Engineering Capstone Design:

To Better Prepare Graduates to be Successful in Today's Profession

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What I tell our students

The discipline of engineering is changing…..

Technical excellence is **EXPECTED;**
Your professional skills are what will **DIFFERENTIATE YOU**

Can you *collaborate*?
Can you *communicate*?
Can you *lead*?

Capstone Senior Design

Course Objective

- To combine previously learned engineering concepts in finding **solutions to multi-faceted,open ended, real world problems**.
- To **develop methods of independent learning for exploring and solving problems not previously encountered**. There will be a vast amount of information to be learned to complete the project. Students must perform research to seek out the answers to problems encountered on the project.
- To familiarize senior engineering students with the **engineering design process and its key elements**: selection of appropriate technical procedures, team participation, integration of social and environmental preferences and constraints, and the roles of ethical and fiscal constraints.
- To develop **a design solution for a client.**
- To learn to **communicate with a client** and with fellow student team members.

Capstone Senior Design - Fall

- ***Project Focus*** – Introduction to the project, gathering background information, identification of design options and regulatory constraints, and development of preliminary design concepts
- ***Course Focus*** – Professional Development and Engineering Practice

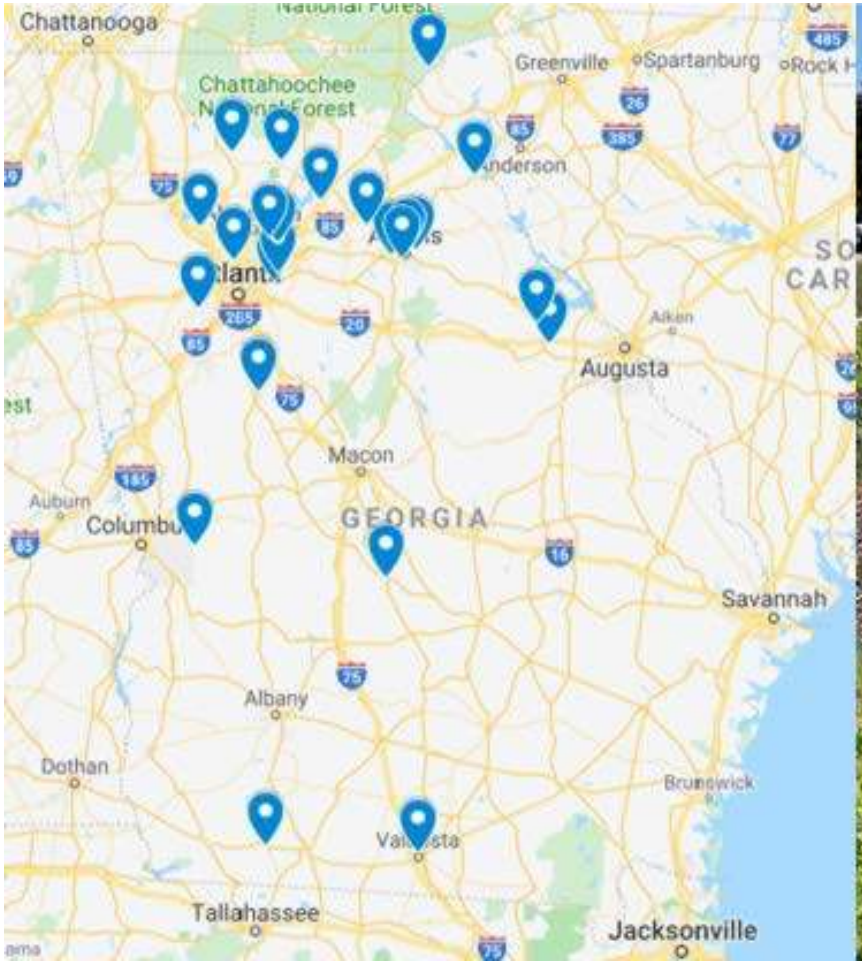
- **Course Focus Topics**
  - Introduction to Senior Design (Expectations)
  - Advice for New Graduates
  - Client Meetings and Performing Site Visits
  - Customer Discovery
  - Project Understanding
  - Project Concepts
  - Engineering Standard of Care
  - Introduction to Engineering Ethics
  - Engineering Ethics and Failures
  - Tips for Making a Good Presentation
  - Engineering Workplace
  - Engineering Business Models
  - Civic Duty and Professional Organizations
  - Top 10 Ways to Lose a Client
  - Top 10 Items to Include in Your Contract
  - Hiring Principles
  - Rough Estimating Project Costs

