Department of Electrical and Computer Engineering
Iowa State University
Computer Engineering Program

Student Outcomes Assessment Tools

ABET ACCREDITATION VISIT - FALL 2012

For more information, please see:

D. T. Rover, D. Jacobson, A. E. Kamal and A. Tyagi,
"Implementation and Results of a Revised ABET Assessment Process",
in the proceedings of the American Society of Engineering Education Annual Conference, 2013 (http://www.asee.org/public/conferences/20/papers/7964/view).

- Download paper
- Download slides

The multilevel Student Outcome assessment process

	Direct	Indirect	Informal
Program level ***(Level 1)***	OPAL – Employer	OPAL – Student Student forums	Student input Faculty input
Demonstration level ***(Level 2)***	Student Portfolios Senior Design	Senior Design – Student	Student input Faculty input
Learning level ***(Level 3)***	Several courses	Student forums	Student input Faculty input

Summary of Student Outcomes Assessment Tools

Assessment Tools	Direct/Indirect/Informal					Source
	Direct	Indirect	Informal	Quant	Qual	
Senior design scoring	x			x		Employer, Faculty
Portfolio assessment by faculty	x			x	x	Employer, faculty
OPAL-based competency assessment by employers	x				x	Employer
Course-Outcomes mapping by instructor	x			x	x	Faculty
OPAL-based competency self assessment by students		x		x		Students
Senior design student survey responses		x		x		Students
Student comments/forums		x			x	Students
Course assessment by students		x		x	x	Students
Student exit interviews		x			x	Students
Student input			x	x	x	Students
Faculty input			x	x	x	Faculty

Coverage map of the direct measures

Direct Assessment tool	**Student Outcomes**										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
Level 1: OPAL based survey from employers	√	√	√	√	√	√	√	√	√	√	√
Level 2: Senior design industry panel scoring			√		√		√				√
Level 2: 492 Faculty advisor	√		√	√	√	√	√				√
Level 2: Senior design instructor			√			√	√				
Level 2: Portfolio assessment by faculty								√	√	√	√
Level 3: Course based											
CPRE 281		√									
EE 230		√			√						
CPRE 288			√								
CPRE 381					√						√
CPRE 310	√										
CPRE 394						√					

ASSESSMENT TOOLS

E1: Level 1 SO assessment tools
- E.1.1 OPAL supervisor (employer) survey
- E.1.2 OPAL student (intern) survey

E2: Level 2 SO assessment tools
- E.2.1 Senior design rubrics
- E.2.2 Portfolio review rubrics

E3: Level 3 SO assessment tools
- E.3.1 Coursework assessment rubrics

E4: Other SO assessment information
- E.4.1 Senior Design Faculty Advisor Evaluation Form
- E.4.2 Senior Design Student Survey Form
- E.4.3 Senior Design IRP Evaluation Form
- E.4.4 Graduating student exit survey
- E.4.5 Course evaluation by students
- E.4.6 Laboratory evaluations by students

E1: Level 1 SO Assessment Tools

E.1.1 OPAL Supervisor (Employer) Survey

Requestor Name	Date Received	Survey Name
Administrator, System	Wednesday, January 11, 2012	Engineering Alumnae ABET Survey 2011

Instructions
Use the scale below to rate how often you perform each action when given the opportunity.

When given the opportunity, how often does this person perform the action?
1 **Never or almost never.** This person hardly ever performs the action.
2 **Seldom.** This person often does not perform the action.
3 **Sometimes.** This person performs the action about half of the time.
4 **Often.** This person performs the action on most occasions.
5 **Always or almost always.** This person performs the action just about every time.
No Response: No opportunity to observe.

Analysis and Judgment (ISU Accreditation Aligned)
Identifying and understanding issues, problems, and opportunities; comparing data from different sources to draw conclusions; using effective approaches for choosing a course of action or developing appropriate solutions; taking action that is consistent with available facts, constraints, and probable consequences.

Identifies issues, problems, and opportunities
Recognizes issues, problems, or opportunities and determines whether action is needed.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Gathers information
Identifies the need for and collects information to better understand issues, problems, and opportunities.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Interprets information
Integrates information from a variety of sources; detects trends, associations, and cause-effect relationships.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Generates alternatives
Creates relevant options for addressing problems/opportunities and achieving desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Chooses appropriate action
Formulates clear decision criteria; evaluates options by considering implications and consequences; chooses an effective option.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Commits to action
Implements decisions or initiates action within a reasonable time.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Involves others
Includes others in the decision-making process as warranted to obtain good information, make the most appropriate decisions, and ensure buy-in and understanding of the resulting decisions.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Values diversity
Embraces and values diverse collection of inputs, values, perspectives, and thought paradigms in approaching the application of engineering to products and processes.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Communication (ISU Accreditation Aligned)

Clearly conveying information and ideas through a variety of media to individuals or groups in a manner that engages the audience and helps them understand and retain the message.

Organizes the communication
Clarifies purpose and importance; stresses major points; follows a logical sequence.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Maintains audience attention
Keeps the audience engaged through use of techniques such as analogies, illustrations, body language, and voice inflection.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Adjusts to the audience
Frames message in line with audience experience, background, and expectations; uses terms, examples, and analogies that are meaningful to the audience.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Ensures understanding
Seeks input from audience; checks understanding; presents message in different ways to enhance understanding.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Adheres to accepted conventions
Uses syntax, pace, volume, diction, and mechanics appropriate to the media being used.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Comprehends communication from others
Attends to messages from others; correctly interprets messages and responds appropriately.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Continuous Learning (ISU Accreditation Aligned)

Actively identifying new areas for learning; regularly creating and taking advantage of learning opportunities; using newly gained knowledge and skill on the job and learning through their application.

Targets learning needs
Seeks and uses feedback and other sources of information to identify appropriate areas for learning.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Seeks learning activities
Identifies and participates in appropriate learning activities (e.g., courses, reading, self-study, coaching, experiential learning) that help fulfill learning needs.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Maximizes learning
Actively participates in learning activities in a way that makes the most of the learning experience (e.g., takes notes, asks questions, critically analyzes information, keeps on-the-job application in mind, does required tasks).

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Applies knowledge or skill
Puts new knowledge, understanding, or skill to practical use on the job; furthers learning through trial and error.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Takes risks in learning
Puts self in unfamiliar or uncomfortable situation in order to learn; asks questions at the risk of appearing foolish; takes on challenging or unfamiliar assignments.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Cultural Adaptability (ISU Accreditation Aligned)
Being open to and making changes to accommodate the differences found in other cultures in order to interact effectively with individuals and groups from a different cultural background.

Demonstrate inclusive behavior
Establishes effective relationships with people of other cultures and backgrounds; shows genuine acceptance of people from backgrounds different from one's own.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Exhibits sensitivity
Exhibits sensitivity to and respect for the perspectives and interests of people of a different culture; attends to and tries to understand different perspectives and approaches.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Adapts behavior to other culture
Adjusts own approach to interactions, communications, and decision making to be

appropriate and effective within another culture without sacrificing own values.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Adapts products and processes to cultural concerns
Identifies, understands and incorporates cultural factors into the design of products and processes.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Customer Focus (ISU Accreditation Aligned)

Making customers and their needs a primary focus of one's actions; developing and sustaining productive customer relationships.

