

Seattle Pacific University
Electrical/Computer Engineering
Senior Design Projects

June 5, 2008
4:00-6:00 pm
Otto Miller Hall 109

Welcome

Welcome to our celebration of the completion of our Senior Design Projects for 2008! We are very proud to showcase the capstone achievements of the seniors in our engineering programs. In these presentations, you will see a small sample of the projects which came from years of training and thousands of hours of design and engineering in classes and experiences here at SPU.

EE 4211, 4212, 4899 Overview

Each of the projects presented represents the culmination of a full year's worth of research, development, and testing of a unique solution to a design challenge. The design and prototyping of the project comes about in three classes. Representing the application of most of the knowledge gained in studying for an engineering degree, each project is based around a microcontroller-based embedded system. The projects vary greatly in purpose and scope, but all involve the use of both digital and analog systems, the design of a unique printed circuit board, and writing of hundreds of pages of documentation. The hundreds of hours of work for a senior design project are spread out among three one-quarter classes, EE 4211, 4212, and 4899 as follows:

EE 4211: Teams develop a design concept and then design and build a working prototype system including all hardware and rudimentary software.

EE 4212: Teams develop complete software for the system, while designing a multi-layer printed circuit board to be used for the final design.

EE 4899: Teams populate and power-on their newly-created PCBs and completely test and debug the entire hardware and software system. Students also reflect upon their vocation, or calling from God, as they make plans on where to go next in their lives.

Engaging the culture, changing the world.



Seattle Pacific
UNIVERSITY

Seattle Pacific University Mission

Seattle Pacific University seeks to be a premier Christian University fully committed to engaging the culture and changing the world by graduating people of competence and character, becoming people of wisdom and modeling grace-filled community.

SPU Engineering Program Mission

Preparing engineers with a Christian worldview who are called to serve, equipped to lead and sent to engage the world with their lives and through the appropriate use of technology.

SPU Engineering Program Goals

We believe that achievement and ongoing development of all of the engineering program goals are dependent upon a thorough understanding of the Christian worldview and its implications and relevance for the individual and their interaction with and service to humanity. Hence our first goal is foundational to all of the rest.

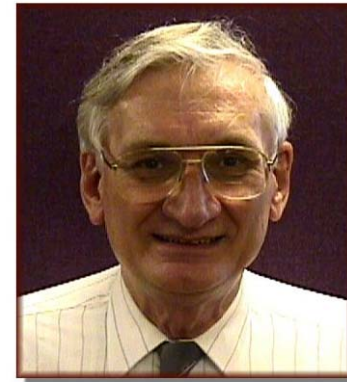
- I. Our graduates will have a thorough understanding of the Christian worldview and its implications and relevance for humanity.
- II. Our graduates will be competent in the core disciplines of engineering and progressing toward technical excellence.
- III. Our graduates will recognize the need for and have an ability to engage in lifelong learning.
- IV. Our graduates will exhibit servant leadership skills.
- V. Our graduates will demonstrate a knowledge of contemporary issues.
- VI. Our graduates will understand and be sensitive to the impact of engineering solutions in a global/societal/community context.
- VII. Our graduates will be prepared to be successful in a variety of postgraduate experiences which could include employment in industry, graduate school, missions, medicine and business.

Scholarship Awards and Project Demonstrations

Thursday, June 5, 2008. 4:00 – 4:30pm

EDWARD J. BAUMAN ENGINEERING EXCELLENCE AWARD – Presented to this year's Edward Bauman Scholar. Awarded to the premier Electrical Engineering junior based on character, scholarship, and potential.

EDWARD J. BAUMAN ENGINEERING SERVANT LEADER AWARD – Presented to the graduating senior who most clearly demonstrates leadership with the humble attitude of a servant.



Edward J. Bauman
Founding Director of Engineering Programs
Seattle Pacific University
1985-2000

DEMONSTRATIONS – Take a few minutes to see live demonstrations of this year's five senior projects and congratulate all of the students on their successes. Demonstrations will be located around OMH 109.



