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Capstone 2014 DESIGN Conference

JUNE 2 - 4, 2014 ▸ COLUMBUS, OHIO

CONFERENCE PROGRAM

The Ohio State University

www.capstoneconf.org

SCHEDULE OVERVIEW

Monday, June 2, 2014

8:00 - 9:00 a.m.....Registration / Continental Breakfast
9:00 - 10:30 a.m.....Opening Session
10:30 - 11:00 a.m.....Break
11:00 - 12:30 p.m.....Panel Session 1
12:30 - 2:00 p.m.....Keynote Lunch
2:00 - 3:30 p.m.....Panel Session 2
3:30 - 4:00 p.m.....Break
4:00 - 5:30 p.m.....Poster Session 1
5:30 - 6:00 p.m.....Break
6:00 - 7:30 p.m.....Workshop Session 1 (with box dinner)
8:00 - 9:30 p.m.....”News” and Brews

Tuesday, June 3, 2014

7:00 - 9:00 a.m.....Continental Breakfast
7:30 - 12:30 p.m.....Local Tours / Activities
8:00 - 9:00 a.m.....Registration
9:00 - 10:30 a.m.....Workshop Session 2
11:00 - 12:30 p.m.....Workshop Session 3
12:30 - 2:00 p.m.....Birds of a Feather Lunch
2:00 - 3:30 p.m.....Panel Session 3
3:30 - 4:00 p.m.....Break
4:00 - 5:30 p.m.....Poster Session 2
5:30 - 6:00 p.m.....Break
6:00 - 7:30 p.m.....Workshop Session 4 (with box dinner)
7:30 - 8:00 p.m.....Dessert Break
8:00 - 9:30 p.m.....Break-out / Working Group / Social Meetings

Wednesday, June 4, 2014

6:30 - 7:30 a.m.....Informal Walk / Run
8:00 - 9:00 a.m.....Registration / Continental Breakfast
9:00 - 10:30 a.m.....Panel Session 4
10:30 - 11:00 a.m.....Break
11:00 - 12:30 p.m.....Panel Session 5
12:30 - 2:00 p.m.....Closing Lunch and Next Steps

Welcome
from the Co-Chairs

Greetings! On behalf of the entire Capstone Design Conference Organizing Committee we welcome you to Columbus, OH for the 2014 Capstone Design Conference!

We are thrilled to continue the success of the previous capstone conferences and to continue building a community of educators, students, and industry to discuss, analyze, and improve capstone design education. Following the interest of past conference attendees and planners at the 2013 ASEE session regarding this conference, the theme for the 2014 Capstone Design Conference is Multidisciplinarity and Experiential Learning in Capstone Design.

As with the previous capstone conferences, this conference is intentionally designed to promote discussion and interaction across the capstone community. In other words, welcome to a conference at which you will get a chance to confer! In contrast to the traditional podium presentation format, this conference instead features two conference-wide poster sessions (including faculty, industry affiliates, and students) to encourage vibrant and extensive sharing of ideas and experiences. Moreover, based on themes that emerged from the accepted papers and posters, we developed interactive panel sessions to discuss topics related to the conference theme. In addition, we accepted a range of workshops to enable attendees to learn new skills and strategies to work with capstone design.

The 2014 conference continues the tradition of student involvement, reflecting students' key role in capstone design. Keep an eye out for featured capstone student projects in the poster session as well as invited student participation in many of the panel sessions. We are grateful to the contributions of our many conference sponsors, exhibitors, and advertisers who support the conference and help us keep our conference fees as low as possible.

So, again welcome! Please take the opportunity to immerse yourself in this conference; expand your capstone network, exchange ideas, and empower your involvement with capstone design courses. We thank you for attending the 2014 conference - we welcome feedback on conference effectiveness and encourage you to spread the word. We look forward to collaborating with you now and in the future!

- Glen Livesay and Renee Rogge, Co-Chairs

GAME ON

We've Gamified This Conference

Feedback from the last Capstone Design Conference indicated that participants enjoyed the spirit of play, and opportunities to interact informally with other participants. Continuing in that vein, this year we've created a series of "quests" for conference participants. The quests are designed to encourage participants to fully experience the conference, make social and networking connections that otherwise might not occur, explore some local activities and generally have fun. Look for the Quest Center table near the exhibitor tables in the Knowlton School of Architecture to get more information and claim prizes or be entered into prize raffles based on the quests you've completed. And look for conference name tags equipped with "glitter gears" to find other people embarking on quests. **After all, all work and no play make design dreadfully dull…**