Design Thinking

Customer Discovery ***Project Understanding*** ***Project Concept*** ***Heavy Engineering Design*** ***Client(s) Hands***

Fall Semester ***Spring Semester*** ***Future***

Client Meeting and Site Visit



Design Thinking

CUSTOMER DISCOVERY WORKSHEET

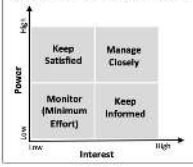
PROJECT NAME: _____
PROJECT SPONSOR: _____
PROJECT TEAM MEMBERS _____

DETERMINE KEY STAKEHOLDERS (Individuals or groups that support the goal of the project, provide input and valuable feedback to improve the quality and impact of the project.

LIST INTERNAL STAKEHOLDERS (individuals and/or groups you are designing with and sometimes for)	LIST EXTERNAL STAKEHOLDERS (individuals and/or groups you are designing for)

DETERMINE STAKEHOLDER NEEDS (For each stakeholder ask "When I _____ I need _____ so that I can _____." Provide a list of key CLIENT and CONSUMER needs and desires:

PRIORITIZE YOUR STAKEHOLDERS (Based on the above list of individuals and groups that are affected by your work, it is time to prioritize your stakeholders. Map your stakeholders according to their power over and their interest in your work (use next page for platting)



High Power/High Interest (Manage Closely) – fully engage these people, make the greatest efforts to satisfy them.
High Power/Less Interest (Keep Satisfied) – put enough work in to keep them satisfied, but not so much they get bored with the message.
Low Power/High Interest (Keep Informed) – adequately inform these people to make sure no issues arise
Low Power/Less Interest (Monitor) – Monitor these people, but don't bore them with excessive communication.

PROJECT UNDERSTANDING WORKSHEET

PRIORITIZED STAKEHOLDERS' NEEDS (INTERNAL AND EXTERNAL)		VALUE/OPPORTUNITIES	
Stakeholder	Need(s)	Human	Financial
COMPETITION/RISK		**CODES/JURISDICTIONS/REGULATORY**	
Current	Future	Technical Codes/Standards	Jurisdictions/Regulatory Agency

Adapted from: Design Thinking. UGA Terry College of Business. Provided by Entrepreneurship Program Faculty David Sutherland and Don Chambers.

PROJECT CONCEPT WORKSHEET

Develop at least 2-3 design concepts that (1) addresses the needs of the stakeholders, (2) maximizes values/opportunities (3) addresses potential competition/risk, and (4) meets applicable codes and regulatory agencies. *It is recommended that each team member develop a concept!*

CONCEPT # ____
CONCEPT NAME

DESCRIBE THE CONCEPT (provide a thorough description of the concept that includes design features/elements, capabilities, etc.). You may provide a sketch of the concept on an additional page.

STAKEHOLDER NEEDS *(What are the stakeholder needs that this concept addresses?)*

ORGANIZATIONAL AND STRATEGIC VALUE/OPPORTUNITIES *(What are the potential achievements/ reward/improvements, return on investment, revenue/profit, and innovation value of the concept?)*

POTENTIAL COMPETITION/RISKS *(What are the risks to the client and other stakeholders with this concept? What are the technical design/production risks (cost, IP, practicality) of this concept?*

ADVANTAGES/DISADVANTAGES OF CONCEPT *(What are the Adv/Disadv for the client if they were to select this concept?)*

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Fall Course Requirements

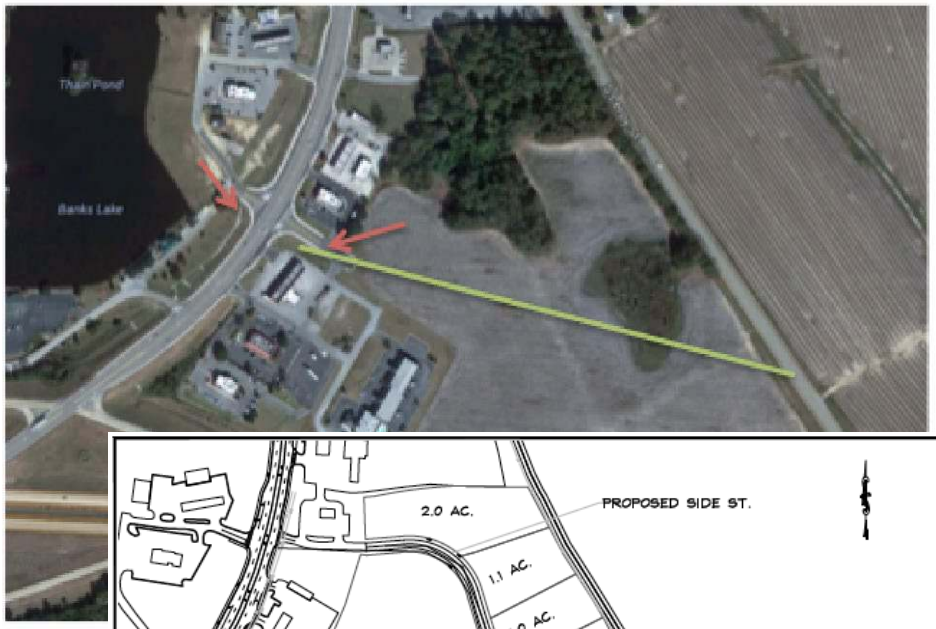
Ethics Assignment (individual)	3%
Professional Licensure Assignment (individual)	3%
Meeting with Faculty or P.E (individual)	2%
Meeting with Career Center (individual)	2%
Professional Meeting Attendance (individual)	2%
Professional Membership (2) (individual)	2%
Professional Periodical (individual)	1%
Engineering Leadership Assignments (individual)	5%
360 Evaluation Survey (individual)	5%
Digital Design Notebooks (individual)	25%
Project Milestone Deliverables (group)	10%
Mid-Term Ethics Exam	5%
Instructor Presentation (group)	10%
Design Report and Client Presentation (group)	25%
Total	100 %

