ASSE SOUTHEASTERN SECTION
ANNUAL CONFERENCE

APRIL 5 - 7, 2009

“Preparing the Engineers and Technologists of Tomorrow”

SOUTHERN POLYTECHNIC STATE UNIVERSITY
MARIETTA, GEORGIA

Proceedings Editor: Barbara Bernal
Southern Polytechnic State University

Technical Program Chair: Brent Jenkins
Southern Polytechnic State University

Conference Site Coordinator: Jeffrey Ray
Southern Polytechnic State University
Table of Contents

1. Conference Information ................................................................. 1.0
   University Welcome: Dean Jeff Ray, Southern Polytechnic State University ....... 1.1
   Conference Welcome: Barbara Bernal, ASEE SE Section President ................. 1.2
   Acknowledgements ........................................................................ 1.3
   Conference Overview ..................................................................... 1.4
   Conference Schedule ..................................................................... 1.5
   Parking and Transportation ............................................................ 1.8
   Map of Conference meeting rooms .................................................. 1.9
   Map to Sunday Night Reception – Southern Museum and Williamson Bros........ 1.10
   Conference Meals and Receptions .................................................. 1.12
   Conference Workshops ................................................................ 1.16
   Keynote Speaker: George Blanks, Director, Pinnacle Investments ................... 1.19
   ASEE Southeastern Section Officers ............................................... 1.20
   Technical Session Information ....................................................... 1.21
   Instructions for Technical Session Moderator Chairs ............................. 1.22
   Student Poster Session Information ............................................... 1.23
   Schedule of Technical Sessions ....................................................... 1.24
   ASEE Conference Proceedings Information ..................................... 1.35
   Conference Registrants ................................................................. 1.36

2. Technical Session Extended Abstracts ............................................. 2.0

3. Student Poster Session Abstracts .................................................... 3.0

4. Index ............................................................................................ 4.0

5. Call for ASEE SE 2010 ................................................................. 5.0
Chapter 1
Conference Information
5 April 2009

Dear 2009 ASEE Southeastern Conference Attendees:

On behalf of the faculty, staff, and students of the School of Engineering Technology and Management and the entire Southern Polytechnic State University community, welcome to the 2009 ASEE Southeast Section Conference. There are many wonderful and interesting places to visit in the metro Atlanta region and hopefully you will be able to take time to explore the area.

The theme of this year’s conference is “Preparing the Engineers and Technologists of Tomorrow.” This is a topic of much interest given the recent economic news and the need for the US and other developing countries to continue expanding globally. Additionally, we have all read the many articles on the shortage of students entering the engineering profession and other STEM fields; this conference will address many of the issues we as a nation are currently experiencing.

We are fortunate to have two distinguished speakers highlighting this year’s conference. Our keynote speaker this year is Dr. George Blanks. Dr. Blanks is Director of K-12 Engineering Outreach for the Samuel Ginn College of Engineering at Auburn University. He is also Executive Director of the BEST (Boosting Engineering, Science, and Technology) Robotics competition. The second is Dr. Lisa Rossbacher, President of SPSU. President Rossbacher is in her eleventh year as President of SPSU and has overseen significant growth in engineering technology and engineering programs during her tenure.

We hope you will enjoy the conference and your stay in Marietta. I know you will find the conference stimulating, both professionally and personally. I am looking forward to renewing old friendships and making new ones.

Best regards,

Jeffrey L. Ray, Dean
School of Engineering Technology and Management
Professor of Mechanical Engineering
Welcome to the 2009 ASEE Southeastern Section (SE) Annual Conference: Preparing the Engineers and Technologists of Tomorrow! We have prepared a motivating program which brings together new education knowledge, practices, and methodologies involving engineering. Sunday’s conference activities will be held at the Southern Polytechnic State University (SPSU) campus, less than two miles from the conference site at The Hilton Atlanta/Marietta Hotel & Conference Center in North Metro Atlanta.

The kick-off for the Conference begins at one p.m. on Sunday afternoon at the SPSU campus with five workshops and the Executive Board Meeting. The Welcome Reception at the Southern Museum of Civil War and Locomotive History Tour followed by dinner at Williamson Brothers Barbeque Restaurant will conclude our first day. I look forward to Monday’s Keynote Address "Developing Tomorrow's Workforce Today: An Industry and Education Partnership" given by George Blanks. Our five technical sessions have one hundred and three presentations (93 peer-reviewed papers and 10 abstracts) given to the one hundred fifty attendees on Monday and Tuesday.

I want to express my sincere thanks to all involved in the preparation for this conference. I understand what it takes to pull an event such as this together and I greatly appreciate the time and effort they have dedicated to making it a success. I also want to thank all of the officers and members of the Section who have worked on the conference technical program. The conference could not be a success without those of you who planned the design of the technical program, participated in the peer-review of the manuscripts, coordinated the workshop, organized the student poster session, prepared the conference Book of Abstracts, reviewed award nominations, and volunteered to moderate technical sessions. You played a major role in providing a conference that offers something useful for everyone interested in engineering education. This meeting will truly offer something to every engineering faculty member.

I especially want to welcome the newcomers to ASEE SE section who are joining us for the first time this year. Technical education in our modern society is a continuum, and engineering faculty need to have discussions with our partners who teach our students before we see them. We also want to welcome our students who may be considering a future faculty career. I want to express a special welcome to the undergraduate and graduate students who are participating in the conference technical sessions and/or poster session. Thank you for your important contribution to the conference.

As your President, I have discovered that the Southeast Section is one of the most active and lively sections in ASEE both in terms of the amount and variety of participation at our annual conference. We all have ideas to share and much to learn from each other. This meeting would not be the same without your participation, and I hope that you have an informative and exciting time in Marietta.

Regards,

Barbara V. Bernal
President ASEE-SE
A Special Thank You…

This conference had many hands to contribute to its success. I would like to express my gratitude for all you have done. My appreciation goes out to:

- the 126 registered conference attendees from 45 universities
- the 17 student teams in the poster competition
- all of the presenters in the technical sessions
- the Continuing Education Department at SPSU for all their hard work and patience
- Jeffrey Ray, Conference Site Coordinator, Conference Planning & Operations, Southern Polytechnic State University for its contribution to the success of the conference.
- Dr. George Blanks (keynote speaker) and Dr. Lisa A. Rossbacher (Luncheon address)
- Barbara Bernal for her welcome address and support from the Department of Computer Science and Software Engineering
- the staff at the Hilton, Southern Museum, and Williamson Bros. Barbeque
- Brent Jenkins, Barbara Bernal and the members of the Executive Board for their guidance in the planning
- The University of Memphis and all the previous hosts for warning us of what was coming and helping us over most of the rough (and our best wishes to Virginia Tech for next year)
- Brent Jenkins, Tom Currin, and Barbara Bernal who were the working committee from the Southern Polytechnic State University
- Denise Stover who designed the cover for this program
- Brent Jenkins and Barbara Bernal for reminding me of details that I would never have remembered

If you need any assistance during the conference, stop by the Conference Registration area at the Hilton. Enjoy the conference and your time visiting Marietta.

Jeff Ray
Conference Chair
ASEE SE 2009 Conference Overview

Sunday, April 5, 2009
11:00am – 7:00pm Conference Registration Hilton Marietta Conference Center
1:00pm – 3:00pm Workshop: Session 1 SPSU Building J Room 131
1:00pm – 3:00pm Workshop: Session 2 SPSU Building J Room 201
1:00pm – 3:00pm Workshop: Session 3 SPSU Building J Room 202
3:00pm – 5:00pm Workshop: Session 4 SPSU Building J Room 202
3:00pm – 5:00pm Workshop: Session 5 SPSU Building J Room 110
3:00pm – 5:00pm Executive Board Meeting SPSU Student Center Ballroom
6:00pm – 8:00pm Welcome Reception Southern Museum & Williamson Bros. Barbeque Restaurant

Monday, April 6, 2008
7:30am – 8:30am Conference Registration Hilton Marietta Conference Center
7:30am – 8:30am Breakfast & Unit Meetings Joe Mack I
8:45am – 10:00am Welcome & Keynote Address JMW III & IV
10:00 am – 10:30am Morning Break Prefunction I
10:00am – 12:00pm Student Poster Session Prefunction II
10:30am – 12:00pm Technical Session 1 Breakout Rooms
12:00pm – 1:30pm Lunch and Presentation JMW I &II
1:45pm – 3:15pm Technical Session2 Breakout Rooms
3:15pm – 3:45pm Afternoon Break Prefunction I
3:45pm – 5:30pm Technical Session 3 Breakout Rooms
6:00pm – 9:00pm Reception and Award Banquet JMW I & II

Tuesday, April 7, 2008
7:30am – 8:30am Breakfast & Division Meetings Joe Mack I
8:45am – 10:15am Technical Session 4 Breakout Rooms
10:15am – 10:30am Break Prefunction I
10:30am – 12:00pm Technical Session 5 Breakout Rooms
12:00pm – 1:30pm Lunch & Business Meeting Sanford Room
1:30pm Conference Adjourn

Note: Map of the Hilton Marietta Conference Center is on page 1.9
## ASEE SE 2009 Annual Conference Schedule

**Sunday, April 5, 2009**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 - 7:00 pm</td>
<td><strong>Conference Registration</strong>&lt;br&gt;Hilton Atlanta/Marietta Hotel &amp; Conference Center&lt;br&gt;500 Powder Springs St.; Marietta, Georgia 30064</td>
</tr>
<tr>
<td>1:00 - 3:00 pm</td>
<td><strong>Workshops</strong>: Southern Polytechnic State University Building J (Atrium Building)&lt;br&gt;Some Real and Anecdotal Guidance in Authoring a Text Book (Room 131)&lt;br&gt;Building The User Experience into Design: Just Add Usability Testing (Room 201)&lt;br&gt;Recent and Near-Future Changes in ABET Accreditation (Room 202)</td>
</tr>
<tr>
<td>3:00 - 5:00 pm</td>
<td><strong>Workshops</strong>: Southern Polytechnic State University Building J (Atrium Building)&lt;br&gt;Computing and Engineering Education (Room 202)&lt;br&gt;Virtualizing Engineering Labs with In-Lab Partners: Discussion and requirements Gathering (Room 110)</td>
</tr>
<tr>
<td>3:00 - 5:00 pm</td>
<td><strong>Executive Board Meeting</strong>&lt;br&gt;Southern Polytechnic State University&lt;br&gt;Student Center Ballroom</td>
</tr>
<tr>
<td>5:30 - 7:00 pm</td>
<td><strong>Tour</strong>&lt;br&gt;Southern Museum of Civil War and Locomotive History&lt;br&gt;2829 Cherokee Street&lt;br&gt;Kennesaw, GA 30144</td>
</tr>
<tr>
<td>7:30 - 9:00 pm</td>
<td><strong>Welcome Reception</strong>&lt;br&gt;Williamson Brothers Barbeque&lt;br&gt;1425 Roswell Rd&lt;br&gt;Marietta, GA 30062</td>
</tr>
</tbody>
</table>
### ASEE SE 2009 Annual Conference Schedule

**Monday, April 6, 2009**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 – 8:45 am</td>
<td><strong>Breakfast</strong>&lt;br&gt;Joe Mack Wilson I (Seating by Division)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Division Meetings</strong>&lt;br&gt;Administrative, Instructional, K-12, Professional Skills, and Research&lt;br&gt;Joe Mack Wilson I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Programs Unit Meeting</strong>&lt;br&gt;Joe Mack Wilson I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 – 10:05 am</td>
<td><strong>General Session</strong>&lt;br&gt;Joe Mack Wilson III/IV&lt;br&gt;Moderator: Barbara Bernal, President, ASEE Southeastern Section&lt;br&gt;Welcome: Jeff Ray, Dean, SPSU School of Engineering Technology and Management&lt;br&gt;Keynote Address: George Blanks, Director of K-12 Engineering Outreach for the Samuel Ginn College of Engineering at Auburn University Executive Director, BEST Robotics Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:05 – 10:20 am</td>
<td><strong>Morning Break</strong>&lt;br&gt;Pre-Function I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:20 – 12:00 pm</td>
<td><strong>Technical Session 1</strong>&lt;br&gt;Room A&lt;br&gt;Civil Engineering 1&lt;br&gt;Course Enhancements, Plus&lt;br&gt;Room C&lt;br&gt;Electrical Engineering 1&lt;br&gt;Courses, Labs, and Projects&lt;br&gt;Room G&lt;br&gt;K-12 Outreach 1&lt;br&gt;Curricula&lt;br&gt;Room B&lt;br&gt;Mechanical Engineering 1&lt;br&gt;Frontiers and Fresh Approaches&lt;br&gt;Room D&lt;br&gt;Software Engineering 1&lt;br&gt;Room H&lt;br&gt;Student Posters&lt;br&gt;Room H&lt;br&gt;Open to the Public&lt;br&gt;T1-A&lt;br&gt;T1-B&lt;br&gt;T1-C&lt;br&gt;T1-D&lt;br&gt;T1-E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 – 1:30 pm</td>
<td><strong>Conference Luncheon</strong>&lt;br&gt;Thomas C. Evans Outstanding Instructional Paper&lt;br&gt;Joe Mack Wilson I/II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:40 – 3:20 pm</td>
<td><strong>Technical Session 2</strong>&lt;br&gt;Room A&lt;br&gt;Administrative 1&lt;br&gt;ABET, Etc.&lt;br&gt;Room B&lt;br&gt;Engineering Technology&lt;br&gt;Room C&lt;br&gt;Industrial Engineering&lt;br&gt;Room G&lt;br&gt;Instructional 1&lt;br&gt;Technology in the Classroom&lt;br&gt;Room D&lt;br&gt;Keynote Follow-up&lt;br&gt;Room D&lt;br&gt;Starting a BEST Hub: Q&amp;A (1:40 - 2:30 pm)&lt;br&gt;Open to the Public&lt;br&gt;T2-A&lt;br&gt;T2-B&lt;br&gt;T2-C&lt;br&gt;T2-D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:20 – 3:40 pm</td>
<td><strong>Afternoon Break</strong>&lt;br&gt;Pre-Function I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:40 – 5:20 pm</td>
<td><strong>Technical Session 3</strong>&lt;br&gt;Room D&lt;br&gt;Engineering Graphics&lt;br&gt;Room C&lt;br&gt;Instructional 2&lt;br&gt;Courses and Curricula&lt;br&gt;Room G&lt;br&gt;K-12 Outreach 2&lt;br&gt;Summer Camp, Extracurricular, and After-School&lt;br&gt;Room B&lt;br&gt;Mechanical Engineering 2&lt;br&gt;Practical Experience&lt;br&gt;Room A&lt;br&gt;Professional Skills&lt;br&gt;Room E&lt;br&gt;Teams, Etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6:00 – 9:00 pm</td>
<td><strong>Reception (6:00)</strong> and <strong>Awards Banquet (6:30)</strong>&lt;br&gt;Joe Mack Wilson I/II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 7:30 – 8:45 am | **Breakfast**  
Joe Mack Wilson I (Seating by Division)  
Division Meetings  
Joe Mack Wilson I  
Bioengineering, Civil Engineering,  
Engineering Graphics, Engineering  
Technology, Industrial Engineering  
Chemical Engineering, Computer  
Engineering, Electrical Engineering,  
Mechanical Engineering, Software Engineering  
Awards and Recognition Unit Meeting  
Joe Mack Wilson I  
Publications and Promotion Unit Meeting  
Joe Mack Wilson I |
| 9:00 – 10:00 am | **Technical Session 4**  
T4-A Room D  
Chemical Engineering  
T4-B Room G  
Instructional 3  
Distance Learning  
T4-C Room A  
K-12 Outreach 3  
Clubs  
T4-D Room C  
Mechanical Engineering 3  
Nuclear, Etc.  
T4-E Room B  
Research |
| 10:00 – 10:20 am | **Morning Break**  
Pre-Function II |
| 10:20 – 12:00 pm | **Technical Session 5**  
T5-A Room G  
Administrative 2  
Faculty Effectiveness, Etc.  
T5-B Room A  
Civil Engineering 2  
Outreach and Retention, Plus  
T5-C Room C  
Electrical Engineering 2  
T5-D Room B  
K-12 Outreach 4  
T5-E Room D  
Software Engineering 2 |
| 12:00 – 1:30 pm | **Section Annual Business Luncheon**  
Sanford Room |
| 1:30 pm       | **Conference Adjourns** |
Conference Parking and Transportation

The 2009 ASEE-Southeastern Conference is being held at the Hilton Marietta Conference Center in Marietta, Georgia. The workshops and executive board meeting will be held on the campus of Southern Polytechnic State University on Sunday, April 5, 2009. The Welcome Reception will be held at the Southern Museum and Williamson Brothers Barbeque Restaurant. Free parking is available at each location. A shuttle will be provided from the Hilton to SPSU from 12:30 pm–3:00 pm (every thirty minutes), in order to transport workshop attendees and executive board members to the campus. Two charter buses will pick up from the Hilton at 4:45 pm on Sunday to take conference attendees to the Welcome Reception. The buses will stop by SPSU to pick up those at attending workshops and the executive board meeting at 5:00 pm.
Hilton Marietta Conference Center Meeting Rooms Layout
Directions and Map: Sunday Night’s Reception at the Southern Museum and Williamson Brothers Restaurant

The Welcome Reception (5:30 – 9:00 pm) will be held at the Southern Museum and Williamson Brothers Barbeque Restaurant.

DRIVING DIRECTIONS

A) 500 Powder Springs St, Marietta, GA 30064-1529 US

1. Start out going NORTH on POWDER SPRINGS ST SE/POWER SPRINGS RD SE/GA-160 toward HEDGES ST SE. (go 0.4 miles)
2. POWDER SPRINGS ST SE/POWER SPRINGS RD SE/GA-160 becomes S MARIETTA PKWY SW/GA-120 LOOP. (go 0.9 miles)
3. Turn LEFT onto CHEROKEE ST NW/GA-5 N. Continue to follow GA-5 N. (go 1.0 miles)
4. Turn LEFT onto CHURCH ST EXT NW. (go 0.6 miles)
5. CHURCH ST EXT NW becomes BELLS PERRY RD NW. (go 0.2 miles)
6. Turn LEFT onto N COBB PKWY NW/US-41 N/GA-3 N. (go 2.9 miles)
7. Turn SLIGHT RIGHT onto OLD 41 HWY NW/S MAIN ST NW/GA-293. (go 1.3 miles)
8. Turn RIGHT onto CHEROKEE ST NW. (go 0.0 miles)
9. End at 2029 Cherokee St NW Kennesaw, GA 30144-2823

>> ESTIMATED TIME: 16 minutes | DISTANCE: 7.81 miles

B) 2829 Cherokee St NW, Kennesaw, GA 30144-2833 US

1. Start out going WEST on CHEROKEE ST NW toward N MAIN ST NW/OLD 41 HWY NW/GA-293. (go 0.0 miles)
2. Turn LEFT onto S MAIN ST NW/OLD 41 HWY NW/GA-293. (go 0.2 miles)
3. Turn RIGHT onto SUMMERS ST NW. (go 0.2 miles)
4. Stay STRAIGHT to go onto KENNEDY DUX WEST RD NW. (go 0.3 miles)
6. Turn LEFT onto RUSSELL RD SE/RUSSELL RD NE/GA-120. (go 0.6 miles)
7. End at 2525 R ussell Rd Marietta, GA 30062-3688

>> ESTIMATED TIME: 13 minutes | DISTANCE: 8.43 miles

C) 1425 Roswell Rd, Marietta, GA 30062-3688 US

>> TOTAL ESTIMATED TIME: 39 minutes | DISTANCE: 16.24 miles
Transportation for Sunday:

All workshop attendees and executive board members are encouraged to use the shuttle from the Hilton to SPSU because the bus will pick up from SPSU on the way to the Welcome Reception.
Conference Meals and Receptions

Welcome Reception: Sunday, April 5th 5:30pm – 9:00pm
Southern Museum of Civil War and Locomotive History
2829 Cherokee Street
Kennesaw, GA 30144
Enjoy the South! One-hour of fun and interaction touring and watching a movie that entailsthe history behind the museum
Williamson Bros. Bar-B-Q
1425 Roswell Road
Marietta, GA 30062
770-971-3201
Fax: 770-971-3694
Eat and be merry at one of Marietta’s best barbeque restaurants.

Function-Related Division Meetings Breakfast
Monday, April 6th (7:30am – 8:45am)
Joe Mack Wilson I, Hilton Marietta Conference Center
A full breakfast will be served starting at 7:30. Sit down at one of the table clusters and meet colleagues with interests in the following ASEE-SE divisions:

- Administrative
- Instructional
- K-12
- Professional Skills
- Research

Each division will hold a brief meeting after breakfast, followed by a meeting of the Programs Unit.

Thomas Evans Award Luncheon: Monday, April 6th (12:00 – 1:30pm)
JM威尔逊 I & II, Hilton Marietta Conference Center
The Thomas Evans Outstanding Instructional Paper will be presented at Monday’s lunch.

Awards Banquet: Monday, April 6th (6:00 – 9:00pm)
JM威尔逊 I & II, Hilton Marietta Conference Center
Let’s celebrate with those who will be congratulated on their outstanding contributions to the field of engineering education!
Discipline-Related Division Meetings Breakfast
Tuesday, April 7th (7:30 – 8:45am)
Joe Mack Wilson I, Hilton Marietta Conference Center
A full breakfast will be served starting at 7:30. Sit down at one of the table clusters and meet colleagues with interests in the following ASEE-SE divisions:

Awards and Recognition Unit Divisions
- Bioengineering
- Civil Engineering
- Engineering Graphics
- Engineering Technology
- Industrial Engineering

Publications and Promotion Unit Divisions
- Chemical Engineering
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- Software Engineering

Each division will hold a brief meeting after breakfast, followed by meetings of the respective units.

Section Business Meeting Lunch: Tuesday, April 7th (12:00 – 1:30pm)
Sanford Room
Please come to the ASEE SE Business meeting to meet your present Section Officers and vote for your Section Officers for the upcoming year. We will also recap the events of the conference and officially announce the location for the 2010 Conference.
Conference Workshops

Sunday, April 5, 2009, 1:00 - 3:00 pm

- **Some Real and Anecdotal Guidance in Authoring a Text Book**
  Southern Polytechnic State University Building J Room 131

This is a 2 hour workshop for those who have experienced the frustrations of locating the “right” textbook and, as a result, have entertained such thoughts as writing a text-book one day. It is conducted by 4 authors who are on the faculty of School of Computing and Software Engineering at Southern Polytechnic State University. These authors have published a combined total of 7 textbooks in the last 10 years. The workshop is divided into two parts. The first part is a formal presentation and the second portion is a Q/A discussion with the group. The following are some of the key topics that will be covered.

- Understanding your reasons for wanting to write a book.
- Searching the market and understanding the potential competitors.
- Developing a proposal
- Searching for a publisher and submit proposal
- Negotiating the publication contract
- Developing a detailed writing schedule and staying on schedule
- Handling reviewers’ comments
- Completing and preparing for editing
- Preparing teaching guide and presentation slides
- Assisting in developing any marketing material

- **Building The User Experience into Design: Just Add Usability Testing**
  Southern Polytechnic State University Building J Room 201

This 2-hour workshop will introduce session attendees to the art and science of usability testing, with the purpose of establishing the fundamentals for building simple testing processes into curriculum creation and enhancement. Whereas many traditional models of testing—such as quality assurance (QA)—focus on testing a product for flaws or performance, usability testing situates the user experience as key for obtaining information that can drive a development and improvement model. The workshop will include a presentation of principles and strategies for conducting simple tests, a tour of the Usability Center on the campus of Southern Polytechnic, and a workshop in which attendees will conduct a small usability study and discuss the results.

Activity 1: Presentation (45 minutes)
A 45-minute presentation will provide an overview of the principles and processes of usability testing so that workshop attendees will have a baseline to understand how and why to add a testing component to existing courses or new curriculum development.
Activity 2: Lab Tour (15 minutes)
Following the presentation of the principles for conducting a usability test, attendees will take a tour of the 3-room complex comprising the Usability Center at Southern Polytechnic. This lab is for student projects as well as client testing, and it represents the state-of-the-art in terms of facilities to support usability testing; however, the workshop leaders will make clear that a lab is not needed to conduct effective tests.

Activity 3: Workshop/Usability Test (1 hour)
To demonstrate how quickly and easily a usability study can be conducted without the need for a lab, attendees will conduct their own small study in a computer lab, then report the results. Working in small groups, attendees will learn how to develop effective testing scenarios, administer a study and record findings for analysis. At the end of the testing session, we will re-convene as a group to discuss the outcomes of testing. In particular, attendees will have the opportunity to review the benefits of usability testing and ask questions of the workshop leaders.

This workshop activity is intended to give attendees hands-on experience, based on a getting-started toolkit that can be used in curriculum planning and development.

- **Recent and Near-Future Changes in ABET Accreditation**
  Southern Polytechnic State University Building J Room 202

ABET's vision is to provide world leadership in assuring quality and in stimulating innovation in applied science, computing, engineering, and technology education. Accreditation is the largest component of its mission, and ABET over the past two years has undertaken a number of initiatives directed at broadening and improving its ability to provide accreditation not only in the United States, but internationally. This session will describe some of the accreditation challenges facing ABET, will summarize on-going activities to address them, and will describe progress on recent and future changes in accreditation such as the expansion into non-domestic accreditation; the increased use of multi-commission accreditation visits; training of ABET volunteers; cross-commission revisions to improve criteria; major revisions to policies to clarify, update, and accommodate nontraditional delivery of instruction; and harmonization of processes and documentation to make them more consistent across the four commissions. The presentation will focus on topics that are commission-generic, and the session will solicit feedback to assist ABET in its efforts to improve. Audience interaction regarding presentation topics will be encouraged throughout the presentation, and an open question/answer session on issues of interest to participants will follow.
Sunday, April 5, 2009, 3:00 – 5:00 pm

Computing and Engineering Education
Southern Polytechnic State University Building J Room 202

Computing has become an enabling technology for other sciences, engineering, and technologies. As computing becomes more important in all engineering disciplines, engineering education or engineering technology education would be beneficial if computing could be seamlessly integrated into engineering and engineering technology curriculum. Unfortunately, despite some creative efforts in a small number of institutions, computing in engineering and engineering technology today often looks much as it did several decades ago. To date, undergraduate computing curriculum for engineering and engineering technologies has been highly heterogeneous, and has suffered from a lack of systematic integration of emerging computing technologies into engineering education. Future engineers with the computing competencies and skills are imperative to our Nation’s health, security and prosperity in the 21st century. To enable systematic integration of computing with engineering and engineering education, this workshop is trying to get ASEE members together to discuss, formulate and implement plans to transform computing curriculum in engineering and engineering technology education to meet the challenges and opportunities for the 21st century world. This workshop will discuss a new way, called “Threads Model”, to revise and re-design computing curriculum to address the common challenges such as fluctuating enrollments, changes and trends in workforce demographics, the imperative to integrate fast-paced computing innovations into engineering and engineering technologies, and the need of a diverse, agile engineering workforce with computing knowledge essential to U.S. leadership in the global innovation enterprise.

Virtualizing Engineering Labs with In-Labb Partners: Discussion and Requirements Gathering
Southern Polytechnic State University Building J Room 110

As more universities begin to offer engineering and technology coursework via distance education there is a need to examine capabilities and limitations of the possible range of laboratory activities for distance learning students. We propose to have a structured discussion about laboratory activities specifically for major courses in engineering and technology programs. Questions to be addressed include
- lists of lab activities for various majors and courses
- listings of successful simulation systems as substitutes for specific lab experiences
- feasibility of partnering distant students with in-lab students for specific experiments
- brainstorming about hardware and software needed for supporting virtual lab partners
- description of hybrid online and on-campus activities
- external partnerships with corporate or educational organizations with lab equipment

The facilitators will survey participants in the working session, record the discussions, and produce and disseminate a summary report of the meeting to all participants and to other interested parties.
Keynote Speaker
George Blanks
Director, K-12 Engineering Outreach for the Samuel Ginn College of Engineering at Auburn University

George Blanks is Director of K-12 Engineering Outreach for the Samuel Ginn College of Engineering at Auburn University. He is also Executive Director of BEST (Boosting Engineering, Science and Technology – www.bestinc.org) Middle and High School Robotics Competition, which is headquartered in the college. BEST is a non-profit, volunteer-based program that licenses “hubs” (competition sites) to organizations, colleges and universities, school systems, and groups of individuals to host the competition. In fall 2009, BEST will operate 39 hubs in 16 states with over 750 schools and 12,000 students participating. BEST is the second largest robotics competition in the U.S. and the only one that is free to participating schools. It is recognized nationally for its affordability, open access to all schools, and effectiveness at helping students develop technological literacy skills.

As Executive Director, Dr. Blanks’ primary duties include establishing educational partnerships with major corporations and professional engineering societies; recruiting national sponsors to help fund its hubs; raising awareness of BEST as a K-12 workforce development program; and recruiting Engineering schools and colleges to host BEST competitions on their campuses.

Prior to his current position, George was Director of Business and Engineering Continuing Education in Auburn’s College of Engineering. Previously, Blanks was Director of Student Life at Auburn, responsible for creating Auburn’s residence life, service learning, and leadership development programs. Before coming to Auburn in 1985, Blanks was Associate Dean of Students at Samford University in Birmingham.

George earned an undergraduate degree in Communications from Samford, a master’s degree in Counseling Psychology from the University of Alabama at Birmingham, and a doctorate in Educational Leadership/College Student Development from Auburn University.
ASEE Southeastern Section Officers

Members of Executive Board

- President: Barbara Bernal
- President-Elect: Keith Plemmons
- Immediate Past President: Cecilia Wigal
- Vice-President (Programs Unit): Don Visco
- Vice-President (Awards & Recognition Unit): Alice Scales
- Vice-President (Publications & Promotions Unit): Scott Schultz
- Secretary/Treasurer: Tulio Sulbaran

Other Officers

- Newsletter Editor/Webmaster: Ken Brannan
- Proceedings Editor: Barbara Bernal
- Campus Representative Coordinator: Thomas Dion

Unit and Division Officers

<table>
<thead>
<tr>
<th>Unit</th>
<th>Chair</th>
<th>Vice-Chair</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programs</td>
<td>Don Visco</td>
<td>Brent Jenkins</td>
<td>Zhaoxian Zhou</td>
</tr>
<tr>
<td>Awards &amp; Recognition</td>
<td>Alice Scales</td>
<td>Paul Palazolo</td>
<td>Tyson Hall</td>
</tr>
<tr>
<td>Publications &amp; Promotions</td>
<td>Scott Schultz</td>
<td>Priscilla Hill</td>
<td>Hodge Jenkins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Division</th>
<th>Chair</th>
<th>Vice-Chair</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>Tim Wilson</td>
<td>Scott Yost</td>
<td>John Brocato</td>
</tr>
<tr>
<td>Bioengineering</td>
<td>Vacant</td>
<td>vacant</td>
<td></td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>David Silverstein</td>
<td>Adrienne Minerick</td>
<td>Jackie Mobley</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Stephanie Ivey</td>
<td>Michael Casey</td>
<td>Deborah Besser</td>
</tr>
<tr>
<td>Computer Engr &amp; Tech</td>
<td>Tom Banning</td>
<td>Daniel Kohn</td>
<td>Claire McCullough</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>Paul Devgan</td>
<td>Tim Pratt</td>
<td>Brent Jenkins</td>
</tr>
<tr>
<td>Engr Design Graphics</td>
<td>Michael Woo</td>
<td>Petros Katsioloudis</td>
<td>Aaron Clark</td>
</tr>
<tr>
<td>Engineering Technology</td>
<td>Salame Amr</td>
<td>Jerry Newman</td>
<td>Claude Hargrove</td>
</tr>
<tr>
<td>Industrial Engineering</td>
<td>Cecelia Wigal</td>
<td>Evelyn Brown</td>
<td>Scott Schultz</td>
</tr>
<tr>
<td>Instructional</td>
<td>Ted Branoff</td>
<td>Tyson Hall</td>
<td>Dick Kunz</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Mary Emplaincourt</td>
<td>Fustavo Molina</td>
<td>Dirk Schaefer</td>
</tr>
<tr>
<td>Professional Skills</td>
<td>Ed Hajduk</td>
<td>Peter Hoadley</td>
<td>Paul Palazola</td>
</tr>
<tr>
<td>Research</td>
<td>Sally Pardue</td>
<td>Ed Hajduk</td>
<td>Cindy K. Waters</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>Sheryl Duggins</td>
<td>Rey Seyfarth</td>
<td>Andrew Stelzoft</td>
</tr>
</tbody>
</table>
Technical Session Information

Session and Presentation Timing
Each technical session is scheduled for 3-5 presentations. Some technical sessions have sections with a non-uniform number of papers. This is a result of late cancellations and attempting to theme sessions. In order to facilitate movement between sections in a technical section, each paper in a given technical section will be allotted the same amount of time. The presentation start times are listed in the grid below. This includes the introduction time and a 2 minute question/answer period. If there is a no-show author in a session, a break will be called. **Papers should not be moved up or rearranged in sessions.**

<table>
<thead>
<tr>
<th>Presentation #1</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation #2</td>
<td>10:20</td>
<td>1:40</td>
<td>3:40</td>
<td>9:00</td>
<td>10:20</td>
</tr>
<tr>
<td>Presentation #3</td>
<td>10:40</td>
<td>2:00</td>
<td>4:00</td>
<td>9:20</td>
<td>10:40</td>
</tr>
<tr>
<td>Presentation #4</td>
<td>11:00</td>
<td>2:20</td>
<td>4:20</td>
<td>9:40</td>
<td>11:00</td>
</tr>
<tr>
<td>Presentation #5</td>
<td>11:20</td>
<td>2:40</td>
<td>4:40</td>
<td>—</td>
<td>11:20</td>
</tr>
<tr>
<td>Presentation #6</td>
<td>11:40</td>
<td>3:00</td>
<td>5:00</td>
<td>—</td>
<td>11:40</td>
</tr>
</tbody>
</table>
Instructions for Technical Session Moderator Chairs

Be prepared to moderate the session.
Arrive 10 minutes early to the room where the session you are moderating is being held. Meet the presenters as they enter the room and go over the pronunciation of their name. Make sure all presentations are loaded and ready to go before the session starts. Bring a watch.

Provide presentation guidelines at the beginning of the session.
Introduce yourself at the beginning of the session. Remind presenters of the time limitations and that you will give a hand signal to warn that there are 5 minutes and then 2 minutes remaining.

Introduce each presenter or presenters prior to their presentation.
At the end of each presentation, the next speaker should come up and ready their slide show. Introduce the presenter when ready.

Maintain the presentation schedule.
One primary responsibility of the moderator is to ensure that the presenters begin and finish their presentations on time according to the technical program. Maintaining the presentation schedule within the session allocated time helps to have fair treatment for all presenters. In the event that a presenter, who is not last in the hour, is not present or has canceled, please wait to begin the next paper at the scheduled time, so that all who planned to attend the remaining paper(s) can. The moderator has the authority to stop a presentation that is about to run overtime in a respectful manner. It is also the job of the presenter to prepare to fit the presentation in the allotted time. Try your level best to not let a presentation and Q&A overrun the allotted time.
Student Poster Session Information

The Research Division is offering the 4th annual Student Poster Competition, immediately after the Monday morning keynote address. The posters will be located in the Prefunction II. Students may set up their posters immediately following the keynote address with judging taking place shortly from 10:30-12:00. The poster exhibits will be open to the public from 1:45-3:30. Awards and certificates will be presented during the Monday evening awards banquet for the following categories:

- Freshman/Sophomore Engineering and/or Engineering Technology Design Teams
- Junior/Senior Engineering and/or Engineering Technology Design Teams
- Undergraduate Research

The Student Poster Competition gives undergraduate students the opportunity to (1) share their research/project work with students and faculty from other institutions and (2) practice their visual, written, and oral communication skills in a professional/conference environment. The goals of the competition are to (1) improve the visibility of student efforts, (2) recognize excellence in student projects, and (3) promote the sharing and exchange of ideas about team projects and undergraduate research among the members in the section.