Seeks to understand customers
Actively seeks information to understand customers' circumstances, problems, expectations, and needs.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Educates customers
Shares information with customers to build their understanding of issues and capabilities.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Builds collaborative relationships
Builds rapport and cooperative relationships with customers.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Takes action to meet customer needs and concerns
Considers how actions or plans will affect customers; responds quickly to meet customer needs and resolve problems; avoids overcommitments.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Sets up customer feedback systems
Implements effective ways to monitor and evaluate customer concerns, issues, and satisfaction and to anticipate customer needs.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Engineering Knowledge (ISU Accreditation Aligned)

Having achieved a satisfactory level of knowledge in the relevant specialty areas of mathematics, science and engineering.

Knowledge of mathematics
Demonstrates a knowledge of the mathematical principles required to practice engineering in one's specialty area.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Knowledge of science

Demonstrates a knowledge of the scientific principles required to practice engineering in one's specialty area.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Knowledge of experimental design and analysis
Demonstrates a knowledge of the principles of experimental design and data analysis in one's specialty area.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Knowledge of current engineering tools
Demonstrates a knowledge of the use of contemporary tools needed to practice engineering in an effective manner.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Knowledge of engineering
Demonstrates a knowledge of engineering principles required to practice in one's specialty area.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

General Knowledge (ISU Accreditation Aligned)
Having achieved a satisfactory level of knowledge outside the areas of mathematics, science and engineering.

General Knowledge
Demonstrates a knowledge of important current issues and events outside the areas of mathematics, science and engineering.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Relates general knowledge to engineering
Demonstrates a knowledge of the interrelationships between important issues and events outside of engineering and one's engineering specialty area.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Initiative (ISU Accreditation Aligned)
Taking prompt action to accomplish objectives; taking action to achieve goals beyond what is required; being proactive.

Responds quickly
Takes immediate action when confronted with a problem or when made aware of a situation.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Takes independent action
Implements new ideas or potential solutions without prompting; does not wait for others to take action or to request action.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Goes above and beyond
Takes action that goes beyond job requirements in order to achieve objectives.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Innovation (ISU Accreditation Aligned)
Generating innovative solutions in work situations; trying different and novel ways to deal with work problems and opportunities.

Challenges paradigms
Identifies implicit assumptions in the way problems or situations are defined or presented; sees alternative ways to view or define problems; is not constrained by the thoughts or approaches of others.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Leverages diverse resources
Draws upon multiple and diverse sources (individuals, disciplines, bodies of knowledge) for ideas and inspiration.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Thinks expansively
Combines ideas in unique ways or makes connections between disparate ideas; explores different lines of thought; views situations from multiple perspectives; brainstorms multiple approaches/solutions.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Evaluates multiple solutions
Examines numerous potential solutions and evaluates each before accepting any.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Ensures relevance
Targets important areas for innovation and develops solutions that address meaningful work issues.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Integrity (ISU Accreditation Aligned)
Maintaining social, ethical, and organizational norms; firmly adhering to codes of conduct and professional ethical principles.

Demonstrates honesty
Deals with people in an honest and forthright manner; represents information and data accurately and completely.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Keeps commitments
Performs actions as promised; does not share confidential information.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Behaves consistently
Ensures that words and actions are consistent; behaves consistently across situations. (

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Planning (ISU Accreditation Aligned)
Effectively managing one's time and resources to ensure that work is completed efficiently.

Prioritizes
Identifies more critical and less critical activities and tasks; adjusts priorities when appropriate.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Makes preparations
Ensures that required equipment and/or materials are in appropriate locations so that own and others' work can be done effectively.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Schedules
Effectively allocates own time to complete work; coordinates own and others' schedules to avoid conflicts.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Leverages resources
Takes advantage of available resources (individuals, processes, departments, and tools) to complete work efficiently.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Stays focused
Uses time effectively and prevents irrelevant issues or distractions from interfering with work completion.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Professional Impact (ISU Accreditation Aligned)
Creating a good first impression; commanding attention and respect; showing an air of confidence.

Dresses appropriately
Maintains professional, businesslike image.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Displays professional demeanor
Exhibits a calm appearance; does not appear nervous or overly anxious; responds openly and warmly when appropriate.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Speaks confidently
Speaks with a self-assured tone of voice.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Quality Orientation (ISU Accreditation Aligned)
Accomplishing tasks by considering all areas involved, no matter how small; showing concern for all aspects of the job; accurately checking processes and tasks; being watchful over a period of time.

Follows procedures
Accurately and carefully follows established procedures for completing work tasks.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Ensures high-quality output
Vigilantly watches over job processes, tasks, and work products to ensure freedom from errors, omissions, or defects.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Takes action
Initiates action to correct quality problems or notifies others of quality issues as appropriate.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Safety Awareness
Identifying and correcting conditions that affect employee safety; upholding safety standards.

Identifies safety issues and problems
Detects hazardous working conditions and safety problems; checks equipment and/or work area regularly.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Takes corrective action
Reports or corrects unsafe working conditions; makes recommendations and/or improves safety and security procedures; enforces safety regulations and procedures.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Monitors the corrective action
Monitors safety or security issues after taking corrective action and ensures continued compliance.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Teamwork (ISU Accreditation Aligned)
Actively participating as a member of a team to move the team toward the completion of goals.

Facilitates goal accomplishment
Makes procedural or process suggestions for achieving team goals or performing team functions; provides necessary resources or helps to remove obstacles to help the team accomplish its goals.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Involves others on team
Listens to and fully involves others in team decisions and actions; values and uses individual differences and talents.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Informs others on team
Shares important or relevant information with the team.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Models commitment
Adheres to the team's expectations and guidelines; fulfills team responsibilities; demonstrates personal commitment to the team.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ No Response

Tip: To keep a copy of your responses, print them using the Print command in your browser's File menu. After sending your responses, you cannot retrieve them online.

Cancel Send

E.1.2 OPAL Student (Intern) Survey

See the OPAL instrument given in E.1.1.

E2: Level 2 SO Assessment Tools

E.2.1 Senior Design Rubrics

Student outcome a: an ability to apply knowledge of mathematics, science, and engineering				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Ability to apply knowledge of mathematics (e.g., statistics, probability, discrete mathematics)	Inability solve and identify relevant mathematical problems	Ability to solve but not able to identify the relevant mathematical problems	Ability to identify and solve the relevant mathematical problems	Ability to identify and solve relevant mathematical problems, and to explore formulations and solutions using alternate approaches.
Ability to apply knowledge of science (e.g., mechanics, semiconductor physics, electromagnetic, biology)	Inability solve and identify relevant scientific problems	Ability to solve but not able to identify the relevant scientific problems	Ability to identify and solve the relevant scientific problems	Ability to identify and solve relevant scientific problems, and to explore formulations and solutions using alternate approaches
Ability to apply knowledge of engineering (e.g., electronics, control systems, power systems, VLSI, communications and networks, software systems, computer architecture, embedded systems)	Inability solve and identify relevant engineering problems	Ability to solve but not able to identify the relevant engineering problems	Ability to identify and solve the relevant engineering problems	Ability to identify and solve relevant engineering problems, and to explore formulations and solutions using alternate approaches

Student outcome c: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental , social, political, ethical, health and safety, manufacturability, and sustainability				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Develops a design strategy based on project and client needs and constraints.	Lacks design strategy. Does not recognize client needs and constraints	Has some design strategy; Haphazard approach. Cannot design processes or individual pieces of equipment without significant amounts of help	Develops a design strategy. Comes up with a reasonable solution.	Develops a design strategy, including project plan and requirements. Suggests new approaches and improves on what has been done before
Thinks holistically: sees the whole as well as the parts	Has no knowledge of the design process. No holistic thinking	Has some knowledge of the design process. Has no concept of the process as a sum of its parts	Understands the design process. Makes an attempt to think holistically.	Articulates the design process and how areas interrelate. Thinks holistically: Sees the whole as well as the parts
Supports design procedure with documentation and references	No documentation	Design is done incompletely without the proper justification. Lacks documentation	Provides reasonable design procedure with documentation and references	Clearly lays out the design procedure with supporting analysis. Document relevant information. Provides market/literature survey
Considers all the relevant technical, nontechnical constraints and design tradeoffs.	Missing all relevant constraints	Considered technical constraints. Nontechnical constraints and design tradeoffs are missing.	Design strategy includes relevant technical constraints and design tradeoffs. Some relevant nontechnical constraints are missing.	Design strategy includes all the relevant technical and non technical constraints. Clearly shows the design tradeoffs