- Kay C Dee, Quest Ladyboss
Rose-Hulman Institute of Technology

Organizing Committee

Glen Livesay
Rose-Hulman Institute of Technology
Co-Chair

Renee Rogge
Rose-Hulman Institute of Technology
Co-Chair

Patsy Brackin	Rose-Hulman Institute of Technology	Panels
Steve Beyerlein	University of Idaho	Workshops
Beth DeBartolo	Rochester Institute of Technology	Posters
Craig Forest	Georgia Institute of Technology	Special Sessions
Jay Goldberg	Marquette University	Exhibitors
Susannah Howe	Smith College	Communications
Amit Jariwala	Georgia Institute of Technology	Special Sessions
Junichi Kanai	Rensselaer Polytechnic Institute	Paper Management
Scott Palo	University of Colorado	Webmaster
Peter Rogers	The Ohio State University	Local Organizer
Daria Kotys-Schwartz	University of Colorado	Student Involvement
Keith Stanfill	University of Florida	Fundraising
Steve Zahos	University of Illinois	Fundraising

8:00 - 9:00 a.m. **Registration / Continental Breakfast –** Blackwell Lobby

9:00 - 10:30 a.m. **Opening Session –** Blackwell Ballroom

10:30 - 11:00 a.m. **Break**

11:00 - 12:30 p.m. **Panel Session 1**

Session 1A: What I Wish I Knew on the Job My First Year

Room Pfahl 202

Patsy Brackin, Rose-Hulman Institute of Technology (Facilitator)
Christopher O'Keefe, eNNOVEA
Duane Detwiler, Honda Vehicle Research
Robert Priest, Coltene-Whaledent
Andrew Watchorn, National Instruments

The transition from student to full-time professional can be challenging. Industry representatives will discuss lessons learned in their career with student Capstone Design Conference participants—sharing their view on critical professional development, strategies, and professionalism that are essential for an entry-level engineer during their first two years.

Session 1B: Global Capstone Design

Room Pfahl 302

John Aidoo, Rose-Hulman Institute of Technology (Facilitator)
Timothy Dewhurst, Cedarville University
Nirmala Gnanapragsam, Seattle University
Dean Knudson, North Dakota State University
Doga Kumusoglu, University of Michigan

Global design is routine with multi-national companies. This panel will discuss experience unique to global design when performed in the capstone design setting.

Session 1C: Project Definition

Room Pfahl 330

Fred Looft, Worcester Polytechnic Institute (Facilitator)
Jeff Huffman, Marshall University
John Parmigiani, Oregon State University
Gregory Watkins, California State University, Chico

Defining the problem and determining the scope of a project sets the tone for a capstone experience. Approaches to project definition will be discussed.

Session 1D: Uncommon Deliverables in Capstone Courses

Room Pfahl 340

Joshua Summers, Clemson University (Facilitator)
Chris Broberg, Wichita State University
Benjamin Gan Kok Siew, Singapore Management University
Warren Seider, University of Pennsylvania

When you think of deliverables for capstone design, what is the first thing that comes to your mind? Capstone deliverables can vary widely between disciplines and can depend on them emphasis of the course. Attend this panel to hear approaches from various programs.

12:30 - 2:00 p.m. **Keynote Lunch -** Blackwell Ballroom

Industry Perspectives on Multidisciplinary Design

Dr. Susan Finger (Moderator)
NSF Division of Undergraduate Education

Dr. Susan Finger is a program director in the Division of Undergraduate Education at the National Science Foundation on leave from Carnegie Mellon University as a Professor of Civil and Environmental Engineering. She received her B.A. in Astronomy from the University of Pennsylvania, her M.A. in Operations Research from the University of Pennsylvania, and her Ph.D. in Electric Power Systems through Civil Engineering from MIT. She served as faculty at both Boston University and MIT. In 1985, she went to the National Science Foundation as the first Program Director for the Design Theory and Methodology program. In 1987, she joined the Robotics Institute at Carnegie Mellon as a research faculty and later the department of Civil Engineering. She is a founding editor of the journal Research in Engineering Design. Dr. Finger's research interests include collaborative learning in design, rapid prototyping, and integration of design and manufacturing concerns.

Industry Panelists:
Christopher O'Keefe, eNNOVEA
Duane Detwiler, Honda Vehicle Research
Robert Priest, Coltene-Whaledent
Andrew Watchorn, National Instruments

2:00 - 3:30 p.m. **Panel Session 2**

Session 2A: Product vs. Process?

Room
Pfahl 202

Kay C Dee, Rose-Hulman (Facilitator)
Steve Beyerlein, University of Idaho
Mark Calhoun, The Ohio State University
John Mirth, Rose-Hulman Institute of Technology
Chuck Pezeshki, Washington State University
Colleen Stevenson, Rose-Hulman Institute of Technology

Does what you emphasize (process vs. product) impact what your students learn in capstone design? Join us for a lively discussion!

Session 2B: Intellectual Property

Room
Pfahl 302

Alex Breger, NCIIA (Facilitator)
David Alexander, University of Idaho
Kristine Csavina, Arizona State University
James Vallino, Rochester Institute of Technology

The panel will discuss best practices for dealing with intellectual property issues in capstone design.

