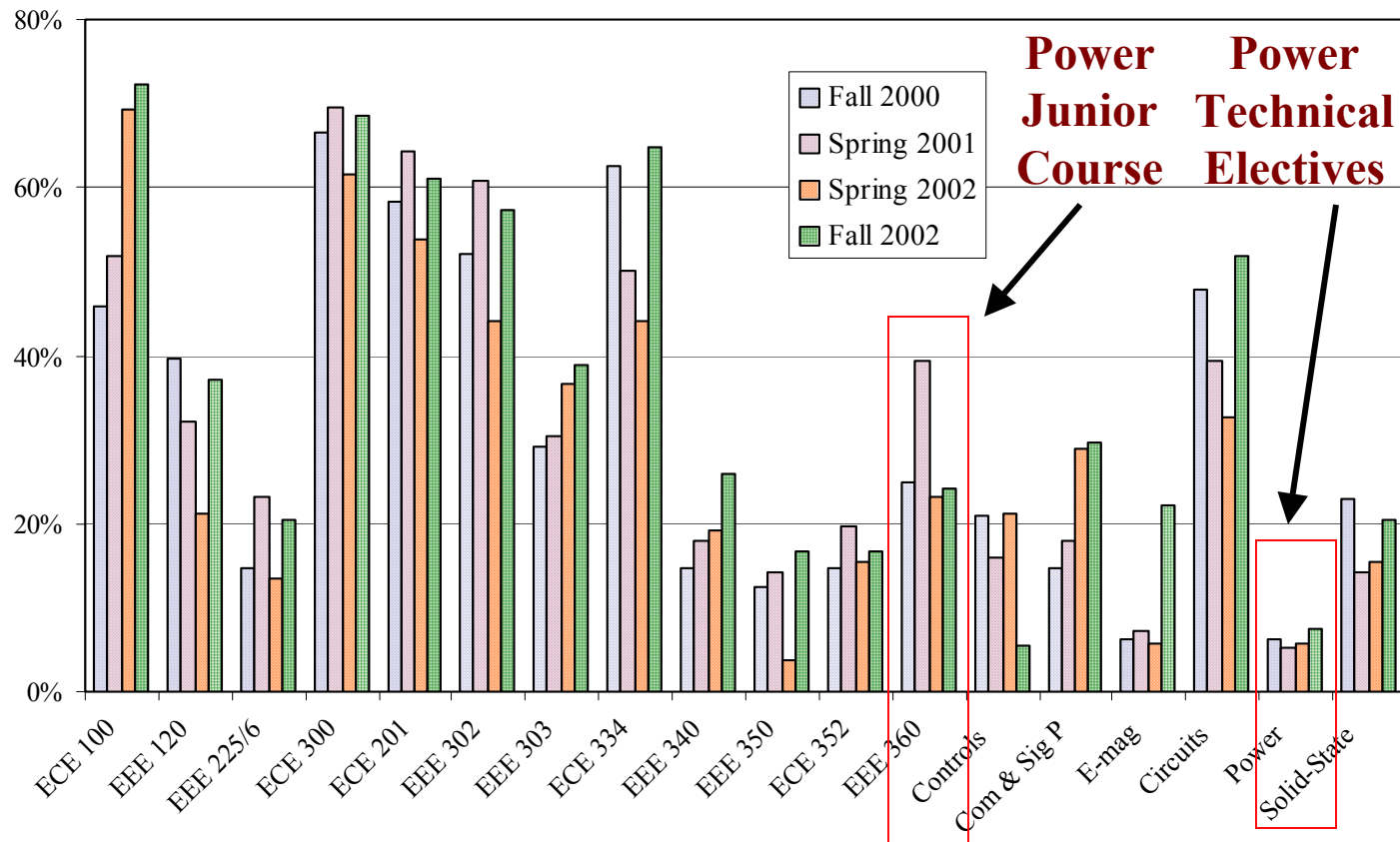
- Digitally Programmable Switch-Mode Power Supply
- A Phase Controlled, Series Boost Voltage Conditioner
- Remote Current Measurement
- Voltage Measurement Using Fiber Optic Cables
- Multiplexing Data Communication onto Power Distribution Lines
- Bi-Directional DC-DC Converters for the 42V Architecture of Future Automobiles

Power Related Design Projects

- Electric Airplane
- Development of a Digital Power Quality Measuring System
- A Series Voltage Boost Voltage Regulator
- High Efficiency Switch-mode Music system
- Passive Lighting System



Courses and Technical Areas from which Student's Draw Knowledge and Skills to Complete Their Project



Analysis of Student Usage of Power Related Knowledge & Skills

- 28% of students are utilizing the material from the required junior-level power course; about average compared to other areas
- Only 6% of the design projects applied concepts from the senior-level power engineering technical electives; the lowest of the six technical elective areas at ASU