Student outcome d: An ability to function on multidisciplinary teams				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Team Participation	Is absent from team meetings or work sessions >50% of the time. Does not contribute to group work at all or submits own work as the group's. Routinely fails to prepare for meetings.	Absent occasionally, but does not inconvenience group. Sometimes depends on others to complete the work; contributes less than fair share. Prepares somewhat for group meetings, but ideas are not clearly formulated	Routinely present at team meetings or work sessions. Is prepared for group meeting with some ideas.	Routinely present at team meetings or work sessions. Contributes a fair share to the project workload. Is prepared for the group meeting with clearly formulated ideas
Fullfill Team Roles Assigned	Does not perform any duties of assigned team role	Inconsistently performs duties that are assigned	Performs duties that are assigned	Performs all duties assigned and effectively assist others
Involves Others	Does work on his/her own; does not value team work. Does not consider the ideas of others	Sometimes keeps information to himself/herself; not very willing to share.	Most of the time listens and involves others in the team decisions and actions. Values individual differences and talents	Listens to and fully involves others in team decisions and actions; values and uses individual differences and talents. Shares credit for success with others.
Facilitates goal accomplishment	Does not contribute to team goals. Does not make an attempt to accomplish the team goals.	Sometimes depends on others to define team goals. Makes an attempt to finish the set goals.	Contribute to establishing team goals. Has plan to accomplish the set goals	Clearly establishes team goals. Provides necessary resources or helps to remove obstacles to help the team accomplish its goals.

Student outcome e: An ability to identify, formulate, and solve engineering problems				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Ability to identify key points of the project. Ability to formulate an approach to solve.	Does not understand the problem. Cannot solve the problem	Understands the problem. Difficulty in coming up with an approach to solve the problem.	Understands the problem to be solved. Formulated an approach to solve the problem.	Problem to be solved is clearly stated and explained. Formulated the approach in such a way that various solutions strategies can be investigated.
Ability to analyze and solve	A solution is proposed without analysis and justification	A workable solution is proposed. Lacks analysis	Alternative approaches are considered. Analysis is complete but contains minor procedural errors.	Alternative approaches are considered. Each alternative approach is correctly analyzed for technical feasibility. Best possible solution is proposed
Prototyping , testing, evaluation and validation	Prototype is not developed. No validation.	Working/model prototype is build and demonstrated with performance issues. Prototype validation shows that some (important) design requirements are met, but some are missed.	Model prototype is presented demonstrating basic design principles. Prototype validation proves that most design requirements are met.	Working prototype is build and demonstrated. Validation proves that all design requirements are met

Student outcome f: an understanding of professional responsibility(faculty advisor)				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
An awareness of the safety, environment, legal and regulatory issues in the project	Lacks basic understanding of these issues	Some level of understanding of all or a subset of applicable issues	Aware of all applicable issues	Well aware of and familiar with all applicable issues
An ability to understand the importance of patents and intellectual property rights	Is not aware of intellectual property and patent rights	Some level of understanding of intellectual property and patent rights	Aware of intellectual property and patent rights	Well aware of and familiar with intellectual property and patent rights

Student outcome f: an understanding of professional and ethical responsibility(instructor)				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Understanding of professional responsibility (e.g., safety, environmental, legal, regulatory, intellectual property, project management, risk management)	Lacks basic understanding of professional responsibilities.	Some level of understanding of all or a subset of applicable issues	Good understanding of all applicable issues and a limited application of them to the project	Good understanding of all applicable issues and a satisfactory application of them to the project
Understanding of ethical responsibility (e.g., Code of Ethics defined by IEEE and National Association of Professional Engineers)	Lacks basic understanding of ethical responsibilities	Some level of understanding of professional responsibility	Good understanding of professional responsibility and a limited application of them to the project	Good understanding professional responsibility and a satisfactory application of them to the project

Student outcome g: An ability to Communicate Effectively				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
ORAL COMMUNICATION: Organization	Poor organization. No introduction. Summary and conclusions are not clear	Audience has difficulty following presentation because of some abrupt jumps; some of the main points and conclusion are unclear.	Satisfactory organization; clear introduction; main points are well stated, even if some transitions are somewhat sudden; clear conclusion.	Superb organization; clear introduction; main points well stated and argued, with each leading to the next point of the talk; clear summary and conclusion.
ORAL COMMUNICATION: Content	Boring slides; numerous mistakes; Main points are missing	No real effort made into creating a truly effective presentation; poor participation of team members.	Generally good set of slides; conveys the main points well. Adequate participation of team members.	Very creative slides; carefully thought out to bring out both the main points as well as the subtle issues while keeping the audience interested..
ORAL COMMUNICATION: Delivery	Delivery lacks confidence. Reads slides. No eye contact with audience	Low voice, occasionally inaudible; some distracting filler words and gestures; pronunciation not always clear.	Clear voice, generally effective delivery; minimal distracting gestures, but somewhat monotone.	Natural, confident delivery that does not just convey the message but enhances it; excellent use of volume and pace.
WRITTEN COMMUNICATION: Style	Spelling or grammar errors present throughout more than 2/3 of paper. style is inappropriate for audience; prescribed format is not followed	Text rambles, key points are not organized; spelling or grammar errors present throughout more than 1/3 of paper. prescribed format is followed.	Articulates ideas; one or two grammar or spelling errors per page; prescribed format is followed.	Articulates ideas clearly and concisely; presented neatly and professionally; grammar and spelling are correct; uses good professional style; and conforms to prescribed format.
WRITTEN COMMUNICATION: Organization	Little evidence of organization or any sense of wholeness & completeness. Use poor transitions or fails to provide transitions.	Material generally well organized, but paragraphs combine multiple thoughts or section / subsections are not identified clearly.	Organizes material in a logical sequence to enhance reader's comprehension (paragraph structure, subheadings, etc.) with few lapses.	Organizes material in a logical sequence to enhance reader's comprehension (paragraph structure, subheadings, etc.). Provide transitions that eloquently serve to connect ideas.

WRITTEN COMMUNICATION: Use of graphs and tables	Figures presented are flawed: axes mislabeled, no data points, etc.	Uses graphs, tables, diagrams, but only in a few instances are they used to support, explain, or interpret information.	Most of the instances, Uses graphs, tables, diagrams to support points; to explain, interpret, and assess information; figures are all in proper format.	Throughout the report, Uses graphs, tables, diagrams to support points; to explain, interpret, and assess information; figures are all in proper format.