Session 2C: Best Practices in Multidisciplinary Capstone Design

Room
Pfahl 330

Keith Stanfill, University of Florida (Facilitator)
Michael Paul, University of Delaware
Bob Rhoads, The Ohio State University
Clifford Whitfield, The Ohio State University
Michael Delph, Worcester Polytechnic Institute

Nationally recognized capstone programs that involve multi-disciplinary projects will share best practices in course design, project selection, design team facilitation, and assessment.

Session 2D: Best Practices in Industry Sponsorship

Room
Pfahl 340

Jay Goldberg, Marquette University (Facilitator)
Joel Barnett, Vanderbilt University
Ruth Levine, Olin College
Alisha Sarang-Sieminski, Olin College
Jimmy Trent, Brigham Young University

Industry sponsorship includes identifying clients, matching clients to student teams, coaching team, evaluating projects and determining methods for improvement. This panel will discuss a variety of approaches that result in successful collaboration.

3:30 - 4:00 p.m. **Break**

4:00 - 5:30 p.m. **Poster Session 1 – Upper and Lower Levels, Knowlton School of Architecture**
Food and beverages will be available while you browse the posters and chat with the authors in the beautiful Knowlton School of Architecture (across the street from Pfahl Hall).

5:30 - 6:00 p.m. **Break**

6:00 - 7:30 p.m. **Workshop Session 1 (with box dinner)**

Workshop 1A: I Didn't Sign Up for This: Dealing with Difficult Students and Problem Teams

Room
Scott Lab
E100

Shari Robinson, University of Florida
Keith Stanfill, University of Florida

Capstone project mentors work on a more intimate professional basis with students than their colleagues who teach traditional lecture-based courses. It is not uncommon for mentors to get involved resolving team conflicts, counseling team leaders in handling nonproductive team members, and performing damage control on dysfunctional teams. These situations can have nothing to do with the sophistication and thoroughness of students' technical training—i.e. team member immaturity, "bad apple" personality types, stress level, physical health, and mental health. This interactive workshop session will use role playing and facilitated discussion to explore coaching strategies for difficult project team situations. Workshop leaders include a Counseling and Wellness Center psychologist and a veteran capstone design instructor.

Workshop 1B: Framework for Engineering Design Learning and Assessment

Room
Pfahl 302

Denny Davis, Washington State University
Peter Rogers, The Ohio State University

The goal of this workshop is to lay groundwork for a major proposal to fund the development of versatile assessments for engineering design learning and performance across undergraduate engineering programs. Desired outcomes include (1) set of design learning and performance outcomes for undergraduate engineering students (through all four years), (2) draft framework that identifies critical abilities necessary for design learning and performance (throughout entire curriculum), (3) proposal concept that can be developed into a versatile valid assessment for design learning and performance, (4) identified leadership for preparation of proposals for funding, (5) identified research collaborators, and (6) plan to prepare the proposal for submission.

Workshop 1C: Biomimicry = Engineering + Biology: Tools for Capstone Design

Room
Pfahl 330

Darrell Kleinke, University of Detroit Mercy

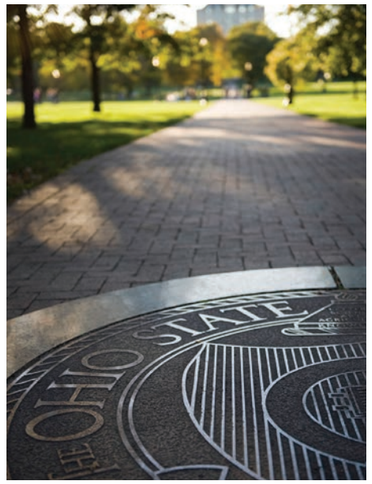
The application of biomimicry has led to many recent breakthroughs in engineering design, such as robotics inspired by rodents and cameras inspired by beetles. In this workshop, participants will study practical examples of biomimicry and explore techniques of varying difficulty. First, a simple tool, random association, will be utilized as a way to introduce students to biomimicry. Second, a moderately difficult tool, the Ask Nature taxonomy, will be illustrated as a vehicle for understanding applicable biological phenomena. Finally, an advanced tool, "bio-TRIZ", will be examined for use by determined student innovators.

Workshop 1D: Using Requirements for Project Health Monitoring

Room
Pfahl 340

Shradda Joshi, Clemson University
Beshoy Morkos, Florida Institute of Technology
Joshua Summers, Clemson University

The workshop illustrates how to systematically use requirements as a tool for monitoring project health throughout the entire design process. Requirements play a critical role in engineering design projects and much time is spent eliciting and documenting them. However, while requirements are frequently used to evaluate solution concepts, there are many other venues in the design process where these can add value. By the end of the workshop attendees will be able to measure 'completeness' and 'specificity' of requirements as well as better use these to monitor project health at all stages in the design process.



8:00 - 9:30 p.m.

Room
Scott Lab
E100

"News" and Brews

This informal session (with drink!) will provide an opportunity for capstone "newbies"to connect with more seasoned capstone colleagues for casual conversation. Whether you're new to capstone or have been around the capstone block (or you just like microbrews!), you are welcome to join in the discussion.