Student Poster Competition Abstracts

The Southeastern Section of the American Society of Engineering Education (ASEE) has solicited extended abstracts from undergraduate students to present in a poster session at this year’s conference.

Section 3 in this book contains the extended abstracts from this year’s student participants. During a morning judging section, they will be evaluated on their abstract, poster, and communication skills. In the afternoon, the Research Division encourages all conference attendees to stop by and learn from students about the wonderful projects going on throughout the section.

Poster Specifications

Each poster shall be set on one easel. Posters shall be of standard presentation student presentation quality (typically made of corrugated cardboard), and shall stand on their own when opened. Participants may use tape, glue, or pushpins to make attachments to the poster. Special, professionally fabricated presentation displays will NOT be allowed. All supporting display material shall fit on the table with the poster in the space provided. Electrical power will not be supplied.
Monday, April 6, 2009 Technical Sessions

<table>
<thead>
<tr>
<th>T1-A: Civil Engineering 1</th>
<th>Moderator: Ken Brannan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Enhancements, Plus</td>
<td>10:20 - 12:00, Room A</td>
</tr>
</tbody>
</table>

**Classroom Polling Systems in Upper Level Transportation Engineering Classes: A Pilot Study**
Steven M. Click; Tennessee Technological University

**Use of Interactive Display Technology for Construction Education Applications**
Javier Irizarry and Pavan Meadati; Georgia Institute of Technology/Southern Polytechnic State University

**Vibration Course Enhancement through a Dynamic MATLAB® Graphic User Interface**
Elizabeth K. Ervin and Weiping Xu; University of Mississippi

**A Forensic Engineering Teaching Paradigm for Improving Student Learning of Hydraulics**
Faisal Hossain; Tennessee Technological University

**Traffic Study for UT Martin Campus and Surroundings**
Mohammad Obadat, Stephanie Kissell, William Anderson, and Matt Kee; University of Tennessee at Martin

<table>
<thead>
<tr>
<th>T1-B: Electrical Engineering 1</th>
<th>Moderator: Zhaoxian Zhou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses, Labs, and Projects</td>
<td>10:20 - 12:00, Room C</td>
</tr>
</tbody>
</table>

**Assessment Based Instruction Applied to a Course and Lab in Digital Signal Processing**
Timothy A. Wilson; Embry-Riddle Aeronautical University

**Concept Map Presentation Tool (CMPT): Teaching Wireless Communications using Concept Maps**
Rasha Morsi, Wael Ibrahim, and Edward Jackson; Norfolk State University/ECPI

**A Laboratory Component of a Switching Power Supply Course Requiring Nominal Resources**
Walter E. Thain; Southern Polytechnic State University

**Honors Undergraduate Research: Autonomous Robot for Remote Detection of UXO**
Joshua Galloway and Daren Wilcox; Southern Polytechnic State University

**A High Voltage DC Power Supply to Excite a Laser Tube: A Capstone Design Project**
Jeng-Nan Juang and R. Radharamanan; Mercer University

*Presentation only — Paper not included in the Proceedings*
### T1-C: K-12 Outreach 1

**Curricula**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20 - 12:00</td>
<td>Elementary and Middle School Engineering Outreach: Building a STEM Pipeline</td>
<td>Gary J Rivoli and Patricia A. S. Ralston; University of Louisville</td>
</tr>
<tr>
<td></td>
<td>A.C.E.S Wild: &quot;Applied Concepts of Engineering and Science&quot; Course Shakes Up Tradition</td>
<td>Fred Stillwell and Jeff Rosen; East Cobb Middle School/Georgia Institute of Technology</td>
</tr>
<tr>
<td></td>
<td>Engineering for High School Students</td>
<td>Ashley N. Johnson, Douglas Edwards, Marion Usselman, and Donna Llewellyn; Georgia Institute of Technology/Westlake High School</td>
</tr>
<tr>
<td></td>
<td>Promoting Engineering at an Inner-City Chartered School</td>
<td>Ashley Bernal and Alan Gravitt; Georgia Institute of Technology/Tech High School</td>
</tr>
<tr>
<td></td>
<td>Civil Engineers Design High School Statistics Tasks</td>
<td>Marsha Shrago, Laurie Garrow, and Marion Usselman; Georgia Institute of Technology</td>
</tr>
</tbody>
</table>

### T1-D: Mechanical Engineering 1

**Frontiers and Fresh Approaches**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20 - 12:00</td>
<td>Computer-Aided-Nano-Design Education in the Engineering Curriculum: Scope and Challenges</td>
<td>Raghu V. Pucha and Tristan T. Utschig; Georgia Institute of Technology</td>
</tr>
<tr>
<td></td>
<td>New Frontiers in Manufacturing Education: Rapid Prototyping, 3D Scanning and Reverse Engineering</td>
<td>Atin Sinha; Albany State University</td>
</tr>
<tr>
<td></td>
<td>A New Design Process Paradigm: Sustainable System Design</td>
<td>John C. Duke, Jr.; Virginia Tech</td>
</tr>
<tr>
<td></td>
<td>Integration of Industry-Sponsored and Design Competition Projects in the Capstone Course</td>
<td>Daudi R. Waryoba, Cesar A. Luongo, and Chiang Shih; FAMU-FSU</td>
</tr>
<tr>
<td></td>
<td>Early Intervention and Mechanical Engineering: Balancing Stakeholder Expectations in an Engineering Education Environment</td>
<td>Stephen L. Canfield and Kenneth W. Hunter, Sr.; Tennessee Technological University</td>
</tr>
</tbody>
</table>
**T1-E: Software Engineering 1**  
**Moderator: Tyson Hall**  
10:20 - 12:00, Room D

<table>
<thead>
<tr>
<th>Title</th>
<th>Presenter and Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Introduction to Fuzzy Logic Applications for Robot Motion Planning</td>
<td>Paul Yanik, George Ford, and Brian Howell; Western Carolina University</td>
</tr>
<tr>
<td>Delivery of Multimedia Education Content in Collaborative Virtual Reality Environments</td>
<td>Tulio Sulbaran and Andrew Strelzoff; University of Southern Mississippi</td>
</tr>
<tr>
<td>Teaching Software Engineering Online Using 21st Century Technology</td>
<td>Sheryl Duggins and Ray Walker; Southern Polytechnic State University</td>
</tr>
<tr>
<td>Semiotics within User Interaction Engineering*</td>
<td>Barbara Victoria Bernal; Southern Polytechnic State University</td>
</tr>
<tr>
<td>Propagating Software-Based Educational Innovations</td>
<td>Edward F. Gehringer; North Carolina State University</td>
</tr>
</tbody>
</table>

**T2-A: Administrative 1**  
**Moderator: Adrienne Minerick**  
1:40 – 3:20, Room A

<table>
<thead>
<tr>
<th>Title</th>
<th>Presenter and Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Student-Designed Computer System to Aid ABET Assessment</td>
<td>Kathy Winters and Claire McCullough; University of Tennessee at Chattanooga</td>
</tr>
<tr>
<td>KISMET: An Open Source Process for Faculty Participation in ABET Accreditation</td>
<td>Ravi Shankar and Ankur Agarwal; Florida Atlantic University</td>
</tr>
<tr>
<td>Utilizing Senior Capstone Design as an Instrument for Student and Faculty Assessment of Program Outcomes</td>
<td>Laura W. Lackey, Hodge E. Jenkins, Richard O. Mines, Jr., and Scott R. Schultz; Mercer University</td>
</tr>
<tr>
<td>Synchronizing International Service Learning with ABET Outcomes</td>
<td>Pauline Johnson, Beth Todd, Laura Ingram, Bettie Aruwayjoye, Hannah Beatty, William Black, Cole Burchalter, and Kendrick Gibson; University of Alabama</td>
</tr>
<tr>
<td>Successful Interventions for Engineering Student Retention</td>
<td>Aliecia R. McClain and Sandra J. DeLoatch; Norfolk State University</td>
</tr>
</tbody>
</table>

*Presentation only — Paper not included in the Proceedings
T2-B: Engineering Technology

**Integrating Rapid Product Development Methods in Engineering Technology**

William L. McDaniel, Aaron K. Ball, Chip Ferguson, Ron Bumgarner, and Wes Stone; Western Carolina University

**Bridging Tomorrow through Strengthening Partnerships**

Robert L. Anderson, William L. McDaniel, Aaron K. Ball, Frank Miceli; Western Carolina University/Asheville-Buncombe Technical Community College

"I Have This Calculator; I'm Not Supposed To Have To Think"

Jerry Newman; University of Memphis

**Basic aspects of hurricanes for technology faculty in the United States**

John Patterson and George Ford; Western Carolina University

**The damaging impacts of hurricanes upon coastal structures**

John Patterson and George Ford; Western Carolina University

T2-C: Industrial Engineering

**The Pedagogy of Form versus Function for Industrial Design**

David Domermuth; Appalachian State University

**Introducing Freshmen Engineering Students to Function Modeling to Enhance Design**

Cecelia M. Wigal; University of Tennessee at Chattanooga

**Undergraduate Packaging Programs at CBU**

Siripong Malasri, Asit Ray, Yongquan Zhou, John Ventura, Paul Shiue, and Jose Davila; Christian Brothers University/FedEx Express

**Recruiting for Undergraduate Packaging Programs at Christian Brothers University**

Siripong Malasri, Asit Ray, Yongquan Zhou, John Ventura, Paul Shiue, and Jose Davila; Christian Brothers University/FedEx Express
T2-D: Instructional 1
Moderator: Ted Branoff
1:40 – 3:20, Room G

Technology in the Classroom

Re-defining, De-limiting, and Activating the Engineering Learning Space with Tablet PC Convertible Computers and Associated Applications ................................................................. 2.49
Thomas D. L. Walker; Virginia Tech

A New Meaning to “Click Here” in a Computer Class ................................................................. 2.24
Kenneth P. Brannan, John A. Murden, and Edward L Hajduk; The Citadel

Homework Solutions Using Smartboard* .................................................................................. 2.89
Peter W. Hoadley; Virginia Military Institute

Technology in the classroom: College Students’ computer usage and ergonomic risk factors ................................................................................................................................. 2.18
Karen Noack Cooper, Carolyn M Sommerich, Naira H. Campbell-Kyureghyan; University of Louisville/Ohio State University

T3-A: Engineering Graphics
Moderator: Michael Woo
3:40 – 5:20, Room D

Employing Rapid Prototyping in a First-Year Engineering Graphics Course ....................... 2.67
Wayne M. Johnson, Cameron W. Coates, Patrick Hager, and Nyrell Stevens; Armstrong Atlantic State University/Savannah State University

Solid Model Numerical Representation: An Emerging Skill for Engineering Graphics Students ................................................................................................................................. 2.72
Cameron W. Coates, Kam Fui Lau, and Michael Brown; Armstrong Atlantic State University/OpenVision Inc.

Large Course Redesign: Moving an Introductory Engineering Graphics Course from Face-to-Face to Hybrid Instruction ................................................................. 2.17
Theodore J. Branoff and Kathleen Mapson; North Carolina State University

Results of a Study using the Motivation Strategies for Learning Questionnaire (MSLQ) in an Introductory Engineering Graphics Course ...................................................... 2.90
Aaron C. Clark, Jeremy V. Ernst, and Alice Y. Scales; North Carolina State University

*Presentation only — Paper not included in the Proceedings
**T3-B: Instructional 2**

Moderator: Scott Schultz

**Courses and Curricula**

3:40 – 5:20, Room C

1. **Creative Coursework Development using a Creative Problem Resolution Process** ....2.21
   Ronald J. Miers and Jack Patterson; Western Carolina University

2. **Use of Concept Development Projects in Science and Engineering Courses** ...........2.64
   Adrienne R. Minerick and Giselle Thibaudeau; Mississippi State University

3. **POK's: Useful Tools in Planning Learning Objectives for Courses*** .........................2.84
   Pedro E. Arce; Tennessee Technological University

4. **An Unexpected Experiment in Project Based Learning**.................................2.101
   Daniel Kohn; University of Memphis

---

**T3-C: K-12 Outreach 2**

Moderator: Tom Banning

**Summer Camp, Extracurricular, and After-School**

3:40 – 5:20, Room G

1. **Attracting Students to Engineering Through Robotics Camp** .........................2.62
   Greg Nordstrom, Ginger Reasonover, Ben Hutchinson; Lipscomb University/David Lipscomb Campus School

2. **Auburn University Robotics and Computer Literacy K-12 Engineering Camps: A Success Story** .................................................................2.45
   Daniela Marghitu, Michael Fuller, Taha Ben Brahim, and Eliza Banu; Auburn University

3. **Pushing the Limit Further: Exposure of High School Seniors to Engineering Research, Design and Communication** .................................................................2.63
   Priya T. Goeser, Cameron W. Coates, Wayne M. Johnson, and Chris McCarthy; Armstrong Atlantic State University

4. **Promoting Equity and Diversity in First Lego League** ........................................2.38
   Marion Usselman and Jeffrey Rosen; Georgia Institute of Technology

5. **Developing K-16 Pre-Engineer Learning Communities Through Mentoring: Interrelationship Between Higher Learning Organizations, Industry, After-School Robotics Competition and Pre-Engineering K-12 education** ..................2.1
   Marcos Chu; The Boeing Company

---

*Presentation only — Paper not included in the Proceedings*
T3-D: Mechanical Engineering 2  
Moderator: Chris Emplaincourt  
Practical Experience  
3:40 – 5:20, Room B

Manufacturing Practices - A Hands-On Course in Metalworking for Engineering Undergraduates .................................................................2.19  
Richard Kunz; Mercer University

Early Assessment of a Project to Enhance the Programming Experience for Engineering Students through Hands-On Integrated Computer Experiences ..........2.100  
Stephen Canfield, Mohamed Abdelrahman, and Nick Patton; Tennessee Technological University

A Multicourse Effort for Instilling Systematic Engineering Problem Solving Skills Through the Use of a Mathematic Computer Aided Environment.................................2.87  
Rogelio Luck and B. K. Hodge; Mississippi State University

Development of a Modern Integrated Thermal Systems Design Laboratory ..........2.46  
John Abbitt; University of Florida

T3-E: Professional Skills  
Moderator: Ed Hajduk  
Teams, Etc.  
3:40 – 5:20, Room A

Cross-Functional Teams: Learning from Industry to Identify Opportunities in Undergraduate Education .................................................................2.37  
Marie C. Paretti, Raymond R. Tucker, and Lisa D. McNair; Virginia Tech

Teaching Interdisciplinary Collaboration: Learning Barriers and Classroom Strategies ...............................................................................2.36  
David M. Richter, Marie C. Paretti, and Lisa D. McNair; Virginia Tech

Teaching Engineers to Compete in the 21st Century-A Multidisciplinary Approach for Honors Students .................................................................2.76  
Kenneth W. Jackson and Nancy L. Reichert; Southern Polytechnic State University

Creating A Positive Work Ethic in Civil Engineering Students: A Case for Attribution Theory and Scaffolding .........................................................2.23  
Thomas R. Dion and Kevin C. Bower; The Citadel

The Luddite Exam: Not Using Technology to Gauge Student Writing Development .........................................................................2.68  
John Brocato; Mississippi State University
Tuesday, April 7, 2009 Technical Sessions

**T4-A: Chemical Engineering**

- **Electrokinetics-Hydrodynamics: A Powerful Framework for Systematic Research in Applied Electrical Field Processes**
  - Jennifer Pascal, Mario Oyanader, and Pedro E. Arce; Tennessee Technological University
  - 9:00 – 10:00, Room D

- **Low Cost and High Value Laboratory Expansion: the Shell and Tube Heat Exchanger**
  - David L. Silverstein and Jimmy L. Smart; University of Kentucky
  - 9:00 – 10:00, Room D

- **A Learning Lesson from Thermodynamics: Ideal Fluids. Not True in Transport!**
  - Jennifer Pascal and Pedro E. Arce; Tennessee Technological University
  - 9:00 – 10:00, Room D

**T4-B: Instructional 3**

- **Distance Learning**
  - **Enhancing the Distance Learning Experience: Designing Virtual Classroom and Laboratory Environments**
    - Charles J. Lesko and John L. Pickard; East Carolina University
    - 9:00 – 10:00, Room G

- **Differences in Perceptions of On-line Education Between Those Who Have and Have Not Experienced On-line Learning**
  - Christina R. Scherrer, Renee J. Butler, and Shekinah Burns; Southern Polytechnic State University
  - 9:00 – 10:00, Room G

- **Issues with Online STEM Education - Assessment and Accreditation**
  - Venu Dasigi and Han Reichgelt; Southern Polytechnic State University
  - 9:00 – 10:00, Room G

**T4-C: K-12 Outreach 3**

- **Clubs**
  - **A Comparative Analysis of Engineering Clubs in Atlanta Area High Schools**
    - Ashley N. Johnson, Jason D. Weaver, Akibi Archer, Brian Post, Marion Usselman, and Donna Llewellyn; Georgia Institute of Technology
    - 9:00 – 10:00, Room A

- **Engineering Outreach by High School Students in NSBE Jr**
  - Akibi Archer, Samantha Andrews, Karolyn Babalola, Jacqueline Fairley, and Margaret Tarver; Georgia Institute of Technology/Tri-Cities High School

- **The STEM Club at Marietta High School**
  - Anthony Baldridge, Ashley Nutt, Mary Vaughn, Celis Hartley-Lewis, and Amanda Amos; Georgia Institute of Technology/Marietta High School

*Presentation only — Paper not included in the Proceedings*
### T4-D: Mechanical Engineering 3
**Moderator:** Dick Kunz  
**9:00 – 10:00, Room C**

**Preparing Non-nuclear Engineers for the Nuclear Field**
Elizabeth K. Ervin; University of Mississippi

**Developing a Nuclear Certificate Program**
Shih-Liang (Sid) Wang; North Carolina A&T State University

**Simulation on Human Body Injury Locations during a Fall due to Slip**
Ha Van Vo and R. Radharamanan; Mercer University

### T4-E: Research
**Moderator:** Sally Pardue  
**9:00 – 10:00, Room B**

**The Systems Biology and Bioengineering Undergraduate Research Experience at Vanderbilt University**
Kevin Seale, Patricia Armstrong, and John Wikswo; Vanderbilt University

**Pimp My Browser: Browser Plug-ins Enhance Undergraduate Research**
Andrew Wohrley; Auburn University

**Enhancing the Collection Process for the Delphi Technique**
Petros Katsioloudis; Old Dominion University

### T5-A: Administrative 2
**Moderator:** Tim Wilson  
**10:20 – 12:00 pm, Room G**

**Survey of Teaching Assessments at Engineering Educational Institutions**
Hodge E. Jenkins and Laura W. Lackey; Mercer University

**Engaging Students Participation through Faculty Self-Assessments**
Otsebele Nare and Weiying Zhu; Hampton University

**Revising Faculty Performance Evaluations: Not for the Faint of Heart**
André Butler, Scott Schultz, and Loren Sumner; Mercer University

**Developing an Efficient Transformational-Based Leadership Model for Academic Units**
Pedro E. Arce; Tennessee Technological University

**Development of RFID-Based Real-Time Inventory Tracking as a Project Assessment Tool in a Problem-Based Laboratory Environment**
Esfandiar Behravesh, Auroop Roy, Shaun Duncan, and Christopher Tuthill; Georgia Institute of Technology

*Presentation only — Paper not included in the Proceedings*
T5-B: Civil Engineering 2
Outreach and Retention, Plus
10:20 – 12:00 pm, Room A

**Building Engineering Achievement Through Transportation (BEAT): A Traffic Engineering Program for High School Students** ................................................................. 2.43
Dwayne Henclewood, Mshadoni Smith, Laurie Garrow, Angshuman Guin, Michael Hunter, and Marion Usselman; Georgia Institute of Technology

**Civil Engineering Outreach with Middle School Age Students** ........................................ 2.93
Rod E. Turochy; Auburn University

**Stormwater Pond Beautification in East Tampa: The Basis for University, K-12, and Community Partnerships that Broaden Participation in Environmental Engineering** .................................................................................................................................................................................... 2.81
Ken D. Thomas, Joniqua A. Howard, Erlande Omisca, Trent Green, and Maya A. Trotz; University of South Florida

**Movie-making Exercise for a Freshmen Course to generate excitement about Engineering** .................................................................................................................................................................................... 2.14
Faisal Hossain; Tennessee Technological University

**Data Structuring for Statistical Analysis of Effectiveness of Rumble Stripes on Highway Safety** .................................................................................................................................................................................... 2.102
Tulio Sulbaran and David Marchman; University of Southern Mississippi

T5-C: Electrical Engineering 2
Moderator: Claire McCullough
10:20 – 12:00 pm, Room C

**QuizMe - An Interactive Learning Tool with Application to Electrical Circuits** ....... 2.29
Feras Batarseh, Moataz Abdelwahab, Issa Batarseh, and Michael Haralambous; University of Central Florida

**LabVIEW Simulation of Induction Motors** ................................................................. 2.55
Zhaoxian Zhou and James Matthew Johnson; University of Southern Mississippi

**Numerical Simulation of Lightning Induced Voltage on Power Transmission Lines** .................................................................................................................................................................................... 2.54
Zhaoxian Zhou; University of Southern Mississippi

**Effect of Temperature on Dry Cell Life Span: A Case Study** ........................................ 2.71
R. Radharamanan and Jeng-Nan Juang; Mercer University

*Presentation only — Paper not included in the Proceedings*
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20 – 12:00 pm, Room B</td>
<td>T5-D: K-12 Outreach 4</td>
<td>Corporate Partnerships in the Georgia Intern-Fellowships for Teachers (GIFT) Program</td>
<td>Bonnie Harris and Marion Usselman; Georgia Institute of Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Consequences of Canceling Physics: Revisiting a Case Study in an At Risk Urban High School</td>
<td>Alison Stucky, Marcus Bellamy, Donna Llewellyn, and Marion Usselman; Georgia Institute of Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bridging the Gap: Connecting Biology and Engineering in the High School Curriculum</td>
<td>Brian K. Post, Susan E. Riechert; Georgia Institute of Technology/University of Tennessee, Knoxville</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Using Inquiry Biomedical Engineering Cases to Increase Middle and High School Student Interest in Science and Engineering</td>
<td>Jason Weaver, Michael Ryan, and Marion Usselman; Georgia Institute of Technology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:20 – 12:00 pm, Room D</td>
<td>T5-E: Software Engineering 2</td>
<td>Preparing Systems Engineers of Tomorrow</td>
<td>Ravi Shankar; Florida Atlantic University</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validating Tools for Cell Phone Forensics</td>
<td>Neil Bhadsavle and Ju An Wang; Southern Polytechnic State University</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temporal Text Extraction and Automated Time-OWL Population</td>
<td>Min Xia and Ju An Wang; Southern Polytechnic State University</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Security Metrics for Software System</td>
<td>Hao Wang and Andy Wang; Southern Polytechnic State University</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An Ontology-based Approach to Model Common Vulnerabilities and Exposures in Information Security</td>
<td>Minzhe Guo and Ju An Wang; Southern Polytechnic State University</td>
</tr>
</tbody>
</table>
ASEE SE 2008 Conference Proceedings Information

The ASEE SE 2008 Conference Proceedings are provided in CD format to all full paying registrants and all program Deans of the Southeastern Section. To obtain additional copies of the CD version of the Proceedings, please contact

Barbara Bernal, Professor

Mail: School of Computing & Software Engineering
     Building J 367
     Southern Polytechnic State University (SPSU)
     1100 South Marietta Parkway
     Marietta, GA  30060

Phone: 678-915-4283
Fax: 678-915-5511
Email: bbernal@spsu.edu
### ASEE SE 2009 Conference Registrants

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaron Ball</td>
<td>Western Carolina University</td>
</tr>
<tr>
<td>Adrienne Minerick</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Akibi Archer</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Algermon Evans</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Alice Scales</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>Aliacia McClain</td>
<td>Norfolk State University</td>
</tr>
<tr>
<td>Alison Stucky</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Amos Pierre</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Anant Honkan</td>
<td>Georgia Perimeter College</td>
</tr>
<tr>
<td>Andrew Wohrley</td>
<td>Auburn University Libraries</td>
</tr>
<tr>
<td>Andy Wang</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Aniruddha Mitra</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td>Anthony Baldridge</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Ashley Bernal</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Ashley Johnson</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Atin Sinha</td>
<td>Albany State University</td>
</tr>
<tr>
<td>B. Hodge</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Barbara Bernal</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Benjamin Brown</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Beth Todd</td>
<td>University of Alabama</td>
</tr>
<tr>
<td>Bob Harbort</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Bonnie Harris</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Brandon Miller</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Brent Jenkins</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Brian Post</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Cameron Coates</td>
<td>Armstrong Atlantic State University</td>
</tr>
<tr>
<td>Cecelia Wigal</td>
<td>University of Tennessee</td>
</tr>
<tr>
<td>Charles Gaie</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Charles Isbell</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Charles Lesko</td>
<td>East Carolina University</td>
</tr>
<tr>
<td>Charles Walker</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td>Chip Ferguson</td>
<td>Western Carolina University</td>
</tr>
<tr>
<td>Christina Scherrer</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Cindy Waters</td>
<td>NCA&amp;T State University</td>
</tr>
<tr>
<td>Claire McCullough</td>
<td>University of Tennessee</td>
</tr>
<tr>
<td>Clarence Williams</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Daniel Kohn</td>
<td>The University of Memphis</td>
</tr>
<tr>
<td>Daniela Marghitu</td>
<td>Auburn University</td>
</tr>
<tr>
<td>Danielle Sands</td>
<td>Embry-Riddle Aeronautical University</td>
</tr>
<tr>
<td>Daren Wilcox</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Daudi Waryoba</td>
<td>Florida State University</td>
</tr>
<tr>
<td>David Domermuth</td>
<td>Appalachian State University</td>
</tr>
<tr>
<td>David Richter</td>
<td>Virginia Tech</td>
</tr>
<tr>
<td>David Silverstein</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Donald Visco</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Donna Llewellyn</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Donna Reese</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Ed Gehringer</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>Edward Hajduk</td>
<td>The Citadel</td>
</tr>
<tr>
<td>Elizabeth Ervin</td>
<td>University of Mississippi</td>
</tr>
<tr>
<td>Erlande Omosca</td>
<td>University of South Florida</td>
</tr>
<tr>
<td>Esfandiar Behravesh</td>
<td>Georgia Tech</td>
</tr>
<tr>
<td>Eshson Sheybani</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Faisal Hossain</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Feras Batarseh</td>
<td>University Of Central Florida</td>
</tr>
<tr>
<td>Frank Tsui</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Fred Stillwell</td>
<td>East Cobb Middle School</td>
</tr>
<tr>
<td>Gary Berry</td>
<td>American Military University</td>
</tr>
<tr>
<td>Gary Rivoli</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>George Ford</td>
<td>Western Carolina University</td>
</tr>
<tr>
<td>Ginger Reasonover</td>
<td>Lipscomb University</td>
</tr>
<tr>
<td>Greg Nordstrom</td>
<td>Lipscomb University</td>
</tr>
<tr>
<td>Ha Vo</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Hodge Jenkins</td>
<td>Mercer University</td>
</tr>
<tr>
<td>India Young</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Indumathi Jeyachandran</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>J.P. Mohsen</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>Jacob McBride</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td>Jacqueline Fairley</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Jared Fulcher</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Jarmal Norcom</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Jason Weaver</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Javier Irizarry</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Jeff Rosen</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Jeffrey Ray</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Jeng-Nan Juang</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Jennifer Pascal</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Jerry Newman</td>
<td>The University of Memphis</td>
</tr>
<tr>
<td>Jodie Beadles</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>John Abbitt</td>
<td>University of Florida</td>
</tr>
<tr>
<td>John Baker</td>
<td>General Dynamics Land Systems</td>
</tr>
<tr>
<td>John Brocato</td>
<td>Bagley College of Engineering</td>
</tr>
<tr>
<td>John Duke</td>
<td>Virginia Tech</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>John Ventura</td>
<td>Christian Brothers University</td>
</tr>
<tr>
<td>Juan Carlos Guzman</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Karen Cooper</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>Keith Plemmons</td>
<td>The Citadel</td>
</tr>
<tr>
<td>Ken Brannan</td>
<td>The Citadel</td>
</tr>
<tr>
<td>Ken Jackson</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Kevin Seale</td>
<td>Vanderbilt University</td>
</tr>
<tr>
<td>Laura Lackey</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Marcos Chu</td>
<td>Capella University</td>
</tr>
<tr>
<td>Marcus Bellamy</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Marion Usselman</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Marsha Shrago</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Mary Emplaincourt</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Michael Woo</td>
<td>The Citadel</td>
</tr>
<tr>
<td>Mohammad Obadat</td>
<td>The University of Tennessee at Martin</td>
</tr>
<tr>
<td>Mshadoni Smith</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Nadine Jerome</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Naira Campbell-Kyureghyan</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>Otsebele Nare</td>
<td>Hampton University</td>
</tr>
<tr>
<td>Paul Palazolo</td>
<td>The University of Memphis</td>
</tr>
<tr>
<td>Pauline Johnson</td>
<td>University of Alabama</td>
</tr>
<tr>
<td>Pavan Meadati</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Pedro Arce</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Peter Hoadley</td>
<td>Virginia Military Institute</td>
</tr>
<tr>
<td>Petros Katsioloudis</td>
<td>Old Dominion University</td>
</tr>
<tr>
<td>Priscilla Hill</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Priya Goeser</td>
<td>Armstrong Atlantic State University</td>
</tr>
<tr>
<td>Raghu Pucha</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Ramachandran Radharamanan</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Rasha Morsi</td>
<td>Norfolk State University</td>
</tr>
<tr>
<td>Ravi Shankar</td>
<td>Florida Atlantic University</td>
</tr>
<tr>
<td>Rebecca Tothiani</td>
<td>Mississippi State University</td>
</tr>
<tr>
<td>Renee Butler</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Richard Denning</td>
<td>University of Central Florida</td>
</tr>
<tr>
<td>Richard Gregory</td>
<td>Lipscomb University</td>
</tr>
<tr>
<td>Richard Kunz</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Robert Tucker</td>
<td>Virginia Tech</td>
</tr>
<tr>
<td>Rod Turochy</td>
<td>Auburn University</td>
</tr>
<tr>
<td>Ronald Miers</td>
<td>Western Carolina University</td>
</tr>
<tr>
<td>Ryan Mooney</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td>Salame Amr</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Sally Pardue</td>
<td>Tennessee Tech University</td>
</tr>
<tr>
<td>Name</td>
<td>University</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Sarah Printy</td>
<td>Embry-Riddle Aeronautical University</td>
</tr>
<tr>
<td>Scott Schultz</td>
<td>Mercer University</td>
</tr>
<tr>
<td>Scott Yost</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Shahnam Nevaea</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td>Sheryl Duggins</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Shih-Liang Wang</td>
<td>NC A&amp;T State University</td>
</tr>
<tr>
<td>Singli Garcia-Oteru</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Siripong Malasri</td>
<td>Christian Brothers University</td>
</tr>
<tr>
<td>Stephen Canfield</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Steven Click</td>
<td>Tennessee Technological University</td>
</tr>
<tr>
<td>Tamara Chowdhury</td>
<td>Alabama A&amp;M University</td>
</tr>
<tr>
<td>Ted Branoff</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>Thomas Banning</td>
<td>The University of Memphis</td>
</tr>
<tr>
<td>Thomas Dion</td>
<td>The Citadel</td>
</tr>
<tr>
<td>Thomas Walker</td>
<td>Virginia Tech</td>
</tr>
<tr>
<td>Timothy Wilson</td>
<td>Embry-Riddle Aeronautical University</td>
</tr>
<tr>
<td>Travis Davis</td>
<td>Virginia State University</td>
</tr>
<tr>
<td>Tulio Sulbaran</td>
<td>University of Southern Mississippi</td>
</tr>
<tr>
<td>Tyson Hall</td>
<td>Southern Adventist University</td>
</tr>
<tr>
<td>Venu Dasigi</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Walter Thain</td>
<td>Southern Polytechnic State University</td>
</tr>
<tr>
<td>Wayne Johnson</td>
<td>Armstrong Atlantic State University</td>
</tr>
</tbody>
</table>
Chapter 2
Technical Session
Abstracts

Marcos Chu
INCOSE Midwest Gateway Chapter Immediate Past President

EXTENDED ABSTRACT

Mentoring is a key developmental tool for pre-engineer students that will eventually be in the workforce creating, designing, testing and developing complex engineering projects. It is necessary to understand the framework in which to engage the student on a mentoring relationship and ensure that the mentor has the tools and experiences that will help transition the student from higher learning institution to the workforce.

A mentor and protégé relationship is a relationship that needs to be nurtured and monitored. The key is to develop an architecture in which industry and higher education can collaborate in making a positive impact in the lives of pre-engineering students. Learning Communities provide an opportunity for students and engineers that share same interest to be able to interact and be involved.

Mentors from industry can provide real-life experience and positive role modeling to engineering students. A successful mentoring relationship is one in which allows the “pipelining” of students into an engineering career. The key is that the student is able to have interaction with engineer mentors thru out their growth from childhood to early-adulthood. The mentoring relationship also helps develop the subject matter expertise within the organization in which the engineers practice while giving an opportunity for the organization to be engaged within the community in which it operates.

The success of mentoring programs hinges on the ability of companies to develop the organization’s engineering and mentoring skills thru training. In addition, these programs should provide opportunities for employees to interact with students thru after-school programs such as robotics competitions.

After School Robotics Programs geared toward high school and middle school students enable engagement of mentors from industry and higher learning institutions with K-12 students. The engagement between adult mentors and student proteges allows mentors to develop their engineering and leadership skills while giving back to the community.
Basic aspects of hurricanes for technology faculty in the United States

Dr. John Patterson¹ Dr. George Ford²

Abstract- As predicted by Svante Arrhenius in 1896, global warming is taking place as evidenced by documented rises in average sea level of about 1.7 millimeters per year during the 20th Century. There have been naturally occurring cycles of global warming and cooling throughout the history of the world. Much has been written about the catastrophe that global warming would present to humankind such as an increase in the frequency and severity of hurricanes. This paper presents a discussion of the formation of hurricanes, hurricane season, hurricane ratings, and hurricane prediction and tracking for engineering technology and construction management faculty to use to supplement instruction in courses taught which are not in the environmental or energy related subjects.

Keywords: global warming, hurricane aspects, hurricane characteristics, hurricane formations

¹ Western Carolina University, Belk 211, Cullowhee, NC 28779. jpatterson@wcu.edu
² Western Carolina University, Belk 211, Cullowhee, NC 28779. gford@wcu.edu
A New Design Process Paradigm: Sustainable System Design

John C. Duke, Jr.

Virginia Tech

EXTENDED ABSTRACT

Traditionally the planning and design process taught to engineering students and practiced for the most part by industry ignores maintenance. As such maintenance is considered an activity that is to be undertaken long after commissioning and operation is underway. However, for many of our most important systems, transportation vehicles, water distribution systems, power plants, and bridge structures failure to include maintenance as part of the initial planning and design limits the approaches that can be used to maintain such systems. This is especially problematic when it is decided to “extended-the-life” of such systems. Even sophisticated reliability-centered maintenance schemes cannot overcome designs that ignore maintenance.