Student outcome k: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Techniques and skills (such as modeling, simulation, experimentation, measurement, and data analysis)	Lack technical skills to complete the project.	Has some knowledge but not adequate to complete the project	Has adequate knowledge to complete the project	Is capable of applying knowledge to derive an innovative and efficient design for the project
Selection and application of modern engineering tools and standards (such as Oscilloscope, Matlab, LabView, PSpice, and IEEE standards)	Not familiar with the tools and standards and is unable to select the right ones for the project.	Familiar with a few tools and standards but requires assistance in selecting and using them appropriately for the project	Is able to select and use tools and standards that may fit the project, with occasional guidance	Independent ability to choose and use tools and standards that are best for the project
Ability to acquire new knowledge and expertise	Is unable to learn new tools and skills	Is unable to learn new tools and skills unless with assistance	Given enough time, is able to learn new tools and skills	Is able to learn new tools and skills quickly and independently

E.2.2 Portfolio Review Rubrics: outcomes h,i,j,k (by faculty)

Student outcome (h): the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context				
Performance Indicators	**Proficiency/Performance Scale**			
	1: Beginning	**2: Developing**	**3: Accomplished**	**4: Exemplary**
(h.A) Has the student been exposed to a sufficient variety of courses/situations that involve societal, global, economic and environmental aspects?	Almost no exposure to courses/situations involving societal, global, economic, or environmental contexts	Exposure to courses/situations related to only one aspect of societal, global, economic and environmental contexts	Exposure to situations/courses related to more than one aspect of societal, global, economic and environmental contexts	Balanced exposure to situations/courses related to all contexts - societal, economic, global and environmental
(h.B) Has the student discussed the influence of societal, global, and environmental issues in engineering problem formulation and solution?	The student does not discuss the impact of societal, global, and environmental issues in engineering problem formulation and solution.	The student realizes the impact of societal, global, and environmental issues in engineering problem formulation and solution.	The student discusses the impact of societal, global, and environmental issues in engineering problem formulation and solution, and gives a specific example.	The student discusses the impact of societal, global, and environmental issues in engineering problem formulation and solution, and gives multiple specific examples.

Student outcome(i): a recognition of the need for, and an ability to engage in life-long learning				
Performance Indicators	**Proficiency/Performance Scale**			
	1: Beginning	**2: Developing**	**3: Accomplished**	**4: Exemplary**
(i.A) Description / discussion of use of external sources of information to complete class projects and other problem-solving tasks	Cannot use materials outside of what is explained in class. Assumes that all learning takes place within the confines of the classroom.	Seldom brings information from outside sources to assignments. Completes only what is required.	Multiple examples of use of external sources of information, including library resources, professional journals, experts in field, and other students.	Demonstrates ability to learn independently – goes beyond what is required in completing an assignment.
(i.B) Awareness of learning activities outside of the classroom, including participation in professional and technical societies, learning communities, industry experiences, etc.	Shows little or no interest in outside learning resources, including professional and/or technical societies, learning communities, internships, etc.	Co-curricular and/or extra-curricular learning experience. Occasionally participates in the activities of local learning opportunities.	Multiple co-curricular and/or extra-curricular learning experiences. Active participation in local learning activities.	Participates and takes a leadership role in learning opportunities available to the student body.
(i.C) Acknowledgement of how the college experience contributes to understanding the need to continuously update professional skills to solve new problems	Has difficulty in recognizing own shortcomings.	Acknowledges the need to take responsibility for own learning.	Demonstrates connection between short/long term goals and life-long learning.	Demonstrates responsibility for creating one's own learning opportunities.

Student outcome (j) : a knowledge of contemporary issues				
Performance Indicators	**Proficiency/Performance Scale**			
	1: Beginning	**2: Developing**	**3: Accomplished**	**4: Exemplary**
(j.A) Knowledge of current trends, complex problems, and career opportunities in your field of study	Has difficulty identifying current topics related to problems and opportunities in the field of study.	Identifies and possibly describes at least one or two topics of interest related to the field.	Identifies and describes multiple current topics relevant to the student's major field of study.	Identifies and describes multiple current topics relevant to the student's major field of study; interprets and analyzes key topics of special importance.
(j.B1) Awareness of contemporary issues facing society and various perspectives, such as engineering, economic, political, environmental, legal, professional, ethical, global, and/or cultural	Has difficulty identifying an issue involving non-engineering and engineering factors.	Identifies and possibly describes a contemporary issue from at least one non-engineering perspective.	Identifies and describes a contemporary issue from multiple perspectives.	Identifies and describes a contemporary issue from multiple perspectives; explains relationships of various aspects.
(j.B2) Inclusion of issues and various perspectives in problem-solving activities	Has difficulty identifying an issue involving non-engineering and engineering factors.	Recognizes at least one non-engineering factor in an engineering problem.	Incorporates several perspectives in an engineering problem-solving activity.	Uses an interdisciplinary or systems thinking approach to problem solving.
(j.C) Knowledge of engineering relevance to regional, national, or global problems	Has difficulty describing a major problem or associating engineering with it.	Identifies one or more engineering aspects of a technical problem.	Describes and recognizes engineering knowledge or practice in relation to a major problem.	Discusses, interprets, and analyzes key engineering knowledge and practices as applied to a major problem.

Student outcome (k): an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice				
Performance Indicators	**Proficiency/Performance Scale**			
	1: Beginning	**2: Developing**	**3: Accomplished**	**4: Exemplary**
(k.A) Description/discussion of the use of state-of-the-art equipment for engineering system design, control, and analysis	Gives 1 or more discussions that reference the use of standard equipment for engineering system design, control, or analysis	Gives 1 or more discussions that reference the use of standard equipment for engineering system design, control, or analysis; at least 1 concrete piece of evidence that supports the discussion of the equipment/tools used (e.g. project presentation showing data collected and analyzed)	Gives 2 or more discussions that reference the use of standard equipment for engineering system design, control, or analysis; at least 2 concrete pieces of evidence that support the discussion of the equipment/tools used (e.g. project presentation showing data collected and analyzed)	Gives 3 or more discussions that reference the use of standard equipment for engineering system design, control, or analysis; 3 or more concrete pieces of evidence that support the discussion of the equipment/tools used (e.g. project presentation showing data collected and analyzed)
(k.B) Application of modern engineering analysis and design techniques to solve engineering problems	Little or no discussion related to the importance of design techniques or analysis approaches	1 or more instances where a discussion demonstrates that a student is aware of the importance of specific design techniques or analysis approaches; 1 or more concrete examples that support the discussions about applying design techniques and engineering analysis (e.g. project presentation that gives some details on the technique or analysis approach taken)	2 or more instances where a discussion demonstrates that a student is aware of the importance of specific design techniques or analysis approaches; 2 or more concrete examples that support the discussions about applying design techniques and engineering analysis (e.g. project presentation that gives some details on the technique or analysis approach taken)	3 or more instances where a discussion demonstrates that a student is aware of the importance of specific design techniques or analysis approaches; 3 or more concrete examples that support the discussions about applying design techniques and engineering analysis (e.g. project presentation that gives some details on the technique or analysis approach taken)

E.3 Level 3 SO Assessment Tools

E 3.1 Coursework Assessment Rubrics

E3.1.1 CPRE 281 : Outcome b

Student outcome B: an ability to design and conduct experiments, as well as to analyze and interpret data				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Satisfactory	(4 pts) Exemplary
Design Experiment	No plan for data collection; does not properly identify equipment needed for experiments	Experimental plan is incomplete, and partially correct; able to identify some equipment needed for experiments, but unable to identify their proper use	Experimental plan is correct but incomplete; needs some assistance in identifying equipment needed for experiments and their use	Experimental plan is correct and complete; does not need assistance in identifying equipment and their use in experiments
Conduct Experiment	Does not follow experimental procedure; does not know how to operate equipment and instruments properly; poor documentation of data; requires frequent supervision	Experimental procedure is partly followed; makes many mistakes in operating equipment; documentation is partly complete; requires some supervision	Experimental procedure is mostly followed; requires some guidance in operating equipment; documentation is mostly complete; requires little supervision	All experimental procedure are followed; does not require guidance or assistance in operating equipment; documentation is complete; does not require supervision
Analyze Data	Data collection is disorganized and incomplete; no identification of measurement errors	Data collection is partly complete and organized; identifies some measurement errors, but cannot analyze	Data collection is mostly complete and organized; identifies measurement errors but are not taken in analysis	Data collection is complete and well organized; measurement errors are identified and used in analysis
Interpret Data	Does not relate experimental data to theory; incorrect conclusions	Makes some relation of experimental data to theory; conclusions are partly correct	Mostly successful in relating experimental data to theory; conclusions are mostly correct and mostly complete	Experimental data is related to theory; conclusions are correct and complete