Team PAL

Thursday, June 5, 2008. 4:30pm

PROJECT TITLE: PARTY AND AMBIENT LIGHTING

TEAM MEMBERS AND FUTURE PLANS:

- KAIMANA FUKUOKA:** Pursuing career in video game consoles.
- BRIAN GONG:** Engineering at Ballard Technology
- JOSH KANEHEN:** Pursuing a career.
- BRENT WIERSMA:** Staying in the NW and working in the tech. industry

PROJECT DESCRIPTION:

The PAL System is a wireless indoor and outdoor lighting network. It provides lighting for ambient or decorative purposes in any setting. This offers full color spectrum as well as a variety of special effects. The system can have up to 16 different lighting groups with unique displays.



The PAL Remote allows the user to wirelessly select the lighting programs of the entire system with ease. Also, by connecting to a computer, the user can create customized lighting effects. Using the PAL Programmer software, you can design and display a unique lighting program. This capability makes the PAL System truly a one-of-a-kind innovation that no indoor or outdoor party should be without!



Team UMEME

Thursday, June 5, 2008. 4:45pm

PROJECT TITLE: PEDAL POWERED GENERATOR FOR USE IN RURAL AFRICA

TEAM MEMBERS AND FUTURE PLANS:

HALEY KROMMENHOEK: Working in the Seattle area and getting a kitten

TIM OGNE: Applications Engineer at Cypress Semiconductor

MICHAEL SHI: I plan to work?

ZACH WILLIAMS: Development work in Africa

PROJECT DESCRIPTION:



Currently, one of the main issues in third world countries is the inability of people to access electrical power. One troubling consequence of this is that the education of children in Africa is hampered because they cannot do their homework once the sun goes down. While there are alternatives to electric lighting, such as fires, candles, kerosene lamps, and battery operated lights, these options can cause major health problems, and are often expensive. Our team sought out to create a device that could aid rural areas that are so desperately in need of some form of electricity.

PRIMARY FEATURES:

- Pedal Driven Alternator
- Internal Battery
- Ability to Charge External Batteries
- Fuel Gauging to Monitor Battery
- 12 Volt DC Power Outlet
- Inverter With 230 Volt AC Power Outlet



Team Thor's Hammer

Thursday, June 5, 2008. 5:00pm

PROJECT TITLE: WIRELESS VALVE CONTROL SYSTEM FOR IRRIGATION AND SPRINKLER SYSTEMS

TEAM MEMBERS AND FUTURE PLANS:

KARL BRETZ: Taking some time off before starting work in fall

JACOB DUNN: United States Marine Corps

TODD DUST: Getting married and starting a new job at Cypress

BIZHAN HOOMAN: Summer internship and finishing school

PROJECT DESCRIPTION:



This project came about due to the need for quick and easy retrofitting of existing sprinkler and irrigation valves. Traditionally controlled by wires run underground to a central location, a wireless controller allows for more flexibility in replacement and location of valves. The desired end product is a wireless valve control module capable of being attached to existing watering infrastructure

without the need to bury control lines.

The design we pursued was a base station with wireless and network capabilities and a valve controller module capable of controlling up to four valves. The base station has the capability of keeping track of time/date, watering schedules, and user inputs, while the valve control module simply responds to base station commands. Future revisions of this system would include a wireless technology known as ZigBee, which allows for mesh networking, as well as monitoring and sensor technologies to more closely observe water usage. Such an application could help this technology become an integral part of future home automation systems.



Team Power

Thursday, June 5, 2008. 5:15pm

PROJECT TITLE: ENERGY USE MONITORING SYSTEM

TEAM MEMBERS AND FUTURE PLANS:

HANANE BENANAYA: Marketing EGR at Cypress; vacation in Morocco
STEPHANIE DOST: Going to Boston, either short-term or long-term
MARK SEYMOUR: Pursue engineering career; looking to travel
CODY VANDERPOL: Graduates June 2009, commissions into the USAF

PROJECT DESCRIPTION:

God has called us to be stewards of his creation. As energy becomes a more valuable resource, we must analyze our use of it. Seattle Pacific University's (SPU) campus uses natural gas and electricity for energy, therefore this project focused on these two resources. Part of SPU's signature commitments include knowing what is going on in the world, including knowledge of cutting edge research and technology.

This product helps the students in this design team, as well as others who will use this product, gain a better understanding of how people interact with their resources. Often times energy saving tips are vague in their effectiveness for an entire building. This design team hopes that through this device, SPU can measure tangible results rather than basing their energy use decisions on theory. In other words, if SPU turns down the heat two degrees in Otto Miller Hall in the winter, what will be the actual savings in energy? The basic motivation for this project is summed up in a quote from Cody Vanderpol in *etc* magazine, "Optimizing energy



efficiency is our goal." The basic function of the EUMS is to measure electrical energy consumed by SPU's Otto Miller Hall and display it on an SPU computer. It also displays real time values on an LCD screen, located on its face. Our device is designed to collect electricity measurements once an hour. The data is collected and stored by the system and is organized into easily viewable tables

and graphs to display daily, monthly and yearly trends. This means the measurements are stored so that information from specific dates and times are easy to display on any SPU computer.

Team Helios

Thursday, June 5, 2008. 5:30pm

PROJECT TITLE: ENVIRONMENTALLY CONTROLLED LED LIGHTING

TEAM MEMBERS AND FUTURE PLANS:

PHIL CHASE: Graduating in 2009
NATHAN EVERETT: Getting married. Engineering at Avtech.
DANIELLE PARRIS: Firmware/Software Engineering at Pico Computing
GRAHAM SCHWINN: I am going to become a mad scientist.

PROJECT DESCRIPTION:

Many of today's lighting systems are grossly inefficient, producing much more heat than light energy. Thus, there is a need for improved, durable, energy efficient lighting for commercial, residential, and industrial use. This can be achieved through the development of an environment controlled LED lighting system. LEDs are much more efficient than incandescent or compact fluorescent bulbs. They also produce less waste and pollution. Additionally, they are far less vulnerable to breaking than traditional light bulbs.



In order to demonstrate the efficacy of LED's as an everyday light source, we designed an environmentally controlled LED lighting system. This system was designed specifically to reduce power consumption. To further increase the overall efficiency of the system, we added features such as a user-defined operation schedule, a motion sensor, and a light sensor.

The Helios project is sponsored by a grant from Puget Sound Energy

SPU Engineering Advisory Council

The SPU Engineering Advisory Council includes representatives from over a dozen companies in the Puget Sound region. Members of the Advisory Council meet regularly with the engineering faculty to help insure the quality of our program. We welcome representatives from any companies with business related to engineering. Each company that regularly sponsors projects or provide internships for our students is especially encouraged to participate. Please contact the Director of Engineering Programs if you are interested in more information.

Friends of SPU Engineering

People who believe in the mission of SPU Engineering, regardless of their background and training, are welcome to all official SPU engineering activities and are encouraged to meet personally with the director to find ways that they can partner in the vision and mission. This includes, among other things:

- Serving on the advisory board
- Promoting SPU engineering in local schools
- Speaking in our classes, cadre and society meetings
- Arranging tours of engineering companies
- Helping with intern placement
- Sponsoring student design and research projects
- Judging contests
- Providing contacts with local schools and businesses
- Donating equipment, books and training materials
- Supporting existing endowments for student scholarships, missions projects, faculty development and equipment
- Establishing endowments for distinguished speakers and professors

Corporate Sponsors/Donors

Puget Sound Energy
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Brannom Instruments

Engineering Faculty

Kevin Bolding, Ph.D.	Melani Plett, Ph.D.
Robert Lindberg, P.E	Phil Prins, Ph.D.
John Lindberg, Ph.D.	Elaine Scott, Ph.D.
Donald Peter, M.S., P.E	

Emeritus Faculty

Edward Bauman, Ph.D., P.E.	Hugh Nutley, Ph.D., P.E. (deceased)
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SPU Engineering

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Senior Design Final Presentations 2008