It might be assumed that a simple remedy would be to include “consider maintenance” on the design consideration checklist. However, most engineering design for mechanical performance is limited by a strength value or limit on the number of stress cycles and offers no insight into how deterioration develops prior to these limit points. Consequently consideration of maintenance requires some modest awareness of how materials degrade due to the service environment which might involve thermal, chemical, and mechanical factors. Furthermore, the capabilities to assess the condition of the deteriorated components to support the maintenance actions must also be understood.

This paper will overview a planning and design process paradigm for sustainable systems. Here “sustainable system” is used to suggest a system that will last indefinitely. Since all systems begin to deteriorate as soon as they are placed into service, maintaining a system indefinitely that is both reliable and highly available requires a new design paradigm. It is recommended that this new paradigm be the basis of design taught in engineering education.
Utilizing Senior Capstone Design as an Instrument for Student and Faculty Assessment of Program Outcomes

Laura W. Lackey, Hodge E. Jenkins, Richard O. Mines, Jr., Scott R. Schultz
Mercer University School of Engineering

EXTENDED ABSTRACT

The Mercer University School of Engineering (MUSE) in Macon, Georgia offers an ABET, Inc. accredited General Engineering Degree in six engineering specializations. MUSE has established eight program outcomes that characterize the knowledge and skills to be gained by students by the time of their graduation. Under Criterion 3, Program Outcomes, ABET lists eleven outcomes (a through k) that engineering programs must demonstrate that their students attain. MUSE’s program outcomes are bundled together and directly related to the a-k criteria. The focus of this paper is to describe the process and instrument used to assess four program outcomes using data collected from the two-semester senior capstone design course. The course is required of all engineering and industrial management students. The four outcomes of interest include:

- Program Outcome 2: Identify, formulate, and solve engineering problems.
- Program Outcome 3: Apply appropriate breadth and depth of skills in engineering design to meet desired needs with realistic constraints using the techniques, skills, and modern engineering tools necessary for engineering practice.
- Program Outcome 5: Function on interdisciplinary teams.
- Program Outcome 6: Communicate to both specialized and public audiences in a variety of modes, i.e. writing, presentation, etc.

Two means were used to assess each outcome. Based on data for the 2007-08 academic year, preliminary conclusions are:

1. Both the first and second means of assessment for Outcome 2 and the criterion for success were met.
2. Both the first and second means of assessment for Outcome 3 and the criteria for success were met.
3. The first means of assessment for Outcome 5 and the criterion for success was met; however, the second means of assessment and criterion for success was not met.
4. Both the first and second means of assessment for Outcome 6 and the criteria for success were met.
Traffic study for UT Martin campus and surrounding
Mohammad Obadat, Stephanie Kissell, William Anderson, Matt Kee
Assistant Professor of Engineering/Under graduate student(s)

Some of the challenges that the undergraduate students during their course of study are translating the theories and concepts they learn in class to hands on applications in the real world. It becomes an evident that once the students establish this link that they get more engaged in learning the theory and concept behind the engineering designs and systems.

The senior students in the engineering department at the University of Tennessee of Martin are required to take a senior design project as part of their course work degree requirements. The intended projects are established to cover a set of criteria and objectives that stimulate the engineering thinking in terms of analysis and design. ENGR 410 is the first half of the project activities and ENGR 411 is the other half for completion of the design project. This paper summarizes the project’s goals and the activities involved in the ENGR 410 part.

The University of Tennessee at Martin is in need for solutions to some problems that are related to traffic and parking on its campus. A group of civil engineering undergraduate students are willing to face the challenge of the traffic problems as part of their senior design project. The traffic study is intended to cover intersection analysis for signalized and un-signalized intersections, evaluate level of services and delays, conduct speed studies, assess the vehicle occupancy rates in the study area, and perform parking effectiveness studies. This hands-on experience is an excellent opportunity for our undergraduate students to get engaged in the practical and professional engineering world. This paper intends to describe the work done in the study and the learned experience, challenges, and benefits.

The traffic study was found to be more exhaustive than it appeared at the beginning of the work. The traffic study for the UT Martin campus and surrounding areas was initiated to identify potential traffic related conflicts. Some locations were diagnosed to have potential traffic problems especially in the intersections that had low level of services. Also it was found that many corridors experienced high speeds above the designed speeds. That trend was found for the 85th percentile speed at different sections. At the moment, no serious parking problems are identified based on the analysis of data collected for the studied parking lots. The vehicle occupancy study revealed the fact that most riders drive alone. The car pooling has to be encouraged by means of educating the campus community of its benefits and needs. These benefits include traffic and environmental quality of the campus. The traffic problems identified in this study require attention and solutions which will be covered in ENGR 411.

Main benefits that the students experienced in this paper are the hands on experience with the data collection, professional formatting, professional software implementations, interpreting results, making design (re-design) decisions, manuals usage and following standardized procedures. Also, the students submitted bi-weekly memos that described the work done. They presented their work in group meetings. The students gained communication experience by contacting local professional such as the TDOT traffic division and the parking and traffic administrators on campus.

Keywords: traffic, Speed, Delay, studies, intersections, parking, signals
A Student-Designed Computer System to Aid ABET Assessment

Kathy Winters and Claire McCullough
Department of Computer Science and Engineering
University of Tennessee at Chattanooga

EXTENDED ABSTRACT
The amount of paperwork typically provided to an ABET accreditation visitor for a single academic program may easily reach thousands of pages for a single academic year. When this is multiplied by a number of academic years and a number of programs at an institution, the burden of collecting the information and physically storing it can quickly become unmanageable. In spring 2008, the CSE department at UTC used the required student capstone design to address this issue. The senior Computer Science students in CS 490 were given the assignment to design a system to assist in ABET assessments required for accreditation.

The ABET project addressed three areas of ABET reporting. The key and most complex component of the project involved the design and implementation of a software/hardware system that allowed the professor to scan a document, associate one or more ABET outcomes with the document, and have the document automatically stored in such a way that the stored documents can be retrieved by ABET outcome, class number, or other ad hoc criteria selected by the system user. This component also provided additional reporting features, and has the potential to enable UTC to work toward “paperless” ABET visits in the future. In addition, a second component was generated which entailed the storage, access and editing of faculty related information; basically an online vita system. The last portion of the project created an electronic survey of alumni, students, and industrial partners.

The paper discusses specifics of the hardware and software functionality of the system, and the presentation will include screen shots illustrating the operational features of the system.
Preparing Non-nuclear Engineers for the Nuclear Field

Elizabeth K. Ervin
The University of Mississippi

Extended Abstract

Environmental, energy, and economic concerns are leading to exploration of sustainable alternative energy as never before. As the greatest user of world energy resources, the United States of America should certainly contribute to energy technological education and development. An understanding of power generation is important for all modern-day engineers, and nuclear energy serves as a good example of a technically viable option that is oft overlooked due to non-technical fears. While global perspectives are shifting, only a limited number of American programs have nuclear-related components. Twenty-four universities have nuclear-related programs, including Nuclear or Radiological Engineering, Nuclear Science, or Nuclear Physics; some are strictly graduate programs related to industrial research and development.

Minimally meeting this educational need, a nuclear-related introductory course complies with common university goals by enhancing engineering curricula, providing more qualified non-nuclear engineers for the nuclear industry, and improving faculty teaching competencies. The only required cost is faculty time, which has been covered at the University of Mississippi by a Nuclear Regulatory Commission Educational Grant. Usually enough interest exists so that at least one instructor will be interested. The resulting nuclear training is an educational benefit for both students and the faculty at large. The appropriate lecturer needs little experience with nuclear systems in particular but does need a broad-based view of complex engineered systems. In fact, the examination of a new technical field may have the added benefit of research stimulation. The development of nuclear engineering education will also improve student recruitment and industrial collaboration. However, participation from the nuclear industry may be a challenge due to confidentiality and security. If possible, industrial plant site tours can contribute to the educational experience by allowing students to see full-scale systems in a practical application.

As an example, the initiation of nuclear technical education at the University of Mississippi is discussed. Acting as a "grabber," nuclear power generation will be employed as the model application of interdisciplinary systems engineering. Promoting technical appreciation rather than apprehension of nuclear technology, the proposed course relates nuclear systems engineering, safe reactor design, infrastructure sustainability, and environmental management. Although this module will not be offered until the fall semester of 2009, course development and assessment plans are discussed from the viewpoint of a professor with nuclear industrial experience. The author intends to publish lessons learned subsequent to the course offering in the Journal of Engineering Education.
Vibration Course Enhancement through a Dynamic MATLAB® Graphic User Interface

Elizabeth K. Ervin and Weiping Xu
The University of Mississippi

EXTENDED ABSTRACT

From the string of a guitar to the radio wave, vibration occurs all the time and everywhere. Although vibration is an everyday phenomenon, related topics tend to be difficult for both undergraduate and graduate students. The ability to visualize motion through differential equation analysis is essential for subject comprehension. In order to help students have deeper understanding of vibration as well as inspire the interest of high school students, a MATLAB® Graphic User Interface (GUI) program has been formulated at the University of Mississippi.

As MathWorks MATLAB® is commonly used in the engineering field, any exercise that has students using this program is helpful for their professional education. A GUI provides high-technology interactive demonstration tools that can aid learning. Setup requirements include appropriate software packages and knowledgeable programmers, but novice users can operate the GUI. Named GUIde, the MATLAB® package also provides the display framework for GUI construction.

The GUI described herein includes the analysis of four different types of systems: single-degree-of-freedom (SDOF), multi-degree-of-freedom (MDOF), axial rod, and transverse beam. All the features and interfaces have been given detailed description in the paper. Sample analysis cases have been included for each type of system as well.

Assessment thus far shows that the program aids dynamics comprehension for both inexperienced and experienced users. For those with little or no understanding of vibrations, the GUI can provide informative animations with interactive options. Although controlled by differential equations of motion, the visible system can be understood without mathematics. For students with some vibration knowledge, the GUI can visualize derived equations to provide deeper command of the material. The relationship between SDOF systems and continuous systems can also be illuminated for both undergraduate and graduate students.

Future plans include larger distribution of the GUI; to post online, conversion to a programming language is required. Despite a few remaining glitches, the program will be expanded to include further modal analysis.
Differences in Perceptions of On-line Education Between Those Who Have and Have Not Experienced On-line Learning

Christina R. Scherrer, Renee J. Butler, and Shekinah Burns

Southern Polytechnic State University

EXTENDED ABSTRACT

In recent years there has been significant growth in the popularity and offering of on-line education. However, many students and faculty are still not very familiar or comfortable with it as a course delivery method. The purpose of this research is to study both student and faculty perceptions of on-line education and characterize the differences that exist between those who have used an on-line delivery method before and those who have not.

To accomplish this goal, we surveyed students that have taken courses on-line, have not taken courses on-line, and that have taken partially web-based courses. We also surveyed faculty members who have taught on-line courses and those who have not. Although almost every survey participant agreed that on-line courses are more convenient for students and are becoming very popular in general, there were also noted differences in perception.

For students, these differences included effectiveness of several aspects of the learning experience, difficulty level of the courses, and interaction opportunities. There were also significant differences in their stated likelihood of taking various types of courses (quantitative, qualitative, lab-based, etc.) in the future.

Faculty who have taught on-line classes were significantly more likely to believe in its effectiveness as well as its opportunities for suitable interactions. Additionally, faculty in both groups believed that success in on-line courses is very dependent upon student maturity, while that theme was absent in the student surveys. Faculty and students also had differing perceptions on the best on-line technologies to use for courses. In this paper we expand upon these themes, and provide statistical analysis of the survey results.

As universities continue to expand their on-line offerings, the views of their various stakeholders are important to consider. Results from this research can be used to inform strategies for new faculty and courses to include in a university's on-line portfolio as well as to shape marketing and advising efforts aimed at students.
Bridging Tomorrow through Strengthening Partnerships

Robert L. Anderson and William L. McDaniel and Aaron K. Ball

Western Carolina University

Frank Miceli

Asheville Buncombe Technical College

EXTENDED ABSTRACT

Western Carolina University and Asheville-Buncombe Technical Community College have a long standing partnership for service to the region and providing economic development opportunities. With recent losses of jobs in the manufacturing sector, both institutions have taken a forward thinking approach to meet needs of future engineering and technical careers. Due to plant closings and layoffs, North Carolina has been particularly hit hard. The magnitude of job loss in manufacturing and the effect on local economies have been reported as near crises proportion. Growing unemployment rates and soaring energy costs have created even greater challenges both two-year and four-year institutions to prepare engineering and technology students to pursue successful technical careers. Factors resulting in job loss and the necessary actions to mitigate these effects have sparked discussions from leaders in business, education, and government across the Nation. Strengthening the competitiveness of remaining industry through the development of regional based technology and educational resources can serve as a means to aid reviving local economies. Additionally, increasing the number of professionally prepared engineering and technology graduates will prove equally important in regional economic development. This paper will describe how the two institutions work together through (1) articulation, (2) advancing technical and engineering skills, and (3) economic development opportunities. Previous, current, and future projects will be discussed. Emphasis will be placed on educational approaches, student activities and educational merit.
An Introduction to Fuzzy Logic Applications for Robot Motion Planning

Mr. Paul Yanik\textsuperscript{1}, Dr. George Ford\textsuperscript{2}, Dr. Brian Howell\textsuperscript{3}

Abstract - This paper considers a fuzzy logic application for navigation and obstacle avoidance of a robotic vehicle in a 2D environment. An algorithm for 2D navigation was implemented in a simulation, and its effectiveness in various obstacle fields is discussed. Fuzzy algorithms have proven effective in achieving performance objectives for attainment of goal configurations and real time autonomous operation as exemplified in an environment which was simulated using National Instruments LabVIEW version 8.2 software.

Keywords: fuzzy logic applications, robot motion planning, trajectory planning, fuzzy logic

\textsuperscript{1} Assistant Professor, Western Carolina University, Belk 338, Cullowhee, NC 28723. pyanik@wcu.edu
\textsuperscript{2} Assistant Professor, Western Carolina University, Belk 115, Cullowhee, NC 28723. gford@wcu.edu
\textsuperscript{3} Assistant Professor, Western Carolina University, Belk 339, Cullowhee, NC 28723. bhowell@wcu.edu
The damaging impacts of hurricanes upon coastal structures

Dr. John Patterson¹ Dr. George Ford²

Abstract - This paper presents a discussion of the damage potential of a hurricane. Coastal regions in North Carolina are becoming more and more developed. There is a possibility that hurricanes may become more intense and more frequent with global warming. Every construction manager who performs work along coastal regions should be aware of the basic causes of structural damage due to hurricanes. This paper provides a detailed discussion of the potential damage a hurricane may cause to a structure due to the effects of wind pressure, storm surge, flooding, scour, hydrology, hydraulic pressures, tornadoes, topography and soils.

Keywords: hurricane damage, hurricane impact, coastal structures

¹ Western Carolina University, Belk 211, Cullowhee, NC 28779. jpatterson@wcu.edu
² Western Carolina University, Belk 211, Cullowhee, NC 28779. gford@wcu.edu
A Forensic Engineering Teaching Paradigm for Improving Student Learning of Hydraulics

Faisal Hossain

Department of Civil and Environmental Engineering, Tennessee Technological University,
Cookeville, TN 38505-0001

EXTENDED ABSTRACT

Most undergraduate curriculums in engineering adopt a deductive approach where the general theories, formulas and design steps are presented first and then the application and design are discussed afterwards. This is particularly prominent in the instruction of hydraulics for Civil Engineering where the concepts of fluid mechanics are assumed known by students a priori and then used to demonstrate how hydraulic structures and systems are designed. However, it is well known that human learning has progressed much more from an inductive nature of learning – ‘learn from a specific example and then generalize into a theory’. Such ‘forward’ way of imparting systematic knowledge (one step at a time) in a hydraulics course could be improved by implementing some ‘reverse’ engineering strategies in teaching. In this study, a ‘forensic’ or ‘reverse engineering’ paradigm is explored as a more effective method for teaching a first course in hydraulics. Students are first subject to the traditional ‘forward’ teaching style of design of various components of the hydraulics syllabus such as Culverts, Open Channels and Storm-Frequency relationships. After the step-by-step procedures for design and identification are taught, students are then exposed to the ‘reverse’ or ‘forensic’ engineering mode. Herein, the students are assigned to hydraulically characterize a real-world hydraulic system (such as a culvert and open channel) on the assumption that they have already acquired the necessary knowledge in the forward mode. Each student is expected to fully identify the design flow capacity and return period of the storm which the hydraulic system could have most likely been designed for. No additional clue is provided. However, students are provided with the full range of field surveying and instrumentation facilities for hydraulic characterization. Each student is then expected to apply the knowledge of design steps acquired in the forward mode now ‘backwards’ to arrive at the most-likely design parameters of the hydraulic system. Results over one semester of 20-plus student of hydraulics indicate that the clueless environment of forensic engineering teaching actually forces students to apply their critical thinking skills, explore beyond the text book content and trace all the design steps backwards to arrive at a solution. While such a forensic engineering instruction style may be time-consuming to implement, it can actually generate excitement in learning and improve the understanding of the fundamental design process of hydraulics. Most students agreed that they learned the course material better and commented that they would take a similar course again over pure forward teaching methods. Many students suggested that similar forensic engineering concept be implemented in the teaching of other senior-level courses such as hydrology and water resources engineering.

Keywords: Hydraulics, design, inductive versus deductive learning, reverse engineering.
Movie-making Exercise for a Freshmen Course to generate excitement about Engineering

Faisal Hossain
Department of Civil and Environmental Engineering, Tennessee Technological University, Cookeville, TN 38505-0001

EXTENDED ABSTRACT

This work describes a recent movie making competition that was organized in Fall 2009 as part of a freshmen course (CEE1020 – Connections to Civil Engineering) designed to improve Civil Engineering enrollment and retention. The overarching goal of the exercise was to generate adequate excitement among freshmen students that would make them want to pursue Civil Engineering as a career path in their sophomore years. Freshmen students engaged themselves in a movie making effort throughout the semester of Fall 2009 aided by the instructor, faculty and multi-media facilities. The four essential objectives of the movie making exercise were: 1) to have fun. 2) to Understand in basic terms, the aspects of the Civil Engineering profession; 3) to foster teamwork; and 4) to improve communication skills. Students were grouped into a team of four members. Each member was assigned a specific role of director, researcher, cameraman and video editor. Each group was assigned an aspect of the Civil engineering profession (environmental, water, transportation and structures) to make a movie on. After explaining to each group what each aspect of the Civil Engineering involved, they were helped with forming a documentary movie plot. Students were encouraged to make a documentary that could explain to the public in non-technical terms the importance of the chosen aspect of the Civil Engineering profession and how it served society. Each group was judged by a panel of four judges in terms of creativity, clarity in presentation and the dramatic level of the use of multi-media (audio, video, voice commentary) in articulating the main message. Experience of supervising and the ensuing movie documentaries indicate that such a movie-making exercise is an excellent way to generate interest among Civil Engineering freshmen. The semester-long exercise provided valuable early exposure to each Freshmen as to what engineering can truly be to them. All students participated in the exercise actively and indicated that the semester-long effort helped them appreciate the big-picture specific segment of Civil Engineering profession.

Keywords: Movie making, freshmen enrollment, retention, Civil Engineering.
Use of Interactive Display Technology for Construction Education Applications

Javier Irizarry and Pavan Meadati

Building Construction Program, Georgia Institute of Technology / Construction Management Department, Southern Polytechnic State University

EXTENDED ABSTRACT

This paper discusses the results of experimental testing of an interactive display technology system being developed at the Virtual Construction Instructional Laboratory at Southern Polytechnic State University. The system facilitates the use of Building Information Modeling (BIM) to teach students about construction operations. The first phase consists of evaluating the usability implications of large format interactive displays for manipulation of building information models. The purpose of the tests is to compare the performance of students when using the standard desktop computer display versus the large format interactive display.

The hardware used in the experiment includes a rear projection SmartBoard display, a front projection SmartBoard display, and standard 22 in LCD desktop monitors. The software used in the experiment for development of the BIM and for students to perform the required task during the experiment is Autodesk Revit Architecture.

A total of 38 students participated in the experiment. Students were selected at random and asked to perform the task of identifying discrepancies in a building information model. Several changes were made to the model to introduce discrepancies in standard design conventions that could have an impact in the construction of the structure represented by the model.

A comparison of the average number of discrepancies found by students was conducted from the data collected. The results showed an average difference of 36.6% between the mean number of discrepancies found by students when they used the different display types. It was also observed that better performance resulted when students used the SMARTBoard displays. For example, more than half (52.63%) of the students who found 8 to 10 discrepancies did so when using the front projection SMARTBoard.

Future phases of the project will test learning outcomes when the system is used to teach students about construction operations planning with the 4D-BIM. The technology being developed has the potential to greatly enhance the educational experience of students and will provide faculty with a tool that can facilitate teaching of construction concepts in a more visual and interactive manner.
Integrating Rapid Product Development Methods in Engineering Technology

William L. McDaniel, Aaron K. Ball, Chip Ferguson, Ron Bumgarner, and Wes Stone

Western Carolina University

EXTENDED ABSTRACT

With increased competition through an ever growing global economy, engineering and engineering technology education have a renewed emphasis in teaching and implementing rapid product development and practice-oriented methodologies. Topics and instructional methods must be more in line with current competitive practices in industry. A major shift in product development has been toward rapid product development including enhanced engineering design for product development and analysis, computer-assisted tool design, rapid prototyping, rapid tooling, and simultaneous engineering. To address this ever growing need, an integrated project was implemented at Western Carolina University that specifically focused on rapid product development. Using a curriculum integration approach to teach engineering applications focusing on design-build-test-and-analyze provides an opportunity for students to gain a better understanding of modern manufacturing methods. Students were required to develop and refine mold designs in a parametric modeling class followed by building the mold in a rapid tooling and prototyping course. Further, each student brought forward the completed mold insert to a polymers class where the mold insert was mounted and injection molded proof parts were generated for analysis and testing during a metrology and reverse engineering course.

This paper will present the approach being implemented in Engineering Technology classes Western Carolina University. A description of how the project is being implemented in multiple courses including Parametric Modeling, CAM, Polymers and Quality is explained. Educational merit and future plans for further implementation will also be discussed.
Large Course Redesign: Moving an Introductory Engineering Graphics Course from Face-to-Face to Hybrid Instruction
Theodore J. Branoff and Kathleen Mapson
North Carolina State University

EXTENDED ABSTRACT

During the fall 2007 semester, three sections of an introductory engineering graphics course were delivered using a hybrid or blended instruction. The asynchronous, online component of the course consisted of voice-over content presentations, software demonstrations, and sketching videos. During the weekly face-to-face meetings, faculty highlighted the important concepts for the next lesson, gave brief constraint-based CAD demonstrations, covered ideation and technical sketching techniques, and checked homework. Data were gathered on how students navigated through the online content, and final exam scores were compared to other traditional sections of the course. Students used nineteen different strategies to complete the textbook material, twenty different strategies to complete the solid modeling assignments, and fifteen strategies to complete the sketching assignments. No difference was found between the final exam scores in the hybrid sections and the face-to-face sections.

During the fall 2008 semester, faculty ran another pilot study with a different faculty member teaching two of three hybrid sections. The fall 2008 data revealed that more students elected not to use the online streaming videos to complete work. Thirty-nine percent of students used strategies for studying the textbook material that did not involve using the streaming media. This was up from 13% during the fall 2007 study. In the current study, less than 5% of students reported preparation strategies for the online assessments that did not include reading or reviewing the textbook. Less than 10% of students used strategies that did not include watching video demonstrations for the SolidWorks assignments. This was similar to the data from 2007. Approximately 46% of students did not view videos to help complete their sketching assignments. This was more than double the number of students from the fall 2007 study.

The analysis of midterm exam scores revealed no difference between the hybrid and face-to-face sections. Students in the hybrid sections scored significantly higher on the final exam than students in the face-to-face sections.

This effort is part of a Large Course Redesign Grant from the university to help convert all sections of the course to hybrid instruction. Key components of the redesign include revising online streaming media, moving online content from Blackboard to Moodle, conducting synchronous online help sessions, and developing an automated grading system for constraint-based CAD files. This paper summarizes the previous research conducted in the introductory course, presents data from the fall 2008 semester, and describes the plan for the whole course revision.
Technology in the classroom: College Students’ computer usage and ergonomic risk factors

Cooper, K.N./ Sommerich, C.M./ Campbell-Kyureghyan, N.H.

Center for Ergonomics, University of Louisville/ Department of Industrial, Welding and Systems Engineering, The Ohio State University/ Department of Industrial Engineering, University of Louisville

EXTENDED ABSTRACT

The personal computer (PC) is essential in today’s workplace, and as a result has become a critical component of the educational system. Many colleges and universities have instituted requirements for students to purchase or lease computers upon admission. Justification for student computer ownership includes ensuring access for all students, usefulness as a learning tool, and imparting skills for future careers. However, despite the immense investment of finances and time to implement such programs, little is known about the effects (positive and negative) on student education or potential physical harm due to increased computer usage.

There is a concern that college students who own a computer, particularly a mobile PC, may consequently use a computer more hours in a day or week, thereby increasing their exposure to risk factors for computer-use-related musculoskeletal disorders and pain. Training in healthy computing techniques may reduce risk factor exposure, as seen from ergonomics programs in the workplace. However, few colleges include such programs in conjunction with the computer ownership requirement.

This paper provides results of an examination of computer ownership programs in a number of US higher educational institutions. The reasons for having such a requirement, and whether their institution includes an ergonomics program or healthy computing component, were examined. This paper also provides an overview of research studies that have examined the prevalence of computer-use-related musculoskeletal discomfort in college students, and associated risk factors.

Universities are responsible not only for the theoretical training of their students, but also for teaching them sustainable habits for lifelong learning. Because computer usage has become a major component in most educational environments, universities must prepare their students to utilize computers in ways that do not jeopardize their physical well-being or career path.

Keywords: Technology in the Classroom, Computer Usage, University Students, Musculoskeletal Discomfort, Ergonomic Risk Factors, Education.
Manufacturing Practices - A Hands-On Course in Metalworking for Engineering Undergraduates

Richard Kunz
Mercer University

EXTENDED ABSTRACT

It is a recurring observation among industry stakeholders that graduating engineers are well-versed in engineering sciences but lack fundamental skills needed to make immediate contributions: understanding the realities of manufacturing practices, ability to function in teams, aptitude for creative synthesis and design, and communication skills. The reasons for this situation are many and complex, as are the potential approaches to addressing it. At Mercer University, a course in Manufacturing Practices required of students specializing in Mechanical Engineering, Industrial Engineering, and Engineering Management, provides students with an opportunity to gain significant hands-on fabrication experience, while developing teaming, design, and communication skills.

Students use traditional machine shop tools – drill press, band saw, grinder, lathe, milling machine – as well as welding equipment to perform specific exercises and gain ability and confidence in using the machines, both individually and in small groups. Two practical tests require each student to fabricate a meat tenderizer and a boot scraper. Students divide into two-to-three person teams at the beginning of the semester, and the teams stay together throughout the course, with each student expected to take an equal turn on the machines.

A major component of the course is a design project, in which each team designs, fabricates, and demonstrates a fixture for mass-producing a specified small part from blanks using a vertical milling machine. In response to a Request for Proposals containing specifications for the fixture early in the term, teams submit a preliminary design report addressing the specifications, followed by a detail design report containing detailed engineering drawings for the fixture components, assembly drawings for the fixture, and instructions for the use of the fixture to make the required part. Teams then make their fixtures and demonstrate them to the class at the end of the course.

Typically taken during the junior year, the course has provided a valuable bridge between the freshman engineering design course and the senior year capstone design experience. By combining the hands-on fabrication activities with functioning in teams throughout the semester, written and oral communication, and a significant design component, the course helps to prepare students for the environment and expectations of industry.
Security Metrics for Software System
Hao Wang and Andy Wang

EXTENDED ABSTRACT

Security metrics for software systems provide quantitative measurement for the degree of trustworthiness for software systems. This paper proposes a new approach to define software security metrics based on vulnerabilities included in the software systems and their impacts on software quality. We use the Common Vulnerabilities and Exposures (CVE), an industry standard for vulnerability and exposure names, the Common Weakness Enumeration (CWE), a list of software weaknesses and the Common Vulnerability Scoring System (CVSS), a vulnerability scoring system designed to provide an open and standardized method for rating software vulnerabilities, in our metric definition and calculation. Examples are provided at the end of the paper, which show that our definition is consistent with the common practice and real-world experience about software quality.
Creative Coursework Development using a Creative Problem Resolution Process

Dr. Ronald J. Miers and Dr. John Patterson
Western Carolina University / Western Carolina University

EXTENDED ABSTRACT

The development of university coursework requires holistic approaches that develop courses incorporating sound structures, creative problem solving techniques and a creative learning environment. Prerequisite materials and standards for course development are drawn from many sources around the educational institution. Participants to course development processes may include state and local educational officials, accrediting bodies, professional organizations, and the home institution. Guidelines and standards must be met in the course development process to address all constituencies. Prerequisite courses must be determined and new material must be aligned horizontally and vertically within the individual program. In this discussion, guidelines will be developed and presented for developing a course with the use of a Creative Problem Resolution Process. This systems based approach identifies the participant’s individual thinking styles, and missions, goals and objectives that must be met in the course development process. Creative course development processes and problem solving techniques will be reviewed. The process can be used by new and veteran faculties that are interested in updated their coursework. New trends in industry and products create a never ending redevelopment of coursework. Following the matrices in this article, faculty can identify the new trends opening lines of communication with industry and industry boards at the university. Feasibility studies can be done regarding the importance and acceptance of the new tend. Discussions can include acquisition of materials, software, and special needs to meet the introduction of a trend. Time and cost allotments will be developed using the CPRP and implementation strategies developed.
Temporal Text Extraction and Automated Time-OWL Population
Min Xia and Ju An Wang
Southern Polytechnic State University / Southern Polytechnic State University

EXTENDED ABSTRACT

The Web Ontology Language (OWL) has been widely used as a knowledge representation language for building ontologies in semantic web research. However, it remains a manual process so far to build an OWL file from a natural language query on a domain-specific ontology. In this paper, we present an approach to populate ontological concepts automatically with instances expressed in a natural language query. We focus on temporal expressions and time-related reasoning based on an existing OWL-Time1 ontology established by Hobbs and Pan. Our approach consists of two steps: First, the time phrases expressed in natural language queries are extracted and translated into a standard format with a domain specific language parser. Second, the standard time expressions are sent to an OWL generator that produces an OWL file for semantic reasoning. With this approach, temporal reasoning can be performed by end users without OWL knowledge using their everyday languages. Various semantic applications can be built with our automatic population approach such as summarizing a story in terms of a time-line, extracting and chronologically ordering events in a narrative report, generating a project plan or time-line based on its user requirements, and scheduling classes, meetings, and events by a software agent, to name just a few.
Creating A Positive Work Ethic In Civil Engineering Students: 
A Case for Attribution Theory and Scaffolding

Thomas R. Dion/The Citadel and Kevin C. Bower/The Citadel

EXTENDED ABSTRACT

Because engineering is a profession that requires participants to protect the health, welfare, and wellbeing of the public, it is imperative that all successful engineering students have the desire to approach their profession from the standpoint that their solutions must work and be safe among other things. From the pedagogical standpoint, this can be a challenge for instructors who must try to motivate average and below average student who are participating at a low performance level.

Influencing a student’s mindset can be challenging especially when students have had negative learning experiences. How a student rationalized their success or failure is called “attribution theory”. Their attribution, or explanation, centers on either an external or internal forces causing their performance. For example, a student who thinks he or she has a poor teacher who uses a poorly written textbook is the reason for the 62% test grade uses an external attribution. If on the other hand, a test indicates a 95% achievement level, then the student may feel that superior intellect and intelligence played a part. Once an attribution has been asserted, it reflects the mindset of the student until another attribution is asserted. One means of trying to improve average and less than average student performance, is to intervene in this cycle where students want to change their mindset. The desired focus of a student’s rationalization should be effort drive, because, that is the only condition that students can control.

This paper examines some possible ways for instructors to intervene where students want to create and possess a positive work ethic that will allow them to perform their required functions in a manner that draws from their best efforts. In addition, the process of “scaffolding” will be discussed where students provide a solution to a problem. If the solution is less than satisfactory, the instructor provides guidance as to where the student erred, and the student reworks the solution. If the reworked solution is still lacking, the process is repeated until a workable solution is achieved. Scaffolding provides a means for students to have a chance to complete their work in a satisfactory manner, while discarding the notion that they failed on the first try, and therefore there is no incentive to try to learn how to do the problem correctly. By using this approach, hopefully students will change their attribution assertion to a positive outlook, where those who do not complete their work in a satisfactory manner have no reason to blame others on their performance except themselves for the lack of effort. An example is shared that involves the design of a highway as part of a junior level course.
A New Meaning to “Click Here” in a Computer Class
Kenneth P. Brannan, John A. Murden, Edward L. Hajduk
The Citadel

EXTENDED ABSTRACT

Over the years, a number of teaching techniques have been used to help create interest and enhance understanding in the Computer Applications in Civil and Environmental Engineering class offered in The Citadel’s Department of Civil and Environmental Engineering. Techniques used in the past include team teaching, active learning, hands-on electronic workbook, frequent tests and assignments, flow charting, pseudocode, and debugging features. The most recent addition to the class involves the use of interactive student equipment (“clickers”) to increase student attention, interest, and retention in the lecture portion of the class. Clickers, also known as response pads, are handheld devices that allow an instructor to view student responses to True/False, Yes/No, multiple choice, or numerical questions. Immediate feedback on the collective response from the class can be shown to the students within seconds, enabling the professor to begin addressing conceptual problems during the same class. This gives clickers a powerful advantage over traditional tests and quizzes in which problems may be addressed only after a test or quiz has been graded and returned. The purpose of this paper is to describe how clickers were used in the computer applications class and to assess the impact on student interest and learning.

According to results from an in-class student survey, clickers incorporated into the class helped to enhance the students’ classroom experience with material that they considered to be difficult. 94% believed that use of clickers was helpful to their understanding of either loops or subscripted variables in loops or both. Students rated clicker use highly in helping them to maintain their attention (4.4/5.0), maintain their interest (4.1/5.0), and retain the course material (4.0/5.0). In a list of six teaching tools or techniques, students ranked the use of clickers in helping them to understand loops and subscripted variables only behind the value of doing a Mathcad assignment. 96% said that they would like to see clickers used in future civil engineering classes and 87% indicated that they would not be opposed to extending the use of clickers to several classes during the same semester.
Engaging Students Participation through Faculty Self-Assessments

Otsebele Nare and Weiying Zhu

Department of Electrical Engineering, Hampton University, Hampton, VA 23666

EXTENDED ABSTRACT

The measurement of student outcomes is a critical element in assessing and evaluating whether an engineering program is meeting its educational objectives as well as guiding program improvements. Past knowledge and research have shown that this measurement could be attained through student and faculty assessments. The purpose of this paper is to report on work in-progress looking at student self-assessments as an approach in engaging the students through targeted, course-specific, and field specific faculty self-assessment surveys. This approach allows students to be continually part of their own education improvement process. This work draws on students’ responses to surveys that have been administered over the past two years in sophomore- and senior-level electrical engineering courses. Directed questions on learning objectives and outcomes are addressed as well as students’ opinions on learning outcomes. The resulting survey outcomes show consistence in student perspectives at sophomore- and senior-levels as well as over two different semesters.

Approach

Faculty self-assessments surveys were administered at the end of the semester to a sophomore-level electric circuits course and a senior-level energy conversion course in both spring 2007 and 2008. The assessment surveys asked students to reflect on the knowledge of theorems, laws, and concepts taught during the semester. In addition, the students were asked to reflect on the teaching methods employed and the preparation needed prior to taking the courses. Also, the survey allowed open opinions that were directed towards what students thought were the most important and most challenging concepts in the course as well as their suggestions on course improvements.