E.3.1.2 EE 230: Outcomes b, e

Student outcome b: An ability to design and conduct experiments, as well as to analyze and interpret data				
Performance Indicators	Unsatisfactory (1)	Developing (2)	Satisfactory (3)	Exemplary (4)
Design experiments	No systematic plan, it would not allow experimenters to achieve any goals	It would allow experimenters to achieve some goals	The procedure would allow experimenter to achieve most goals	Well-designed experimental procedure would allow experimenter to achieve all goals
Conduct experiments	No ability Did not collect meaningful data	Some ability to conduct experiments and collected some meaningful data	Adequate ability, with some help Collected most of the needed data	Superior ability Collected all the appropriate data
Analyze data	No insight Missed the point of the experiment	Little insight Analyzed only the most basic points	Adequate insight Most data are analyzed correctly	Excellent insight Analyze data completely and apply the error analysis
Interpret data	Little or no attempt to interpret data	Interpreted some data correctly	Interpret most data correctly	Data completely and appropriately interpreted, not over-interpreted

Student outcome e: An ability to identify, formulate, and solve engineering problems				
Performance Indicators	Unsatisfactory (1)	Developing (2)	Satisfactory (3)	Exemplary (4)
Ability to identify key points of the project and to formulate an approach to solve	Does not understand the problem. Cannot solve the problem	Understands the problem. Has difficulty in coming up with an approach to solve the problem	Understands the problem to be solved. Formulates an approach to solve the problem	Problem to be solved is clearly stated and explained. Formulates the approach in such a way that various solutions strategies can be investigated
Ability to analyze and solve	A solution is proposed without analysis and justification	A workable solution is proposed. Lacks analysis	Alternative approaches are considered. Analysis is complete but contains minor procedural errors	Each alternative approach is correctly analyzed for technical feasibility. Best possible solution is proposed
Prototyping, testing, evaluation and validation	Prototype is not developed. No validation	Working/model prototype is built and demonstrated with performance issues. Prototype validation shows that some (important) design requirements are met, but some are missed	Model prototype is presented demonstrating basic design principles. Prototype validation proves that most design requirements are met	Working prototype is built and demonstrated. Validation proves that all design requirements are met

E.3.1.3 CPRE 288: Outcome c

Student outcome c: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental , social, political, ethical, health and safety, manufacturability, and sustainability				
Performance Indicators	(1 pt) Unsatisfactory	(2 pts) Developing	(3 pts) Competent	(4 pts) Exceptional
Makes design decisions.	Lacks design strategy. Does not recognize client needs and constraints	Has some design strategy; Haphazard approach. Cannot design processes without significant amounts of help.	Develops a design strategy. Comes up with a reasonable solution.	Develops a design strategy, including project plan and requirements. Suggests new approaches.
Sees how the part one is working on fits into the whole project.	Has no knowledge of the design process. No holistic thinking	Has some knowledge of the design process. Has no concept of the process as a sum of its parts	Understands the design process. Makes an attempt to think holistically.	Articulates the design process and how areas interrelate.
Documents work within reason. Helps with lab notebook and documents code.	No documentation	Design is done incompletely without the proper justification. Lacks documentation	Provides reasonable design procedure with documentation and references	Clearly lays out the design procedure with supporting analysis. Document relevant information.

E.3.1.4 CPRE 381: Outcomes e and k

Student outcome e: an ability to identify, formulate, and solve engineering problems				
Performance Indicator	1: Beginning - Unsatisfactory - Low level	2: Developing – Partly satisfactory – Medium level	3: Accomplished – Satisfactory – Medium-high level	4: Exemplary – Beyond satisfactory – High level
Ability to identify scope of implementation. Ability to enumerate implementation permutations and potential challenges.	Confusion with regards to the scope of the implementation Lack of understanding with regards to big picture challenges.	Understanding of problem scope. Limited understanding with regards to permutations and potential challenges.	Able to use appropriate discrete structures, and Identification of problem scope, with correct enumeration of implementation permutations and potential challenges. algorithms in solution.	Problem identification indicates superior understanding of implementation permutations and potential challenges.
Ability to create schematics and implement individual components.	Significant flaws in individual components. Lack of evidence of pre-implementation conceptual work, including schematics.	Individual components are in place, with minor problems leading to issues in full-system implementation. Schematics lack important detail.	Individual components are well-designed and correctly implemented.	Components are optimized beyond the requirements of the project. Superior full-system perspective enables insights regarding individual components
System integration, testing, and verification. Demonstration of correctness and ability to describe implementation.	Inability to correctly integrate system. No or severely limited full-system testing.	System is integrated with non-trivial flaws. Testing catches flaws without additional insight.	System passes major functional tests.	Additional infrastructure is provided to enable advanced testing and evaluation.

Student outcome k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice				
Performance Indicator	1: Beginning - Unsatisfactory - Low level	2: Developing – Partly satisfactory – Medium level	3: Accomplished – Satisfactory – Medium-high level	4: Exemplary – Beyond satisfactory – High level
Ability to design hardware using a Hardware Description Language (HDL)	Lack of HDL skills to accomplish any significant goals of the project.	Basic HDL capabilities. Can complete some individual modules, but has not gained enough expertise to complete project.	Adequate HDL skills to complete the project.	Superior HDL skills, leading to some design optmization in terms of efficiency or performance.
Application of an industry-strength HDL simulator (e.g. ModelSim) for design testing and verification	Lack of simulator familiarity, leading to lack of progress.	Familiarity with basic simulator functionality, hindering overall progress.	Ability to provide strong evidence that the design is fully tested in simulation	Use of automation to increase designer efficiency with regards to testing and verification.
Ability to develop and analyze programs at the assembly-level	Lack of assembly-level programming ability.	Can write small benchmarks and individual test-cases, but struggles with more complex applications.	Demonstrates ability to write complex applications.	Mastery of assembly-level programming allows for more in-depth component and full-system testing.

E.3.1.5 CPRE 310: Outcome a

Student outcome a: an ability to apply knowledge of mathematics, science, and engineering				
Performance Indicator	1: Beginning - Unsatisfactory - Low level	2: Developing – Partly satisfactory – Medium level	3: Accomplished – Satisfactory – Medium-high level	4: Exemplary – Beyond satisfactory – High level
Does the student use graphs effectively to represent the data and solve the problem of social network aggregation?	Unable to abstract out the discrete structures in the problem.	Able to use appropriate discrete structures, but uses inefficient algorithms in solution.	Able to use appropriate discrete structures, and effective algorithms in solution.	Able to use effective structures and algorithms and can point to alternate solutions, and compare their effectiveness.
Does the student design a precise and appropriate metric for measuring the “centrality” of a person in the network?	The student does not have a metric for defining centrality in a network.	The student has a metric which maybe ambiguous in some cases.	The student has a precise metric, but has not taken into account the cost of computing the metric while defining this.	The student has defined a metric keeping in mind the cost of computing the metric on a network.