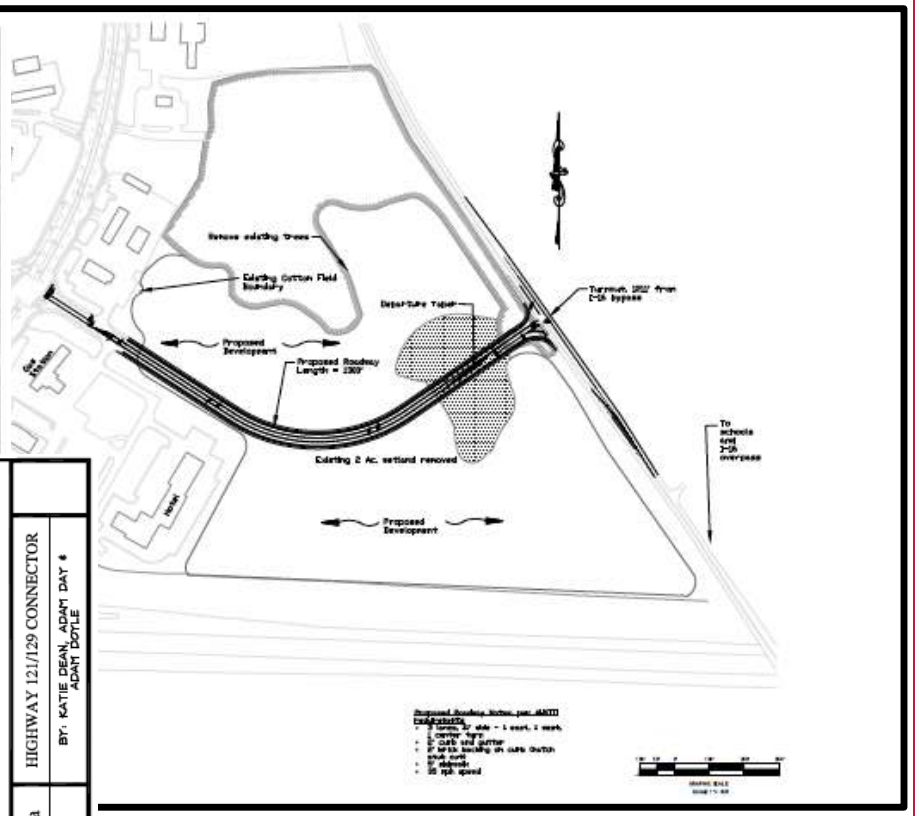
Capstone Senior Design - Spring

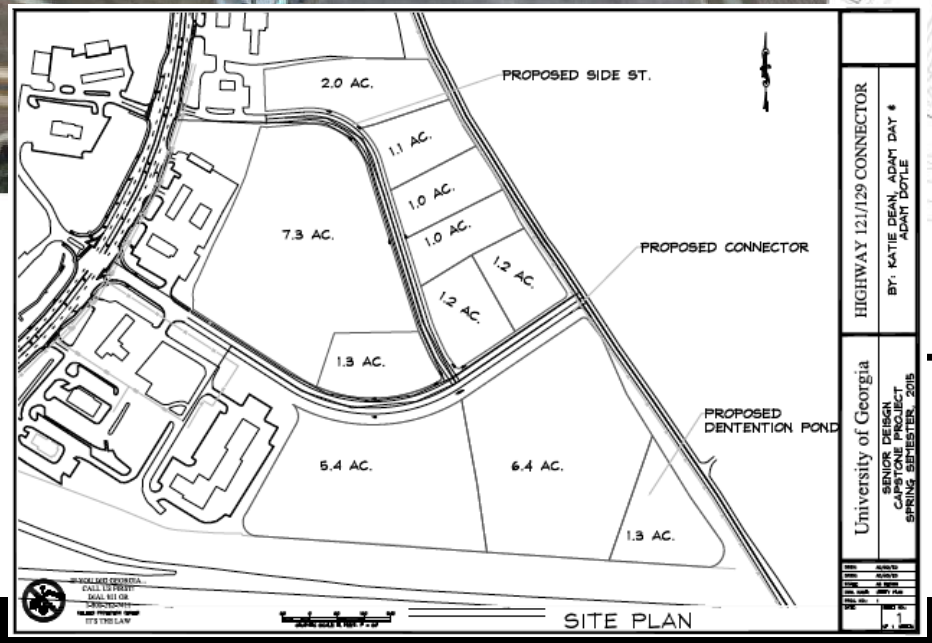
- ***Project Focus*** – Take projects to final design incorporating applicable codes, ordinances, and client preferences; production of complete construction documents; oral presentation of design to external clients; and development of a written engineering report.
- ***Course Focus*** – Review for the Fundamentals of Engineering Exam

- **FE Review Topics**
  - Engineering Economics
  - Engineering Statistics
  - Engineering Mechanics and Structural Design
  - Fluid Mechanics
  - Hydraulics and Hydrology
  - Geotechnical Engineering
  - Environmental Engineering
  - Surveying and Transportation

Design Development







Client: Candler County Archway Partnership
Project Name: Hwy 121/129 Feasibility Study and Site Development

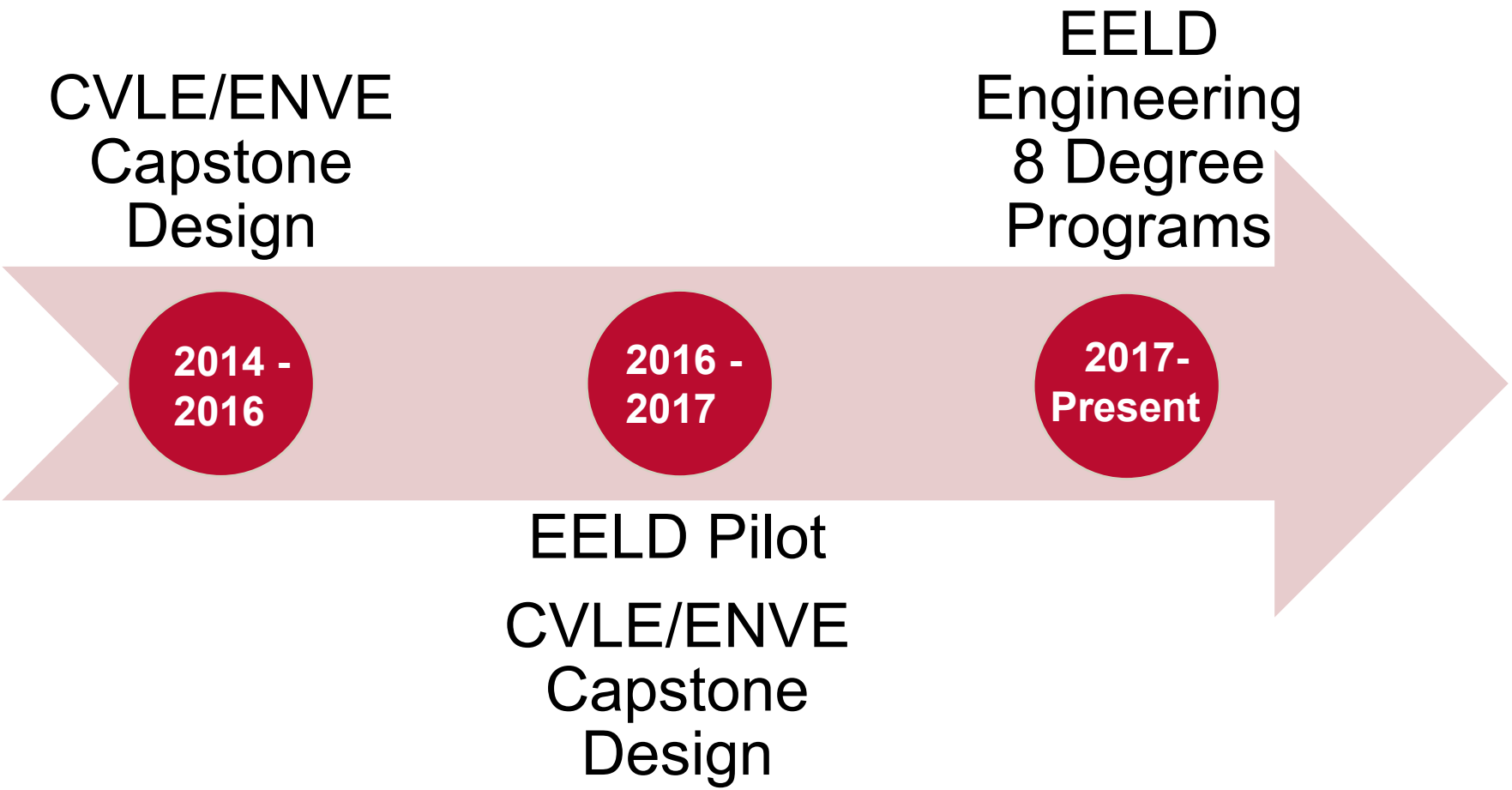
Community Partners

Putting students in position to use/develop their leadership skills! BUILD CONFIDENCE!!!!

Spring Course Requirements

360 Evaluation Survey/Class Participation (individual)	5%
FE Review Assignments (individual)	10%
Design Notebooks (individual)	25%
Project Progress Memos (group)	10%
Engineering Leadership Assignments (individual)	5%
Class Project Presentation (group)	10%
Final Design Report/Project Files (group)	30%
Final Design Poster/Display and Client Presentation (group)	5%
Total	100 %

Engineering Leadership Program



Engineering Leadership Program

- *The lessons have opened my eyes to how I lead and how I interact with others.*
- *I plan on using these skills well beyond college and into my future career.*
- *A lot of the tools given to us through these leadership modules will be very useful to me in my future career.*
- *I think these lessons simply helped me create an idea of who I would like to be as a leader.*