Preliminary Results

The open opinions were most telling of what students were learning as well as their levels of engagement. A significant number of responses indicated the realization of a lifelong learning process and the need to understand their curriculum and be part of its improvement. There were also indications of some students who did not give accurate assessments. In order to weed them out, future surveys will include specific questions on concepts not taught in these particular courses and on methods that were not employed in the course. For instance, the survey could plant a question on the use of Blackboard. The responses that say Blackboard was very useful, which in fact was not used, will be set aside from data analysis. The preliminary results showed that this approach will not only help identify areas of program growth and improvement but also help engage students as well. Past research has shown that engaged students are more successful.
“I Have This Calculator; I’m Not Supposed To Have To Think”

Jerry Newman

University of Memphis

EXTENDED ABSTRACT

The above title is a direct quote made by a freshman engineering technology student to our program coordinator in the classroom. This paper attempts to examine the factors and identify problems that contribute to such a mindset towards mathematics in the engineering disciplines.

We know students are lacking basic analysis and critical thinking skills, making them unprepared for math skills required in an engineering science or technology major. Every student possesses a different attitude, academic achievement level, and a mindset towards a college education. While an attitude and mindset cannot be adequately forecast, a quality education during K-12 will certainly help mold a student’s attitude, mindset, and ultimately a degree of success in whatever level of education one seeks.

In trying to understand how and why the above quote could even occur; we probably have to go back about fifty years and look at the changes in how math was taught back then to how it is done today. Some of the elements affecting this evolution are societal attitudes, academic requirements, government programs and directives, adaptation to emerging technologies, teacher qualifications and attitudes towards teaching mathematics, and the realization that we are no longer the smartest or the best in the world. Many of these elements overlap and affect each other, therefore resulting in changes that ultimately cause further problems in more areas.

Today, many institutions are experimenting with different approaches to teaching to satisfy grade requirements and goals set by their school systems. Textbooks are tried and replaced, sometimes before a concise analysis of results can be made. In some cases, school systems try unproven tests to satisfy goals and in the process, measurement of student success has been diminished. Student success today is measured on a standardized test. Critical thinking skills have left the classroom and at times have been forced onto counseling centers. Many teachers, regardless of credentials or experience, end up teaching outside of their area of expertise.

This paper attempts to identify some of the areas and circumstances that drove the decisions that resulted in where we are today with mathematics and education overall.
An Ontology-based Approach to Model Common Vulnerabilities and Exposures in Information Security

Minzhe Guo and Ju An Wang
Southeastern Polytechnic State University / Southern Polytechnic State University

EXTENDED ABSTRACT

Machine understandable security vulnerabilities are in need for security content automation. Common Vulnerabilities and Exposures (CVE) is an industry standard of common names for publicly known information security vulnerabilities, and has been widely adopted by organizations to provide better coverage, easier interoperability, and enhanced security.

In this paper, we focus our research on the problem domain of software vulnerability and propose an ontology-based approach to model security vulnerabilities listed in NVD, providing machine understandable CVE vulnerability knowledge and reusable security vulnerabilities interoperability. This work will certainly advance the automation of security content management and increase the effectiveness of security mechanisms.

The construction of the ontology is mainly based upon the efforts of CVE, CWE, CAPEC and CPE, and the integration of the knowledge from those efforts to form a heavy-weight ontology which include concepts, concept taxonomies, relationships, properties, axioms and constraints.

We illustrate the major design ideas of the ontology and give examples to illustrate how the ontology can be populated with the knowledge from standards. In addition, we also give examples to demonstrate the benefit of using ontology to study the nature of vulnerabilities and the relationships between vulnerabilities and its related areas.
Elementary and Middle School Engineering Outreach: Building a STEM Pipeline

Gary J Rivoli and Patricia A. S. Ralston

Department of Engineering Fundamentals, University of Louisville

EXTENDED ABSTRACT

The creation of a robust K-12 STEM pipeline has been widely identified as critical to the future of America’s global competitiveness and is based on the research of experts who have produced concrete recommendations in the NAS Gathering Storm Report, Project Kaleidoscope Report on Reports II and the President’s American Competitiveness Initiatives of 2007. Locally, the Kentucky Council on Postsecondary Education STEM Task Force has developed a state-wide strategic plan to accelerate Kentucky’s performance within STEM disciplines. Both the STEM Task Force and the National Science Board recognize the need to form strategic partnerships that inform K-12 students and parents about engineering.

The J. B. Speed School of Engineering is working to build a K-12 STEM (Science Technology, Engineering and Math) pipeline. Speed School is working with the local public school system and eventually the Louisville Science Center to expose young students to the world of engineering to prepare and encourage them to study STEM fields. Two successful bi-weekly programs are currently in place: (1) “Engineering Is Elementary” (EIE) program, offered in three local elementary schools and (2) “In the Middle of Engineering” (IME) clubs in two area middle schools. These elementary schools feed these two middle schools that feed the only high school with a Project Lead The Way (PLTW) curriculum, a pre-engineering curriculum. Both programs are coordinated by the Director of Outreach Programs at the Speed School and are supported by graduate and undergraduate students, faculty, and engineering alumni. Response to these programs has been very positive. This summer, the J.B. Speed School of Engineering participated in a unique training partnership with JCPS to provide teachers with training needed to support additional programs.

Based on Speed’s initial success with building one pipeline from elementary schools to middle schools to the high school with a PLTW program, it is obvious that building such a pipeline is possible. Determining the increase in students applying for the PLTW program at Jeffersontown High School will be a true indicator of success. In order to sustain the pipeline, especially as more JCPS students participate, Speed and JCPS must continue their dialog and support of current programs and support the teacher training. The success of these programs depends on proper training; both for those teachers already in the program and for those who wish to enter. It is this aspect that we will aggressively seek to improve and to obtain funding so the Louisville Science Center can be fully incorporated as a partner and help manage this important element. More Speed students and alumni will need to participate; a process for expanding and managing this is being developed by Speed’s Outreach Director. In the future Speed School hopes to replicate this process and build pipelines from elementary schools to other math or technology magnet high schools.
Quiz Me- An Interactive Learning Tool with Application to Electrical Circuits
Feras Batarseh\(^1\), Moataz Abdelwahab\(^2\), Issa Batarseh\(^3\)

Abstract – Current methods for evaluating student performance and providing feedback to students regarding their understanding of a given subject are very dependent on traditional methods of evaluation, mainly in-class examinations. In this paper we propose an on-line, interactive, self-learning Java-based software package known as QuizMe to assist instructors in evaluating student performance and students in maximizing their understanding of the fundamental principles in any given course. Using QuizMe, instructors can design quizzes with a variety of built-in options, such as multiple attempts, adaptive questioning, question selection criteria, etc. No other software tools were found providing the student and instructor with similar feature flexibility (may need modification). QuizMe is launched with an instruction page to inform students on quiz rules and how to make multiple quiz attempts. Each attempt displays a number of multiple choice questions from a chosen chapter/section of the course text. The questions are divided into groups, according to their type (numerical, symbolic...etc), collections, according to their nature (similar questions in one collection), and levels, according to their hardness. Students can make multiple attempts of the same quiz, but will never get the same question twice. A report will be displayed after submitting the attempt, indicating for each question if it was answered correctly or not, also displaying the correct answers to the student. After class-testing QuizMe at semester’s end using the University of Central Florida course EGN 3373 (Principles of electrical engineering), a survey of its effectiveness was conducted. The survey showed that 61% of students would like to have had the tool from the beginning of the semester, as it increased their understanding of the material, and 54% said they would like to use QuizMe for other classes.
Undergraduate Packaging Programs at CBU
S. Malasri, A. Ray, Y. Zhou, J. Ventura, P. Shiue, J. Davila

Christian Brothers University

EXTENDED ABSTRACT

Packaging at Christian Brothers University started in spring 2001 with an elective course for engineering students in response to industry needs. It grew into a Packaging Engineering Certificate in fall 2002. Between 2004 and 2005, almost $300,000 was spent on equipment for the Packaging Lab. In addition, about $400,000 was spent on related lab equipment in the Polymer Lab, Solid Mechanics Lab, and Manufacturing Lab. CBU introduced B.S. in engineering management with packaging concentration in fall 2007. A new Bachelor of Fine Arts (B.F.A.) in packaging graphic design is under development. This paper describes details of each program, enrollment, program objectives and course selections, as well as examples of projects.

The three undergraduate programs target different groups of people. The Packaging Engineering Certificate focuses on engineering; the B.S. Engineering Management (Packaging Concentration) focuses on management; and the upcoming B.F.A. Graphic Design (Packaging) focuses on visual arts. Graduates of all three programs will be desirable since packaging is a very diverse industry. It would be difficult to include all these skills in a single four-year undergraduate curriculum, so various paths must be provided. As these programs grow, it is possible that CBU will eventually offer a new packaging science program, similar to those being offered at several other programs in the U.S. However, for the time being the packaging program at CBU has chosen to focus on market niches instead of emulating programs from other institutions.
Recruiting for Undergraduate Packaging Programs at Christian Brothers University

S. Malasri, A. Ray, Y. Zhou, J. Ventura, P. Shiue, J. Davila

Christian Brothers University

EXTENDED ABSTRACT

Most high school students have never considered packaging engineering as a career due to lack of information on packaging programs and its career opportunities. Consequently, CBU hosted an after-school corrugated packaging workshop for high school students in November 2007, under a grant from the International Corrugated Packaging Foundation. Due to demand from high school students, the workshop was repeated in January 2008. Another after-school medical device packaging workshop was offered to high school students in November 2008 under a grant from the Medtronic Foundation. As with the corrugated packaging workshop, it will be repeated in January 2009 due to demand. In addition, internal packaging information sessions have been held on campus since spring 2008, and an annual high school competition has been hosted since 2002. Impact of these recruiting activities is also extensively discussed.

The inherent difficulty in starting a new program is magnified if the area is not well known to high school students. Packaging is a major industry that offers tremendous job opportunities. One can enter packaging from engineering, materials, business/management, and graphic design. Because of its interdisciplinary nature, it is hard to develop a packaging program that covers everything. Thus, CBU offers various packaging related programs, including a Packaging Engineering Certificate for engineering students and a B.S. Engineering Management (Packaging) for those leaning toward business/management. A new Bachelor of Fine Arts in Graphic Design (Packaging) is under development to attract students who are more artistically inclined. Getting the word out to high school students and counselors is critical to a new program such as packaging. Fortunately, the packaging industry is eager to support such recruiting efforts.
Teaching Software Engineering Online Using 21st Century Technology

Sheryl Duggins and Ray Walker
Southern Polytechnic State University

EXTENDED ABSTRACT

Higher education is fast becoming a very competitive market with the plethora of universities offering online degrees increasing across the country. In Georgia, the 35 institutions in the University System of Georgia have to compete for students with over 30 other universities in the state offering online degrees. Additionally, the Board of Regents of the University System of Georgia has a goal of increasing the number of online programs and online degrees offered, and have instituted the Georgia on My Line program to support online and distance education offered by the 35 universities in the state system. My university has been offering distance education in various forms for over a decade. The first online class I taught was recorded on video and synchronously delivered to several remote sites in the state, allowing distance students to view and interact with on-site students during class time, as well as to view the videotaped recording of class at a later time. The course I taught in that format included group work and the groups consisted of students from various physical locations, and I recall being quite impressed with the quality of student interaction, and with the fact that students seemed to be unaffected by communicating via microphones and TV screens – they were impervious to the technology and the distance students performed as well as the on-site students. But the courses we could offer using distance technology of the 90s were limited due to the nature of our content – computer science and software engineering courses typically have technology requirements that could not be supported at that time. Now with high-speed internet connections and new technologies such as virtual classrooms and virtual labs, we are no longer limited by our content.

This paper will examine the use of 21st century technology to support the delivery of Software Engineering online. The students in my online class participate in a semester-long group project and are able to master the same learning outcomes, utilize the same software lab facilities and support, and contribute to the classroom learning environment, with the only caveat being that they are doing this remotely, without face-to-face contact. This paper will also address the need for infrastructure support to be able to successfully provide this type of learning environment. Finally, assessment data as well as student feedback will be analyzed to determine if and in what ways the technology interfered with or facilitated student learning.
A Comparative Analysis of Engineering Clubs in Atlanta Area High Schools

Ashley N. Johnson¹, Jason D. Weaver², Akibi Archer³, Brian Post³, Marion Usselman⁴, and Donna Llewellyn⁵

¹School of Electrical and Computer Engineering, ²Department of Biomedical Engineering, ³School of Mechanical Engineering, ⁴Center for Education Integrating Science, Mathematics and Computing (CEISMC), ⁵Center for the Enhancement of Teaching and Learning
Georgia Institute of Technology, Atlanta, GA

Career oriented after-school clubs are a means for students to gain exposure to opportunities in their field of interest, especially in high schools where engineering classes are not offered. Engineering clubs were established at four Atlanta area high schools with differing demographics and curriculum focuses, by science and engineering graduate students placed at the schools through the Georgia Tech Student and Teacher Enhancement Partnership (STEP) program, funded by NSF through the GK-12 program. STEP aims to improve the teaching-related professional and academic skills of graduate students, improve the mathematic and science performance of Atlanta area high school students, and support collaborations between participating teachers and Georgia Tech students and faculty.

Two of the engineering clubs are chapters of a national organization while the others are independent. Each club focuses on exposing high school students to various engineering disciplines and developing analytical problem solving skills with opportunities to interact with engineering professionals. Engineering itself is a discipline to which minimal attention is paid at the high school level in conventional curriculums. As a synthesis of the constituent science classes, the engineering clubs provide a forum in which connections can be developed. Likewise they provide an important opportunity to apply the knowledge gained in mathematic and science classes to solving real-world practical problems through engaging activities. While all the clubs share similar goals, resources, teacher support, and student interest vary greatly and result in a different type of club at each school. For example, one school is math/science magnet, another is performing arts magnet, another is approximately four years old and one has a high-achieving suburban population. The paper will provide a comparative analysis of the best practices for starting a club, maintaining involvement, and successful activities. Student response, STEP involvement, as well as lessons learned will also be presented.
Engineer Class for High School Students
Ashley N. Johnson\textsuperscript{1}, Douglas Edwards\textsuperscript{2}, Marion Usselman\textsuperscript{3}, and Donna Llewellyn\textsuperscript{4}

\textsuperscript{1}School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, \textsuperscript{2}Westlake High School, Atlanta, GA, \textsuperscript{3}Center for Education Integrating Science, Mathematics and Computing (CEISMC), Georgia Institute of Technology, Atlanta, GA, \textsuperscript{4}Center for the Enhancement of Teaching and Learning, Georgia Institute of Technology, Atlanta, GA

EX\textsuperscript{P}ENDED ABSTRACT

The Introduction to Engineering course was developed and first taught during the 1997-1998 school year for the Westlake High School Math/Science Magnet Program to expose students to engineering concepts and disciplines. Westlake High School is a 98\% African American school in south Fulton County, where 43\% of the students are from low income households. The school’s magnet program prepares students for future study and careers in math, science, engineering and technology. Modeled after college programs in medical science, engineering and digital media/computer science, each focus area has an associated extracurricular club.

The Introduction to Engineering course provides a foundation in engineering theory that utilizes higher-level mathematics for problem analysis and conceptual design. It is a project based course that involves computer aided design and technology. The goals of the course are: 1) to introduce engineering concepts and practices; 2) to analyze problem solving from an engineering perspective; and 3) to utilize higher mathematics in real world problems. Introduction to Engineering exposes students to on average four to five engineering disciplines with projects to compliment each area. The paper will present the structure of the course, best practices for projects, and tracking of the students to determine if high school engineering courses lead to students majoring in engineering. The involvement of engineering graduate students through the Georgia Tech Student and Teacher Enhancement Partnership (STEP) program, funded by NSF through the GK-12, program will also be discussed.
The STEM Club at Marietta High School
Anthony Baldridge\textsuperscript{1}, Ashley Nutt\textsuperscript{1}, Mary Vaughn\textsuperscript{1}, Celis Hartley-Lewis\textsuperscript{2}, and Amanda Amos\textsuperscript{2}

\textit{Georgia Institute of Technology}\textsuperscript{1} / \textit{Marietta High School}\textsuperscript{2}

\textbf{Extended Abstract}

The use of inquiry-based learning within the classroom has gained significant attention recently. Major organizations have cited enhanced student learning and deeper understanding of important ideas through the use of inquiry-based learning as a classroom tool. One mechanism to incorporate inquiry-based learning within the secondary education environment is to provide students a means to design and complete science fair projects. The Student and Teach Enhancement Partnership (STEP) program of Georgia Tech has partnered with Marietta High School (MHS) located in Marietta, Georgia to create a new program, entitled the STEM Club, for students to actively engage in the design, research, and presentation of science-fair projects within an area of the student’s choice. The STEP program represents an initiative of Georgia Tech funded through the National Science Foundation to place graduate and undergraduate students within inner city schools to offer support and enhancement within the areas of mathematics and science. STEP Fellows and MHS faculty provide mentorship to students engaged in active research designed by the student, so that they may compete with other schools at the local, regional, and state science fairs held throughout the academic year. This represents MHS first attempt at developing a science fair program within the high school as well as within the Marietta School District and represents a primary goal set by the system for the current academic year. Topics of interest and expertise among the STEP faculty and MHS faculty include chemistry, behavioral science, biological sciences, mathematics, physics, and engineering. STEP fellows within MHS provide a wide range of skills including but not limited to idea formation, use of the scientific methods, and design of experiments, writing skills, and the encouragement to pursue science in the future. This paper highlights the program details and examines the role of Georgia Tech graduate and undergraduate students in the STEM Club.
Teaching Interdisciplinary Collaboration: Learning Barriers and Classroom Strategies

David M. Richter, Lisa D. McNair, and Marie C. Paretti

Department of Engineering Education, Virginia Tech

EXTENDED ABSTRACT

Educators have known for some time that simply putting students in teams is not sufficient to teach teamwork; instead, students need explicit instruction and guidance in teaming to work effectively. A similar principle applies to interdisciplinary teamwork: putting students in interdisciplinary teams – an increasingly common practice in engineering education – is not sufficient to teach interdisciplinary collaboration. Nor are traditional teaming skills alone enough to enable students to work effectively across interdisciplinary boundaries.

This paper addresses this gap in teaching practices by first briefly identifying barriers to students successfully engaging in interdisciplinary collaboration and defining corresponding measurable learning outcomes. It then focuses in detail on teaching practices designed to help students achieve the learning outcomes.

These findings have been developed from a multi-case study of interdisciplinary collaboration in a green engineering program that draws students from multiple engineering disciplines as well as business, industrial design, and related fields. The case studies point to a theory of “disciplinary egocentrism” as a primary barrier to collaboration. That is, students lack both the ability to create connections between an interdisciplinary topic and their own discipline, and the ability to see beyond their discipline to value and incorporate knowledge, beliefs, methods, and values from other disciplines to address an interdisciplinary challenge. An analysis of classroom observations, interviews, and pre-, mid-, and post-course surveys led to measurable learning objectives as well as classroom interventions. This paper describes these interventions in detail, including in-class exercises designed to promote interdisciplinary collaboration, reflective assignments designed to foster interdisciplinary awareness, and use of technology designed to overcome physical barriers such as lack of meeting times and lack of informal interaction outside class. These practical teaching strategies can effectively work together to help faculty provide students with transferable skills that prepare them for an interdisciplinary, cross-functional workplace.

(This material is based upon work supported by the National Science Foundation under Grant Nos. 0648439, and 0633537. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.)
Cross-Functional Teams: Learning from Industry to Identify Opportunities in Undergraduate Education

Marie C. Paretti\textsuperscript{1}, Raymond R. Tucker\textsuperscript{2}, and Lisa D. McNair\textsuperscript{1}

\textsuperscript{1}Department of Engineering Education, \textsuperscript{2}Via Department of Civil Engineering, Virginia Tech

**EXTENDED ABSTRACT**

Universities often speak of “multidisciplinary” or “interdisciplinary” teams, rooted in our understanding of departmental and disciplinary structures. Industry, however, more often refers to “cross-functional” teams, reflecting a slightly different organizational structure. While there are a number of parallels across these concepts, the cross-functionality of industry teams presents several unique barriers that undergraduates—even those with multi/interdisciplinary experience—may not be adequately prepared for.

To address this gap, this paper presents findings drawn from both a literature review on cross-functional teaming and a case study of cross-functional teams in a large consumer-products manufacturing firm to identify key learning outcomes for undergraduate students. In particular, the paper focuses on students’ ability to negotiate the kinds of structural barriers posed by cross-functional teams. These barriers can include complex reporting and hierarchy systems, physical separation of team members that limits informal exchanges of ideas and information, lack of clear communication channels among team members as well as between team leaders and the leaders of the functional units from which team members are drawn.

The ability to effectively navigate such structural complexities requires students to move beyond their technical expertise, and even beyond basic principles of teamwork, and learn to first identify the kinds of challenges a particular team structure might pose and second develop appropriate communication and collaboration strategies. In particular, at the undergraduate level, students can become aware of how organizational structures can affect collaboration and can begin to identify possible strategies for succeeding in those structures. By helping undergraduates learn to identify these challenges and develop a basic set of tools, faculty can better prepare them for the kind of professional demands posed by cross-functional workplaces.

(This material is based upon work supported by the National Science Foundation under Grant Nos. 0619263, 0648439, and 0633537. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.)
Promoting Equity and Diversity in First Lego League

Marion Usselman\textsuperscript{1}, Jeffrey Rosen\textsuperscript{2}

Abstract—The Georgia First Lego League (FLL) tournament has grown from 16 teams registered with FLL in 2002 to 274 teams in 2008. As a consequence, Georgia now has a system of regional and super-regional qualifying competitions that ultimately lead to the State Tournament. To increase the quality of the experience for the largest number of students, we have assigned each team a “Power Rating” based on their prior experience and amount of time allotted to the activity. Teams are assigned to competitions partly based on their power rating to increase the likelihood that teams will compete against teams of similar strength and to help promote the success of urban public school FLL programs. The results from the 2008 tournament season show that there was a marked increase over 2007 in the number of public schools who were in the Top 10 list at the State Championship, from one team in 2007 to six teams in 2008.

\textsuperscript{1} Center for Education Integrating Science, Mathematics and Computing (CEISMC), Georgia Tech, Atlanta, GA 30332-0282, marion.usselman@ceismc.gatech.edu
\textsuperscript{2} Center for Education Integrating Science, Mathematics and Computing (CEISMC), Georgia Tech, Atlanta, GA 30332-0282, jeff.rosen@ceismc.gatech.edu
The Consequences of Canceling Physics:
Revisiting a Case Study in an At Risk Urban High School
Alison Stucky and Marcus Bellamy
Georgia Institute of Technology

EXTENDED ABSTRACT

It is important for students in all schools, regardless of socioeconomic level, to have adequate access to advanced level and college preparatory science and mathematics classes. These classes give the students the opportunity to better prepare for success in a college setting, and are crucial for increasing the pipeline of students entering fields like engineering. This is one reason that universities like the Georgia Institute of Technology (GT) partner with local at-risk urban high schools in the Student and Teacher Enhancement Partnership (STEP), an NSF funded GK-12 program. Graduate STEP Fellows team with teachers in the high school classes in order to enrich those classes. While this is helpful to the high school, the presence of GT graduate students cannot take the place of highly qualified teachers, or substitute for classes that should be in place at the school.

The access to advanced classes can become an issue for students in lower income areas where the high schools do not have sufficient resources to continue the higher level courses while also addressing problems with the lower performing students. Because the standard and lower level courses are important in achieving Adequate Yearly Progress, schools often shift their focus to these courses to improve their pass rate. In 2004, science graduation test scores at Cedar Grove High School dropped dramatically, causing the administration in this urban, lower income, 99% African American high school to enact a variety of measures, including reducing the offerings of physics, a significant higher level class in the sciences. This paper is a longitudinal study to evaluate the consequences of these decisions--the success in achieving the original goal of improved test scores, as well as the unintended impact on the high achieving students, such as changes in Advanced Placement science and mathematics enrollment and performance.
Using Inquiry Biomedical Engineering Cases to Increase Middle and High School Student Interest in Science and Engineering

Jason Weaver¹, Michael Ryan², and Marion Usselman²

¹Wallace H. Coulter Department of Biomedical Engineering, Georgia Institute of Technology
²Center for Education Integrating Science, Mathematics, and Computing (CEISMC), Georgia Institute of Technology

"CSI GT: The Science to Solve the Crime" is a week-long forensic science program for rising 8th and 9th grade students which is run by the Georgia Tech (GT) Center for Education Integrating Science, Mathematics, and Computing (CEISMC) in collaboration with the Department of Biomedical Engineering (BME) at GT. It is led by two local high school teachers and a graduate student from BME who participated in the GT Student and Teacher Enhancement Partnership (STEP), part of an NSF GK-12 initiative. Problem-Based Learning (PBL) methods give students the confidence to solve problems and think critically. The summer program described in this paper employs PBL design and strategy to immerse students in a real-life forensics context where they are expected to learn science and engineering content and techniques in order to capture a criminal. These forensics activities can be combined with BME cases in order to enrich the student experience and expose them to engineering.

The summer program is wildly popular – 65 applications for only 20 openings in 2008 – but CEISMC would like to see this program made available to a much larger audience. Through a piloted initiative, dubbed “Tech in Your Town”, CEISMC is looking to implement its programs in local schools in order to increase student participation and interest in science and engineering. Both high school teachers and STEP Fellows are carrying out this implementation with the guidance of a CEISMC Program Director.

This paper presents the forensics curriculum, methods to link BME to forensics, initiatives to disseminate through Tech in Your Town camps and after school clubs, and program evaluation results. Overall, the ongoing expansion of CEISMC camps serves to support the growth and development of future scientists and engineers.
Development of RFID-Based Real-Time Inventory Tracking as a Project Assessment Tool in a Problem-Based Laboratory Environment
Esfandiar Behravesh, Auroop Roy, Shaun Duncan, and Christopher Tuthill
Georgia Institute of Technology

EXTENDED ABSTRACT

In an open structured a problem-based laboratory, where students routinely make use of time outside of scheduled lab hours and without direct instructor supervision, determining the right type of scaffolding can be problematic as instructors are not immediately available to students for feedback. This lag in real-time transfer of knowledge ultimately hinders the ability of an instructor to assess the provided lab scaffolding for effectiveness. This paper attempts to address these concerns through a radio frequency identification (RFID) based platform.

A smart cabinet was developed using an UHF RFID reader, which communicated directly with the departmental Local Area Network, two circularly-polarized antennas to read RFID tags, and an access control electric lock. The reader contained output ports which were used to drive the electric lock, eliminating the need for additional equipment and relays. A Java program communicated with the reader, ultimately populating a SQL database server showing the available items, real-time. Students and administrators access the database via the internet through Georgia Tech’s implementation of Sakai at www.bme.gatech.edu/rfid. A PHP web program makes SQL calls to gather current tag or user information, and administrators assign available objects or resources to a particular project. With a simplified drag-and-drop checkout system, students are able to visualize available resources, learn how these resources can be used, and to assist students in determining how resources could be used to help solve their proposed problem. The system is able to track student group usage and creates a history file for each team at the item level.

To help identify teams that might need additional outside of class time mentoring, the system informs instructors and teaching assistants the total time a team spends on the module in comparison to expectations. By tracking a team’s estimated and the actual completion time, an efficiency rating can be used to begin formative assessment dialogue with the student team. Additionally, the RFID system has the potential to assess the effectiveness of the provided materials in achieving the desired objectives by examining the differences between the actual and estimated total time for project completion.

From a personal privacy standpoint, this system tracks usage of resources with teams, not individuals. The linkage between a team’s RFID access card and member identification is controlled under the same standards as the student grading system. The provided reports of the system are not used for grading an individual student, but are used as a basis for further formative assessment.

This RFID-based system in a hands-on problem-based learning laboratory setting has benefits beyond simple inventory tracking.
Bridging the Gap: Connecting Biology and Engineering in the High School Curriculum

Brian K. Post\textsuperscript{1}, Susan E. Riechert\textsuperscript{2}

\textsuperscript{1}School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA
\textsuperscript{2}Ecology and Evolutionary Biology Department, The University of Tennessee, Knoxville, TN

EXTENDED ABSTRACT

In the typical high school curriculum, subjects are taught as discrete units without reference to the inherent inter-connectedness among them. This disconnect is particularly evident between math and biology. Math skills are taught without reference to their potential application in the science of biology, and in biology classes, students do not get exposure to the quantitative framework underlying modern biological constructs. Because engineering often draws inspiration from the natural world, it affords an excellent curriculum enrichment opportunity that interconnects math, biology and technology. Robotics, for example, has largely developed from observations of the behavior and structures of living organisms. Similar ties between engineering and biology exist in almost every subset of engineering and physics. Utilizing these ties to broaden the educational perspective of high school students can strengthen the biology curriculum and provide a much needed connection between the sciences and math.

Under the auspices of the STEP NSF GK-12 program Brian Post is collaborating with Dr. Susan Riechert, a Biology Professor at the University of Tennessee who has developed an outreach program that offers K-12 students exercises and materials on various biological themes through the auspices of the Biology in a Box Project \url{http://eeb.bio.utk.edu/biologyinbox/default.htm}. In addition to discussing the merits of providing biology classes with an ‘Engineering Box’ in this paper, we will include discussion of example exercises (e.g., Projectile Motion: Monkey & the Zoo Keeper/Predator Catching Prey, Aerodynamics: Whirligigs/Seed Dispersal Strategies, Tension & Compression: Bridge Construction/Spinal Columns and Sound Production). We will show how exercises integrate engineering principles and biological examples, are inquiry-based, utilize the teacher as a facilitator of student-active learning and offer the opportunity for further open-ended exploration.
BUILDING ENGINEERING ACHIEVEMENT THROUGH TRANSPORTATION (BEAT): A TRAFFIC ENGINEERING PROGRAM FOR HIGH SCHOOL STUDENTS

Dwayne Henclewood¹, Mshadoni Smith¹, Laurie Garrow¹, Angshuman Guin¹, Michael Hunter¹, Marion Usselman²
¹School of Civil and Environmental Engineering
²Center for Education Integrating Science, Mathematics and Computing (CEISMC)
Georgia Institute of Technology

The BEAT the Traffic program was a week-long summer program conducted by the School of Civil and Environmental Engineering at Georgia Tech, and supported by the Federal Highway Administration through the Garrett A. Morgan Technology and Transportation Education Program. The program introduced high school students to the field of transportation engineering while honing and developing skills to prepare them for success in science and engineering. The curriculum was designed to be highly interactive and flexible. It included an overview of the transportation sector, the process through which transportation projects are initiated and completed, and the fundamentals of developing appropriate signal timing plans for signalized intersections.

The goal was to enable the students to coordinate, and in turn minimize, the delay experienced through a network of two signalized intersections. Knowledge gained about the fundamentals of a signal timing plan and the use of a time-space diagram was subsequently reinforced and transferred with the use of VISSIM, a transportation simulation software application, and with exercises in which traffic interacted with a series of developed signal timing plans.

The curriculum culminated with a design challenge in which teams of students attempted to design the best signal timing plan for a series of two intersections given corresponding volumes at the various approaches. Each group’s timing plans were then executed and presented to an audience of parents, graduate students, fellow classmates and curious onlookers. The presentation of the solutions involved the use of a software program developed by the camp staff, traffic signal heads, a taped-off corridor and individuals walking through the network at particular speeds to mimic vehicle behavior. This paper will give details about the curriculum, evaluation results, and lessons learned about high school outreach.
Engineering Outreach by High School Students in NSBE Jr.

Akibi Archer\textsuperscript{1}, Samantha Andrews\textsuperscript{2}, Karolyn Babalola\textsuperscript{3}, Jacqueline Fairley\textsuperscript{3}, Margaret Tarver\textsuperscript{4}

\textsuperscript{1}School of Mechanical Engineering, \textsuperscript{2}School of Biomedical Engineering, \textsuperscript{3}School of Electrical and Computer Engineering, \textsuperscript{4}Tri-Cities High School

\textit{Georgia Institute of Technology, Atlanta, GA}

\textbf{EXTENDED ABSTRACT}

The Tri-Cities High School engineering club, which is very active in the East Point, Georgia community, is a part of a larger organization, the National Society of Black Engineers (NSBE), under NSBE’s pre collegiate initiative. The NSBE Jr. Club meets every week and does activities and projects centered around science and engineering. Graduate students that participated in the Georgia Tech Student and Teacher Enhancement Partnership (STEP) program, which is an NSF funded GK-12 initiative, serve as NSBE Jr. advisers and mentors. While working with the STEP Fellows, the high school students enhanced their leadership and technical skills, and impacted the community by planning and implementing a variety of middle and high school outreach events.

One goal of the engineering club was to introduce the Science, Technology, Engineering and Math (STEM) fields to majority minority elementary and middle school students. At the NSBE Region III Fall Regional Conference in Jackson, Mississippi, the students organized and presented a time management workshop for other conference participants. The engineering club students also participated in K.I.D.S. Club, a Georgia Tech Saturday program designed to enhance and encourage curiosity and enthusiasm for STEM fields, where they used a fun activity to teach an introductory industrial engineering concept on assembly line efficiency. Tri-Cities’ first annual NSBE Jr. STEM day was introduced by this engineering club, where the high school students presented demonstrations to encourage 4th and 5th grade students to pursue technical careers. This paper will present the specific activities used in the outreach programs, and lessons learned regarding engineering outreach in low income, minority communities.
Auburn University Robotics and Computer Literacy
K-12 Engineering Camps: A Success Story

Daniela Marghitu\textsuperscript{1}, Michael Fuller\textsuperscript{1}, Taha Ben Brahim\textsuperscript{1}, Eliza Banu\textsuperscript{2}

\textbf{Extended Abstract}

New educational methodologies for engineering education are to be designed in order to address changes in the structure and design of the traditional classroom at all academic levels. Laws concerning education, inclusion and outreach for special needs students are as well pushing towards a change in the structure and design of the traditional classrooms. Therefore educators from all academic levels are likely to have students from a variety of backgrounds. In this case the preparation programs for educators need to ensure that candidates are familiar with special needs pedagogy and assistive technologies. Teaming students from diverse disciplines is one step closer in making this possible. Two Auburn University K12 engineering outreach programs have been established, Computer Literacy Academy for typical and special needs students ages seven to eighteen and Robo Camp, a robotics program for advanced students ages ten to eighteen. The aims of these very two successful programs are to enhance students’ knowledge in computing and robotics fields, and to offer graduate students a hands-on experience in working with school aged typical and special needs population.

Programs for typical children included Lego Mindstorms & Robotics Invention System, Lego Mindstorms NXT, Microsoft Robotics, and Carnegie Mellon University's Alice application. Prentice Hall MyITLab training and assessment web-based application assist students through the keystrokes needed to master the Internet, WWW, and Microsoft Office core applications. Microsoft's Zoo Tycoon, Age of Empires II, Rise of Nations, and Flight Simulator X are interactive educational games that are helping students to improve their computer operating skills while, as well, increasing their knowledge on economics, history, and geography. Computers are conducive to learning for all children, particularly children with special needs, because the pace can be adapted to the children’s response level.