E.3.1.6 CPRE 394: Outcome f

Student outcome f: An understanding of professional and ethical responsibility				
Performance Indicators	**Proficiency/Performance Scale**			
	1: Beginning	**2: Developing**	**3: Accomplished**	**4: Exemplary**
(f.A) Explain important ethical obligations associated with your discipline.	Cannot adequately recognize or explain an ethical issue.	1. Explain at least one major ethical obligation.	1. Explain at least one major ethical obligation. 2. Explain how the obligation applies to professional action. 3. Use a systematic argument to support the application.	1. Explain at least one major ethical obligation. 2. Explain how the obligation applies to professional action. 3. Use a systematic argument to support the application. 4. Give several specific examples of professional activities where the ethical obligation applies.
(f.B) Apply a systematic ethical framework to an ethical issue or situation in a disciplinary context.	Provide no basis for analysis (e.g., professional standards, code of ethics).	1. Clearly explain the issue or situation to be analyzed.	1. Clearly explain the issue or situation to be analyzed. 2. Show which professional duties apply to the issue or situation by citing a relevant code of ethics. 3. Resolve any conflicts among the applicable duties through a reasoned analysis.	1. Clearly explain the issue or situation to be analyzed. 2. Show which professional duties apply to the issue or situation by citing a relevant code of ethics. 3. Resolve any conflicts among the applicable duties through a reasoned analysis. 4. Show how an appropriate stance on the issue or situation follows from the analysis.
(f.C) Analyze a complex situation involving multiple conflicting ethical interests or principles to support an appropriate course of action.	Use incomplete information and provide no resolution.	1. Clearly explain the facts relevant to an ethical evaluation of the situation.	1. Clearly explain the facts relevant to an ethical evaluation of the situation. 2. Show what competing interests are at work in the situation. 3. Resolve disputes among the competing interests using a systematic ethical framework and/or professional standards.	1. Clearly explain the facts relevant to an ethical evaluation of the situation. 2. Show what competing interests are at work in the situation. 3. Resolve disputes among the competing interests using a systematic ethical framework and/or professional standards. 4. Justify an appropriate course of action and explain why it is the best among the available alternatives.

E.4 Other SO Assessment Information

E.4.1 Senior Design Faculty Advisor Evaluation Form

CPRE/E E/S E 492: Senior Design II – Fall 2011
Faculty Advisor Grading Form (40% of the Course Grade)

Team Number: _____ Faculty Advisor: _____

Team Member	Planning and Design (5%)	Implementation/Testing (25%)	Participation (10%)	Total (40%)

Planning Checklist:	***Design Checklist:***	***Implementation/Testing:***	***Participation Checklist:***
Requirements/Specification: Problem / need statement Concept description Concept sketch / block diagram Operating environment User interface description Functional requirements Non-functional requirements Market / literature survey Deliverables *Project Plan:* Work breakdown Resource requirements Project schedule Risks	*System design:* System requirements / analysis Functional decomposition *Detailed design:* HW/SW design I/O & User interface design Design tradeoffs & Creativity Modeling/Simulation/Prototype *Design Documents:* Mechanical design / CAD Schematics / PCB Software design	*Prototype:* Build System integration Test plan Test Results & Evaluations *Project Closure:* Field test & Client feedback Conclusions / lessons learned Future work *Demo* *Q&A* *Overall:* Engineering Presentation / communication	*Weekly Meeting Attendance* *Timeliness* *Contribution to:* Discussions Documentation Development Testing Client interaction

E.4.2 Senior Design Student Survey Form

Senior Design Student Survey – EE/CPRE/SE 492 (Spring 2011) – ***Dear Student:*** ***Please complete this survey based on your overall learning experience in the senior design project (491 and 492 courses).***

Name (*optional*): _____ Major: _____

Team #: _____

Scoring Range: **9** ***Exceeded Expectations*** **6** ***Fully Met Expectations*** **3** ***Marginally Met Expectations*** **0** ***Did Not Meet Expectations***

Criterion	Comments	YOUR SCORE (0 to 9)
a. Overall, did you display **"an ability to apply knowledge of mathematics, science, and engineering"**?		
a.1 An ability to apply knowledge of mathematics?		
a.2 An ability to apply knowledge of science?		
a.3 An ability to apply knowledge of engineering?		
c. Overall, did you display **"an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability"**?		
c.1 An ability to design accounting realistic technical constraints		
c.2 An ability to design accounting realistic non-technical considerations		
d. Overall, did you display **"an ability to function on multidisciplinary teams"**?		
e. Overall, did you display **"an ability to identify, formulate, and solve engineering problems"**?		
e.1 An ability to identify and formulate engineering problems		
e.2 An ability to solve engineering problems		
f. Overall, did you attain **"an understanding of professional and ethical responsibility"**?		
g. Overall, did you display **"an ability to communicate effectively"**?		
g.1 An ability to communicate orally (project presentations and demonstrations)		
g.2 An ability to communicate in written (project plan, design report, final report, poster)		

Provide at least one positive aspect, if any, of your learning experience in senior design project

Provide one negative experience, if any, of your learning experience in senior design project

Provide at least one suggestion, if any, for improvement/change in the senior design program

E.4.3 Senior Design IRP Evaluation Form

Senior Design IRP Survey – EE/CPRE/ SE 492 (Spring 2011) – ***Dear IRP member:*** ***Please complete this survey based on your overall assessment of ECpE Capstone design program .***

Name (*optional*): _____

Scoring Range:

9	**6**	**3**	**0**
Exceeded Expectations	***Fully Met Expectations***	***Marginally Met Expectations***	***Did Not Meet Expectations***

Criterion	**Comments**	**YOUR SCORE (0 to 9)**
a. Overall, did the capstone design students display **"an ability to apply knowledge of mathematics, science, and engineering"**?		
a.1 An ability to apply knowledge of mathematics?		
a.2 An ability to apply knowledge of science?		
a.3 An ability to apply knowledge of engineering?		
c. Overall, did the capstone design students display **"an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability"**?		
c.1 An ability to design accounting realistic technical constraints		
c.2 An ability to design accounting realistic non-technical considerations		
d. Overall, did the capstone design students display **"an ability to function on multidisciplinary teams"**?		
e. Overall, did the capstone design students display **"an ability to identify, formulate, and solve engineering problems"**?		
e.1 An ability to identify and formulate engineering problems		
e.2 An ability to solve engineering problems		
f. Overall, did the capstone design students attain **"an understanding of professional and ethical responsibility"**?		
g. Overall, did the capstone design students display **"an ability to communicate effectively"**?		
g.1 An ability to communicate orally (project presentations and demonstrations)		
g.2 An ability to communicate in written (project plan, design report, final report, poster)		

Provide at least one positive aspect, if any, of CPRE Capstone Design

Provide one negative experience, if any, of CPRE Capstone Design

Provide at least one suggestion, if any, for improvement/change in the CPRE Capstone Design

E.4.4 Graduating Student Exit Survey

Class Climate	Senior Questionnaire (VFD) Spring 2012	SCANTRON

IOWA STATE UNIVERSITY

Mark as shown: ☐☒☐☐☐ Please use a ball-point pen or a thin felt tip. This form will be processed automatically.

Correction: ☐■☐☒☐ Please follow the examples shown on the left hand side to help optimize the reading results.

1. Self-Identifying

Your assistance in carefully completing this questionnaire will provide vital input toward our efforts for continually improving our curriculum. Please select the best answer(s) for the below questions.