Leadership Program

Exploring My Leadership Styles

August

Communicating in a Virtual World

September

Stakeholder Mapping and Engagement

September

Making Group Decisions

October

Managing Conflict

November

Working Across Generations

January

Risk and Entrepreneurial Innovation

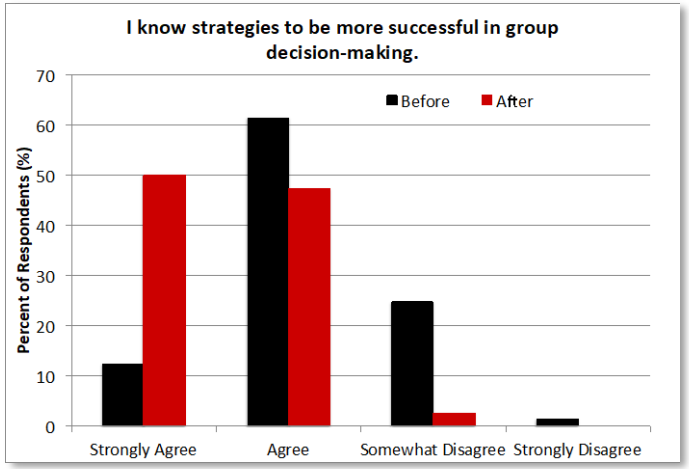
February

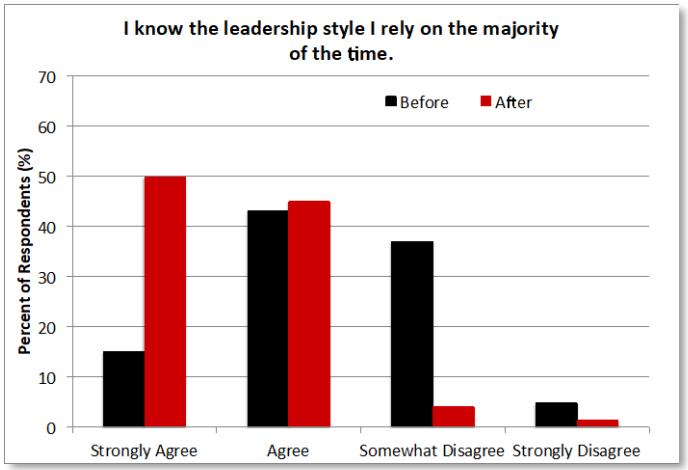
Creating My Leadership Vision

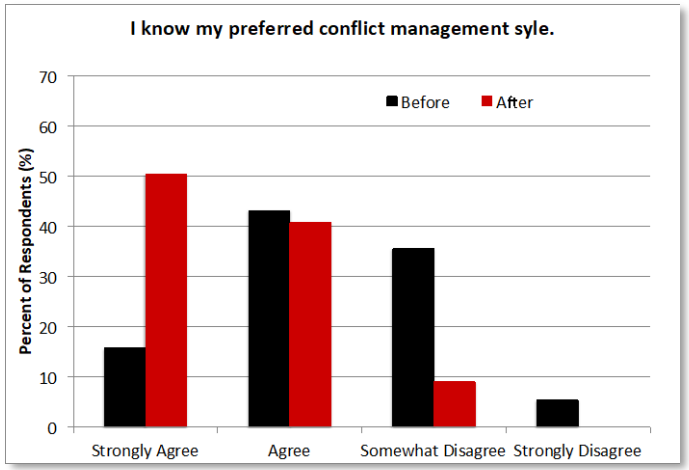
March

Developing Personal Accountability

March







Leadership Module #9
Developing Personal Accountability

Consider the leadership lessons throughout this program and your experiential learning through your capstone project as you complete this assessment by answering the following questions:

Question #1 – Has your leadership vision changed as you've progress through your Senior Capstone Design Course and these leadership lessons?

Question #2 – How have you used these leadership lessons working within your project group?

Question #3 – How have you used these leadership lessons to work with your project clients?

Question #4 – How will you use these lessons about your own leadership development in your future engineering career?

"My leadership vision has changed as I have progressed through the Senior Capstone Design Course and these leadership lessons. ***I feel more responsible for acting professionally*** when not only working directly with the client(s) and project members, but also when completing the project work. I have a ***better understanding for what is required when communicating with clients and other people*** involved in the project. I can now foresee how the efforts of my project team will ***result in stronger community bonds and better represent the College of Engineering, here at UGA***."

Outcomes assessment provides a foundation for continual improvement and accreditation.

Questions?

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