Computer tasks for the special needs children included traditional computer programs (Microsoft Word, Excel, and Power Point), and a variety of software and hardware Educational and Assistive Technology Applications including programs such as Acorn’s Tree House Vocabulary; No Glamour Language and Reasoning; Understanding and Following Directions; Webber Interactive WH Questions, Autism & PDD Adolescent Social Skills Lessons, and Dell Touch Screen E157FPT. In this manner children with special needs population

\textsuperscript{1} Department of Computer Science and Software Engineering at Auburn University, daniela.fullemg,benbrah@eng.auburn.edu

\textsuperscript{2} Department of Mechanical Engineering at Auburn University, Banueli@auburn.edu
Development of a Modern Integrated Thermal Systems Design Laboratory

John Abbitt
Department of Mechanical & Aerospace Engineering
University of Florida, Gainesville, FL

ABSTRACT

The Department of Mechanical and Aerospace Engineering at the University of Florida is in the process of developing a modern thermal systems laboratory that integrates a broad range of topics from the engineering curriculum with the objective of improving the analytical ability, teamwork skills, and, most importantly, the design expertise of our students. This is accomplished by coordinating just-in-time lectures with hands-on, small-group laboratory experiences involving industrial-type equipment and data acquisition systems, a design objective for each experiment, and culminating in an open-ended group design project. The integrated lectures, laboratory experiments, and design experiences in such topics such as heat exchangers, pump/pipe system matching, pool boiling, cooling towers, and air-conditioning break down the traditional compartmentalization of these education experiences. During this development, we have received numerous requests for descriptions of the equipment and experiments used in our labs. Therefore, a discussion of the apparatus and the experiments is included in this paper as well as the novel method used to fund the laboratory. Feedback from our students and alumni has been very positive. Students have listed their experience in the lab on their resumes and have emphasized their lab and design proficiency with potential employers. Alumni have reported that the synthesis of their previous coursework gained in this laboratory has been directly applicable to their job duties in the workplace.

It is the opinion of this author that the development of the lab experiments, student participation, scheduling, and equipment acquisition has proceeded very well. An important reason for the success was the development of the long-range plan which clearly identified the needed equipment, a detailed floor plan, and equipment costs. Key to the implementation of the plan was presenting the plan to the entire faculty early on and obtaining their support. The second reason for the success of the program was the establishment of an equipment fee. Probably the most important reason for the success of the program was the assignment of an instructor whose full-time duties are to lecture, develop, and maintain the laboratory facilities.
Enhancing the Collection Process for the Delphi Technique

Petros Katsioloudis

EXTENDED ABSTRACT

The purpose of this article is to describe a process that enhances the collection process for the Delphi technique. The approach is consisted of online platforms to expedite the process and reinforce the validity of the conventional Delphi technique. The context of the study was the identification of quality indicators of visual-based learning material in Technology Education programs for grades 7-12. A three-round modified Delphi method was used to answer the following research questions: RQ1: What indicators should quality visual-based learning material in Engineering education have to be effective and efficient in transmitting information for grades 7-12? RQ2: What are the indicators of the learner’s characteristics that impact the selection of visual-based learning material in engineering education for grades 7-12? The quality indicators were determined by consensus reached by a panel of 21 educational experts randomly selected from participants in two NSF funded projects that piloted and field-tested visual learning material in engineering education courses. Based on the outcomes of this study, the modified online approach represents a promising mechanism for extending the usefulness of the Delphi tool to unique studies. The findings also indicate that the factors that erode the validity and usefulness of traditional modified Delphi studies also positively affect the hybrid approach.
Honors Undergraduate Research: Autonomous Robot for Remote Detection of UXO

Joshua Galloway and Daren R. Wilcox

Southern Polytechnic State University

EXTENDED ABSTRACT

An undergraduate Electrical and Computer Engineering Technology (ECET) honors student at Southern Polytechnic State University developed a prototype for an autonomous landmine and unexploded ordinance seeking (UXO) robot. The system provided functionality including: locating metallic landmines and UXO within a defined area/environment, recording the location of said landmines and UXO’s, and storing the data off unit via an IEEE 802.11b/g connection to a Windows or Linux-based laptop computer. Application of the prototype and corresponding research may lend themselves to de-mining the more than 100 landmine/unexploded ordinance affected countries in the world (US Department of State Fact Sheet, 2 July 2003) particularly in desert terrain. Presented in this paper are a discussion of the UXO de-mining problem and the extent of proliferation, a design review of the robot, initial testing results using simulates, and lessons learned that could be applied towards future research.
Re-defining, De-limiting, and Activating the Engineering Learning Space with Tablet PC Convertible Computers and Associated Applications

Thomas D. L. Walker, P.E.
Engineering Education Department, Virginia Tech

EXTENDED ABSTRACT

The College of Engineering at Virginia Tech mandated tablet-pc convertible computers for all incoming first-year and transfer students beginning with fall 2006. These students have now percolated throughout the various departments within the college. Concurrently, tablet-specific, tablet-optimized, and/or tablet-friendly applications appropriate for the engineering learning space have become increasingly available, capable, and user-friendly and parallel improvements in wireless infrastructure and economies allow continuous, reliable broadband access throughout the campus and world-wide. These developments have delivered unprecedented opportunities for reforming and re-designing the engineering learning space. This paper briefly reports on the various technical and human problems encountered and resolved and the way students and faculty have applied the technologies within the engineering learning space.

In addition to purely reporting on the current state of the tablet initiative at VT and recent tablet-enabled classroom research verifying the positive impact of the technology on learning, there is a call for disruptive innovation in engineering education, particularly as computer and communications technologies now allow, and even require, that innovation to take place.
Survey of Teaching Assessments
at Engineering Educational Institutions

Hodge E. Jenkins and Laura W. Lackey

School of Engineering
Mercer University
Macon, GA

EXTENDED ABSTRACT
A primary goal of engineering educators should be to provide the best classroom experiences, using modern techniques, for educating students. While teaching methods may vary by individual, dependent upon technical skill, talent, and personality, it is necessary to have honest, fair, and expert feedback to improve teaching by the faculty. By improving the actual, as well as the perceived, quality of teaching other significant goals may be achieved.

Every academic institution has systematic assessments of curricula for accreditation organizations, and a method for review of faculty achievements for salary considerations. Despite these review and assessment instruments, it is not clear the how individual teaching is truly evaluated, assessed, improved, and kept current in the use of technology. It is the goal of this manuscript to provide a sampling of current practices for assessment of teaching for engineering professors at peer and leading institutions.

This paper discusses some current trends in course evaluations and teaching assessment, including student surveys and peer reviews. Educational institutions have long implemented evaluation surveys to improve the quality of instruction, especially in the areas of instructor performance and course content. While the data provided by these student surveys are perceived by some faculty to be of limited value as an effective assessment and improvement tool, these surveys remain the primary means of teaching and course feedback to the instructor and the administration. As such the best survey methods, content, and format are required to extract accurate student information for any meaningful interpretation.

Techniques for improving survey response quality, completion rates, and a review of a limited sampling of course evaluations at peer and leading institutions of higher education are offered. Data presented in this paper were gathered from the public domain. Benchmarking the approaches at these institutions is a critical step in the development of an effective means of assessing faculty teaching and providing resources for continuous improvement. The survey content data indicated that many questions, not directly relate to teaching or course content are present on student surveys. Appropriate length, incentives, and information on the use of the data are required to motivate students and to provide higher quality data.

Raghu V. Pucha and Tristan I. Utschig

Extended Abstract – With many nanotechnology initiatives by government, industry and academia, there is an increasing trend of nanotechnology products using both top-down and bottom-up manufacturing methodologies. Today nanomaterials and devices of moderate complexity can be designed and manufactured using bottom-up molecular manufacturing approaches and self-assembly. Realization of these new technological systems requires integration of design knowledge with CAD/CAE tools that can explore targets for development well in advance of their physical feasibility. Therefore, it is essential that our nation prepare its engineers for tomorrow’s bottom-up nano-technology product development through Computer-Aided-Nano-Design Education. While research developments in the design—for—implementation method regarding nano-physical systems are happening at a reasonable pace, the incorporation of nano-design education in engineering curricula is not getting attention in academia. It is estimated that about 2 million nanotechnology workers will be needed worldwide by 2015 and nanotechnology has the potential to create 5 million additional related jobs in the global market.

Are we ready to train our engineering students for tomorrow’s nano-manufacturing needs? What are the challenges and pedagogical needs of curriculum development in this highly emergent field? What is the path for the process of systematic curriculum design and instructional resource development that is commensurate with the emerging needs of nano-manufacturing? What are the developments in academia around the world in this direction? What are the available engineering tools today that can be integrated into the nano-design curriculum? What are the scope and associated integration challenges of such a curriculum? To address these issues, the authors (i) Describe how emerging needs for engineering expertise relate to the process of systematic curriculum design (ii) Review various efforts in academia that will contribute to Computer-Aided-Nano-Design and related courses (iii) Review available engineering tools that can be integrated into the Computer-Aided-Nano-Design curriculum and (iv) Analyze the challenges associated with the scopeing and integration of Computer-Aided-Nano-Design Education in the engineering curriculum. The framework presented here illustrates how design engineers are confronted with new demands due to application of new technologies. Thus, this work provides value to the engineering education community beyond the specifics of Computer-Aided-Nano-Design. The generic aspects of the process may be viewed as a template for integrating new demands on engineers into the engineering curriculum. In preparing our students to lead the world into the future of nano-fabrication and design, one must take into account elements of practice, pedagogy, and curriculum design. This will enable rapid skill development that integrates all areas of the technology and can move engineering curricula forward strategically and systematically. This work, at its core, represents the integration of several bodies of knowledge towards a unified purpose of overcoming current challenges regarding the incorporation of computer-aided-nano-design in engineering curriculum.

1 School of Mechanical Engineering, Georgia Tech, ragharam.pucha@me.gatech.edu
2 Center for Enhancement of Teaching & Learning, Georgia Tech, ttutschig@cetl.gatech.edu
Assessment Based Instruction Applied to a Course and Lab in Digital Signal Processing

Timothy A. Wilson
Department of Computer and Software Engineering, Daytona Beach Campus, Embry-Riddle Aeronautical University

EXTENDED ABSTRACT

This paper describes three instructional practices in the context of lecture and laboratory courses in Digital Signal Processing. The three concepts are: (1) In the course development process, articulate learning outcomes associated with each section meeting, then develop assessments for each learning outcome prior to developing instructional material for the course, and then, and only then, prepare instructional materials related to the learning outcomes. (First sense of “Assessment First”); (2) Start each section meeting with students completing assessments of the learning outcomes covered in the previous section meeting. (Second sense of “Assessment First”); and (3) Use the large number of assessments to evaluate student performance; i.e., when there are lots of assessments, relative frequency of assessment achievement is an adequate basis for assigning grades.

In its background section, the paper discusses the origins of the framework in the author’s participation in a “course makeover” class and describes concept of “learning outcomes.” The “Description of the Method” section goes into some detail about the two senses of “Assessment First,” and describes how assessment results can be used to direct teaching directions; that section also describes an evaluation process by which assessment results were mapped into student letter grades, and how exams and projects factor in to determining the term grade. The “Discussion” section gets into workload issues associated with the instructional framework, nuances in using assessments to evaluate instructional effectiveness and degree of student learning, issues involving the almost-daily assessments and lack of graded homework assignments, particulars regarding grading rubrics for the assessments (in particular, granularity of the assessment results into three tiers: Excellent, Satisfactory, and Unsatisfactory, and the novelty of the entire approach. The “Discussion” section also relates the approach to the Software Engineering practice of “Test First.”
Corporate Partnerships in the Georgia Intern-Fellowships for Teachers (GIFT) Program

Bonnie Harris and Marion Usselman
Center for Education Integrating Science, Mathematics and Computing (CEISMC)
Georgia Institute of Technology

In order for the United States to retain a competitive advantage in the new global economy, we need to increase the number of students who are proficient in the fields of science, technology, engineering and mathematics (STEM). This requires that we improve K-12 students’ readiness for STEM careers by including all types of educators (K-12 teachers, administrators, and higher education faculty) and STEM professionals from businesses and industries in a creative, coordinated and integrated approach to education.

Since 1991, the Georgia Institute of Technology’s Georgia Intern-Fellowships for Teachers (GIFT) program has placed over 1,200 science, mathematics and technology teachers into summer internships that immerse them in research experiences in both university and corporate settings. These internships provide the teachers with first hand connections between classroom activities and real world applications, and help rejuvenate them for the next school year. Beginning in 2004, the GIFT program also incorporated high school students into the program by placing them in science and engineering laboratories to conduct research on ‘real world’ challenges.

During the 1990s, GIFT placed large numbers of teachers into corporate settings, and fewer into university research labs. Since 2000, these numbers have been reversed, with few industry partners coming on board. In this paper we analyze the reasons for this decline, and present strategies for building back up the industry partnerships that strengthen STEM education.
Numerical Simulation of Lightning Induced Voltage on Power Transmission Lines

Zhaoxian Zhou
School of Computing, University of Southern Mississippi
Hattiesburg, MS 39406
Email: zhaoxian.zhou@usm.edu

Abstract - One of the reasons that over-voltages exist in electric power system is that lightning hits on a power line. Over-voltages are induced on the conductors when the lightning strikes on the transmission line. The over-voltages and thus over-currents can disturb and even damage the system. An understanding of lightning induced voltage and current on the power transmission lines is critical both in industry and in academia, for the protection of power systems. In this paper, formulations from finite difference time domain method and time domain integral equation method are given to calculate the over-voltage and over-current due to direct lightning strike and induced by indirect electric fields. Based on the measurement results in literature, the electric filed is given in the form of transient, time domain Gaussian pulse, having a Gaussian-pulsed spectrum. With simulation results of several examples with typical transmission line configuration, it is showed that the induced current is affected by the length of the transmission line. Possible line protection scheme to minimize surge voltage and current is discussed. The simulation is beneficial for the understanding of the physics behind the theory.
Labview Simulation of Induction Motors
Zhaoxian Zhou and James Matthew Johnson
School of Computing, University of Southern Mississippi
Hattiesburg, MS 39406
Email: zhaoxian.zhou@usm.edu

Abstract - Knowledge of steady-state processes of induction motors is critical in the understanding of their operating principle. In addition to the vast, systematic theories in literature, computer simulations provide a keen insight to the mechanism. Suitable modeling methods enable motors to be simulated with various parameters. Many phenomena can be predicted without physical experimentation. From various equivalent circuits of induction motors of different power, assuming constant circuit parameters, this paper gives detailed formulations that can be used to model their steady-state performance. Simulation results are given in LabVIEW, which is a widely-adopted visual modeling platform. Stator and rotor currents, various powers from the source are calculated in steady-state operations. Labview modeling is also discussed.
Low Cost and High Value Laboratory Expansion: the Shell and Tube Heat Exchanger

David L. Silverstein, Ph.D., P.E. and Jimmy L. Smart, Ph.D, P.E.
University of Kentucky

EXTENDED ABSTRACT

Part of the continuous improvement process common to all chemical engineering programs is the need to update and improve laboratory experiences for undergraduate students. At the University of Kentucky Extended Campus Programs in Paducah, much of the existing equipment is bench scale due to space constraints not uncommon to engineering programs. Most lab space is single-story with limited utility capacity. Existing equipment is fairly new (less than 10 years old), but consists of prefabricated experiments purchased from educational laboratory suppliers.

One particular area of concern to faculty in the chemical engineering program was the lack of a larger scale heat transfer experiment. The existing experiment included a shell and tube exchanger with a tube length of about four inches and diameter of three inches. Upgrading this experiment to facilitate the program’s drive to incorporate laboratory experiences throughout the curriculum was a priority, but budget and space constraints were a concern. The first part of this paper describes the process leading to purchase and installation of an industrial scale heat exchanger at a “bargain” price using modern alternative purchase sources (i.e. internet-based brokers and auction houses). Reminders of key considerations in the selection/specification process and infrastructure requirements when selecting an exchanger for educational use will be discussed.

The second part of this paper describes why we believe the shell and tube heat exchanger to be the single most valuable investment that can be made in an undergraduate laboratory. Experiments useful in classes from introductory course to process control will be presented, with details provided for selected experiments. This includes standard heat transfer experiments in addition to experiments and applied design opportunities in process control, fluid dynamics, mass balances, thermodynamics, and equilibrium staged separations. A selection of previously published laboratory experiences are cited to supplement the novel applications provided.
Introducing Freshmen Engineering Students to Function Modeling to Enhance Design

Cecelia M. Wigal, Ph.D. P.E.
The University of Tennessee at Chattanooga

EXTENDED ABSTRACT

The Engineering program at The University of Tennessee at Chattanooga (UTC) defines the Design Process as a systematic decision-making process that aids the engineer in generating and evaluating characteristics of an entity (physical or process) whose structure, function, and operation achieve specified objectives and constraints. The program describes the process as the application of the solid foundation of the basic sciences, mathematics, and engineering sciences to the abstractness, complexity, and solving of real world problems.

At UTC the elements of the Design Process are emphasized throughout the curriculum, beginning with the freshmen year. At the freshman year the Introduction to Engineering Design (IED) course uses project based learning to address (1) problem definition, (2) attribute generation, (3) function, constraint and objective identification, (4) idea generation, and (5) simple decision-making as they apply to the Design Process. Of particular emphasis is the definition of functions, objectives and constraints that provide boundaries, guidelines, and clarification to project definition and design. The freshmen are introduced to project definition research involving customers and users to help them recognize project needs and requirements. The needs and requirements are transferred into project objectives, functions, and constraints using structured nomenclature and modeling techniques.

Often systems modeling and thus systems thinking is used to aid in identifying and developing design functions and objectives. Two specific systems function modeling techniques are the Function Node Tree and the Integrated Definition (IDEF0) model (used by the Systems Engineering community).

This paper introduces systems thinking, the use of Function Node Trees to identify and categorize functions, and an instructor generated modified IDEF0 model to identify functional relationships. In addition, the paper describes the process of introducing the modified IDEF0 model to the students, the student learning outcomes from using the model, the student reactions to applying the model, and the implications of introducing the model at the freshmen level. An example of a student application of the IDEF0 model is also presented.
New Frontiers in Manufacturing Education:
Rapid Prototyping, 3D Scanning and Reverse Engineering

Atin Sinha
Albany State University
Albany, Georgia

With the introduction of the first Rapid Prototyping machine two decades ago, manufacturing technology has now matured from building prototypes by various additive processes to creating net shape finished product from CAD models and reverse engineer parts from data obtained from 3D scanners where no CAD models exist.

Various Rapid Prototyping technologies differ in their choice of materials and processes as in cost and durability of the finished part but all of them significantly shorten the product development cycle from months to weeks. Reverse engineering, on the other hand, has been defined as the process of taking a finished product and reconstructing the design data in a format from which new parts or molds can be produced. With the availability of affordable 3D scanners the process of reverse engineering has become more readily adaptable to a large number of manufacturing applications from medical devices to reconstruction of obsolete parts. The process constitutes of scanning the object, cleaning and merging the scans, patching holes to create 3D computer model, subsequently resizing or redesigning the part in a CAD environment before constructing the prototype.

Albany State University (ASU) conducts a transfer engineering program with Georgia Institute of Technology. Rapid Prototyping was first established at ASU with the purchase of a 3D Printer and SolidWorks CAD software in 2003 which ever since have been used in support of the Engineering Graphics course as well as Engineering Workshops for high school students. A 3D scanner (E-Scan) and reverse engineering software LeiosMesh were added in 2007 to complete all the requirements of a fully functional reverse engineering facility. Acquisition of another scanner from NextEngine and powerful RapidWorks software from RapidForm in the summer of 2008 enhanced the versatility of ASU’s reverse engineering capability. This very unique facility is currently being used to support our engineering student’s research projects. Also, a new laboratory project on reverse engineering has been added to the group of projects in the laboratory based sophomore level introductory engineering course in the fall of 2008 that was well received by the students.
Civil Engineers Design High School Statistics Tasks

Marsha Shrago\textsuperscript{1}, Laurie Garrow\textsuperscript{2}, Marion Usselman\textsuperscript{1}

\textsuperscript{1} Center of Education Integrating Science, Mathematics, and Computing (CEISMC)
\textsuperscript{2} School of Civil and Environmental Engineering
Georgia Institute of Technology

In fall 2008, the Georgia Department of Education began implementing a new mathematics curriculum for high school students. This curriculum, the Georgia Performance Standards (GPS), encourages instruction that “applies mathematical concepts and skills in the context of authentic problems.” The curriculum also places increased emphasis on data analysis and probability. However, relatively few Georgia high school teachers have taught more than elementary statistical concepts, and they have limited access to authentic problems for use in teaching data analysis and probability.

To address this paucity of resources and experiences, the Center of Education Integrating Science, Mathematics, and Computing (CEISMC) invited Dr. Laurie Garrow to challenge students in her graduate course “Statistics for Transportation” to create tasks that would engage ninth and tenth grade students in learning and applying grade-level mathematics content under the GPS data analysis and probability strand. Dr. Garrow’s class developed 13 tasks some of which are being introduced to high school teachers and their students during the 2008-2009 school year.

This paper will discuss the actual assignment, present three of the tasks, and describe teacher and student reactions to the tasks as learning experiences. The paper will reflect on the collaborative efforts and their impact.
A.C.E.S Wild:
“Applied Concepts of Engineering and Science” Course Shakes Up Tradition

Fred Stillwell\textsuperscript{1} & Jeff Rosen\textsuperscript{2}
\textsuperscript{1}East Cobb Middle School, Cobb County School System
\textsuperscript{2}Center for Education Integrating Science, Mathematics and Computing (CEISMC)
Georgia Institute of Technology

New articles are released regularly that talk of the plight of K-12 education in retaining student interest in STEM concepts and that document the fears of STEM based employers that they will not have a workforce ready to handle the challenges of the new Global Economy. Over the past couple of years many groups have studied the loss of interest of students in STEM courses and recommended an expansion of course offerings to provide increased options for the students. As STEM fields at the college and research level increasingly integrate all four of the disciplines (science, technology, engineering and mathematics), K-12 education needs to follow suit and provide a course that involves the students in the true integration at an early age. This type of course has the potential to truly make an impact in the number of enthusiastic STEM learners.

Over the past two years East Cobb Middle School (ECMS) has offered an exploratory course that connects the grade-appropriate science and mathematics concepts through engineering principles. Now, ECMS, in collaboration with Georgia Tech, is proposing to the State of Georgia Department of Education the creation of three new middle school courses, one at each grade level, called Applied Concepts of Engineering and Science (A.C.E.S.). Each year the course would have a specific focus area, but maintain the same primary function--to connect the science and math concepts through engineering based activities. The A.C.E.S courses would be considered an additional academic class that is required for all students. The program strives to raise student scores and interest in the STEM areas by making the academic course standards relevant to the world around them. This paper will describe the course curriculum and the evaluation results from the pilot courses.
Revising Faculty Performance Evaluations: 
Not for the Faint of Heart
André Butler, Scott Schultz, Loren Sumner
Mercer University

EXTENDED ABSTRACT
In many structured organizations, the instrument used to help guide behaviors and appropriately reward employees is a periodic performance evaluation. Academia, however, presents a unique set of challenges for the evaluation process. For example, academic freedom is an important concept in a University setting and yet a unified vision is crucial for organizational growth and harmony. Faculty evaluations, when carefully devised and used appropriately, can deter complacency and elucidate the faculty member's role in accomplishing the mission and goals of the school.

The School of Engineering at Mercer University is currently embarking on a process of assessing and revising its faculty performance evaluation procedures and guidelines. This process includes benchmarking faculty performance procedures from schools within Mercer's peer group, and conducting a literature review to help guide the current course of action.

This paper highlights some of the issues identified and discussed by Mercer's engineering faculty members who were tasked to revise the evaluation process. The paper will also categorize faculty performance evaluation procedures at several other engineering schools of similar stature.
Attracting Students to Engineering Through Robotics Camp

Greg Nordstrom, Ginger Reasonover, Ben Hutchinson

*Lipscomb University, Nashville, TN*

**EXTENDED ABSTRACT**

Using robotics to interest elementary, middle- and high school students in engineering has gained popularity in recent years. Organized activities often take the form of team-based construction and competition events such as those offered by BEST, FIRST, and the National Robotics Challenge. Students learn about engineering by experiencing first hand the challenge and excitement of planning, building, and then competing a creation of their own design.

While such competitions are open to all students of a particular age, oftentimes a level of understanding and experience is assumed, making it somewhat difficult for novice students to get much out of these programs initially. Also, when such competitions are not offered locally, these students have few hands-on options for learning about robotics. In an effort to overcome such barriers to entry, and to provide a more introductory approach to robotics, Lipscomb University has developed a summer robotics program designed introduce students in elementary through high school to engineering through the use of robotics.

This paper presents two years of experience by Lipscomb University’s Raymond B. Jones School of Engineering in planning, developing and implementing summer robotics camps. The camps employ a mixture of in-class and studio experiences, coupling lessons in mechanics, machine design, and electronics with guided hands-on experience in designing and constructing working robots.

We present curricula for both our “fundamentals” and “advanced” robotics camps. The familiar requirements-design-build-test-deliver approach to engineering is used as a framework to guide individual campers and small teams through the robot design and fabrication process. Pre- and post- camp surveys are used to assess camper learning and interest in engineering as a result of attending the camps, and we present these results. Additionally, we show linkages between our robotics camp curricula and the state- and national grade 5-12 scientific, technology, engineering, and math content standards.
Pushing the Limit Further: Exposure of High School Seniors to Engineering Research, Design and Communication

Priya T. Goeser, Cameron W. Coates, Wayne M. Johnson, Chris McCarthy

Assistant Professor, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Associate Professor, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Assistant Professor, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Instructional Technology Support Specialist, College of Science and Technology, Armstrong Atlantic State University, Savannah GA

EXTENDED ABSTRACT

Recent literature attests to the fact that the number and quality of students enrolled in engineering programs in the United States is declining rapidly. In view of this, various undergraduate research projects, summer programs and other academic programs are being implemented at universities and high schools. In an effort to effectively address this at the high school level, a ten-day rigorous Talented Researcher in Engineering (TRIE) summer program was developed at Armstrong Atlantic State University with the following objectives:

1. Increase the awareness of future students of mathematics and technology of the varied functions and roles of research engineers.
2. Encourage more local high school students to pursue careers in engineering with an emphasis on research and development.
3. Push students beyond the usual academic expectations to yield positive outcomes.
4. Provide students with an awareness of the importance of "soft skills" in engineering careers.
5. Increase the ethnic and gender diversity of students among the local student population who pursue careers in engineering.

While most high school programs do not contain a research component, this program was intentionally designed with an emphasis on engineering research using computer aided design, robotics, technical computing and internet programming. The relatively small size of the program (12 – 16 students and four faculty) is geared toward developing a mentor – student relationship between faculty and students. The program was first successfully implemented in the summer of 2006 and then in the summers of 2007 and 2008. Student surveys are used as assessment tools to determine the effectiveness of the program. This paper presents an overview of the program structure, a brief description of the various projects, a summary of assessment results, and a few concluding remarks based on the authors’ experiences.
Use of Concept Development Projects in Science and Engineering Courses

Adrienne R. Minerick and Giselle Thibaudeau

Chemical Engineering / Biological Sciences & Electron Microscope Center
Mississippi State University

EXTENDED ABSTRACT

During their collegiate careers, students usually learn more than the facts and theories they gain from textbook learning and note taking in class. However, the skills which serve them best and prepare them to be productive, technical, members of society include problem solving skills, information filtering skills, and logic skills. Unfortunately, the traditional classroom does not focus on these skills nor does it usually provide individual practice linking unique concepts together. This paper and the corresponding presentation will discuss a concerted effort to strategically develop these skills in Science and Engineering students through Concept Development Projects associated with core or elective courses in the respective curriculum. Two main Concept Development Project efforts at Mississippi State University will be discussed. G. Thibaudeau taught a complimentary section of Honors Cell Biology that enrolled 5 to 15 undergraduate students of the 180 total students enrolled in the parent Cell Biology class each semester. A. Minerick taught an Analytical Microdevice Technology elective course in chemical engineering enrolling 5 graduate students and 10 undergraduate students. Both courses included an independent cooperative learning project structured to allow students to develop a researchable concept via independent reading, discussion, and mini-lectures. This effort has evolved with each implementation in order to address shortcomings noted either by students or professors. Success implementing these skills in students has varied by student, but the skill set demonstrated overall by each class has increased with each implementation.

It has become apparent that engagement of students in critical thinking and research increases student awareness of and excitement for science and engineering and the likelihood of retention through bachelor degree programs and therefore the likelihood of matriculation into graduate programs. The goal of this manuscript will be to provide a guide for development and implementation of Concept Development Projects as well as resources to assess student skills. The information will be presented so that faculty in diverse fields of science and engineering can translate the concept to the classroom and foster development of problem solving, information filtering, logic, and concept linkage skills in their students.
Validating Tools for Cell Phone Forensics

Neil Bhadsavle and Ju An Wang
Southern Polytechnic State University
1100 South Marietta Parkway
Marietta, GA 30060
(01) 678-915-3718
{nbhadsav, jwang}@spsu.edu

Abstract – As mobile devices grow in popularity and ubiquity in everyday life, they are often vulnerable in security and privacy. Cell phones, for instance, have been a target of spam and harassment. Sometimes, they become a media or tool in criminal cases or in corporate investigation. Cellular phone forensics is therefore important for law enforcement and private investigators. Cell phone forensics aims at acquiring and analyzing data in the cellular phone, which is similar to computer forensics. There are two challenges in the field of cell phone forensics: One is that forensic tools fall far behind the great variety of new phone models and new phone products. Another is that many vendors claim that their forensic tools are more powerful, while users do not have a low-cost, effective way to validate these tools. For the first issue, our previous research has tested the solution of using cell phone managers as forensic tools. This requires extra work beyond just applying a phone manager provided by a new phone vendor. For instance, how to disable the “write” functionality of a cell phone manager could be a challenging task. For the second issue, this paper provides a low-cost approach to validate different forensic tools for cell phones. The research is very preliminary, but it lays a foundation for students in this area to test different forensic tools.

This research was accomplished by populating test data onto a cell phone (either manually or with an Identity Module Programmer) and then various tools effectiveness will be determined by the percentage of that test data retrieved. This study will lay a foundation for further research in this field. This research could be expanded further in several ways: First, while we were using a locked T-Mobile standard SIM card thus the amount of change that can be done is limited, a test SIM card or a Smart card which is unlocked will provide for a greater range of area for data to be written. Second, a SIM card writer or an identity module programmer for direct writing onto a SIM card would also allow for population for a greater range of element files. Third, open source SIM card writers or identity module programmers and SIM card readers would be more ideal for reading/obtaining data and writing data so researchers have the ability to look at as well as modify code.

Keywords: Cell phones, Forensics, Security, Privacy.
Issues and Experiences with Online STEM Education

Venu Dasigi and Han Reichgelt
School of Computing and Software Engineering
Southern Polytechnic State University
Marietta, GA 30060

Abstract

While it has become increasingly imperative for universities and colleges to offer high quality online education, effective online instruction that achieves outcomes comparable to traditional modes of instruction is challenging. This paper proposes that these challenges are best approached from the viewpoint of quality in a broad sense. Moreover, given that the overall objective of online programs is not that dissimilar from traditionally delivered programs, namely to prepare graduates for professional and research careers, the quality of online programs and courses is best characterized in terms similar to traditionally delivered programs and courses, rather than by focusing on the medium per se.

The most widely accepted quality standard in higher education is outcomes assessment that drives continuous improvement. Clearly, the infrastructure used to deliver the program and other support must be adequate to enable the program’s graduates achieve the performance criteria underlying such assessment. This view enables faculty and educational administrators on the one hand to identify opportunities for improving online programs, and accreditation agencies on the other hand to develop more practical guidelines to be applied to online programs.

However, the online medium is distinguished by challenges such as reliance on emerging technologies, issues related to hands-on experiences and proctored assessments, a lack of eye contact and constant supervision, perceptions of online courses as being too easy or too hard, etc. While these factors can affect attitudes, effectiveness, and accessibility of online education, especially in the STEM disciplines, we argue that outcomes assessment focuses on what objectives and outcomes are achieved, rather than the details of how. Such assessment, supplemented with attention given to the online infrastructure to support appropriate level of student learning, advising, and progress toward degree completion, leads to a unified approach to quality in online STEM education.
Employing Rapid Prototyping in a First-Year Engineering Graphics Course

Wayne M. Johnson , Cameron W. Coates , Patrick Hager , and Nyrell Stevens
Assistant Professor, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Associate Professor, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Undergraduate Student, Engineering Studies Program, Armstrong Atlantic State University, Savannah GA / Undergraduate Student, Department of Engineering Technology, Savannah State University, Savannah GA

EXTENDED ABSTRACT

Over the past several years, rapid prototyping has played a greater role in engineering graphics education. This is evident by the inclusion of discussions on rapid prototyping technology in most of the recent engineering graphics textbooks, and the use of rapid prototyping in the engineering graphics curricula at various colleges and universities. A major barrier in the adoption of rapid prototyping at smaller educational institutions continues to be the relatively high cost of rapid prototyping machines. This paper presents our efforts to integrate rapid prototyping into our freshman engineering graphics course at Armstrong Atlantic State University. Our objectives are four-fold: 1) To promote student awareness of this burgeoning technology as a tool in design visualization; 2) To improve student spatial visualization skills with the use of rapid prototyped (physical) models; 3) To provide students with practical experience in part measurement and CAD solid model generation with the use of rapid prototyped models; and 4) To expose students to the rapid prototyping fabrication process using the relatively inexpensive Fab@Home desktop rapid prototyping system. All of the equipment used for this project was purchased using small institutional grant funds and assembled by the undergraduate engineering student co-authors. We will discuss our experiences in the acquisition, development, and implementation of the rapid prototyping course materials. We will also present qualitative results of our student’s perceptions of the rapid prototyping course modules. This work will be useful to other two-year engineering programs seeking to implement rapid prototyping into their engineering graphics or introduction to engineering courses.
The Luddite Exam: Not Using Technology to Gauge Student Writing Development

John Brocato

Bagley College of Engineering / Mississippi State University

EXTENDED ABSTRACT

While most current students use some form of computing technology to generate their written documentation, this same technology can make accurate evaluations of student writing development difficult for two reasons: (1) Students become overly dependent on grammar- and spell-checking software programs, which are often fallible and can hamper proofreading/editing abilities; and (2) The Internet provides countless possibilities for plagiarism in most writing situations, thereby severely hindering any chance of an accurate assessment. This paper describes a process – nicknamed the Luddite Exam – that can help remedy these two difficulties. The exam is used in a junior/senior-level technical-communication course required of all engineering undergraduates at Mississippi State University. At the end of the semester, students write a short technical document in response to an engineering-based writing prompt/case study. Students read the prompt for the first time at the exam (without access outside of class), analyze it, and write the required document within a standard three-hour timeframe using only a pen or pencil, paper, their course textbook, a dictionary, and the prompt’s information. In this way, the Luddite Exam is a pure writing sample: an exercise requiring students to write a document without the possibility of outside assistance, on a topic for which they have been unable to prepare anything in advance, using and applying the communication-related knowledge they have hopefully gained during the past semester’s experiences.

The Luddite Exam topic was originally delivered as a poster presentation at the ASEE 2007 National Conference in Honolulu. This paper expands on that previous version by analyzing several more semesters’ worth of results, which unfortunately show that recent administrations have yielded lower scores than in previous semesters. The paper discusses possible reasons for this decline and concludes with plans for modifying the exam so that it can be used more successfully in the future.
A High Voltage DC Power Supply to Excite a Laser Tube: A Capstone Design Project

Jeng-Nan Juang and R. Radharamanan

Mercer University, Macon, GA 31207

EXTENDED ABSTRACT

This paper describes the course of action taken in the development of a power supply capable of driving a Helium-Neon Laser. The power supply will produce a triggering voltage of 8,000 volts DC and an operating voltage of 1,100 volts DC from an input voltage of 10 volts DC. The power supply will also produce an operating current between 0.004 and 0.0055 ampere while drawing approximately 0.750 ampere of current. The enclosure for the power supply was constructed of Plexiglas to insulate the operator from the high-voltage output of the power supply, and to allow the user to observe and/or demonstrate the operation of a laser. Three different designs were considered and the design with minimum components as well as cost was chosen for fabrication. Initially, each component was tested individually to be sure that they were in working condition and within the tolerance limits specified for each component. The circuit consists of several capacitors, diodes, resistors, a transformer, two switches, and two transistors. The resistors and diodes were tested with a digital multi-meter (DMM). The transformer was tested using an AC power source. The multiplier and the inverter were tested using appropriate circuits. System tests were performed to ensure that the circuitry and the laser would perform as expected without overheating. The power supply operates the laser within the operational specifications without overheating. The power supply’s dimensions and weight allow it to be portable, although it will be primarily used in the Electromagnetic Laboratory for demonstrations at Mercer University School of Engineering. The Plexiglas enclosure gives a clear view of the laser tube, making it very easy to demonstrate how a laser works. The power supply’s size and weight, as well as its ability to be operated with batteries (DC), make it possible to demonstrate the operation of a laser at any place.
Promoting Engineering at an Inner-City Chartered School

Ashley Bernal and Alan Gravitt

School of Mechanical Engineering, Georgia Institute of Technology/Center for Sustainable Technology, Tech High School

EXTENDED ABSTRACT

Tech High, a charter high school located in Atlanta, Georgia, was created in 2003 in order to deal with the student performance needs and the shortage of highly skilled workers required by Atlanta’s high-tech community. The demographics of Tech High are as follows: 96% black students, 4% white students, and 66% of the students are eligible for free/reduced lunch. Because Tech High is a charter school, it has flexibility to implement innovative curricula such as the Center for Sustainable Technology (CST). One of the goals of CST is to promote engineering as a career option through over a dozen different projects. Three of the projects currently being implemented are: the conversion of an old motorcycle into an electric vehicle; altering a diesel car to run off of vegetable oil, and the adaptation of an enclosed trailer into a mobile workshop and lab. Other planned projects for this year include solar collection, solar concentration, sustainable gardening, methane and hydrogen production, and the conversion of a house trailer to a high efficiency, off the grid residence.

Promotion of engineering as a career choice is not only done through these hands-on projects but also through the involvement of Georgia Tech students through the Student and Teacher Enhancement Partnership (STEP) NSF GK-12 program. Georgia Tech students come to Tech High weekly in order to conduct engineering lessons and act as mentors. They also help ignite students’ curiosity through Georgia Tech lab tours. The CST course is graded using a mastery method in which the course is divided into sections and points for each section are not awarded until the student scores at least a 90% on the section test.

The success of this grading method along with lessons learned about developing engineering courses for high school students will be addressed. As will be shown, promoting engineering at the high school level can be a challenging task but with patience and determination it can be done. The students in this engineering course are starting to take their own intuitive in their projects and are excited to come to class. Many of the students have commented that they cannot wait to go to college to get their degree in engineering, which is really rewarding. Therefore, overall the engineering course has been a success despite the usual classroom interruptions and misbehavior.
Effect of Temperature on Dry Cell Life Span: A Case Study

R. Radharamanan and Jeng-Nan Juang
Mercer University, Macon, GA 31207 / Mercer University, Macon, GA 31207

EXTENDED ABSTRACT

In this paper, the lives of dry cells using a flashlight at different temperatures were tested. The dry cells used were heavy-duty (non-alkaline) batteries using zinc and carbon electrodes. The objective is to see whether a dry cell's life span is affected by temperature because the dry cell relies on a chemical reaction to generate its energy, and typically, as temperature increases, the rate of chemical reaction also increases. The batteries were subjected to a specific temperature, 72°F and 170°F, for 15 minutes and then run until the light emitted by the flashlight was determined not visible anymore. Once the tests were completed, the data were analyzed and the results indicated that temperature has a significant effect on the life span of dry cell batteries. Finally, the chemical reaction's overall activation energy equation was solved using the average life spans of batteries measured.

Conclusions

Once the tests were completed, the data were analyzed and interpreted using ANOVA, residuals, confidence interval, and Tukey's test to determine if temperature affects the life expectancy of dry cell batteries. Analyzing the results from the ANOVA table, it can be concluded that temperature has a significant effect on the life span of dry cell batteries. The residual plots indicate that the errors tend to follow a straight line indicating normality; the variance is constant between errors; and there is significant difference in mean battery life expectancy between 72°F and 170°F. Tukey's test also indicated a significant difference in the means for battery life at different temperatures. However, Tukey's test did not provide any value added information since only two treatment means were being compared. From these findings, it can be concluded that increase in temperature decreases the life span of dry cell batteries by altering the rate at which the internal chemical reaction takes place; and many spares would be needed if the equipment being used was subject to high environmental temperatures.

Recommendations

For future research and development, different brands of AA batteries could be tested and analyzed by measuring voltage, current, or power. The experiments could be run until the battery voltage reaches 5% of the starting voltage. This may also be applied to larger sized batteries. Studies may also be performed on different types of batteries such as lead-acid, lithium-ion, and zinc-air batteries as well as based on the user's environmental and situational needs.
Synchronizing International Service Learning with ABET Outcomes
Pauline Johnson¹, Beth Todd²

¹Associate Professor, Department of Civil Construction & Environmental Engineering, The University of Alabama, paulinej@eng.ua.edu / ²Associate Professor, Department of Mechanical Engineering, The University of Alabama, btodd@eng.ua.edu

EXTENDED ABSTRACT
The international service learning experience for engineers at The University of Alabama engages students in leadership and teaming roles on service projects for academic credit in remote Peruvian Amazon villages. During this experience students practice some of the skills necessary for the challenges of engineering in a globalizing profession and demonstrate accreditation learning outcomes not easily taught in traditional classrooms. The service part of the course has involved the planning and installation of a range of projects in five remote Amazonian villages. Students live and work with villagers on installations in accordance with the Engineers Without Borders™ model. Students on the trips also participate in a formal post-trip assessment. They score elements of the experience using the five-level Likert scale to evaluate twelve course elements that include ABET outcomes. In addition, the students are asked four open-ended questions that allow for both qualitative assessments and additional comments. Among the outcomes that serve as an assessment basis for engineering accreditation, students agreed strongly that it was an effective learning experience with regard to communication, learning outside the classroom, teaming, and assessment of societal impacts. They agreed, but not as strongly, that it was a valuable learning experience regarding leadership. The student assessment is consistent with feedback the instructors have received following similar service learning trips. Learning outside the classroom box is the real deal and teaching outside that box has similar rewards for faculty.
Solid Model Numerical Representation: An Emerging Skill for Engineering Graphics Students

Cameron W. Coates¹, Kam Fui Lau¹, Michael Brown²

¹. Armstrong Atlantic State University, Savannah GA, 2. OpenVision Inc. Hilton Head SC

EXTENDED ABSTRACT

An IGES Parser Utility program has been developed that enhances the ability of an engineering student to interpret solid model data and use this data to understand how engineering graphic components are represented by numerical data files and their transferability among different CAD programs. The program is designed such that it can be used consistently throughout the Engineering Graphics course with several topics within the course. It is also designed to integrate easily with web based and other digital media applications. The Utility program is designed to serve as an efficient and convenient tool for Engineering Graphics instructors who wish to develop modules on solid model numerical representation for their course.

In the Armstrong Atlantic State University Engineering Studies program, we use SolidWorks CAD software in our Engineering Graphics course. The SolidWorks preprocessor is able to convert its files to many formats, including the IGES file format, which is the industry standard ASCII file used for engineering drawings.

The IGES Parser Utility is a 32-bit Microsoft Windows® based software application. The data is provided in tabular form such that the entity designation, value and description are distributed among three columns. The functional purpose of the software application is to parse and display in a readable format various sections and data contained in an IGES (Initial Graphics Exchange Specification) file. Primary functionality includes but is not limited to: File open dialogs, Tree view structure of IGES file sections and data, Web-page style summary of IGES file sections, Web-page style detail of IGES file section data, 3D CAD viewer for representation of the object and Print and print preview dialogs.

In this paper, we describe the IGES file structure, the software platform and development tools, the code architecture, and the software architecture of the IGES Parser utility. An example of the parameter data immediately available to the student or instructor is also provided. The background, objectives and justification for the application are described and implementation plans are proposed.
The Systems Biology and Bioengineering Undergraduate Research Experience at Vanderbilt University

Kevin Seale, Patricia Armstrong and John Wikswo

Department of Biomedical Engineering, Vanderbilt University/ Center for Teaching, Vanderbilt University / Departments of Biomedical Engineering, Molecular Physiology & Biophysics, and Physics

EXTENDED ABSTRACT

We describe an ongoing program at Vanderbilt University centered on independent, long-term undergraduate research, the Systems Biology and Bioengineering Undergraduate Research Experience (SyBBURE). The program is loosely structured with the intention of enabling young students to fulfill the most basic and appealing aspect of scientific research: curiosity-driven experimental discovery and peer-to-peer communication of results. Microfluidics and biomicroelectromechanical devices are part of an exciting new wave of technology for studying biological systems and have proven well suited for training undergraduates in hands-on fabrication and laboratory experimental techniques. The encapsulation of idea generation, device design, fabrication and experiment within the experience of a single student leads to powerful opportunities for instruction in foresight, craftsmanship and outcome assessment – often with a redoubling of student motivation over time. SyBBURE is highly interdisciplinary, with faculty and staff project leaders from the Natural Sciences, Engineering, and Medicine. In notable cases the student-researcher becomes a bridge between basic bench research and more clinically focused laboratories. Short-term, high-risk, high-benefit projects that are inappropriate for grant-funded graduate students on a PhD track are ideal for undergraduates. The work can be demanding, so SyBBURE has significant attrition. We believe this is doubly effective as an early identifier of those students that might not be inclined to excel in graduate research, and rigorous preparation and credentialing for those students that are. SyBBURE efficiently identifies students with an inclination and aptitude for scientific research and prepares them for the challenges of a career in science. While quantitative outcomes cannot be obtained without a control group, independently assessed qualitative feedback suggests the program is highly effective in stimulating learning by actual problem-solving, cooperative approaches to science and communication of scientific problems and data.
A Laboratory Component of a Switching Power Supply Course Requiring Nominal Resources

Walter E. Thain

Southern Polytechnic State University

EXTENDED ABSTRACT

A graduate electrical engineering technology course in switching power supply design was created with a laboratory component having a practical focus. Important goals for the course were to avoid the use of specialized laboratory equipment and to select experiments minimizing the usual safety concerns associated with high voltages and currents. Furthermore, the course and laboratory component emphasized the close coupling of theory, simulation, fabrication and testing. Several of the experiments are constant from one semester to the next, and a small project that varies each time is selected that requires students to apply key principles highlighted in the course. The experiments utilize low-power converter circuits based on Linear Technology’s controllers and components. This enables students to use that company’s free and versatile SPICE-based simulator that includes models of their devices, allowing students to realize simulations that closely match experimental results. It also avoids the need for students to design controller models that often include proprietary functions and circuitry. Power supply switching frequencies are selected so that circuit waveforms can be displayed with reasonable accuracy on 100 MHz oscilloscopes. Students are required to build their circuits on a circuit board having a ground plane so that the influence of parasitic elements is reduced and the probability of a successful implementation is high.
EXTENDED ABSTRACT

A recurring challenge for engineering educators is to discover and teach the critical competencies that each generation of engineers must acquire in four short years. Moreover, it is exceedingly difficult to recognize the emergence of a definite need for curriculum innovation within the multitude of dynamic requests and recommendations from employers and institutional researchers. Curriculum innovation is particularly important and challenging during periods of technological revolution, changing economic landscapes, and resource scarcity such as those being ushered in for the 21st century. As information and communications technology evolve, engineering and technical programs also evolve. Programs are continually engaged in balancing and refining the roles of analysis, design, systems thinking, creativity and collaborative problem solving while assuring that students stay grounded in engineering fundamentals. This paper describes a multidisciplinary, process-focused approach that gives technical students experience solving ill-structured, design and development problems. The course focuses on the collaborative design and systems engineering related skills that the National Academy of Engineering has deemed critical to American competitiveness in the 21st century. In addition, it provides students with a basic understanding of the principles and body of knowledge of product development. Multidisciplinary in the context of this paper refers to engineering technology and other technical disciplines. The prototype vehicle is an honors course, titled “Bringing a New Product to Market from Concept to Launch”. Multidisciplinary teams collaborate to solve ill-structured, real world problems, design a virtual product, develop a launch plan and present their results. Students learn process analysis methods and concurrent engineering practices developed and used by corporations, industrial and systems engineers, and quality professionals within the context of the design and development of a virtual product. Assessment tools include conventional exams, final team reports and presentations. The course differs from the traditional capstone design course in that students learn to integrate their specialized knowledge with that from other technical disciplines. In addition, the course supports the Southern Polytechnic State University’s Honors Program and teaches students how the principles of process management and systems engineering are applied in practice to product design and development.
Enhancing the Distance Learning Experience: Designing Virtual Classroom and Laboratory Environments

Charles J. Lesko, Jr. Ph.D. and John L. Pickard

East Carolina University

EXTENDED ABSTRACT

New virtual environments are evolving to a point where academics can visualize the benefits of these more socially interactive distance media. A first step in evaluating these virtual environments is to build virtual classrooms, meeting spaces, and laboratories that look to improve the distance student’s ability to collaborate and interact. The next step is to identify new ways to interface with existing classroom and lab materials. The goal is to accelerate the process of building out new virtual course offerings and also provide distance-based class platforms for further study and analysis. Finally, evaluating the effectiveness of these newly built virtual classrooms and laboratories is critical to any proposed pedagogical presentation.

Current efforts have focused on the building of several classroom and laboratory environments in the Second Life virtual space. Discussion includes efforts to identify, design and develop virtual environments that enhance the learning experience for distance students. Further observations describe the conduct of several other academic events conducted in these newly established virtual spaces including holding office hours, completing lab assignments, giving group presentations, working with student project teams, and conducting class lecture meetings virtually.

This paper documents courses of action taken by the authors in the development of virtual classrooms, meeting spaces, and learning labs in the realm of Second Life where students and faculty can conduct effective and meaningful academic activities. Key discussion areas include choosing a virtual environment, virtual classroom and meeting room design considerations; virtual lab and workspace design considerations; preparations for successful initial virtual meetings; and a look toward future virtual design efforts.
KISMET: An Open-Source Process for Faculty Participation in ABET Accreditation

Ravi Shankar and Ankur Agarwal

Computer Science and Engineering, Florida Atlantic University, Boca Raton, FL

EXTENDED ABSTRACT

ABET accreditation visits are met with much trepidation at the host institution. Apprehension may arise out of ‘unforeseen’ and ‘unreasonable’ requests from the visiting ABET group. However, the host group may also have failed to anticipate such requests. This is possible because of the high stakes associated with the accreditation process. The tendency for the administrators would be to let a few ABET-experienced steady hands to steer the currents. It would be considered unwise and risky to involve a novice and to consider new initiatives. This prevents an open and constructive dialogue, and the ABET experienced faculty members may find it difficult to adapt to new expectations from ABET (for e.g., continuous improvement). The process in general stagnates because of lack of infusion of fresh ideas and initiatives. Interestingly, once one gains insight on the rationale behind ABET’s accreditation process, it becomes obvious how one could use the ABET process as a living document and reap benefits from it.

KISMET (Keep It Simple and Measurable for Effective Teaching) takes a holistic approach to make ABET documentation a living document and empower all faculty and staff members to participate, discuss, improve, and benefit from it. It incorporates all the initiatives that faculty members and department committees would have had into an integrated open-source document. It helps one build a community of learners and teachers, who share each other’s knowledge and expertise. This helps the department to prosper as a whole. This formalization also helps build the documents that ABET group will need during their visits, with historical evidence. A more robust process with significant potential for continuous improvement will ensue.

KISMET sub-processes have existed informally in our department; we integrated and published them internally; this enhanced visibility, fostered discussion, and induced energetic participation and creative solutions. We have documented the process in the paper using Dr. Dori’s OPM (object process methodology). OPM combines formal yet simple graphics with natural language sentences to express the function, structure, and behavior of systems in an integrated, single model. Objects and processes are the two main building blocks that OPM requires to construct models. OPM has been used by other investigators to describe complex systems with many concurrent processes. Our model shows three concurrent processes that are inter-related: student graduation, continuous improvement (of the curriculum), and (program) accreditation. An explicit model helps all to undertake a holistic approach towards building a robust program.

We will present the model and discuss KISMET’s impact on curriculum and accreditation.
Successful Interventions for Engineering Student Retention

Aliecia R. McClain and Sandra J. DeLoatch
College of Science, Engineering, and Technology
Norfolk State University

Abstract

The College of Science, Engineering, and Technology (CSET) at Norfolk State University (NSU) offers a rigorous honors program for students who major in engineering and other science and technology disciplines. The program was established in 1986 to reduce the shortage of minority scientists by producing highly trained graduates capable of earning advanced degrees. Students receive full scholarships, book stipends, and other special considerations for their participation in the program. Students are also encouraged to apply for and participate in summer research programs. Currently, the graduation rate for students who enter the honors program is approximately 70%. The average graduation rate for the university is approximately half this number. In order to enhance retention and improve the graduation rate of these students, a more proactive and integrated set of activities has been introduced. Interventions include an enhanced summer bridge program for entering freshmen with a greater emphasis on mathematics skill development; socialization to the discipline; and required peer-tutoring, collaborative learning, and mentoring activities. The goal of these initiatives is to create a comprehensive and supportive learning environment that promotes student success in engineering as well as other science and technology disciplines. An analysis of academic performance data for the past few years suggests these integrated approaches have been effective in enhancing the success of engineering students. Moreover, these structured academic support initiatives may be considered as “best practices” that can be expanded to include all STEM students at Norfolk State University. This paper will present details on the interventions and student accomplishments.
Integration of Industry-Sponsored and Design Competition Projects in the Capstone Course

D.R. Waryoba, C.A. Luongo and C. Shih

Department of Mechanical Engineering, FAMU-FSU College of Engineering, Tallahassee, FL.

EXTENDED ABSTRACT

For the past ten years, the capstone senior design projects in the Department of Mechanical Engineering at the FAMU-FSU College of Engineering have evolved from a few (~10%) industry-sponsored projects to an overwhelming majority (~90%). This transition was adopted based on the fact that these types of projects offer realistic problems (open-ended), assist in the placement of students, and harbor student-client (industry) relationship and the ability to pursue design under conditions of shifting requirements. A few of the projects are, however, either sponsored by internal faculty or involve national design competitions. Most of our competition-based capstone projects are sponsored by the American Society of Mechanical Engineers (ASME), American Institute of Aeronautics and Astronautics (AIAA), or the Society of Automotive Engineers (SAE). Unlike industry-sponsored projects, competition-based design projects, favored by many engineering programs, present problems that are fairly well-defined, with concise guidelines, constraints, and specifications as stipulated by the professional societies that usually sponsor these student competitions.

This article compares the effectiveness of these two types of projects: the completely open-ended externally sponsored and the relatively well-defined competition-based design projects, with the aim of identifying “best practices” for integrating the two forms of projects in the capstone design courses. Despite their diverse differences, our experience show that their ‘strengths’ and ‘weaknesses’ are worthy of ‘mixing’. We can draw some conclusions in terms of pros and cons for each kind of project. Industrial projects provide a superior platform to teach systems engineering and the product design cycle methodology as most problems are truly open-ended and often exhibit shifting requirements. Students gain significantly from the interaction with a practicing engineer sponsoring the project. In the end, students feel a higher sense of achievement and feel better prepared for a professional career. On the other hand, national competitions improve teamwork and provide an excellent platform for design and prototype test. The projects tend to be hands-on and provide a better avenue for prototype development, test, and iteration, sometimes in detriment of a more rigorous analysis and design methodology. One of our challenges moving forward is to blend the best each kind of project has to offer as educational platforms.
Stormwater Pond Beautification in East Tampa: The Basis for University, K-12, and Community Partnerships that Broaden Participation in Environmental Engineering

Ken D. Thomas, Joniqua A. Howard, Erlande Ominca, Trent Green, Maya A. Trotz

Department of Civil & Environmental Engineering, School of Architecture, University of South Florida, Tampa, FL, 33620

Stormwater retention ponds play a vital role in flood and pollution control in communities throughout Florida. Community funded revitalization programs in East Tampa, an economically disadvantaged urban area, include beautification efforts of stormwater ponds, but do not address water quality, maintenance or potential impacts on the pond and community members (from fish consumption) posed by increased accessibility and use of the ponds. The Engineers for a Sustainable World University of South Florida Chapter (ESW-USF) received an EPA P3 award to establish a collaborative mechanism involving USF faculty and students, Young Middle Magnet School (YMM) (an East Tampa middle school adjacent to a pond that was beautified) and East Tampa community members that effectively raises environmental awareness in East Tampa using stormwater ponds as an initial focal point. This project builds on USF-community education and research collaborations and ESW-USF experience with K-12 outreach in Tampa. Some student assignments in the undergraduate Environmental Engineering Laboratory at USF are linked to this project through water quality analysis. Informal education was done during East Tampa’s Community Survival Day in August 2008, which attracted over 800 community members where the ESW-USF booth provided hands on activities related to water and appropriate literature donated by local agencies like the South West Florida Water Management District. Through community education and awareness, local pollutant inputs to storm water will be reduced - an activity that not only impacts local pond water quality, but also water quality in the Tampa Bay. Outputs from this project include: a) curriculum development for students at YMM, b) stormwater retention pond demonstration modules and community tour; c) baseline water quality data collection for three retention ponds in East Tampa and establishment of a sustainable water monitoring program that links USF classes with YMM’s seventh grade class.

Key words: Community, outreach, K-12, education

Jennifer Pascal, Mario Oyanader, and Pedro E. Arce
Department of Chemical Engineering
Tennessee Technological University
Cookeville, Tennessee.

EXTENDED ABSTRACT

Applied field sensitive technologies are a very relevant and relatively large family of problems in chemical engineering applications. The key characteristic involved in these processes is the presence of an external field, i.e. electrical, acoustic, magnetic, or photon-based that requires an additional conservation equation compared to the mass, momentum and energy regularly needed in the more classical applications. These problems are relevant to applications in environmental, biomedicine, and material manufacturing. Soil cleaning, drug delivery, clinical diagnostics and others are some of the examples related to these applications.

The presence of an additional conservation (field) equation and the coupling with variables such as velocity, temperature and concentrations makes the analysis of such systems very challenging. These processes can require electrical fields at low and high values. We focus in this contribution on applied sensitive electrical field processes and the analysis of their fundamental behavior. The contribution will present a systematic approach where research can be conducted efficiently by using the convective-transport model suggested by Bird, Stewart and Lightfoot (2001) adapted for the case of electrical fields. The description is based on a two domain approach, i.e. the “fluid” and the “solute” domains that have successfully been used to describe, for example the role of different driving forces in EK soil cleaning by Arce et al. (2008) and optimal separation times in electrophoresis applications (see, for example, Pascal et al., 2008).

The description also effectively uses methods borrowed from the spatial-averaging techniques originally introduced by Whitaker, Slattery, and Carbonell to complete predictions of the system behavior without actually solving the conservation equations. Problems related to bioseparation of macromolecules, soil cleaning and nanocomposite gels will be used as illustrative examples.

A Learning Lesson from Thermodynamics: Ideal Fluids. Not True in Transport!

Jennifer Pascal and Pedro E. Arce
Department of Chemical Engineering
Tennessee Tech University
Cookeville, Tennessee

EXTENDED ABSTRACT

Many of us would most likely remember that Thermodynamics was not a trivial subject from a learning point of view. However, the instructor focused in the introduction of basic concepts on ideal fluids and mixtures and their behaviors first. Therefore, the law of ideal gases was an important learning tool to describe the system behaviors in many topics. Likewise, ideal mixtures were very useful when the focus switched to systems with more than one component. Only after students have mastered a good level of understanding of the subject, real gases and fluids as well as real mixtures were introduced.

The picture described above is entirely different when one analyzes the textbooks related to the subject of transport phenomena with the exception of the analysis of hydrostatics. Here, the nature of the fluid from the point of view of the ideal vs. real behavior is irrelevant since the fluid velocity is zero. As soon as focus of the subject switched to fluid motion, the textbook introduces the not very inviting tetrahedral domain analysis of tensions and stresses and incorporate the items into the momentum conservation equation. This is done at a point where students do not even understand motion. Moreover, ideal fluids are considered in many textbooks as a graduate level subject!

In this contribution, the authors introduced a very systematic analysis of the momentum conservation equation by using ideal fluids. The efforts will show the enhancing effect on learning by following the analysis of different cases without the complications of viscous flows and the associated viscous flow theory. The contribution also introduces an effective way of studying the cases of viscous flows after many of the basic cases of motion has been studied with ideal fluids. Illustrative examples and discussion will be offered in the presentation. One important item to guide the analysis is the up-scaling approach recently illustrated for the case of diffusion and reaction in a catalytic pellet (see Arce et. al, 2007) where a macroscopic approach, i.e. up-scaled learning model is used to introduce the conservation principle. Afterwards, a down-scaling approach is used to obtain the microscopic conservation equations and the identification of the Euler equation of motion (Bird et al., 2001).

POK’s: Useful Tools in Planning Learning Objectives for Courses

Pedro E. Arce, PhD
Chemical Engineering Department
Tennessee Tech University
Cookeville, Tennessee

EXTENDED ABSTRACT

Principal Objects of Knowledge or POKs were introduced in 1994 (see Arce) as part of the Colloquial Approach environment for learning and they were generalized in 1999 (see Arce) for a variety of situations in transport phenomena. The basic characteristic of these learning and visualization objects is that they integrate a number of concepts that, usually, appear unlinked from a student point of view. Several examples have been identified and include the Fourier constitute equation in heat conduction (and other similar equations in mass and momentum transfer), the soccer ball model for the up-scaling in continua (see Arce 1994 and Arce et al, 2008) and the catalytic pellet (see Arce et at al. 2007) among others.

The POKs are excellent tools for planning learning objectives for courses since they efficiently reduce the number of topics that students must handles (individually) and offer a powerful linker to applications. Students are exposed to an object that allow for an effective visualization of the connection of the different topics within the course material. For example, for the case of the Fourier Law, this includes heat fluxes, gradient, material properties and linear equations. By using the POK, students now efficiently are introduced (and connected) to a variety of subjects that, otherwise, would appear unlinked. In this presentation, the author will discuss the role of POKs in planning learning objectives in courses and present a strategic tool for effectively selecting these objectives and sequentially organize the material delivery. Illustrative examples related to transport and reaction courses will be discussed.

Developing an Efficient Transformational-Based Leadership Model for Academic Units

Pedro E. Arce, PhD
Department of Chemical Engineering
Tennessee Tech University
Cookeville, Tennessee

EXTENDED ABSTRACT

The old fashion and “solo” playing, “plantation” style administrative model present in many places in academia should be a thing of the past. Within vertical and inflexible structures where, for example, the “wisdom” or solo view of the chief administrator/s of an academic unit not only lead to unmotivated key elements of such academic unit including faculty, staff, and students but also forbid opportunities for innovation and effectiveness. In short, catalytic action for promoting and implementing novel and powerful ideas that will enhance excellence within a given academic units are seriously hindered within this environment. Fortunately, there is an efficient and recognized approach to bring healthy changes to the situation described above. This is the transformational leadership approach that, when implemented correctly, has the potential to move an academic unit towards a renaissance environment where everyone now find an important and valued (by the other team members) role in moving the unit towards higher level of excellence. Maybe the approach will not bring exactly the idealistic “Camelot” round table style of leadership but it is a great engineering approximation to it. Some of the most successful business companies (see Liker, 2004; Sawyer, 2007) are now engaging all levels of employees in a team-based and community environment that leads to more and powerful initiatives and continuous improvement in a way that was almost impossible to foresee within the old fashion administrative approach.

Since academic units are, in a sense, business organizations that need to satisfy customer demands, deliver a quality product, and stay in healthy business, they will benefit from a more team- and collaborative-based approach of the upper leadership; thus, transformational-based leadership models could be an excellent option. This implies an important change of culture within the organization where roles of individuals and values of the unit need to be carefully re-calibrated. In fact, the unit needs a new and (more) sharing model where individual contributions are viewed as a function of the benefit for the entire unit and qualifications of leaders are judged more on a functional base rather than on a preset of values that may or may not be relevant. By using the efforts at Tennessee Tech University Dpt of Chemical Engineering, the author will analyze and illustrate the key aspects involved in developing a transformational leadership model.

Simulation on Human Body Injury Locations
during a Fall due to Slip

Ha Van Vo and R. Radharamanan

Mercer University, Macon, GA 31207 / Mercer University, Macon, GA 31207

EXTENDED ABSTRACT

Most of the engineering projects at Mercer University School of Engineering require some level of simulations before the construction of prototypes or experiments. This paper presents one such study where students carried out simulations on human body injury locations during a fall due to slip. The objective of this study is to analyze the varying forces in the fall injuries that depend on the location of the center of gravity of the body of angle of slip. Force versus time dependent simulations were carried out using Lifemod software for thoracic and lumbar vertebrae. An example of a fall injury was carried out and the simulation results showed that the highest compressive stresses occur at the lumbar vertebrae (2,250 psi) and thoracic vertebrae (1,750 psi) respectively. The stresses calculated were significantly lower than the ultimate stress value of cortical bone (13.1 GPa). It can be concluded that there will be no bone fracture occurring at the vertebrae but there will be possibly ligaments and muscles tearing.

Materials and Methods

This study focused on using a computational software modeling called Lifemod, which can be used to predict human motion when subjected under loading conditions. In order to use the software correctly, four steps were followed to arrive at the results: create 3D skeletal model, attach muscles and skin to the skeleton, assign materials property and boundary conditions, and run the simulation. The skeletal body was created for a 170 pound person with a height of 5’5”.

The units were set to foot, pound mass, and pound force. The center of gravity (COG) is located 2 inches anterior to sacrum S2; and the joint stiffness is 1 ksi (Using the joint stiffness of the Hybrid III dummy of Lifemod). The second model shows the skeletal system along with joints that were created to simulate the injury mechanics of a slip, trip and fall injuries. The muscles were then added to the skeletal body and it was finally covered with skin as shown in third model. The limbs were then positioned such that the human body mimics the ideal position during the fall. The cases were carried out for COG angles 15°, 25°, 35°, 45°, and 60°.

Conclusions

The lumbar force magnitude increases with increasing in angle of slip from 15° to 35° and decreases with increasing in angle of slip from 35° to 60°. The maximum lumbar force magnitude occurs at a slip and fall at 35° angle. The magnitude of the lumbar force decreases from 35° to 60° angle of slip due to the increasing in moment arm in the x-axis which decreases the vertical lumbar force impact in the y-direction. Similar biomechanical forces are acting on the thoracic region.
A Multicourse Effort for Instilling Systematic Engineering Problem Solving Skills Through the Use of a Mathematic Computer Aided Environment

Rogelio Luck and B. K. Hodge
Department of Mechanical Engineering, Mississippi State University

EXTENDED ABSTRACT
This paper describes a coordinated, multicourse effort at the Mechanical Engineering (ME) Department at Mississippi State University (MSU) to inculcate disciplined/systematic engineering problem solving skills through the use of mathematical worksheets such as those found in Mathcad, Derive, Macsyma, Maple, Mathematica, or TK Solver. The advantage of these worksheets is that, with proper guidance, students can learn a methodical approach that allows for a better understanding on how to approach and solve engineering problems as compared to using pencil, paper, and/or graphing calculators. For ME students at MSU, these worksheets are required in three courses: Engineering Analysis (EA), System Dynamics (SD), and Energy Systems Design (ESD). In EA and SD, students are required to solve homework using Mathcad worksheets following a strict, professionally presented, homework format consisting of clearly formulated Given, Find, Solution, and Verification/Validation sections. The Given and Find sections of the homework format are in congruent with the Given and Find formulations in Mathcad for solutions of algebraic and differential equations. Furthermore, the Mathcad Given and Find commands are very helpful in conveying the importance of describing the problems in a mathematically well-posed manner. The Verification/Validation sections are considered of equal importance as the Solution section during grading. Students are required to show that their answers are reasonable by checking that the units are consistent, the magnitudes are reasonable, and the models/equations behave as expected. The physical units processing as well as the 2D and 3D plotting features of Mathcad are heavily used in these sections. Finally, the ESD course, takes the previously acquired problem solving skills one step further into engineering design scenarios. A significant advantage to sequencing courses in this manner is that students spend more time (and effort) in engineering functions (formulation, verification, and validations) than in the arithmetic function (primarily accomplished by Mathcad). Details, examples, and assessment of effectiveness are be discussed in the paper.
Pimp My Browser: Browser Plug-ins Enhance Undergraduate Research
Andrew Wohrley

EXTENDED ABSTRACT

Undergraduate research should be built upon the literature search. Today, an undergraduate can search an online index to find articles, write the paper on a word processor, perhaps organize the articles with citation software, and finally, use translation software to get a rough sense of a foreign language article. Now consider using browser plug-ins to manage all these tasks. Students can now customize the browser to serve their needs. Open Source software allows this.

The browser is the ideal place to put all these research functions, yet up to now librarians have ignored the possibility of browser customization. The introduction of LibX for easy access to library catalogs, Zotero for citation management, and other add-ons puts powerful technology in the hands of undergraduate researchers looking for help in their research.

Unfortunately, some people still are not aware of the browser add-ons that could enhance undergraduate research, both faculty and undergraduates. There are more add-ons than could be mentioned in this paper, but some of them include LibX, Google Translate, and Zotero. LibX is an Open Source toolbar that makes the library catalog “instantly on” for students. Google Translate provides a good, but not perfect, machine translation of web pages written in the major languages. Zotero is citation management software built into the browser and can also interoperate with Microsoft Word.

These add-on enhance the browser experience by making research both easier and more effective for the undergraduate.
Homework Solutions Using *Smartboard*
Peter W. Hoadley

**EXTENDED ABSTRACT**

Solutions to homework problems are a staple in engineering courses. Often hardcopies of completed solutions are kept in a file folder for student use. Scanned copies of completed solutions or electronic versions using Excel, MathCad, etc. may be placed in an electronic file folder or posted on the web. These posted solutions do not necessarily describe the thought process necessary to solve the problem. An explanation of the process is often what a student needs. There are several pieces of software available that may be used to record the process of engineering problem solving.

*Smartboard* is one piece of software that may be used to record homework solutions. One may import figures and text from homework assignments into a Smartboard file and then annotated the files with audio commentary. Windows Media Player may be used to replay the file. Several tutorials were created for a junior level structural analysis course and students will be surveyed to measure how the tutorials affect learning.

The proposed presentation will demonstrate the software and describe student response.
Results of a Study using the Motivation Strategies for Learning Questionnaire (MSLQ) in an Introductory Engineering Graphics Course

Aaron C. Clark¹ Jeremy V. Ernst² Alice Y. Scales³

Abstract – This paper will present data related to a study conducted at NC State University in the spring of 2008 that focused on student motivation in an introductory graphics course. This study conducted a motivation and learning assessment using the Motivated Strategies for Learning Questionnaire (MSLQ) Attitude Survey. Thirty-one of the questions related to motivation, out of the 81 on this questionnaire, were used for the study. The motivation questions on the MSLQ survey focuses on six areas associated with student learning and motivation. These areas were intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy learning performance, and test anxiety. Seven sections of the introductory engineering drawing course were surveyed, with a total of 161 participants. A one-sample Chi Square was performed on the data to determine the association of specific questions to each other in a category as well as their association to a category. Findings from the study included some identification of enduring motivational factors for learning graphics education. Insights into the strategic learning process of students in a graphics education course will be discussed. Also, areas of concern for future pedagogical development and course improvement will be highlighted. From the data collected for this study, it can be observed that grades, relevance of content, and understanding subject matter are the main factors that affect students’ motivation. The

¹ NC State University, Box 7801, Raleigh, NC 27695-7801, aaron_clark@ncsu.edu
² NC State University, Box 7801, Raleigh, NC 27695-7801, jeremy_ernst@ncsu.edu
³ NC State University, Box 7801, Raleigh, NC 27695-7801, alice_scales@ncsu.edu
Concept Map Presentation Tool (CMPT): Teaching Wireless Communications using Concept Maps

Rasha Mori1 Wael Ibrahim2 Edward Jackson1

Abstract – Engineering education and its reach beyond the traditional classroom setting has dictated the need for new forms of content development and presentation. The need for interactive environments that teach as well as “entertain” has become the heart of recent engineering education research. Prevalent concerns for educators usually encompass student learning and mastery. The ability to present students with an aggregate view of the topic taught and maintain at the same time the interrelationship of key areas is critical to a better understanding and student engagement. The variations in student’s abilities and perceptions often impede learning if they are not taken into consideration when planning curriculum and pedagogy. Concept maps have been used extensively across multiple engineering disciplines and are considered to be a useful tool for active learning as well as for learning assessment and evaluation. The graphical and process-based nature of concept maps is thought to complement engineering education due to the belief that engineers are predominantly visual learners. In the past, concept maps have been used in Mechanical, Chemical, and Computer Engineering. This work investigates their use in Electrical Engineering.

The ‘Concept Map Presentation Tool (CMPT)’ presents an aggregate view of main concepts in a concept map conjoined with propositions lay down the map to better understand the ‘big picture’. Faculty have the ability to embed within the ‘map nodes’ their drill down learning resources, e.g., presentations, assignments, media files, etc. The structure of the map and ‘location tracking’ enables students to explore different concepts while maintaining awareness of the interrelationship between those concepts. With the wide variety of embedded learning resources, the tool can target different learning styles and provide a valuable aesthetically engaging resource for content development and delivery. CMPT is developed through an NSF funded research project (DUE-0501781). It utilizes a dual-mode delivery method. The first mode is a file tab structure where the learner can navigate from the main concept map to sub-concepts. The second mode is a directory structure style layout of all concepts in the concept map. CMPT was developed using Adobe Flash 8.0 (formerly Macromedia Flash) [1]. The choice of Flash as the implementation platform was due to its wide availability to users. The project targeted both 2 year and 4 year college students in the wireless communications field. CMPT was designed and developed and a Wireless Communications concept map set was developed and used to show the desired functionality of the tool.

1 Norfolk State University, Virginia; Email: rmorsi@nsu.edu, e.d.jackson@nsu.edu
2 ECPI College of Technology, Virginia; Email: wbrahim@ecpi.edu

2009 ASEE Southeast Section Conference
The Pedagogy of Form versus Function for Industrial Design

David Domermuth, PhD
Appalachian State University

EXTENDED ABSTRACT

Industrial Design is a combination of science and art. Determining the balance of the two is a preeminent challenge for teachers. The function is dominated by science/engineering principles while the form is an artistic/aesthetic expression. The teacher has a limited number of courses to present the foundational material while leaving enough courses to practice designing. This paper presents an objective summary of foundational courses, programs of study from various institutions, program evaluations by industrial experts, and a discussion about predetermined student success. A summary of accreditation requirements and how they affect the programs of study is also included.

This on-going research project found that most Industrial Design programs in the United States are heavily centered on teaching product form and give little attention to product function. This is true for programs accredited and unaccredited by NASAD in spite of NASAD’s competency requirements of a significant coursework of a functional nature. Design firms agree that recent graduates from many Industrial Design programs lack sufficient training in the functional aspect of products. The recommendation of this research is the inclusion of additional coursework concentrating on how products function. This research also brought out the necessity of understanding about the left/right brain characteristics of design students. Potentially successful design student must have a strong right brain with its creative nature and concentration on form. One challenge for design teachers is helping student train their left brain and develop an appreciation for the functional aspects of product design.
Civil Engineering Outreach with Middle School Age Students

Rod E. Turochy, Department of Civil Engineering, Auburn University

Abstract – This paper describes an outreach effort to introduce civil engineering to middle school aged children. A course consisting of nine 75-minute sessions was developed in which basic concepts of civil engineering were explained and reinforced with a wide variety of activities. These sessions introduced civil engineering, covered the basics of forces and moments, provided depth on each of the subdisciplines of civil engineering, and then concluded with a summary and review session which closed with a series of questions on student perceptions of civil engineering and topics covered. A field trip was also taken to a pavement testing facility associated with Auburn University but located about 15 miles from its campus. While “presentations” or “slide shows” played an important role in course delivery, other activities included demonstration of materials and structures, hands-on learning through simple construction and experimentation, reinforcement of concepts through a field identification and observation, and writing activities. This range of activities was intended to help students learn through many modes and understand course concepts at many levels. The course was then evaluated by examining changes in student attitudes toward civil engineering as a learning subject and as a career. Students were also asked a series of open-ended questions to obtain their impressions of what they learned. The course was found to substantially improve the students’ perceptions of civil engineering as a topic and as a career choice.
Semiotics within User Interaction Engineering

Barbara Victoria Bernal
Southern Polytechnic State University

EXTENDED ABSTRACT

This paper offers an interpretation of the theory of semiotics within the software engineering design of new interfaces. Currently, Software Engineering faculty and students are exploring the fascinating body of knowledge called Semiotic through a specialized user interaction engineering course. Semiotic is an interdisciplinary science whose goal is to study all types of signs and symbols as elements of the communicative behavior involved with a user and a computer interface. We use this study of dialogue to investigate specific computer system interfaces domains, and specifically to learn more about their representation and interpretation by the users. In a semiotic sense, signs take the form of words, images, patterns, sounds, and objects. We describe the overall organization and content of the interface as a sign system which promotes the user working on a computer to experience the interface as a complete “language.”

The design of new interface dialogue benefits greatly from in-depth analysis of the vocabulary of the signage used throughout the system. Methods for the definition of all keystrokes combinations at the lexical level for the interaction language are described in the paper. A system’s interface, which promotes correct and complete grammar of interaction, is the outline of the syntactical level. The semantics associated with the syntax statements hold the key to effective communication. The paper includes discussion of the different media and genres within the current interface sign systems, how they provide the user with different frameworks for representing task experiences, and examples of signs facilitating forms of expression in the work force and society.
Propagating Software-Based Educational Innovations

Edward F. Gehringer

North Carolina State University

EXTENDED ABSTRACT

Much software has been created for teaching various aspects of IT. Most of it, however, is sparsely used. Educators frequently do without any of it, or “reinvent the wheel.” This paper discusses approaches to improving the visibility and adoptability of educational software. First, others must be aware of the software. There is no substitute for face-to-face contact. Conferences, e.g., CCSCs, SIGCSE, ITiCSE, SIGITE, and ACM regional meetings, can play a major role. Paper presentations are quite useful, but because of strictures against self-plagiarism, it is difficult to write multiple papers on the same tool. Work can also be presented in a poster or a demo, or by organizing a panel or a BoF on a related topic. Publishers can also help, by publicizing your work on Web sites associated with their textbooks. E-mail forums, such as SIGCSE-members, are also useful. Do not ignore repositories of course material, e.g., MERLOT and CITIDEL, but active publicity is still needed to attract a critical mass of users. Once aware of the innovation, faculty must be reminded, e.g., by e-mail, at the appropriate time in their course. If the software deals with doing homework, the most critical time is the month before the start of an academic term. Try to minimize the need for risk-taking, especially for software without a long track record: If it can be used in a short assignment (or a demo), instructors will be more inclined to “get their feet wet” and expand usage later.

The full paper considers the experience of such projects as Web-CAT and JHavéPop, as well as several algorithm visualizations, and the author’s own Conoscenza and Expertiza projects. It will include a survey of instructors who have expressed interest in, but not adopted, software innovations, and analyze how they might have been persuaded to follow through.
Developing a Nuclear Certificate Program

Shih-Liang (Sid) Wang
Department of Mechanical and Chemical Engineering
North Carolina A&T State University

EXTENDED ABSTRACT

To promote awareness of nuclear energy and to prepare workforce to meet the growing demand in the nuclear energy sector, four courses on nuclear energy and nuclear engineering are being developed at North Carolina A&T State University, with the financial support from a curriculum development grant funded by Nuclear Regulatory Commission.

In the first year of the grant, an elective on nuclear energy for engineering majors was taught to juniors and seniors. A second elective on nuclear energy was developed for all majors, as part of general education. In the second year, two additional courses are being developed as engineering electives: nuclear fluid mechanics and heat transfer and an elective on reliability and risk.

With four elective courses available, an undergraduate Nuclear Certificate program is proposed for engineering majors. The certificate program will raise the profile of the nuclear field on this campus and will give students an edge to compete for nuclear related jobs in industry and government agencies.
Early Intervention and Mechanical Engineering  
Balancing Stakeholder Expectations in an  
Engineering Education Environment  

Stephen L. Canfield and Kenneth W. Hunter, Sr.  

Tennessee Technological University  

EXTENDED ABSTRACT  
The mission of the Early Intervention and Mechanical Engineering (EIME) project is to provide real-world design experiences for undergraduate engineering students while simultaneously enhancing adaptive and assistive technology services provided to children with special needs in the Upper Cumberland region surrounding Tennessee Technological University. These enhanced services are provided through a mutually beneficial collaboration between early-childhood intervention programs and the College of Engineering at Tennessee Tech. As part of their curriculum, engineering students engage in team projects to design, develop, test, and deliver new and novel applications of adaptive and assistive technology to facilitate transitioning of children from early intervention programs to preschool programs and inclusive environments. This paper describes the EIME model that has been used at Tennessee Tech since 2001, and replicated at other institutions in the State of Tennessee.  

The EIME project is based on a close collaboration of multiple partners, each with specific motivations and expectations from the project. Success and sustainability of the project depends on meeting partners’ expectations. All stakeholders contribute and all stakeholders benefit. Students provide the engineering effort required to complete the projects. They receive real-world design experience, meet course requirements, and gain valuable insights and skills related to the engineering profession. Early-intervention organizations provide the projects and coordinate meetings with the families served by the EIME project. They benefit from the additional resources that can be used to address the adaptive and assistive technology needs of their client children and families. The children and families served by the project provide the engineering students with a very real and personal design experience by serving as the clients. In return, the needs of the children with disabilities are addressed. And finally, the State of Tennessee provides financial resources for the project. In return, the State receives enhanced services for its citizens with special needs and an enhanced education for its future engineers.
Classroom Polling Systems in Upper Level Transportation Engineering Classes: A Pilot Study

Steven M. Click, Ph.D, PE*

Extended Abstract

With the emphasis on active learning techniques growing, engineering faculty continue to search for effective ways to involve students during class. According to vendors, classroom response systems offer increased interaction between student and teacher, helping to improve learning by changing the classroom experience. With the advent of second-generation systems, response pads are no longer limited to A-E choices, but now offer numeric inputs with decimals, significantly improving their applicability to engineering courses.

The question is: can these devices truly improve student attitude or student learning? To do so, students must embrace the opportunity these systems provide. This paper presents the results from a pilot study performed during the Fall 2008 semester in two upper level transportation engineering courses: CEE 3610 Transportation Engineering, a junior level required course for all CEE majors; and CEE 4630 Traffic Engineering, a senior level elective course. Students were provided with response pads for approximately two weeks during the course, and then asked to rate their experiences, including changes in attitude toward response systems, enjoyment of class, amount of involvement during class, and learning during class.

Based on the study, students felt that using a classroom polling system increased both their enjoyment of class and their level of participation during class, and together these resulted in a slight increase in their learning during class. They reported that they were generally the same or more diligent in working class example problems, due to increased time available for problem solving and to the instructor waiting for them to provide input via the pad. Students also appreciated the fact that their responses were anonymous.

Overall, classroom polling systems appear to provide at least some of the benefits claimed by their vendors, especially in larger classes where meaningful participation is more difficult.

---

* Assistant Professor, Department of Civil and Environmental Engineering, Tennessee Tech University, Box 5015, Cookeville, TN 38505, aclick@tttech.edu.
Preparing Systems Engineers of Tomorrow

Ravi Shankar

Computer Science and Engineering, Florida Atlantic University, Boca Raton, FL

Extended Abstract

An engineering product designed in a vacuum without appropriate stakeholder input may fail in the marketplace. Despite ABET’s guidance to the contrary, both professors and students in engineering lack the real-life skills and motivation to develop commercially relevant products. Many working engineers are content to focus on engineering issues, such as coding, logic design, and testing. Unfortunately, such pure engineering jobs can be automated, out-sourced, and migrated to technicians, as they are well-defined and really not that challenging anymore – witness the availability of low cost components and the popularity of component-based design, in software and hardware. More unfortunately, the same engineering professional might consider management and systems engineering below his/her intellectual and engineering capabilities. However, the US Bureau of Labor Statistics shows a definite and remarkable shift in jobs away from emphasis on programming and logic design towards emphasis on systems, applications, and management.

We recently revamped our course on software-hardware codesign to emphasize a top-down flow with UML version 2.0. Key to this was the availability of a well written book on UML with a good case study of a wireless handheld computer system. We derived inspiration from our industry collaborations/innovations to identify six potential team projects for the students. The projects required the students to meet stakeholders in that domain to develop activity diagrams; identify class diagrams and associations; conceptualize use cases; chart sequence diagrams and state diagrams; and design the user interface. We asked students to integrate an on-line business interface that is Ad-driven. The process was completed by evolving a description of the skeleton code that identifies the components, their interaction, and internal behavior. Code development and component integration can easily follow after that (perhaps in their senior project course sequence).

The top-down methodology requires significant up front activity to develop user requirements and engineering specifications, activities that engineers and managers give little credence to. Such a flow, however, has the potential to develop the product faster and make it more robust and useful to the customer. We will present our results in the paper.
Early Assessment of a Project to Enhance the Programming Experience for Engineering Students through Hands-On Integrated Computer Experiences

Stephen Canfield\textsuperscript{1}, Mohamed Abdelrahman\textsuperscript{2}, Nick Patton\textsuperscript{3}

Abstract – Many students enter engineering programs as a result of hands-on experiences that they have had in the past. However, engineering programs often do not provide enough practical experiences early in the curriculum [1]. The freshman-level programming course provides an ideal opportunity to scaffold on incoming student’s perceptions of engineering, creativity, and notions of how things work. The traditional entry-level programming course for engineers is based on learning C or Fortran to solve numerical algorithms associated with common engineering models. Any use of a computer as a device to control physical events is generally contained in upper level courses. While creating programs to solve numerical analysis problems is an important tool for engineers, we contend that the current model is inverted on a pedagogical basis. Ideally, students would begin learning programming in an environment that matches their notions of engineering, to control the world around them, and then later move to solving advanced models that describe how the world works.

This paper provides an early assessment of a project that provides hands-on programming experiences for engineering students in the context of a traditional freshman-level programming course. This project is being initiated in the college of engineering at Tennessee Tech (TTU) to redesign the initial programming experience based on a hardware in the loop model, retaining the C (or similar) programming standard but using a microcontroller as the program target to interface with simple physical systems. The primary outcomes to be evaluated in this assessment are competency in the use of programming and computation tools in engineering coursework and higher satisfaction rates in the freshman-year programming course. In the longer term, the objectives of this project are to improve use of computational tools in engineering and improved retention in the engineering program. This project is currently funded in part by a 2008 NSF CCLI grant.

This paper will provide a summary of the main elements of the project and an overview of the new freshman-level programming class. It will provide results from the early stages of implementation followed by a summary of conclusions and future work.

Keywords: Programming, Enhancing Programming Education, Hardware in the Loop

\textsuperscript{1} Author for correspondence: Department of Mechanical Engineering, Tennessee Technological University, 115 West 10th St., Cookeville, TN 38505, 931-372-6359, SCanfield@tn-tech.edu

\textsuperscript{2} Department of Electrical and Computer Engineering, Tennessee Technological University, MAbdelrahman@tn-tech.edu

\textsuperscript{3} Department of Mechanical Engineering, TTU, NE Patton21@ten-tech.edu

2009 ASEE Southeast Section Conference
An Unexpected Experiment in Project Based Learning

Daniel Koha
University of Memphis

EXTENDED ABSTRACT
Within education there is the question of how to keep students actively participating in their scholarly pursuits. One answer to this question in the Engineering and Engineering Technology fields is Project Based Learning. This fairly new concept turns the "theory then application" approach to teaching upside down. In Project Based Learning, students are given a problem to solve, leading them to questions which then give the instructor the opportunity to teach topics to students already curious about the subject.

In spring 2008, a group of students repeating Microprocessor Interfacing at North Carolina Agricultural and Technical State University and their instructor were forced into a Project Based Learning experiment without any prior knowledge of the concept.

The instructor, faced with students that had already performed the labs for the class, a lab that exceeded the maximum number of seats, limited supplies to perform experiments, no budget to purchase new lab materials and limited time to improvise a solution forced the unexpected experiment upon the instructor.

This paper will describe how the unexpected experiment came about, lessons learned, intangible benefits and pitfalls of project based learning.
DATA STRUCTURING FOR STATISTICAL ANALYSIS OF EFFECTIVENESS OF RUMBLE STRIPES ON HIGHWAY SAFETY

Tulio Sulbaran, Ph.D, David Marchman

Abstract
The United States (U.S.) heavily relies on the roadway infrastructure and a considerable number of highway vehicle miles are driven every year. Unfortunately, the number of fatalities is staggering with accidents becoming more frequent. Every year on U.S highways, there are over 700 fatalities, 40,000 injuries, and 52,000 property-damage-only accidents. Most of the 700 fatalities are due to roadway departures. On average, one roadway departure fatality occurs every 23 minutes, and a roadway departure injury occurs every 43 seconds. It is estimated that the annual cost of roadway departure is $100 billion. The Federal Highway Administration (FHWA) indicates that improvements in infrastructure have helped keep the fatalities number from increasing. However, higher traffic volumes have counteracted any real reductions in the number of fatalities due to roadway departure [Public Roads 2005].

Therefore, countermeasures to prevent or lessen the occurrence of roadway departures are important steps towards improving the safety of U.S. roadways. Roadway departure countermeasures must be designed to keep the motorists in lanes and on the roads, enable the drivers to recover and safely return errant vehicles to the roadway, and keep vehicle occupants from greater harm if a vehicle does leave the roadway.

This paper will focus on a project funded by the Mississippi Department of Transportation to determine the safety effectiveness of one roadway departure countermeasure, rumble stripes, in Mississippi. More specifically, this paper presents a focuses on the process implemented to restructure and consolidate the data obtained from multiple divisions and districts to be able to measure the impact of rumble stripes on highway’ safety.

The content of this paper was later used as the foundation for statistical analysis. The results presented in this paper reveal the importance of inter division and district collaboration, the need to establish a common data structure to facilitate the exchange of information among divisions and districts and the importance of using real life applied research experiences for making the connections that facilitate engineering education.
Delivery of Multimedia Education Content in Collaborative Virtual Reality Environments

Tulio Sulbaran, Ph.D, Andrew Strelzoff, Ph.D

Abstract
The development of Collaborative Virtual Reality Environment (CVRE) for education is a challenging process. One of the many challenges faced during the development of CVRE is the creation, transfer and delivery of educational multimedia content. This multimedia content could include images, voice, video and their combination.

The overall goal of this project was to develop a fully integrated system that allows the faculty and students to seamless share multimedia material. This paper describes the system and technology used for its development and its integration with the CVRE used - Second Life. Second Life is an Internet-based virtual world with a downloadable client program that enables its users, to interact with each other.

The results from this project are expected to help other faculty to migrate their current multimedia educational materials using the system described here for the benefit of the students in the classroom.
Chapter 3
Poster Session
Abstracts

The Southeastern Section of the American Society of Engineering Education (ASEE) has solicited extended abstracts from undergraduate students to present in a poster session at this year’s conference. The students will be entered in one of the following categories:

- Freshman/Sophomore Engineering and/or Engineering Technology Design Teams
- Junior/Senior Engineering and/or Engineering Technology Design Teams
- Undergraduate Research

The following section contains the extended abstracts from this year’s student participants. During a morning judging section, they will be evaluated on their abstract, poster, and communication skills. In the afternoon, the Research Division encourages all conference attendees to stop by and learn from students about the wonderful projects going on throughout the section.
Walker Obstacle Detector

*Dustin Gray and Joshua Solomon*

*Assembly / Leader*

Extended Abstract

**Purpose of Obstacle Detector and Project Goal**
The goal of this project is to create a walker obstacle detector (WOD) for Hannah, a five year old kindergartener. Hannah has servile palsy and must use a walker to maneuver. Hannah is also blind and has difficulty guiding her walker without the assistance of a white cane. The purpose of the WOD is to detect obstacles, protect Hannah, and identify Hannah as blind to others.

**Background**
The WOD is intended to make handicapped children independent and safe. With the WOD children who are blind and using a walker will be able to navigate their way through schools, while protecting themselves and identifying to others their handicap.

Although there are devices available that could be adapted to satisfy Hannah’s needs, the devices could not be mounted to Hannah’s walker.

**Design Team**
The design team consists of Dustin Gray, Joshua Solomon, Christopher Parish, and Jonathan Johnson. Dustin’s responsibilities were to assemble the WOD and machine parts. Joshua’s responsibilities were to make sure the team had regular meetings and to make sure things got done on time. Christopher’s responsibilities were to research parts needed for the construction of the WOD. And Jonathan’s responsibilities were to assemble the WOD and to wire the circuit.

**Obstacle Detector Design**
The arm is made of ½” steel conduit. The detection rod is made is ¼” steel all thread. Both the arm and the detection rod are taped white with a red stripe in the center to indicate to others that Hannah is blind. The detection rod is attached to the arm and held in place using a nylock bolt. The detection rod is connected to a horn button that, when pressed, activates an alarm warning Hannah that she has collided with an obstacle. The arm is connected to a peg that connects to a clamp that can be moved 90 degrees up from the closed position, enabling Hannah to move the WOD out of her way so that she can maneuver in and out of the walker.

The alarm is connected to a 9v battery that is held in place by a 9v battery holder. The 9v battery holder is held in place on the clamp using a nylon zip tie.

The arm is connected to a clamp that is mounted to Hannah’s walker. The clamp can be removed and attached to another walker as Hannah grows.

**Results**
When the WOD was tested, it was found that it did detect obstacle coming up on the user. When the upcoming obstacle came into contact with the detection rod, the alarm went off notifying the user.
Enhanced Walker
Jodie Lanier/Garrett Mitchell/Troy Tallant/Wade Thomson

EXTENDED ABSTRACT

Purpose

The purpose of this project was to encourage a young boy to use his walker. The client had a physical affliction that caused the use of the walker to be a necessity; however, he could not bring himself to employ it, because it offered him so little aesthetic stimulation. As a result of this, he was falling behind in his physical rehabilitation. It was imperative to create a solution to this problem that would fulfill both his physical and emotional needs.

Team Structure

The team included four members as follows: Jodie Lanier, Garrett Mitchell, Troy Tallant, and Wade Thomson. It was compiled by voluntarily selection of this project from many by all four members. All members shared equal responsibility in the planning, building, and reporting of this project.

Methods

The methods employed were finding something that would catch the client’s attention while also being able to use the medically prescribed walker he had been shunning. The original walker was used as a base, because it had already been custom fit to his preferences and needs. The team then found out his hobbies and interests, which included his favorite color, red, and car, a Jeep. After intensive brainstorming, the team searched for a PowerWheels model that would fit the preferences of the client. When one was found, it then had to be modified to accommodate the needs of the child. The inside of the car was cut out so that it could be placed over the walker, then the shell was clamped to the legs. Because he so rarely used the proper handholds, buttons that triggered music of his favorite song were inserted into the handles of the walker. To support his weight if he fell forward, an extra wheel was installed into the front bumper of the PowerWheels shell. The car was cut in half so that the front would open like a door in order to ease the process of getting the child in and out of the module. The wheel on the front bumper also reinforced this development.

Conclusions

The client was very enthused about the final product. His supervisors claimed that he used the walker more in a day after the modifications than he did his entire life before the modifications. The team clearly met all of the aesthetic wishes of the client while still enabling him to properly improve on his medical condition.
Modal Analysis of an Engine Valve Cover: Experimental testing and Finite Element Modeling

Jared Fulcher, Jodie Beadles and Joshua Martin

University of Kentucky College of Engineering

EXTENDED ABSTRACT

The powertrain engine is a major source of vibration and noise in automotive vehicles. Among the powertrain components, the valve cover has been identified as one of the main noise contributors due to its large radiating surface and thin shell-like structure. From design point of view, it is necessary to know the modal characteristics (modal frequencies and mode shapes) of the valve cover structure so that the design modification can be carried out accordingly. In this project, the modal response of a production Ford Windstar engine cover was studied through experimental testing and numerical simulation (finite element modeling).

During testing, the production engine cover was placed in free-standing and fixed conditions. The engine cover was excited with an impact hammer and its vibration responses were measured by a number of accelerometers placed at cover surface. The vibration signals were then converted from time-domain to frequency-domain through a LabView FFT (Fast-Fourier-Transform) program, from which the modal frequencies of the engine cover were obtained. The first five modal frequencies ranged from approximately 500 Hz to 2000 Hz. The modal response of the engine cover was further analyzed by finite element simulation. The simulations were conducted at identical boundary conditions: free-standing and fixed. The finite element analysis predicted the similar modal frequencies to those obtained from experimental testing. In addition, the finite element simulation showed the mode shape of the engine cover corresponding to each modal frequency, which provided valuable guidelines for future design improvement.
Inventory Database and Leveling Point of Sale System (POS)

Nadine E. Jerome

Many companies require user-friendly and manageable methods to maintain stock and inventory levels. Small business may need to switch to a network that can manage inventory that is simple and professional. By creating a simple point of sale (POS) system, we can create unique database for small business to maintain stock with a user-friendly interface and a manageable network.

The POS system takes advantage of a web-based inventory system to achieve a large storage database and backup database from a small business that is affordable and simple. In addition, the business can have accurate readings on inventory, unique bar coding, and massive storage space. The software is able to read information inputted from hardware scanners to provide an accurate count of inventory, trace point of origin, and quantity of all stock.

The system allows continuous updating of the database at more than one location. The database has a secure login, shipment methods, and transaction capabilities. In our system, we use an open source Apache web server as part of the Oracle Internet Application Server (iAS), Perl platform and a content management system called Python. Finally, we use X Windows to organize routines for implementing a graphical desktop for users.

Like many inventory software, our system has control panels and simple troubleshooting tools. The POS application provides easy setup compatibility, high end networking, front end and back end applications, and easy database backup. This is a cost effective solutions for a POS system.

Our design team consists of members who are responsible for creating and configuring the software and to implement the database. In addition, we also configure unique barcodes for hardware scanners. Applications and graphics are be designed by our team to create a professional feel for the business.
Fabrication of Polyurethane based Fabric Composite Shaft

Jacob A. McBride

Mechanical and Electrical Engineering Technology Department, Georgia Southern University, Statesboro, GA 30460

EXTENDED ABSTRACT

Polyurethane based composites are in use in various disciplines including thermal insulations, protective clothing, and medical and structural applications. It also has applications in race car industries. Due to its light weight and water resistant properties it has a potential to be used in water sports like water skiing. The most common form of fabrication of fabric composites of this nature is making sheets with a layer of fabric (pre-impregnated). In many cases equipment like autoclaves is necessary to manufacture these types of composites. Solid or hollow shafts made directly out of these composites are rare.

At Georgia Southern University, Polyurethane cored fabric coated composite shafts are being fabricated using a very low cost process. A high pressure injection molding process is used which utilizes high pressure air lines available in the laboratory. The entire process of creating composite shafts starting from the raw material is designed and optimized. This unique manufacturing technique creates the composite shafts with core matrix material completely wrapped around by the fiber cloths with very strong bonding. Three different types of fibers used for this purpose are: carbon fiber, Kevlar 49 and fiber glass. A manufacturing process is suggested and demonstrated where a mass production of this fabrication process can be accomplished with relatively low cost. In this entire fabrication process there is no direct use of electrical power and there is a very minimal loss of materials. As a follow up of this fabrication process, the shafts’ mechanical properties are being tested.
An Alternate Approach for Analysis of Beams

Ryan Mooney and Shahnam Navaee, Ph.D.

*MET Student /Assoc. Dean of the College of Science and Tech. and Prof. of Engineering Studies*

**EXTENDED ABSTRACT**

In this research, Virtual Instruments (VIs) are developed for studying the behavior of beams subjected to various beam and loading conditions using classical approaches in Mechanics of Materials. Segments of the VIs developed for this project employ MATLAB to produce the numerical results. In several earlier publications of my mentor in the proceedings of the ASEE’s conferences, various computing and programming tools and features of LabVIEW were discussed.

The LabVIEW programs developed in this project will specifically determine the distribution of shear force, bending moment, slope, and deflection along the length of the beam for several loading conditions. Using these distributions, maximum stresses and deflection of beams are also determined. An added component of the developed VIs additionally computes the “principal” normal and shearing stresses using the stress transformation equations to ensure that these stresses do not exceed the allowable stresses. In case of failure, a visual indicator placed on the front-panel of the created VIs will alert the designer.

One of the more important advantages of LabVIEW over other available software tools is its convenient and easy-to-use interface. Through utilizing this interface, the problem input can easily be modified to calculate and display the results in any desired form. The final developed VI for this project allows the user to select and add any combination of loads to compute the results for the specified problem. This program can be utilized as an educational tool to better understand the behavior of beams and aid the user in his or her design. Sample VIs developed for the poster presentation clearly illustrate how the tools and techniques developed for this project can be employed to determine the solution for more complicated problems. The proposed project can also be extended to analyze and test the beams experimentally in the laboratory. The available tools in LabVIEW are ideally suited to perform this experimental analysis.
3D Amorphous Silicon Carbon Nanotube Based Photovoltaics

Justin Nguyen and Jud Ready
Georgia Tech Research Institute, Atlanta, GA

EXTENDED ABSTRACT

In this study, the possibilities of a 3D amorphous silicon (a-Si) based photovoltaic (PV) cell are investigated. Vertically aligned carbon nanotubes provide a significant advantage by allowing more opportunities for light trapping absorption and increasing dwell time in photovoltaic materials, while creating a 3D array. This allows for the use of less and therefore cheaper PV material, particularly a-Si. This study proposes creation of such a novel PV cell through thermal chemical vapor deposition (TCVD), ion assisted deposition (IAD), and plasma-enhanced chemical vapor deposition (PECVD) techniques. This novel 3D a-Si PV cell experiences better absorption and requires thinner layers than its planar counterpart, while encountering an increased short circuit current density and fill factor. The 3D a-Si PV cell consists of a single junction p-i-n photodiode less than 250 nm in total width and absorbs photons just above the 1.7 eV energy level. Combined with the ballistic conductance abilities of carbon nanotubes, the use of thinner layers also leads to the possibility of high performance and inexpensive heterojunction solar cells. Further, the amorphous semiconductive electronic structure of a-Si and its interactions at the CNT interface are explored, as well as the impact of thinner layers on the temperature-efficiency relationship of this unique PV cell.
Applications of Nondeterministic Optimization Methods in Computational Nanotechnology
Robert M. Parrish and Raghu V. Pucha
School of Mechanical Engineering, Georgia Institute of Technology, Atlanta

EXTENDED ABSTRACT
Computational nanotechnology is a new and exciting field that produces theoretical results that precede physical advancements in nanotechnology. A key problem in computational nanotechnology through design is energy minimization of a molecular configuration defining a stable nano-geometry. Achieving this energy minimization requires the determination of the ground state many-body wave-function of the electrons of a molecular configuration and associated observables through solution of the time-independent Schrödinger Equation via the Born-Oppenheimer Approximation. The electron-electron correlation in the potential energy term of the molecular Hamiltonian prohibits the determination of an analytical solution to the eigenvalue problem, and causes numerical methods to be prohibitively expensive or inaccurate.

Nondeterministic optimization is a relatively new class of algorithms including Simulated Annealing (SA) and Particle-Swarm Optimization (PSO) which heuristically search the solution space of a multidimensional, unconstrained optimization problem. Nondeterministic methods often avoid false minima in complex solution spaces, and are generally less expensive than deterministic algorithms in the location of the global minimum.

It is believed that the coupling of nondeterministic optimization methods with quantum chemistry routines might provide a more efficient and accurate method to determine the ground state wave-function of a molecular configuration. In particular, Variational Quantum Monte Carlo (VMC) has been identified as a flavor of quantum chemistry algorithm which could benefit by the addition of nondeterministic energy minimization.

The objectives of this research include:

1. Implementation of a small scale VMC algorithm using Slater Determinants and Jastrow Factors.
2. Modification of the VMC algorithm to incorporate nondeterministic optimization techniques of the PSO or SA variety.
3. Analysis of the validity and efficiency of both.

The results of this research have the potential to make ab initio calculations tractable for larger molecular configurations, and to significantly increase the speed of small to medium scale energy minimization calculations.

This work is funded by President’s Undergraduate Research Award (PURA), Georgia Tech.
Designing DNA Nanostructures using Analytical and NanoCAD Tools

John D. Semmens and Raghu V. Pucha
School of Mechanical Engineering, Georgia Institute of Technology, Atlanta

EXTENDED ABSTRACT

With a diameter of 2 nm and a helical repeat of 34 nm, deoxyribonucleic acid (DNA) has presented a variety of promising opportunities in bottom-up nanoscale manufacturing. There is an acute need for more sophisticated modeling of DNA lattices, as simulating large DNA lattices is a computationally challenging task. Analytical software such as MATLAB and various NanoCAD tools may aid in the bottom-up design and visualization of branched DNA arrays and nanostructures. This research is of interest from a mechanical engineering perspective as it provides opportunities to develop Computer-Aided Design tools for the design and manufacture of nano-components and structures.

This research encompasses three primary goals:

1. Model stable nanoscale arrays of programmable branched DNA utilizing analytical and NanoCAD tools. Initially, one and two dimensional DNA origami structures are explored.
2. Determine the feasibility of modeling nanostructures in three dimensions through folding of branched DNA strands.
3. Investigate the compatibility between analytical software and existing NanoCAD tools in developing automated design tools for desired nanostructures and components.

Several DNA sequencing programs, including Tiamat and Uniquimer-3D, are examined to find the most efficient method of computing necessary DNA strands. Once a sequence is obtained representing a desired nano-geometry, analytical tools are used to approximate the corresponding shape and properties of a n-arm junction DNA origami structure. By utilizing the computational powers of these tools, large numbers of repetitive DNA arrays could be plotted quickly and efficiently. This information is then integrated into existing NanoCAD tools, providing a platform for further design and analysis of nanostructures.

One and two dimensional, stable nano-patterns modeled from programmable branched DNA are created through this research work. The compatibilities of analytical and NanoCAD tools are also examined and a method for transferring structural DNA information from DNA sequencing programs to analytical and NanoCAD tools is developed. These integration techniques could greatly advance the development of automated design tools for manufacturing nanoscale shapes and arrays in many applications.

This work is funded by President Undergraduate Research Award (PURa), Georgia Tech.
Triple Point Bending Tests on Polyurethane based Fabric Composite Shafts.

Charles R. Walker

Mechanical and Electrical Engineering Technology Department, Georgia Southern University, Statesboro, GA 30460

EXTENDED ABSTRACT

Polyurethane based composites are in use in various disciplines including thermal insulations, protective clothing, medical and structural applications. It also has applications in race car industries. Due to its light weight and water resistant properties it has a potential to be used in water sports like water skiing. The more common form of fabrication of fabric composite of this nature is making sheets with a layer of fabric. However, in Georgia Southern University, fabric coated polyurethane based shafts are made using high pressure injection molding process at a very low cost.