1.1 Gender: ☐ Female ☐ Male

1.2 Are you an: ☐ International student ☐ In-state student ☐ Out of state student

1.3 Did you: ☐ Come direct from High School ☐ Transfer from a community college ☐ Transfer from a 4-year institution (college/university)

1.4 Do you identify as (optional):

☐ African American ☐ American Indian ☐ Asian American
☐ Caucasian ☐ Latino/a ☐ Multiracial
☐ Other

2. Decision Factors

2.1 What factors affected your decision to choose ISU?

☐ High School teacher or guidance counselor ☐ ISU Visit Day/talking to an ECpE Advisor ☐ Advice from family or friends
☐ Your own research

2.2 What factors affected your decision to choose EE or CPR E?

☐ HS teacher or guidance counselor ☐ ISU Visit Day/talking to an ECpE Advisor ☐ Hearing about EE/CPR E in ENGR 101 at ISU
☐ Hearing about EE/CPR E from an advisor in undeclared engineering ☐ Advice from family or friends ☐ Your own research
☐ Taking EE or CPR E 185

2.3 Other:

3. Degree Information

3.1 What is your graduation term?

3.2 What is your curriculum?

☐ CPR E ☐ EE

3.3 Are you receiving a second degree or major? ☐ Yes ☐ No

3.4 If "yes," please indicate:

3.5 Are you receiving a minor(s)? ☐ Yes ☐ No

3. Degree Information [Continue]

3.6 If "yes," please indicate:

3.7 How many years (within ISU-ECpE) did it take you to complete the degree?

3.8 Did you have a part-time job while working towards your degree at ISU? ☐ Yes ☐ No

3.9 If yes, how many hours of work did you average per week? ☐ 0-10 hours ☐ 11-20 hours ☐ 21-30 hours ☐ 31-40 hours ☐ 41+ hours

3.10 Do you plan to attend graduate school? ☐ Yes, currently a concurrent student ☐ Yes, immediately ☐ Yes, within the next 2- 5 years ☐ Yes, unsure of when I will attend ☐ No plans to attend graduate school

4. Focus Area/Technical Electives

4.1 CPR E's only (EE's continue to the next question). If you completed a focus area, please check all that apply.

☐ Software ☐ Software Systems ☐ Embedded Systems
☐ Networking ☐ Security ☐ VLSI

4.2 EE's only. What area(s) did you complete a sequence in? Check all that apply.

☐ Electromagnetic, Fields, Antennas and Propagation ☐ Communications ☐ Analog/Digital Electronics
☐ Semiconductor Devices ☐ Power Systems ☐ Linear Systems
☐ Computer Engineering

5. Academics

5.1 Did the EE/CPR E curriculum give you the knowledge and experience you need to enter the engineering profession? ☐ Yes ☐ No

5.2 Please explain:

5.3 Would you recommend the ISU ECpE program to others? ☐ Yes ☐ No

5.4 Please explain:

Please rate the educational value that you received <u>at ISU</u> from required courses taught outside of the ECpE Department (leave blank if you transferred in credit or received test-out credit for the listed areas):

		1	2	3	4	5	
5.5 Math (165, 166, 265, 267, elect, etc)	Poor	☐	☐	☐	☐	☐	Excellent
5.6 Chemistry (167, 177, etc.)	Poor	☐	☐	☐	☐	☐	Excellent
5.7 English (150, 250, 314, etc.)	Poor	☐	☐	☐	☐	☐	Excellent
5.8 Physics (221, 222, etc.)	Poor	☐	☐	☐	☐	☐	Excellent

5. Academics [Continue]

5.9	General Education (Social Science, Humanities or other)	Poor	☐	☐	☐	☐	☐	Excellent
5.10	Computer Science (207, 227, 228, 309, 311, elect., etc.)	Poor	☐	☐	☐	☐	☐	Excellent
5.11	Statistics (CPR E's-330, EE's 322)	Poor	☐	☐	☐	☐	☐	Excellent

Please indicate how adequate the following services were for you as a student:

			1	2	3	4	5	
5.12	Library Services (hard copy & electronic)	Poor	☐	☐	☐	☐	☐	Excellent
5.13	Computing support	Poor	☐	☐	☐	☐	☐	Excellent

5.14 Did you complete an undergraduate research experience? ☐ Yes ☐ No

5.15 If yes, please indicate the supervising instructor:

☐ Ajjarapu, Venkataramana	☐ Aliprantis, Dionysios	☐ Aluru, Maneesha
☐ Aluru, Srinivas	☐ Amariucai, George T.	☐ Bigelow, Timothy
☐ Bowler, John R.	☐ Bowler, Nicola	☐ Chang, Morris
☐ Chaudhary, Sumit	☐ Chen, Degang	☐ Chu, Chris Chong-Nuen -
☐ Dalal, Vikram L	☐ Daniels, Thomas	☐ Dickerson, Julie
☐ Dobson, Ian	☐ Dogandzic, Aleksandar	☐ Dong, Liang
☐ Elia, Nicola	☐ Fayed, Ayman	☐ Geiger, Randall L.
☐ Govindarasu, Manimaran	☐ Guan, Yong	☐ Jacobson, Douglas W.
☐ Jiles, David C.	☐ Jones, Phillip	☐ Kamal, Ahmed
☐ Kim, Jaeyoun	☐ Kim, Sang	☐ Kothari, Suraj C.
☐ Kumar, Ratnesh	☐ McCalley, James D.	☐ Mina, Mani
☐ Neihart, Nathan	☐ Nguyen, Tien	☐ Pandey, Santosh
☐ Qiao, Daji	☐ Ramamoorthy, Aditya	☐ Rover, Diane
☐ Somani, Arun K.	☐ Song, Jiming	☐ Stoytchev, Alexander
☐ Tirthapura, Srikanta	☐ Tuttle, Gary	☐ Tyagi, Akhilesh
☐ Vaidya, Umesh	☐ Vaswani, Namrata	☐ Wang, Zhengdao
☐ Xiu, Faxian	☐ Ying, Lei	☐ Zambreno, Joseph
☐ Zhang, Zhao	☐ Other (outside ECpE Department)	

5.16 If "other," please indicate the supervising instructor's name and department.

Please share specific comments on the following categories of departmental courses:

5.17 VLSI:

5.18 Systems and Controls

5.19 Electromagnetics, Microwave & Nondestructive Evaluation

5. Academics [Continue]

5.20 Electric Power & Energy Systems

5.21 Microelectronics & Photonics

5.22 Computing & Networking Systems

5.23 Secure & Reliable Computing

5.24 Software Systems

5.25 Communication & Signal Processing

5.26 Bioengineering

5.27 Embedded Systems

5.28 Please comment on the content and your experience in the ECpE Senior Design capstone courses.

6. Labs

6.1 While working with the technical equipment in the laboratories, you felt: ☐ Completely safe ☐ Generally safe ☐ Not safe

6.2 If you chose "Not safe," please explain:

6.3 Did the laboratories provide an atmosphere that helped you to learn? ☐ Yes ☐ No

6.4 If "no," please explain:

6.5 Did you receive guidance in the use of software, tools and equipment for the laboratories? ☐ Yes ☐ No

6. Labs [Continue]

6.6 If "no," please explain:

6.7 Laboratory equipment: ☐ Exceeded the needs of the lab ☐ Met the needs of the lab ☐ Did not meet the needs of the lab

6.8 If you chose "Did not meet the needs of the lab," please explain (broken parts, software, etc.):

7. Professional Work Experience

7.1 Have you:
☐ Completed an ISU sponsored co-op, internship, or summer intern program
☐ Completed a non-ISU sponsored engineering related work experience
☐ Did not hold an engineering related job while at ISU

7.2 If you have had professional engineering work experience, did you sign up for an Engineering Career Services course while working (298, 396, 397, 398, 498)? ☐ Yes ☐ No