Capstone Overview

The goal of the Capstone Design Conference is to provide a forum for engineering and applied science faculty to share ideas about implementing and improving design-based capstone courses. Conferences are held biannually in even years.

Through the three previous Capstone Design Conferences, we have established a network of capstone design educators and associated stakeholders committed to supporting one another in implementing various capstone course models, managing teams and projects, engaging stakeholders, incorporating new technology and collaborating to identify and disseminate effective practices in capstone design education. We welcome the 2014 conference attendees into this friendly and talented community.

As an outcome of both the 2010 and 2012 conferences, we published an extensive set of peer-reviewed articles about capstone pedagogy in two special issues of the International Journal of Engineering Education (IJEE, vol. 27-6 and vol. 30-1). We intend to pursue another special issue of IJEE following the 2014 conference. We invite you to join us in our quest for shared excellence in capstone design instruction.

7:00 - 9:00 a.m. **Continental Breakfast**
Blackwell Lobby

7:30 a.m. - 12:30 p.m. **Local Tours and Activities**

7:30 - 10:00 a.m. **L Brands Inc. DC5 Victoria's Secret Direct Distribution Center**
Attendees will meet in the Blackwell Lobby

The DC5 facility in Reynoldsburg, Ohio, services all of Victoria's Secret's catalog and internet orders for the entire world. The facility is approximately 1M square feet and ships over 500,000 units per day during peak periods. The facility employs over 1000 associates during peak periods and uses highly automated equipment to process orders to customers.
Cost is $25; advanced registration is required. Limited to 30 participants.

7:30 a.m. - 12:30 p.m. **Honda of America Manufacturing, Inc.**
Attendees will meet in the Blackwell Lobby

The 3.9 million square-foot Marysville plant represents the largest of Honda's Ohio operations and produces the Honda Accord Sedan & Coupe, Accord Hybrid, and Acura TLX for customers in more than 100 countries around the world.
Cost is $25; advanced registration is required. Limited to 35 participants.

8:00 - 9:00 a.m. **Registration –** Blackwell Lobby

9:00 - 10:30 a.m. **Workshop Session 2**

Workshop 2A:
Rapid Design of Embedded Systems with NI myRIO
Margaret Barrett and Mark Walters, National Instruments

Room
Pfahl 330

This hands-on workshop seeks to familiarize educators and students with embedded technology to complete real-world design projects in one semester or less. NI myRIO is an embedded hardware device designed for developing real, complex engineering systems more quickly using a dual-core ARM® Cortex™-A9 real-time processing and customize I/O with a Xilinx FPGA. In this seminar attendees physically setup an NI myRIO, write an embedded program in LabVIEW, and then visualize the results. The exercises are examples of how to leverage graphical programming for stand alone, deterministic systems.
For more information on NI myRIO, visit: **ni.com/myrio.**

11:00 - 12:30 p.m. **Workshop Session 3**

Workshop 3A: Using CATME to Assign Students to Capstone Teams
Richard Layton, Rose-Hulman Institute of Technology
Misty Loughry, Georgia Southern University
Matthew Ohland, Purdue University

Room
Pfahl 340

The CATME system provides free, web-based tools for helping faculty effectively manage student teams. These tools were reviewed favorably at the 2010 Capstone Conference, but participants expressed the need to make team assignments that account for student project preferences. That feature has since been added to the CATME system. The goals of this workshop are to introduce the new feature, reacquaint the audience with the other system tools, and show how the tools can be used together for effective management and training of student teams. Attendees with wireless-network-capable laptop computers will be able to interact with the system in real-time. The workshop leaders have collaborated for many years as part of NSF-sponsored grants to develop and disseminate the CATME system. The system works well for faculty who use teams in any course, including courses at all levels in the engineering curriculum.

12:30 - 2:00 p.m. **Birds of a Feather Lunch –** box lunch, open seating by topics of interest

WiFi Access:
Use "WIFI@OSU" for free open access

2:00 - 3:30 p.m. **Panel Session 3**

Session 3A: Technical Design Reviews

Room Pfahl 202

Jay McCormack, Rose-Hulman Institute of Technology (Facilitator)
Denny Davis, Washington State University
Gene Dixon, East Carolina University
Olga Pierrakos, James Madison University
Andrew Accountis, University of Colorado Boulder

Technical design reviews are routinely used in industry. This panel will discuss a variety of approaches for implementing technical design reviews in a capstone setting.

Session 3B: Student Perspectives on Multidisciplinary Capstone Teams

Room Pfahl 302

Janet Tsai, University of Colorado Boulder (Facilitator)
Julie Angelini, University of Delaware
Michael Delph, Worcester Polytechnic Institute
David Connor, University of Texas Dallas
Aamir Shaikh, University of Texas Dallas
Kyra Wilson-Houck, Rochester Institute of Technology

Students will discuss (1) information other students should know before they work on a multidisciplinary team, (2) new information or skills they learned by working with students from other disciplines, and (3) why they value working with multidisciplinary teams, and why they think industry will value this experience.

Session 3C: IT Nuggets in Capstone

Room Pfahl 330

Bridget Smyser, Northeastern University (Facilitator)
Amit Jariwala, Georgia Institute of Technology
Moses Lee, University of Michigan
Balaji Sharma, MathWorks
William Stoy, Georgia Institute of Technology

This panel presents some useful applications to consider when administering capstone classes. Simulation, team matching, portfolios, and judging posters during design expos will all be discussed. Be prepared to share your favorite nuggets.

Session 3D: Supporting Successful Teams

Room Pfahl 340

Richard Layton, Rose-Hulman Institute of Technology (Facilitator)
David Giurintano, Louisiana State University
Brian Novoselich, Virginia Tech
Shraddha Sangelkar, Penn State Behrend

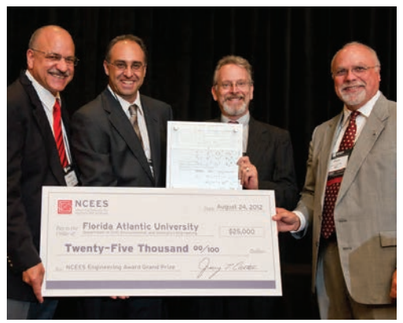
The functioning of a team often determines the success of the capstone project. Shared leadership, leadership coaching, and many other team-related topics will be discussed.

3:30 - 4:00 p.m. **Break**

4:00 - 5:30 p.m. **Poster Session 2 – Upper and Lower Levels, Knowlton School of Architecture**

Food and beverages will be available while you browse the posters and chat with the authors in the beautiful Knowlton School of Architecture (across the street from Pfahl Hall).

5:30 - 6:00 p.m. **Break**



NCEES Engineering Award

NCEES invites EAC/ABET-accredited programs from all engineering disciplines to submit qualifying capstone projects that integrate professional practice and education to compete for

Grand prize: $25,000
Five awards: $7,500 each

NCEES
advancing licensure for engineers and surveyors

See if your capstone project qualifies by visiting ncees.org/award.

6:00 - 7:30 p.m. **Workshop Session 4 (with box dinner)**

Workshop 4A: Coaching the Client: Collaborating with Sponsors to Maximize Student Learning

Room Pfahl 302

Steven Beyerlein, University of Idaho
Chuck Pezeshki, Washington State University

The client is often an underused ally in achieving capstone course goals. With proper coaching, clients can positively impact a multitude of capstone project issues, both social and technical. Without coaching, client actions can exacerbate common social and technical problems. It is incumbent on capstone faculty to cultivate positive relationships with their clients, increasing the likelihood of positive project and professional development outcomes. As part of this workshop, faculty will explore a number of scenarios related to faculty and client actions before project start-up and continuing through the capstone experience. A number of resources developed by the facilitators will be used to scaffold workshop activities. Each of the workshop leaders have more than 15 years of experience working with external capstone course sponsors that have generated more than $1.5M of project funding for their respective programs.

Workshop 4B: Formation and Deployment of a Capstone Course 'Blue Collar' Industrial Advisory Board

Room Pfahl 330

Gregory Kremer, Ohio University

Participants in this workshop will have an opportunity to work on advancing the capstone design experience in their own programs through implementation of a 'blue-collar' advisory board (a hands-on board that gets involved with direct mentoring of student projects). The workshop is based on experiences of the presenters in conjunction with "Designing to Make a Difference", a Year-Long Community-Based Capstone Experience in the Mechanical Engineering Program at Ohio University. This workshop highlights desirable outcomes supported by the 'blue-collar' advisory board to date, explores how to recruit/orient members, outlines the evolution of the current tollgate management structure, and suggests productive ways to engage members in course assessment as well as program assessment.

Workshop 4C: Task Planning – A Management Toolbox for Team Projects

Room Pfahl 340

Robert Fornaro, North Carolina State University
Margaret Heil, North Carolina State University

This workshop provides a script for facilitating a formal one-hour project management session that helps groups of students leverageteam strengths and identify team deficits that threaten accomplishment of project goals. Participants will receive materials and engage in small group activities that develop proficiency in (1) facilitating student discussions so that design tradeoffs are explored and project planning is emphasized, (2) reinforcing positive communicationand leadership styles exhibited by students during small group meetings so that all team members gain ownership of project responsibilities, (3) modeling approaches to conflict resolution, and (4) mentoring students to visualize as well as articulate realistic project scope statements.

7:30 - 8:00 p.m. **Dessert Break!**

8:00 - 9:30 p.m. **Break-out / Working Group / Social Meetings**

6:30 - 7:30 a.m. **Run / Walk -** Meet in the Blackwell Lobby

An informal gathering of attendees who are interested in taking a walk or run around the OSU campus. Can't make the group meeting?
Check out **http://recsports.osu.edu/facilities/outdoor-facilities** for some running/walking trails around the campus!

8:00 - 9:00 a.m. **Registration / Continental Breakfast**

9:00 - 10:30 a.m. **Panel Session 4**

Session 4A: Communication in Capstone Design

Room Pfahl 202

Matt Ohland, Purdue University (Facilitator)
Javier Calvo-Amodio, Oregon State University
Emil Geiger, University of Nevada, Reno
Tracy Ann Robinson, Oregon State University
Sam Villareal, Texas A&M University

Faculty agree that communication is an essential element of a successful capstone design experience. Students struggle with documentation and communication. Peer reviews, use of writing fellows, and scaffolding assignments will be discussed.

Session 4B: Assessment Challenges in Capstone

Room Pfahl 302

Marie Paretti, Virginia Tech (Facilitator)
Ernie Lou, Seattle University
William Stoy, Georgia Institute of Technology
Anita Vila-Parrish, North Carolina State University

Assessment of capstone design can include assessment of individual students, work product, sponsor interactions, work process, and/or program effectiveness. Different methods of assessment will be discussed.

Session 4C: Infrastructure for Prototyping

Room
Pfahl 330

Troy Vogel, University of Illinois (Facilitator)
Craig Forest, Georgia Institute of Technology
Matthew Franchetti, University of Toledo
Tristan Tayag, Texas Christian University
Jim Ustar, Stratasys

Prototyping is useful in conceptualization and design proof of concept. Requirements to support prototyping activities are discussed.

Session 4D: Pathways to Innovation Program

Room
Pfahl 340

Victoria Matthew, NCIIA

Participants will engage in an experiential workshop designed to inform and support the development of a preliminary framework for integrating entrepreneurship in the capstone experience. This will begin with collaboration in generating of goals for acquisition and demonstration entrepreneurial skills within capstone project work. It will culminate in a group exercise to develop program models for achieving these goals. The workshop will build on the experience of current partners in the NSF-funded Pathways to Innovation program. Twelve institutions are participating in the 2013-2014 cohort and an additional 20 – 25 schools are being recruited for 2014-15 cohort. Interested participants will have the opportunity to learn about how their program can become part of this undergraduate engineering curriculum change initiative.

10:30 - 11:00 a.m. **Break**

The Pathways to Innovation program is designed to help institutions transform the experience of their undergraduate engineering students, ensuring that students graduate with the technical skills, tools and attitudes they need to move from ideas to practical solutions that solve real world problems.

The program helps faculty incorporate entrepreneurship and innovation into a range of courses as well as strengthen co- and extra-curricular offerings.

Proposals to join the next group of Pathways schools are due in October 2014.

Learn more at:
epicenter.stanford.edu/page/pathways-to-innovation

NCIIA NSF epicenter STANFORD UNIVERSITY

11:00 - 12:30 p.m. **Panel Session 5**

Session 5A: Teaching Capstone Design

Room
Pfahl 202

Glen Livesay, Rose-Hulman Institute of Technology (Facilitator)
Jay Goldberg, Marquette University
Marie Paretti, Virginia Tech
Steve Chenoweth, Rose-Hulman Institute of Technology
Cliff Whitfield, The Ohio State University

Teaching capstone design is "different"! Join panelists as they discuss some of the perks and perils of teaching design and how it is "different" from teaching a discipline-specific course.

Session 5B: Nifty Ideas and Surprising Flops

Room
Pfahl 302

Susannah Howe, Smith College (Facilitator)
Rick Bannerot, University of Houston
Emil Geiger, University of Nevada, Reno
Dean Knudson, North Dakota State University
Renee Rogge, Rose-Hulman Institute of Technology
Keith Stanfill, University of Florida

This rapid-fire session will feature a collection of "nifty ideas" and "surprising flops" from capstone design. Each presenter will briefly share a nifty/flop, followed by Q&A from the audience. Time permitting, walk-ons from the audience will be welcome - bring an idea to contribute!

Session 5C: Communicating Progress in Capstone Classes

Room
Pfahl 330

JD Yoder, Ohio Northern University (Facilitator)
Richard Bannerot, University of Houston
Ada Hurst, University of Waterloo
Jay McCormack, Rose-Hulman Institute of Technology
Nathan Scott, The Johns Hopkins University

Snapshot posters, peer reviews, and an early substantial prototype are a few of the methods discussed for communicating student progress.
Join us and share your best practices.

Session 5D: Case Studies in Use of Standards with Capstone Projects: A Multidisciplinary Approach

Room
Pfahl 340

Jennifer McClain, IEEE (Facilitator)
Susan K. Tatiner, IEEE
Jim Olshefsky, ASTM International
Erik Puskar, National Institute of Standards and Technology
Ron Schneiderman
Nitin Aggarwal, San Jose State University

The goal of this workshop is to show how using industrial standards in capstone projects can make them more relevant to students and future employers. Standards education promotes the importance of standards in meeting technical, economic, environmental, and societal challenges. The workshop will utilize a case study approach that captures technology, economics, and political issues addressed by industry standards. At the same time, the case studies will illustrate how standards offer strong technical and critical thinking components.

12:30 - 2:00 p.m. **Closing Lunch and Next Steps -** Blackwell Ballroom

POSTER SESSION

Professional Papers

list of posters, alphabetical by first author

	Authors	Poster Location	Poster Title	Poster Session
A	John Aidoo*, Shannon Sipes, Jim Hanson, Kevin Sutterer (Rose-Hulman Institute of Technology)	45	Overcoming Challenges Associated with the Joint Project Model	M
	David Alexander*, Steven Beyerlein, Scott Metlen (University of Idaho	6	Processes to Formalize Sponsored Educational Activity Agreements between Industry and Universities Related to Capstone Design Projects	Tu
B	Richard Bannerot* (University of Houston)	22	Individual Communication Requirements in Capstone	Tu
	Chris Boesch, Benjamin Gan* (Singapore Management University)	27	Evolving an Information Systems Capstone Course to Align With the Fast Changing Singapore Marketplace	M
	Chris Broberg*, Steven Skinner (Wichita State University)	19	Incorporating Entrepreneurship Into the Capstone Design Project: An Across-College Approach to Product Definition and Design	Tu
C	Javier Calvo-Amodio*, John Parmigiani, Tracy Robinson (Oregon State University); Pilar Pazos-Lago (Old Dominion University)	42	The Use of Project Type Tracks, Scaffolding and Websites in a Large and Multi-Disciplinary Capstone Design Course	Tu
	Kristine Csavina*, Kevin Gary, Ann McKenna (Arizona State University)	44	Scalability in an Industry Project Process	Tu
D	Denny Davis (Professor Emeritus, Washington State University)	24	Design Reviews for Rigorous Design Assessment	Tu
E	John Estell*, David Mikesell, John-David Yoder (Ohio Northern University)	20	A Decade of Multidisciplinary Capstone Collaboration	Tu
F	Craig Forest*, Amit Jariwala, Julie Linsey, Roxanne Moore (Georgia Institute of Technology); Christopher Quintero	37	The Invention Studio: Student-Led Fabrication Space and Culture	M
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	David Giurintano*, Summ Dann, Dimitris Nikitopoulos, Warren Waggenspack, (Louisiana State University)	40	Leadership Coaching of Interdisciplinary Capstone Design Teams at LSU	Tu
	Nirmala Gnanapragasam*, John Lauer, Paul Smith-Pardo, Michael Marsolek (Seattle University)	5	International Civil Engineering Capstone Projects - Benefits, Challenges and Lessons Learned	M
	Jay Goldberg* (Marquette University); Susannah Howe (Smith College)	49	Virtual Capstone Design Teams: Preparing for Global Innovation	M

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H	Jeff Huffman* (Marshall University)	14	Benefits of Utilizing 'Existing', Real-World, Civil Engineering Projects in a Capstone Course and The Civil Engineering Capstone Project Depot	Tu
	Ada Hurst* (University of Waterloo)	10	Joint Progress Update Meetings in Capstone Design Courses: Encouraging Peer Review and Cooperative Learning	Tu
J	Amit Jariwala* (Georgia Institute of Technology); Sarvagya Vaish	41	Design of an Online Portal to Assist in the Realization of Institute-Wide Multidisciplinary Capstone Design	M
	Emad Jassim* (University of Illinois MechSE)	9	Formulation of Capstone Design Projects for Experiential Learning	M
K	Katherine Kuder*, Nirmala Gnanapragasam, Paul Smith-Pardo (Seattle University)	17	Experiential Learning Through Structural Retrofit Capstone Projects	M
L	Justine Lawson*, Mohammad Rasul, Prue Howard, Fae Martin (Central Queensland University)	26	Getting It Right: Assessment Tasks and Marking for Capstone Project Courses	Tu
	Fred Looft* (WPI)	46	Graduate Systems Engineering Capstone Projects	Tu
M	Jay McCormack* (Rose-Hulman Institute of Technology); Steven Beyerlein (University of Idaho); Patsy Brackin, (Rose-Hulman Institute of Technology)	15	Snapshot Style Poster Sessions for Large Class Feedback on Project Status in Engineering Capstone Courses	M
	Russell McMahon* (University of Cincinnati)	48	Redesign of the University of Cincinnati's School of Information Technology's Senior Capstone Courses	Tu
P	John Parmigiani*, Javier Calvo-Amodio, Tracy Robinson (Oregon State University)	23	Acquiring a Consistent Source of Quality Capstone Projects	M
	Michael Paul* (University of Delaware)	13	Five Years of Capstone Winners: Analysis of NCEES Engineering Awards 2009-2013	M
	Carl Pettiford* (Liberty University)	55	3-Course Capstone Sequence	Tu
	Olga Pierrakos*, Elise Barrella (James Madison University)	28	On the Use of Design Reviews During a Two-Year Capstone Design Experience: The James Madison University Model	Tu
Q	Charles Quagliana* (Univ. of Wisconsin)	52	Capstone Design: A Cross-curricular Interdisciplinary Approach	Tu
R	Mohammad Rasul, Justine Lawson*, Prue Howard, Fae Martin (Central Queensland University)	50	Learning and Teaching of Capstone Final Year Engineering Projects: An Australian Study	Tu
	Bob Rhoads*, Clifford Whitfield, Jacob Allenstein (The Ohio State University)	16	Impacts of a Multidisciplinary Engineering Capstone Design Program from Early-Career Alumni Perspectives	Tu
	Tracy Robinson*, Javier Calvo-Amodio, John Parmigiani (Oregon State University)	30	Capstone Design as an Individual Writing Experience	Tu
S	Shraddha Sangelkar*, William Lasher, Oladipo Onipede (Penn State Behrend)	57	Understanding Student Attitudes about the Design Process	Tu
	Alisha Sarang-Sieminski*, Rebecca Christianson, Allen Downey, Christopher Lee, Jessica Townsend (Olin College of Engineering)	56	Supporting Successful Teams: Preparation, Team Formation, Teamwork, and Team Health	Tu
	Nathan Scott* (The Johns Hopkins University)	58	Two Innovations in JHU's Two Semester ME Capstone Course	Tu
	Warren Seider* (Univ. of Pennsylvania)	33	Capstone Chemical Engineering Design Courses: Emphasis on Product Manufacturing	M
	Bridget Smyser*, Gregory Kowalski, Charles DiMarzio (Northeastern University)	53	Comparing the Performance of Multi-, Inter-, and Transdisciplinary Capstone Groups	Tu
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T	Tristan Tayag* (Texas Christian University)	34	The Capstone Design Experience Modeled as a Small Business Enterprise	Tu
	Jimmy Trent, Jr.*, Carl Sorensen (Brigham Young University)	4	On the Value of an External Relations Director in an Industry-Sponsored Capstone Program	Tu
V	James Vallino* (Rochester Institute of Technology)	8	Ownership of Artifacts and Intellectual Property for Software-Intensive Capstone Design Projects	Tu
	Anita Vila-Parrish* (North Carolina State University); Renata Konrad, Adrienne Hall-Phillips	36	Is There a Difference in the Engineering Skills Fostered in Structured vs. Unstructured Capstone Courses?	Tu
W	Gregory Watkins*, Nick Repanich (California State University, Chico)	18	A Straightforward Method of Project Definition for Capstone Design Projects	Tu
	James Widmann*, Lily Laiho, Richard Savage (Cal Poly State Univ. San Luis Obispo)	54	Initiating and Sustaining an Interdisciplinary Capstone Design Course	Tu

POSTER SESSION

Student Project Posters

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Arizona State University	Michael Berg , Caleb Rogers, Ryan Goddu, Bobby John, Victoria Taylor, Peter Newman	11	Design and Implementation of a Tablet Application for Boeing Defense Systems	M
Boston University	Charles Vincent, Stuart Minshull, Austen Schmidt, Nandheesh Pras, Vinny DeGenova	25	AutoScan: An automated vehicle pothole detection system	M
Georgia Institute of Technology	Hilary Lynch, Harrison Bartlett	29	Minimally invasive Treatment for Mitral Valve Regurgitation	M
Northeastern University	Steve Corliss, Eric Corti, Keith Sproa, Joe Pellican, Jesse Mitchell	31	Remote Treat Dispenser for Canine Training	M
The Ohio State University	Brad Homyak	35	Geometric Manipulation of Endodontic Files for Enhanced Performance	M
Rose-Hulman Institute of Technology	Colleen Stevenson, Paige Cook, Michael Bush, Kelli Greenberg	3	Electronic Control of Robotic Prosthetic	M
	Chelsea Copenhaver, Anna Mommer, Malorie Piland, Lauren Reberger	1	Lower Body Positioning Feedback for Hippotherapy	M
Sinclair Community College	Sarah Addy, Melissa LeCaze, Jonathan Metcalf, Sharon Reed	21	Webster St Wastewater Treatment Plant	M
University of Colorado	Anadrew Accountiu, Ryan Blume, Sam Hick, James Kohnen, Max Oelschalger, Marshal Poet	39	Toroid Can Making Machine	M
University of Michigan	Doga Kumusoglu, Marcus Papadopoulos, Benjamin Schlange, Elizabeth Sherzer	2	Blood Pressure Screening Device for Low Resource Settings	M
University of Texas, Dallas	Stuart Yu, Ryan Perkinson, Aamir Shaikh, Joel Armstrong, Alexander Kollaja, David Alexander, David Connor, Arash Fan, Sherry Jurcak, Andrew Yin	43	Automated Gap Adjustment Tool (AGAT)	M
University of Waterloo	Kamal Amal, Michael Tatham, Adam Singer, Jared Evans	47	MAJik Connect: Smarter Machine Minotoring Today	M

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For more information contact:

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