Composite shafts are expected to undergo various loading conditions including beading during their applications. While tensile testing is the most common form of testing for this type of composites, it was decided to evaluate the composite under more realistic bending load. A setup was designed and subsequently fabricated to conduct triple point bending tests on these composite shafts. Three different fibers, fiber glass, Kevlar 49 and carbon fiber are used as fabric materials. So the testing was done on these three different composites as well as on the shaft without any fabric reinforcement.

Different characteristics of deformation are observed and noted for different composites. Also, the different failure modes were documented. In all the composites a “yield” like phenomenon were observed marking the onset of local bucking in the fibers on the top (compressed) surfaces of the composites. Results were compared and discussed in detail.

Future work will include traditional tensile test and torque test on those composite shafts.
Assessment of the Potential for Gray Water Reuse for Landscape Irrigation in Georgia

Bruce Bundrick, Brandon Cavendish, Kristina Deer, and Bradley Handziuk

Mercer University / Mercer University / Mercer University / Mercer University

EXTENDED ABSTRACT

Current regulations in the State of Georgia legislation do not encourage homeowners to implement automated gray water reuse systems for landscape irrigation. Homeowners are limited to the application of gray water via watering cans. Furthermore, this hand application of the gray water to the landscape must occur at the time of gray water production as the regulations prohibit storage of gray water. Successful implementation of gray water landscape irrigation systems will require a complete understanding of the risks and benefits associated with these systems as well as identification of design parameters for reliable long term operation.

The goal of this experiment was to evaluate the risks, benefits, and design issues associated with use of gray water for landscape irrigation. This was accomplished by running bench-scale gray water landscape irrigation systems. These systems consisted of gray water storage for approximately seven days followed by irrigation of vegetation. Seven independent storage systems were implemented. Three of the seven systems utilized untreated gray water (shower, laundry, and mixed shower/laundry water) and three of the systems chlorinated the source samples (shower, laundry, and mixed shower/laundry water) prior to storage. The final system was a control system using tap water as the water source. Two grasses (St. Augustine and Centipede) and a ground cover (Ajuga) were irrigated with the water drained from the storage tanks. The experiment was run for approximately seven weeks. Testing consisted of measuring pH, fecal and total coliforms, electrical conductivity (EC), chemical oxygen demand COD, residual chlorine, solids (total, suspended, and dissolved), and recording visual observations.

Analyses indicated that storage with or without chlorination will decrease both fecal and total coliforms levels. Chlorination further reduced these levels. There was no significant change in COD ($\alpha=0.05$) as a result of storage. As would be expected, EC increased as a result of chlorination but did not change as a result of storage. Storage did appear to have some impact on pH however all observations were of neutral pH. There was no detectible change ($\alpha=0.05$) in solids concentrations as a result of storage. Results did not suggest that solids would be a significant problem for an irrigation system, however further research is recommended.

Plant growth was evaluated through visual inspections and by massing the amount of grass grown over 6 weeks. Accelerated growth was observed in grasses watered with stored chlorinated gray water. The soil pH remained neutral through out the experiment.
Solar Water Disinfection for a Developing Region

Bradley Handziuk, Clinesa Lindsay, and Miguel Maxwell

Mercer University / Mercer University/ Mercer University/ Mercer University

EXTENDED ABSTRACT

Our team will design, build, and test a scale model of a functioning water disinfection system. The system will be designed for a developing nation’s rural population without sustainable access to potable water. The system will extract water from a surface water source such as a river and use appropriate, inexpensive, and readily available, natural resources to remove settable and colloidal solids from solution. The water will have a sufficiently low turbidity to allow ultraviolet radiation (UV) penetration to inoculate the pathogens as the water is passed through clear plastic tubing. The tubing is placed on a metal roof to heat and expose the water to UV. Photovoltaic powered pumps will provide the appropriate head to move water through the system. The solar panels will track the sun for optimal power recovery. Flow in the pumps will be variable to provide a constant intensity of solar radiation-to-detention time ratios during overcast days. The water will be stored in reservoirs to maintain drinking supplies for several days for a community of approximately 500 people.

Individual team tasks for the project are as follows: Lindsay will program the feedback and control systems for the solar panel motion and the variable pump flow; Handziuk will design the unit operations and processes for water disinfection; Maxwell will conduct experimental design and simulation of the full scale system as well as create a business plan for the full scale system.
Environmental Monitoring Robot

Jamal Norcome, Amari Long, and Travis Davis

Virginia State University

EXTENDED ABSTRACT

The purpose our design project is to explore the different aspects and abilities of robots. The invention of robots have changed and improved technology in many ways. Since technology has broadened, robots now have the ability to walk, talk and even perform at a human level. The basic concept of our project design is to use technology in aiding the safety of human lives. We designed an Environmental Monitoring Robot, named “Roboma” that is capable of recording activities and give a report on its findings. The robot has an infrared camera attached to it, which will allow us to see live visuals. The camera has zoom in/zoom out capabilities. The robot has a radio transmitter and a voltage converter attached to the body which allows the wireless controller to operate the movements of the robot. Also, it has the capabilities to withstand different climate changes and is cost-efficient. The hardware portion of our project mainly deals with us attaching the body and the components of the robot to make sure it’s going to be sturdy. The main components that allow the robot to operate are: bolts, wheel chains and idlers.

Team Member Responsibilities

Every member assists with building of the robot and researching information to complete any reports and presentations. Every member of the team has the responsibility of giving their time to successfully complete the project in a timely manner.
**Biometric Attendance System**

B. Miller, I. Young  
Advisors: S. Garcia-Otero, E. Sheybani  
Virginia State University  
Department of Engineering and Technology

**EXTENDED ABSTRACT**

This project pertains to a student biometric attendance system. The system will be designed to keep track of class attendance. Keeping track of students coming in and going out of class will be the main objectives of the system. The different types of biometric verifications can be used to determine ones’ identity by a certain characteristic that differs from someone else’s. In this project attendance tracking will be considered through fingerprint recognition.

The team will complete design, implementation, and related documents. The team members considered their skills and the classes they had taken to come up with the idea of their project. The work is divided into smaller tasks, some of which would have to be done by the entire team, and some would require individual attention.

The project will use fingerprint scanning. An associated database in a high-level programming language will keep records of the student’s information and will contain certain information of the student’s data. Once the student inputs his/her information through the scanner, the program will perform a comparison to recognize the fingerprint and will find the exact match in the database. Then, the database, as well as the monitor, will be refreshed by student’s data.
The IDEA: Intelligent Driving Efficiency Assistant
Sarah Printy and Danielle Sands
Embry-Riddle Aeronautical University, Daytona Beach, FL

EXTENDED ABSTRACT

Purpose
The Embry-Riddle Aeronautical University senior design students are participating in EcoCAR: the NeXt Challenge, a three year long continental competition hosted by General Motors and the U.S. Department of Energy. The purpose of the contest is to further the advancement of technology toward reducing greenhouse gas emissions and reducing petroleum consumption in vehicles while exploring a wide variety of breakthrough technologies and techniques. Embry-Riddle’s Computer and Software Engineering design team is developing a control system called the Intelligent Driving Efficiency Assistant (IDEA). This system will be integrated into a hybrid vehicle and used to intelligently improve and track the operating efficiency. Using artificial intelligence, the IDEA will analyze different components within the vehicle such as terrain, speed, and power consumption. This system will also monitor, record, and learn traffic patterns based on the vehicle’s position using a GPS. The IDEA will preemptively predict and analyze environmental variables ahead of the vehicle and, based on the AI algorithms, recommend the most energy efficient hybrid mode of operation for the upcoming conditions.

Development Process
The design team comprised of senior computer and software engineering students are working with a development process known as the Crystal Clear Process*. Crystal Clear utilizes the ideas of reflective development and osmotic communication by co-location to frequently deliver usable code or products for the user. The design team runs on two-week iterations, where the team delivers a set of functionalities toward the overall goal of the project at the completion of each iteration. In addition, at the end of each two-week block, the team undergoes a “Reflection Workshop” in which the team analyzes the process of the past two weeks and discusses what worked best, what needs to be improved and what should be tried for the next iteration.

Team Structure
The group of fourteen individuals is divided amongst five teams—Hardware, Database, Software in the Loop (SIL), Intelligence, and User Interface. Each team has a designated leader responsible for team productivity and management. The Hardware team is responsible for choosing and integrating all necessary hardware elements in order to ensure proper execution of the IDEA system in an automotive environment. Members of the Database team are dedicated to designing and developing a central database system such that the IDEA can operate effectively and quickly, with necessary stability and memory management. SIL members are responsible for designing and developing a seamless SIL testing environment for the system. Responsibilities of the Intelligence team include designing and developing the artificial intelligence modules of IDEA including rule-based inference engines and a voting scheme to recommend the most efficient mode of operation. Members of the User Interface team focus on integrating a user friendly display into both the testing environment and vehicle environment for the IDEA.

Result
Each team is working to complete their individual objectives. The goal is to ultimately integrate each team’s system to create a final product that can be used in the EcoCar target vehicle, a 2009 Saturn Vue. The IDEA system will be presented before a panel of contest judges, made of academic, industry, and government professionals, at the end of the academic year.

C. Williams, C. Gaie, B. Miller  
Advisors: S. Garcia-Otero, E. Sheybani  
Virginia State University  
Department of Engineering and Technology

Robot Medical Assistant

The project, Robot Medical Assistant is designed to provide assistance to medical patients by providing basic services traditionally provided by nurses and doctors. The robot can give people with limited mobility the freedom to perform tasks without possible injury to themselves. In this project, a PT3 robot is assembled and programmed to carry out certain tasks.

The robot is equipped with an arm, a camera, and the ability to perform multiple user programmed tasks. The main focus of our design is the programming language for the user commands. The programs that include a range of algorithms pertaining to building IP connections, configuring the camera, the arm, and the robot’s network server are loaded in to the robot’s hard drive, which allows the end user to use the features and accessories.

The Robot Medical Assistant team consists of three members. There are scheduled meetings to discuss individual progress, group progress, overall design evolution, reports to academic advisors, and also to schedule future meetings and tasks amongst each individual.
This design project is focused on vehicle safety. The goal of the project is to create a new and improved side view mirror that allows drivers to see blind spots without adjusting the position of their mirrors. In order to design such a mirror, a part of the mirror was designated to the blind spot. This part of the mirror is in sync with a motion-sensor and detects a car when it passes by. Once the car is detected, the sensor will cause the mirror to move in the relevant direction. The sensor can only be set to detect the automobile in the blind spots of the car.

It is expected that the mirror will signal if it is safe for the driver to switch lanes. In order to have this accomplished, an LED will be attached to the mirror to turn green when the sensor is off and red when the sensor is on. There will be an additional LED that turns green to indicate to the driver that switching lanes is safe. A red light, once turned on, will indicate that it is not safe to switch lanes.

The project team was influenced by the Eisenhower Fellowship scholarship, which was granted to Benjamin Brown and Algernon Evans. Amos was added to the group because of his achievements in ethics and leadership; he is the team leader. Every individual in the team will collect data and write notes on the results. The team meets at least twice a week to put all of the ideas together to make sure we have the same level of understanding for all team members.

This project is believed to produce a great product for automobile companies, especially for driving at high speeds and in large vehicles. Also, this product could help decrease the rate of automobile collisions and safety issues. Ultimately, this product will improve automobile safety. This project will provide drivers with a sense of well-being and security by providing a complete side view of their automobile while driving and by improving their overall driving performance.
Chapter 4
Index
<table>
<thead>
<tr>
<th><strong>Paper Title</strong></th>
<th><strong>Author</strong></th>
<th><strong>Page</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>“I Have This Calculator; I’m Not Supposed To Have To Think”</td>
<td>Jerry Newman</td>
<td>2.026</td>
</tr>
<tr>
<td>A Comparative Analysis of Engineering Clubs in Atlanta Area High Schools</td>
<td>Ashley N. Johnson, Jason D. Weaver, Akibi Archer, Brian Post, Marion Usselman, and Donna Llewellyn</td>
<td>2.033</td>
</tr>
<tr>
<td><em>A Forensic Engineering Teaching Paradigm for Improving Student Learning of Hydraulics</em></td>
<td>Faisal Hossair</td>
<td>2.013</td>
</tr>
<tr>
<td>A High Voltage DC Power Supply to Excite a Laser Tube: A Capstone Design Project</td>
<td>Jeng-Nan Juang and R. Radharamanan</td>
<td>2.069</td>
</tr>
<tr>
<td>A Laboratory Component of a Switching Power Supply Course Requiring Nominal Resources</td>
<td>Walter E. Thain</td>
<td>2.075</td>
</tr>
<tr>
<td><em>A Learning Lesson from Thermodynamics:</em></td>
<td>Jennifer Pascal and Pedro E. Arce</td>
<td>2.083</td>
</tr>
<tr>
<td><em>Ideal Fluids. Not True in Transport!</em></td>
<td>Rogelio Luck and B K. Hodge</td>
<td>2.087</td>
</tr>
<tr>
<td>A Multicourse Effort for Instilling Systematic Engineering Problem Solving Skills Through the Use of a Mathematic Computer Aided Environment</td>
<td>John C. Duke, Jr.</td>
<td>2.003</td>
</tr>
<tr>
<td>A New Design Process Paradigm: Sustainable System Design</td>
<td>Thomas R. Dion, Kevin C. Bower</td>
<td>2.024</td>
</tr>
<tr>
<td>A New Meaning to Click Here in a Computer Class</td>
<td>Kathy Winters and Claire McCullough</td>
<td>2.006</td>
</tr>
<tr>
<td>A Student-Designed Computer System to Aid ABET Assessment</td>
<td>Fred Stillwell and Jeff Rosen</td>
<td>2.060</td>
</tr>
<tr>
<td>A.C.E.S Wild: “Applied Concepts of Engineering and Science”Course Shakes Up Tradition</td>
<td>Mr. Paul Yanik, Dr. George Ford, Dr. Brian Howell</td>
<td>2.011</td>
</tr>
<tr>
<td>An Introduction to Fuzzy Logic Applications for Robot Motion Planning</td>
<td>Minzhe Guo, Ju An Wang</td>
<td>2.027</td>
</tr>
<tr>
<td>An Ontology-based Approach to Model Common Vulnerabilities and Exposures in Information Security</td>
<td>Daniel Kohn</td>
<td>2.101</td>
</tr>
<tr>
<td>An Unexpected Experiment in Project Based Learning</td>
<td>Timothy A. Wilson</td>
<td>2.052</td>
</tr>
<tr>
<td>Assessment Based Instruction Applied to a Course and Lab in Digital Signal Processing</td>
<td>Greg Nordstrom, Ginger Reasonover, Ben Hutchinson</td>
<td>2.062</td>
</tr>
<tr>
<td>Attracting Students to Engineering Through Robotics Camp</td>
<td>Daniela Marghitu, Michael Fuller, Taha Ben Brahim, Eliza Banu</td>
<td>2.045</td>
</tr>
<tr>
<td>Auburn University Robotics and Computer Literacy K-12 Engineering Camps: A Success Story</td>
<td>Dr. John Patterson, Dr. George Ford</td>
<td>2.002</td>
</tr>
<tr>
<td>Basic aspects of hurricanes for technology faculty in the United States</td>
<td>Dr. John Patterson, Dr. George Ford</td>
<td>2.002</td>
</tr>
</tbody>
</table>

*Southern Polytechnic State University*
<table>
<thead>
<tr>
<th>Paper Title</th>
<th>Author</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging the Gap: Connecting Biology and Engineering in the High School Curriculum</td>
<td>Brian K. Post, Susan E. Riechert</td>
<td>2.042</td>
</tr>
<tr>
<td>Bridging Tomorrow through Strengthening Partnerships</td>
<td>Robert L. Anderson, William L. McDaniel, Aaron K. Ball, Frank Miceli</td>
<td>2.010</td>
</tr>
<tr>
<td>Building Engineering Achievement through Transportation (BEAT): A Traffic Engineering Program for High School Students</td>
<td>Dwayne Henclewood, Mshadoni Smith, Laurie Garrow, Angshuman Guin, Michael Hunter, Marion Usselman</td>
<td>2.043</td>
</tr>
<tr>
<td>Civil Engineers Design High School Statistics Tasks</td>
<td>Marsha Shrago, Laurie Garrow, Marion Usselman</td>
<td>2.059</td>
</tr>
<tr>
<td>Classroom Response Systems in Upper Level Transportation Engineering Classes: A Pilot Study</td>
<td>Steven M. Click, PhD, PE</td>
<td>2.098</td>
</tr>
<tr>
<td>Concept Map Presentation Tool (CMPT): Teaching Wireless Communications using Concept Maps</td>
<td>Rasha Morsi Wael Ibrahim Edward Jackson</td>
<td>2.091</td>
</tr>
<tr>
<td>Corporate Partnerships in the Georgia Intern-Fellowships for Teachers (GIFT) Program</td>
<td>Bonnie Harris and Marion Usselman</td>
<td>2.053</td>
</tr>
<tr>
<td>Creating A Positive Work Ethic In Civil Engineering Students: A Case for Attribution Theory and Scaffolding</td>
<td>Thomas R. Dion and Kevin C. Bower</td>
<td>2.023</td>
</tr>
<tr>
<td>Creative Coursework Development using a Creative Problem Resolution Process</td>
<td>Dr. Ronald J. Miers, Dr. Jack Patterson</td>
<td>2.021</td>
</tr>
<tr>
<td>Cross-Functional Teams: Learning from Industry to Identify Opportunities in Undergraduate Education</td>
<td>Marie C. Paretti, Raymond R. Tucker, and Lisa D. McNair</td>
<td>2.037</td>
</tr>
<tr>
<td>DATA STRUCTURING FOR STATISTICAL ANALYSIS OF EFFECTIVENESS OF RUMBLE STRIPES ON HIGHWAY SAFETY</td>
<td>Tulio Sulbaran, Ph.D, David Marchman</td>
<td>2.102</td>
</tr>
<tr>
<td>DELIVERY OF MULTIMEDIA EDUCATION CONTENT IN COLLABORATIVE VIRTUAL REALITY ENVIRONMENTS</td>
<td>Tulio Sulbaran, Ph.D, Andrew Strelzoff, Ph.D</td>
<td>2.103</td>
</tr>
<tr>
<td>Developing a Nuclear Certificate Program</td>
<td>Shih-Liang (Sid) Wang</td>
<td>2.096</td>
</tr>
<tr>
<td>Developing an Efficient Transformational-Based Leadership Model for Academic Units</td>
<td>Pedro E. Arce</td>
<td>2.085</td>
</tr>
<tr>
<td>Developing K-16 Pre-Engineer Learning Communities Through Mentoring: Interrelationship Between Higher Learning Organizations, Industry, After-School Robotics Competition and Pre-Engineering K-12 education</td>
<td>Marcos Chu</td>
<td>2.001</td>
</tr>
<tr>
<td>Development of a Modern Integrated Thermal Systems Design Laboratory</td>
<td>John Abbitt</td>
<td>2.046</td>
</tr>
<tr>
<td>Paper Title</td>
<td>Author</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Development of RFID-based real-time inventory tracking as a project assessment tool in a problem-based laboratory environment</td>
<td>Esfandiar Behravesh, Auroop Roy, Shaun Duncan, and Christopher Tuthill</td>
<td>2.041</td>
</tr>
<tr>
<td>Differences in Perceptions of On-line Education Between Those Who Have and Have Not Experienced On-line Learning</td>
<td>Christina R. Scherrer, Renee J. Butler, and Shekinah Burns</td>
<td>2.009</td>
</tr>
<tr>
<td>Early Intervention and Mechanical Engineering (EIME): Balancing Stakeholder Expectations in an Engineering Educational Environment</td>
<td>Stephen L. Canfield, Kenneth W. Hunter, Sr.</td>
<td>2.097</td>
</tr>
<tr>
<td>Effect of Temperature on Dry Cell Life Span: A Case Study</td>
<td>R. Radharamanan and Jeng-Nan Juang</td>
<td>2.071</td>
</tr>
<tr>
<td>Elementary and Middle School Engineering Outreach: Building a STEM Pipeline</td>
<td>Gary J Rivoli, Patricia A. S.Ralston</td>
<td>2.028</td>
</tr>
<tr>
<td>Employing Rapid Prototyping in a First-Year Engineering Graphics Course</td>
<td>Wayne M. Johnson, Cameron W. Coates, Patrick Hager, and Nyrell Stevens</td>
<td>2.067</td>
</tr>
<tr>
<td>Engaging Student Participation through Faculty Self-Assessments</td>
<td>Otsebele Nare and Weiying Zhu</td>
<td>2.025</td>
</tr>
<tr>
<td>Engineering for High School Students</td>
<td>Ashley N. Johnson, Douglas Edwards, Marion Usselman, and Donna Llewellyn</td>
<td>2.034</td>
</tr>
<tr>
<td>Engineering Outreach by High School Students in NSBE Jr.</td>
<td>Akibi Archer, Samantha Andrews, Karolyn Babalola, Jacqueline Fairley, Margaret Tarver</td>
<td>2.044</td>
</tr>
<tr>
<td>Enhancing the Collection Process for the Delphi Technique</td>
<td>Petros Katsioloudis</td>
<td>2.047</td>
</tr>
<tr>
<td>Enhancing the Distance Learning Experience: Building Virtual Classroom and Laboratory Environments</td>
<td>Charles J. Lesko, Jr. Ph.D. and John L. Pickard</td>
<td>2.077</td>
</tr>
<tr>
<td>Enhancing the Programming Experience for Engineering Students through Hands-On Integrated Computer Experiences</td>
<td>Stephen Canfield, Mohamed Abdelrahman, Nick Patton</td>
<td>2.100</td>
</tr>
<tr>
<td>Experiences in Civil Engineering Outreach with Middle School Age Students</td>
<td>Rod E. Turochy</td>
<td>2.093</td>
</tr>
<tr>
<td>Homework Solutions Using Smartboard</td>
<td>Peter Hoadley</td>
<td>2.089</td>
</tr>
<tr>
<td>Honors Undergraduate Research: Autonomous Robot for Remote Detection of UXO</td>
<td>Joshua Galloway, Daren Wilcox</td>
<td>2.048</td>
</tr>
<tr>
<td>Paper Title</td>
<td>Author</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Integration of Industrial-Sponsored and Design Competition Projects in the Capstone Design Course</td>
<td>D.R. Waryobaa, C.A. Luongoa, and C. Shiha</td>
<td>2.080</td>
</tr>
<tr>
<td>Introducing Freshmen Engineering Students to Function Modeling to Enhance Design</td>
<td>Cecelia M. Wigal</td>
<td>2.057</td>
</tr>
<tr>
<td>Issues with Online STEM Education – Assessment and Accreditation</td>
<td>Venu Dasigi, Han Reichgelt</td>
<td>2.066</td>
</tr>
<tr>
<td>KISMET: An Open-Source Process for Faculty Participation in ABET Accreditation</td>
<td>Ravi Shankar, Ankur Agarwal</td>
<td>2.078</td>
</tr>
<tr>
<td>Labview Simulation of Induction Motors</td>
<td>Zhaoxian Zhou and James Matthew Johnson</td>
<td>2.055</td>
</tr>
<tr>
<td>Large Course Redesign: Moving an Introductory Engineering Graphics Course from Face-to-Face to Hybrid Instruction</td>
<td>Theodore J. Branoff and Kathleen Mapson</td>
<td>2.017</td>
</tr>
<tr>
<td>Low Cost and High Value Laboratory Exchanger</td>
<td>David L. Silverstein and Jimmy L. Smart</td>
<td>2.056</td>
</tr>
<tr>
<td>Manufacturing Practices - A Hands-On Course in Metalworking for Engineering Undergraduates</td>
<td>Richard Kunz</td>
<td>2.019</td>
</tr>
<tr>
<td>Movie-making Exercise for a freshmen course to generate excitement about Engineering</td>
<td>Faisal Hossain</td>
<td>2.014</td>
</tr>
<tr>
<td>New Frontiers in Manufacturing Education: Rapid Prototyping, 3D Scanning and Reverse Engineering</td>
<td>Atin Sinha</td>
<td>2.058</td>
</tr>
<tr>
<td>Numerical Simulation of Lightning Induced Voltage on Power Transmission Lines</td>
<td>Zhaoxian Zhou</td>
<td>2.054</td>
</tr>
<tr>
<td>Pimp My Browser: Browser Plug-ins Enhance Undergraduate Research</td>
<td>Andrew Wohrley</td>
<td>2.088</td>
</tr>
<tr>
<td>POKs: Useful Tools in Planning Learning</td>
<td>Pedro E. Arce</td>
<td>2.084</td>
</tr>
<tr>
<td>Objectives for Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparing Non-nuclear Engineers for the Nuclear Field</td>
<td>Elizabeth K. Ervin</td>
<td>2.007</td>
</tr>
<tr>
<td>Preparing Systems Engineers of Tomorrow</td>
<td>Ravi Shankar</td>
<td>2.099</td>
</tr>
<tr>
<td>Promoting Engineering at an Inner-City Chartered School</td>
<td>Ashley Bernal and Alan Gravitt</td>
<td>2.070</td>
</tr>
<tr>
<td>Promoting Equity and Diversity in First Lego League</td>
<td>Marion Usselman, Jeffrey Rosen</td>
<td>2.038</td>
</tr>
<tr>
<td>Propagating Software-Based Educational Innovations</td>
<td>Edward F. Gehringer</td>
<td>2.095</td>
</tr>
<tr>
<td>Pushing the Limit Further: Exposure of High School Seniors to Engineering Research, Design and Communication</td>
<td>Priya T. Goeser, Cameron W. Coates, Wayne M. Johnson, Chris McCarthy</td>
<td>2.063</td>
</tr>
<tr>
<td>Paper Title</td>
<td>Author</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Quiz Me- An Interactive Learning Tool with Application to Electrical Circuits</td>
<td>Feras Batarseh, Moataz Abdelwahab, Issa Batarseh, Michael Haralambous</td>
<td>2.029</td>
</tr>
<tr>
<td>Recruiting for Undergraduate Packaging Programs at Christian Brothers University</td>
<td>S. Malasri, A. Ray, Y. Zhou, J. Ventura, P. Shiue, J. Davila</td>
<td>2.031</td>
</tr>
<tr>
<td>Re-defining, De-limiting, and Activating the Engineering Learning Space with Table PC Convertible Computers and Associated Applications</td>
<td>Thomas D. L. Walker, P.E.</td>
<td>2.049</td>
</tr>
<tr>
<td>Results of a Study using the Motivation Strategies for Learning Questionnaire (MSLQ) in an Introductory Engineering Graphics Course</td>
<td>Aaron C. Clark, Jeremy V. Ernst, Alice Y. Scales</td>
<td>2.090</td>
</tr>
<tr>
<td>Revising Faculty Performance Evaluations: Not for the Faint of Heart</td>
<td>André Butler, Scott Schultz, Loren Sumner</td>
<td>2.061</td>
</tr>
<tr>
<td>Security Metrics for Software System</td>
<td>Hao Wang, Andy Wang</td>
<td>2.020</td>
</tr>
<tr>
<td>Semiotics within User Interaction Engineering</td>
<td>Barbara V. Bernal</td>
<td>2.094</td>
</tr>
<tr>
<td>Simulation on Human Body Injury Locations during a Fall due to Slip</td>
<td>Ha Van Voand R, Radharamanan</td>
<td>2.086</td>
</tr>
<tr>
<td>Solid Model Numerical Representation: An Emerging Skill for Engineering Graphics Students</td>
<td>Cameron W. Coates, Kam Fui Lau, Michael Brown</td>
<td>2.072</td>
</tr>
<tr>
<td>Stormwater Pond Beautification in East Tampa: The Basis for University, K-12, and Community Partnerships that Broaden Participation in Environmental Engineering</td>
<td>Ken D. Thomas, Joniqua A. Howard, Erlande Omisca, Trent Green, Maya A. Trotz</td>
<td>2.081</td>
</tr>
<tr>
<td>Successful Interventions for Engineering Student Retention</td>
<td>Ailiecia R. McClain and Sandra J. DeLoatch</td>
<td>2.079</td>
</tr>
<tr>
<td>Survey of Teaching Assessments at Engineering Educational Institutions</td>
<td>Hodge E. Jenkins and Laura W. Lackey</td>
<td>2.050</td>
</tr>
<tr>
<td>Synchronizing International Service with ABET Outcomes</td>
<td>Pauline Johnson, Beth Todd, Laura Ingram, Bettie Aruwayjoye, Hannah Beatty, William Black, Cole Burchalter, and Kendrick Gibson</td>
<td>2.073</td>
</tr>
<tr>
<td>Teaching Engineers to Compete in the 21st Century-A Multidisciplinary Approach for Honors Students</td>
<td>Dr. Kenneth W. Jackson, P.E., Dr. Nancy L. Reichert</td>
<td>2.076</td>
</tr>
<tr>
<td>Teaching Interdisciplinary Collaboration: Learning Barriers and Classroom Strategies</td>
<td>David M. Richter, Marie C. Paretti, Lisa D. McNair</td>
<td>2.036</td>
</tr>
<tr>
<td>Teaching Software Engineering Courses Online Using 21st Century Technology</td>
<td>Sheryl Duggins, Ray Walker</td>
<td>2.032</td>
</tr>
<tr>
<td>Technology in the classroom: College Students computer usage and ergonomic risk factors</td>
<td>Cooper, K.N., Sommerich, C.M., Campbell-Kyureghyan, N.H.</td>
<td>2.018</td>
</tr>
<tr>
<td>Temporal Text Extraction and Automated Time-OWL Population</td>
<td>Min Xia and Ju An Wang</td>
<td>2.022</td>
</tr>
<tr>
<td>The Consequences of Canceling Physics: Revisiting a Case Study in an At Risk Urban High School</td>
<td>Alison Stucky, Marcus Bellamy, Donna Llewellyn, Marion Usselman</td>
<td>2.039</td>
</tr>
<tr>
<td>Paper Title</td>
<td>Author</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>The damaging impacts of hurricanes upon coastal structures</td>
<td>Dr. John Patterson, Dr. George Ford</td>
<td>2.012</td>
</tr>
<tr>
<td>The Luddite Exam: Not Using Technology to Gauge Student Writing Development</td>
<td>John Brocato</td>
<td>2.068</td>
</tr>
<tr>
<td>The Pedagogy of Form versus Function for Industrial Design</td>
<td>David Domermuth, Ph.D.</td>
<td>2.092</td>
</tr>
<tr>
<td>The STEM Club at Marietta High School</td>
<td>Anthony Baldridge,Ashley Nutt, Mary Vaughn, Celis Hartley-Lewis, Amanda Amos</td>
<td>2.035</td>
</tr>
<tr>
<td>The Systems Biology and Bioengineering Undergraduate Research Experience at</td>
<td>Kevin Seale, Patricia Armstrong and John Wikswo</td>
<td>2.074</td>
</tr>
<tr>
<td>Vanderbilt University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic Study for UT Martin Campus and Surroundings</td>
<td>Mohammad Obadat, Stephanie Kissell, William Anderson, Matt Kee</td>
<td>2.005</td>
</tr>
<tr>
<td>Undergraduate Packaging Programs at CBU</td>
<td>S. Malasri , A. Ray , Y. Zhou , J. Ventura , P. Shiue , J. Davila</td>
<td>2.030</td>
</tr>
<tr>
<td>Use of Concept Development Projects in Science and Engineering Courses</td>
<td>Adrienne R. Minerick, Giselle Thibaudeau</td>
<td>2.064</td>
</tr>
<tr>
<td>Use of Interactive Display Technology for Construction Education Applications</td>
<td>Javier Irizarry, Ph.D. Pavan Meadati, Ph.D.</td>
<td>2.015</td>
</tr>
<tr>
<td>Using Inquiry Biomedical Engineering Cases to Increase Middle and High</td>
<td>Jason Weaver, Michael Ryan, and Marion Usselman</td>
<td>2.040</td>
</tr>
<tr>
<td>School Student Interest in Science and Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilizing Senior Capstone Design as an Instrument for Student and Faculty</td>
<td>Laura W. Lackey, Hodge E. Jenkins, Richard O. Mines, Jr., Scott R. Schultz</td>
<td>2.004</td>
</tr>
<tr>
<td>Assessment of Program Outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Validating Tools for Cell Phone Forensics</td>
<td>Neil Bhadsavle and Ju An Wang</td>
<td>2.065</td>
</tr>
<tr>
<td>Vibration Course Enhancement through a Dynamic MATLAB® Graphic User Interface</td>
<td>Elizabeth K. Ervin, Weiping Xu</td>
<td>2.008</td>
</tr>
</tbody>
</table>
The Engineering Educator of 2016
Call for Papers and Presentation Abstracts

Authors are invited to submit full-length manuscripts for presentation at the conference and inclusion in its proceedings. Papers addressing the conference theme have first priority and may include topics such as:

- Preparing the 2020 Engineer
- The 2016 Engineering Professoriate
- Applications of Educational Research
- Capstone and Multi-disciplinary Design Projects
- Curriculum Creation or Enhancement
- Distance Education
- Diversity Recruitment and Retention Programs
- Engagement and Retention Efforts
- Fostering Undergraduate Research
- Freshman Engineering Programs
- Industrial Partnerships
- Innovative Teaching Methods
- Integration of Design throughout the Curriculum
- ABET Accreditation
- K-12 Initiatives
- Learning Communities
- Lifelong Learning
- Outcomes Assessment
- Preparation for Engineering Practice
- Professional Development
- Technology in the Classroom
- Two-year / Four-year Partnerships
- Virtual Classrooms and Laboratories
- Diversity Recruitment and Retention Programs
- Engagement and Retention Efforts
- Fostering Undergraduate Research
- Freshman Engineering Programs
- Industrial Partnerships

Authors may address other topics of interest to the engineering education community as well. Guidelines for preparing the manuscripts are available at [http://cee.citadel.edu/asee-se](http://cee.citadel.edu/asee-se).

This is a peer reviewed conference. Papers will be accepted on the basis of peer review of the complete manuscript. All accepted papers will be included in the conference proceedings. Authors of accepted papers are expected to present their papers at the conference to facilitate the transfer of knowledge through discussion and debate.

In addition to full manuscripts, a limited number of abstracts may be accepted for presentation. These abstracts will be published in the book of abstracts, but will neither be peer reviewed nor included in the reviewed proceedings.

We also anticipate a poster session in which students will discuss their experiences in engineering education (design projects, research, etc.). Information about this session will be available in the fall.

Schedule for Submission of Papers and Abstracts

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 September</td>
<td>Abstracts submitted for consideration</td>
</tr>
<tr>
<td>8 October 2009</td>
<td>Authors notified regarding acceptance</td>
</tr>
<tr>
<td>3 December 2009</td>
<td>Manuscript due from authors for review</td>
</tr>
<tr>
<td>7 January 2010</td>
<td>Reviewed manuscripts returned to authors</td>
</tr>
<tr>
<td>4 February 2010</td>
<td>Final manuscript and extended abstract due from authors</td>
</tr>
<tr>
<td>1 March 2010</td>
<td>Deadline for presentation author to register for conference</td>
</tr>
</tbody>
</table>

Submit a 250–300 word abstract in doc, docx, or pdf file format by 24 September 2009 to the [http://asee.spsu.edu](http://asee.spsu.edu) website.

Direct any questions to:
Dr. Zhaoxian Zhou, Technical Program Chair, Zhaoxian.Zhou@usm.edu

For further information about the conference site, please contact:
Tom Walker, Conference Site Chair, Email: twalker@vt.edu