7.3 If "no," please explain:

8. Activities

8.1 Were you a part of a learning community (residential, academic, etc.)? ☐ Yes ☐ No

8.2 Were you a member of an engineering/science student organization? ☐ Yes ☐ No

8.3 If "yes," please indicate which organizations you were a member of:
☐ IEEE ☐ Eta Kappa Nu ☐ Tau Beta Phi
☐ Digital Women ☐ Critical Tinkers ☐ IASG
☐ Society of Women Engineers ☐ Other

8.4 If "other," please list:

8.5 Please list elected leadership role(s):

8.6 Were you a member of another type of organization/club?
☐ No ☐ Yes

8.7 If yes, were you a member of the following?
☐ Band/Orchestra ☐ Greek Affairs ☐ Choir
☐ Other

8.8 If "other," please list:

8. Activities [Continue]

8.9 Please list elected leardership role(s) in student organizations/clubs outside of engineering:

9. Departmental

9.1 Did you have adequate opportunities to seek advice from an ECpE Faculty member (i.e. on your own, through a course such as 101, 166, 294, 394, office hours)? ☐ Yes ☐ No

9.2 Please explain:

9.3 Please rate your level of satisfaction with the overall building facilities (availability of building, labs, classrooms, etc.) of the ECpE Department: ☐ Very satisfied ☐ Satisfied ☐ Not satisfied

9.4 Please explain:

9.5 Please describe positive experiences you have had with the ECpE Department:

E.4.5. Course Evaluation by Students

LECTURE EVALUATION
ELECTRICAL AND COMPUTER ENGINEERING

To the student: Student evaluation of classroom teaching is an important component of the total evaluation of the teaching effectiveness in the College of Engineering. It is therefore, an important part of your responsibility as a student to give reasoned opinions to the items below. Your response will be considered more carefully if it is provided in a professional and constructive manner.

These forms with summary results will not be returned to the instructor until after final grades for the course have been submitted.

Please mark you answers in the mark sense areas with a soft black PENCIL. Ink marks will not be read by the scanner.

DEPT NAME	COURSE NUMBER	SECTION	LECTURE INSTRUCTOR'S NAME	SEMESTER	YEAR
ECPE	CPRE/EE/SE CIRCLE ONE				

For questions 1-32, use the following 1-5 scale.

1:	2:	3:	4:	5:
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Teaching Methods/Strategies/Practices:

1. The instructor expresses clear expectations for my learning and performance in this class:
2. The instructor clearly explains concepts:
3. The instructor clarifies areas of confusion:
4. The instructor uses effective teaching methods that enhance my learning:
5. The instructor encourages me to raise questions or make comments:
6. The instructor is well organized and prepared:
7. The instructor challenges me to think:
8. The instructor is available on an individual basis outside of class when I request it:
9. The instructor uses technology effectively to advance my learning:
10. The instructor contributes to improving my learning:

Student Involvement/ Engagement:

11. I attend class regularly:
12. In this course, I have been challenged to learn more than I expected:
13. I am prepared, actively participate, and work to my full potential in this course.
14. On average, I have spent _____hours per week doing work **outside of class** for this course:
    a. 0-1 hour b. 2-4 hours c. 5-6 hours d.7-8 hours e. 9+ hours

Student Learning/ Effect:

15. I have learned a lot in this class:
16. This class has increased my interest in this field of study:
17. The instructor shows respect and concern for students:

Evaluation of course materials (resources, assignments, assessments)

18. I believe that what I am being asked to learn in this course is important.
19. The assignments in this course have enhanced my learning.
20. The tests accurately assess what I have learned in this course.
21. The instructor has high standards for achievement in this class.
22. If there is a lab it is coordinated with the lectures
23. The instructor provides clear evaluation criteria.
24. The instructor grades consistently with the evaluation criteria.
25. The assignments are returned quickly enough to benefit my learning.
26. The exam results are returned quickly enough to benefit my learning.
27. The feedback I have received on my work has enhanced my learning.
28. The text materials for this course were appropriate.

General Summative:

29. Overall, the instructor has been an effective teacher.
30. Overall, this course has been effective in advancing my learning.
31. This instructor motivated and inspired me to learn about this subject beyond the material required for the course.

Additional Comments:

E.4.6. Laboratory Evaluation by Students

Class Climate	Laboratory Evaluations (VFD) (VFD)	SCANTRON

IOWA STATE UNIVERSITY.

Mark as shown: ☐☒☐☐☐ Please use a ball-point pen or a thin felt tip. This form will be processed automatically.
Correction: ☐■☐☒☐ Please follow the examples shown on the left hand side to help optimize the reading results.

Using each question as a guide, please click the box that represents your response to each

1. Course Information

1.1 Course:
☐ CprE ☐ EE ☐ SE

1.2 Course Number:

1.3 Section

1.4 Lab Instructor's Name

1.5 Semester
☐ Fall ☐ Spring ☐ Summer

1.6 Year

2. Please answer the following questions using a 5-point scale: 5 = highest; 1 = lowest.

		5	4	3	2	1
2.1	Knowledge of subject: 5 - Appears to possess good knowledge of subject 3 - Occasionally displays limited knowledge of subject matter 1 - Often gives impression of inadequate knowledge of subject matter	☐	☐	☐	☐	☐
2.2	Oral Communication: 5 - Able to get across ideas in an effective manner 3 - Sometimes fails to get point across 1 - Seldom communicates ideas clearly	☐	☐	☐	☐	☐
2.3	Proficiency in English: 5 - Very clear pronunciation and use of language 3 - Occasionally unclear, words mispronounced, hurried speech, moderately strong accent that limits clarity 1 - Generally unclear, many words mispronounced or misused, poorly structured sentences or phrases, accents that eliminate clarity	☐	☐	☐	☐	☐
2.4	Effectiveness of written English: 5 - Clear and understandable 3 - Satisfactory 1 - Unclear	☐	☐	☐	☐	☐

2. Please answer the following questions using a 5-point scale: 5 = highest; 1 = lowest. [Continue]

2.5 Promptness in grading: ☐ ☐ ☐ ☐ ☐
5 - Returned work promptly
3 - Occasionally returned work late
1 - Seldom returned work promptly

2.6 Fairness in grading: ☐ ☐ ☐ ☐ ☐
5 - Graded fairly
3 - Occasionally graded unfairly
1 - Seldom graded fairly

2.7 Usage of instructional materials and equipment: ☐ ☐ ☐ ☐ ☐
5 - Always knowledgeable
3 - Usually knowledgeable
1 - Frequently unknowledgeable

2.8 Organization of presentations: ☐ ☐ ☐ ☐ ☐
5 - Well organized
3 - Adequately organized
1 - Frequently not organized

2.9 Availability: ☐ ☐ ☐ ☐ ☐
5 - Normally available
3 - Sometimes available
1 - Seldom available

2.10 Approachability: ☐ ☐ ☐ ☐ ☐
5 - Always
3 - Usually
1 - Seldom

2.11 Helpfulness: ☐ ☐ ☐ ☐ ☐
5 - Always
3 - Usually
1 - Never

2.12 Overall effectiveness of the teaching was: ☐ ☐ ☐ ☐ ☐
5 - Very effective
3 - Sometimes effective
1 - Seldom effective

3. Please use the following to answer additional questions, amplify answers given, and to add additional comments.

3.1 Did the laboratory exercises help you learn key concepts?

3.2 Are the laboratory exercises coordinated with the class, in terms of timing and content?

3. Please use the following to answer additional questions, amplify answers given, and to add additional comments. [Continue]

3.3 Did the laboratory TA enhance your learning experience in the lab?

3.4 Additional Comments: