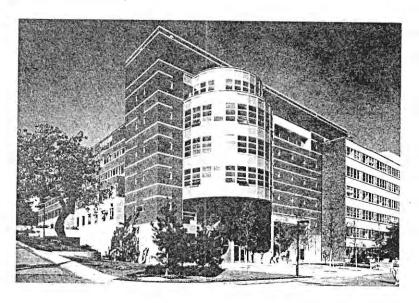# SEATTLE UNIVERSITY
SCHOOL OF SCIENCE AND ENGINEERING
ENGINEERING DESIGN CENTER

1989 PROJECT DAYS

Wyckoff Auditorium
Thursday-Friday, May 18-19

w/ project #s

Seattle University
FOUNDED 1891

Welcome

The Engineering Design Center Project Days are a special time, since we literally hear and see the end results of a Seattle University engineering education. The EDC is only in its second year, but virtually all of the design projects were sponsored by industry, giving our students a taste of engineering practice they will confront upon graduation.

The Engineering Design Center would not have blossomed within two years without the efforts of so many people: Rolf Skrinde, the founding Director of the Engineering Design Center; the companies who have sponsored projects for our students and assigned liaison engineers to help guide them; the faculty, who mentored their students throughout the year; and, most importantly, the students themselves who put forth so much effort and for whom the Engineering Design Center is meant.

<div align="center">

Dr. Terry J. van der Werff
Dean, School of Science and Engineering

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May I add my welcome to that of Dean van der Werff. The student presentations over the next two days represent an effort at Seattle University to orient our program to the needs of industry, prepare our students to be leaders in engineering and improve our curriculum through the participation of practicing engineers. Our growing partnership with industry provides our students with an excellent introduction to the engineering profession, and we trust that some of this professionalism will be reflected in their presentations.

Special thanks go both to students and faculty. Students in the engineering organizations have volunteered to carry out many of the tasks associated with our Project Days events. These organizations include ASCE, ASME, IEEE, Society of Women Engineers, and Tau Beta Pi. Thanks, too, to the Department Coordinators, Prof. Robert Heeren in Electrical Engineering and Prof. Dennis Wiedemeier in Mechanical Engineering.

We appreciate your support and encourage you to visit the displays of student projects, our laboratories, and the construction of our newest Science and Engineering facilities.

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Dr. Rolf T. Skrinde
Director, Engineering Design Center

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SEATTLE UNIVERSITY
SCHOOL OF SCIENCE AND ENGINEERING
ENGINEERING DESIGN CENTER
PROJECT DAYS PROGRAM

Thursday, May 18

12 noon   Engineering Departmental Advisory Board Meeting

1:00 p.m.   Registration, Coffee, Student Conducted Tours

1:25 p.m.   Welcome, Dean Terry van der Werff

Presentations

1:30 p.m.   **Composite Materials Design**   *ME 89.1*
Sponsor: Boeing Commercial Airplanes; Renton, WA
Liaison: Dr. Dodd Grande
Adviser: Prof. Harry Majors, Jr. (CE)
Students: Hau Van Nguyen, Henry Pangelinan, Bruce Parker

During the molding of curved and reinforced polymer composites in traditional laminae orientation of $[0°, \pm 45°, 90°]$s, there is buckling of the inner fibers. The objective of the project was to design a composite of laminae with orientations different from the traditional to compare stiffness and properties that could reduce the buckling under molding operations.

1:50 p.m.   **Intermittent Wiper Control System**   *EE 89.1*
Sponsor: GT Development Corporation; Tukwila, WA
Liaison: John Morris
Adviser: Ward Silver (EE)
Students: Moon Sun Auh, Tuong Hoang, Kenneth Izatt,
              Saraguth Nget

The purpose of the project was to update current intermittent wiper control circuitry. The immediate goal was to investigate, conceptualize, design, build, and test two prototype electronic intermittent wiper control systems that meet the task and specification criteria for heavy-duty trucks.

2:10 p.m.   **Element Test and Maintenance (ETM) Controller: VLSI**   *EE 89.2*
Sponsor: Boeing Aerospace; Kent, WA
Liaison: Linda Bender
Adviser: Prof. Patricia Daniels (EE)
Students: Julianna Panesko, Nimish Shah, Andrew Siguenza,
              Robert Stone

An industry standard element test and maintenance (ETM) bus and controller system has been defined. The objective of the project was to design an ETM controller to coordinate the testing of each element through its ETM interface. System faults were isolated to the element, thus simplifying maintenance and reducing repair time of integrated circuit chips under test.

Break

3:00 p.m.   **Proximity Switch Tester**   *EE 89.3*
Sponsor: Eldec Corporation; Bothell, WA
Liaison: John Ardussi
Adviser: Prof. Robert Heeren (EE)
Students: Kirk Leaf, Phuong Nguyen, Kenneth Sapkos,
              Mark Waechter

The principal goal of the project was to develop a working design and implementation strategy for a hand-held proximity switch confidence tester for Eldec. Variable inductance proximity switches are being used in the field by airline maintenance personnel. The proposed tester could be used by flight maintenance crews to perform a confidence check on a proximity switch before installation on the airplane.

3:20 p.m.   **Ferry Dock Wing Walls**   *CE 89.1*
Sponsor: Wash. State Dept. of Transportation; Seattle, WA
Liaison: Ron Paananen
Adviser: Prof. Richard T. Schwaegler (CE)
Students: Joel Colby, John Fontenot, Jason Kikuta

The objective of the project was to evaluate the characteristics of current wing wall design using wooden piles for ferry docking systems, and propose a cost effective alternative design using high strength steel pipe columns with reinforced concrete pile caps. The new alternative design incorporates the use of a marine fendering system made of butyl rubber compounds which support a rubbing face grillage and act as energy absorbers in the ferry berthing process.

3:40 p.m. Beam Power Transmission   EE 89.4
Sponsor: Battelle Pacific Northwest Laboratories; Richland, WA
Liaison: Edmund Coomes
Adviser: Prof. Robert Heeren (EE)
Students: Kristin Beck, Kerry Flint, Deborah Pendergraft, Michael Yones

A conceptual design has been developed for a test apparatus which will simulate beam power transmission of energy in a space environment. The test facility would transmit energy at optical frequencies in a ground-based test, using a laser system that would transmit upwards of one-hundred watts of power over a distance of approximately fifty miles. These test results could then be adjusted to show equivalent transmission distance of this test apparatus in an outer space environment.

Friday, May 19

9:00 a.m. Alarm Circuit Polling Indicator
Sponsor: US West Communications; Seattle, WA
Liaison: David Alfred   EE 89.5
Adviser: Prof. Xusheng Chen (EE)
Students: Michael Cabalquinto, John Nierenberg, Jason Tang, Ko Tjok

A circuit has been designed to detect and count polling of customer equipment. The circuit will be connected to a 16 port circuit pack, which will detect the occurrence of polling when customers are using their telephone for talking. The circuit will detect a 2.8 KHz polling signal, determine on/off hook status of the telephone, and store a record of data for 16 customers.

9:20 a.m. Software Driven Flow Visualizer
Sponsor: The John Fluke Mfg. Company; Everett, WA
Liaison: Howard Voorheis   EE 89.6
Adviser: Ward Silver (EE)
Students: Teresa Clark, Thomas Davis, An Nguyen, Sean Vaughan

The objective of the project was to design, write, and document a software package that will operate the computer interface which monitors temperatures and air flow velocity resulting from printed circuit cards in a test wind tunnel. The test wind tunnel was designed and fabricated previously as a Mechanical Engineering student project to evaluate the effect of cooling air flow on printed circuit cards. Temperature and air flow data will allow improvements in the design of circuit board systems with respect to cooling and the use of heat sinks.

M E 89.2

9:40 a.m. Integral Air-Operated Windshield Wiper Control
Sponsor: Kenworth Truck Company; Renton, WA
Liaison: Mike Grove
Adviser: Prof. Stephen Robel (ME)
Students: Adil Asafar, Hussain Hajebi, Mark Sessinghaus, Richard Sparks

The objective was to design, build, and test an air-operated windshield wiper control system, which includes off, intermittent, low, high, and wash modes.

Break

10:30 a.m. Digital Accelerometer Test Program
Sponsor: Sundstrand Data Control Group; Redmond, WA
Liaisons: Steve Grlj and Fred Holdren
Adviser: Bert Otten, S.J. (EE)   EE 89.7
Students: Ibraham Altarouti, Donald Gardner, Tyler Tibbetts

A PC Digital Interface Board for collecting data from a Sundstrand ACCELEREX accelerometer was designed and built. The reduced data is graphically displayed on the PC screen in real-time, with the instrument calibrated and made user friendly to test voltage-to-frequency converters.

10:50 a.m. Sea-Tac Storm Drainage
Sponsor: Port of Seattle; Seattle, WA
Liaison: David Van Vleet
Adviser: Prof. Mary Rutherford (CE)   CE 89.2
Students: Todd Jensen, Travis McGrath, Carl McNabb, Mike Spillane

The industrial waste and storm drainage systems at Sea-Tac Airport were evaluated to determine their capacities and needs for improvements to accommodate recent expansions and increased paved areas. A LOTUS Spreadsheet Program catalogued all system information, including additions, analyzed the flow, and calculated the capacity of all elements currently in the system. The program has the capability of evaluating variations in a typical design storm, and can be used for the planning of future additions to the industrial waste and storm drainage systems.

11:10 a.m. Smoke Wand Positioning Device
Sponsor: PACCAR Technical Center; Mount Vernon, WA   M E 89.3
Liaison: Gary Kramer
Adviser: Prof. Robert Viggers (ME)
Students: Jim McGoorty, Jim Harrington, Jay McNeeley, Andy Rzonca, Marc Wunderlich

A system was designed and built to provide precise positioning of a smoke wand in front of a test vehicle while its in operation on the PACCAR Technical Center test track. Lateral and vertical adjustments can be made from a control in the cab.

11:30 a.m. Software Based Navigation System

Sponsor: McCaw Cellular Communications, Inc.; Seattle, WA
Liaison: Michael Riley
Adviser: Prof. Richard Turner (EE)   EE 89. 8
Students: David Burns, Mary Griffith-Russell, Nghia Nguyen, Christopher Rabin

The goal of the project was to evaluate, recommend, and assist in implementing an accurate and portable navigation system that will be free of signal dropouts and signal dead spots in a cellular telephone network. The project consisted of plotting the locations of signal dropouts and dead spots, as well as designing special software to monitor the cellular telephone system performance. Considerable effort has been expended in designing frequency-interference filters.

Lunch

1:00 p.m. Improved High Voltage Defibrillation Relay

Sponsor: Physio-Control Corporation; Redmond, WA
Liaisons: Daniel Yerkovich and James Farr   EE 89. 9
Adviser: Prof. Alvin Moser (EE)
Students: Deborah Conway, Arnold Deguzman, Robert Moffett, Cary Senaga

A defibrillator applies a short but very intense pulse of electricity to the chest of a cardiac arrest victim in order to restore a normal heart rhythm. At present the switching function to apply an approximately 5,000 volt pulse is accomplished through an electromechanical relay. The goal of the project was to duplicate the function of the present relay with a device that will be less expensive, smaller, and more reliable.

1:20 p.m. Built-In Self-Test Chip: VLSI

Sponsor: Seattle Silicon Corporation; Bellevue, WA   EE 89. 10
Liaisons: Dennis Hara and Thomas Thatcher
Adviser: Prof. Paul Neudorfer (EE)
Students: Peter Crabb, Bryan Kraetsch, Jill Sagmiller, Stephen Stegner

An error detection and correction chip presently employs a modified Hamming code to detect errors of transmission. The project sponsor desired that the chip design be augmented to include an automatic built-in self-test (BIST) capability. The BIST feature will be used to test the error detection circuitry whenever the chip is idle.

1:40 p.m. Chirped Signal Processing Chip: VLSI

Sponsor: Seattle Silicon Corporation; Bellevue, WA
Liaison: Robert Yost   EE 89. 11
Adviser: Prof. Gary Erickson (EE)
Students: Lady Oak Arnold, Hollis Duncan, Michael LaFranco, Floyd Tuffs

The project objective was to design a VLSI chip which will analyze a chirped signal and produce the parameters of the signal directly. The signal is expressed as a sum of cosine/sine wave forms, the arguments of which are linear and quadratic parametric functions of time. The silicon compilers and SUN workstations in the VLSI Laboratory were used to implement the project.

2:00 p.m. Magnetic Tape Buckling Due to Alignment Errors

Sponsor: Sundstrand Data Control Group; Redmond, WA
Liaison: John Groenewegen
Adviser: Prof. Hamid Moosavi-Rad (ME)   ME 89. 4
Students: Yanni Gholam, Kamal Hamade, Hassan Makki, Diane Oh

The objective was to examine the phenomenon of buckling in magnetic tape transport systems. An improved knowledge of the mechanisms involved could lead to improvements in tape guidance systems and reduced positioning errors.

Break

3:00 p.m. Duty Cycles-Two Way Radio Systems

Sponsor: Puget Sound Power and Light Company; Bellevue, WA
Liaison: Robert St. Andre
Adviser: Prof. Gary Erickson (EE)   EE 89. 12
Students: John Leung, Kelly McNeese, Russell Myjak, Afshin Shaghaghi

The objective of the project was to record the duty cycle of microwave transmissions, and correlate this with locally recorded weather information. Installation of duty cycle and weather station recorders was carried out, with data obtained and stored via an on-campus personal computer. The data obtained will be utilized to correlate any electromagnetic radiation produced at communications installations with periods of operation and weather conditions.

3:20 p.m. Metro Bio-Assay Unit   CE 89.3

Sponsor: Municipality of Metropolitan Seattle; Seattle, WA
Liaison: Rich Tomlinson
Adviser: Prof. Rolf Skrinde (CE)
Students: Maria Anulacion, Wendy Cooke, Rick Hodgson, Philip Kwock, Robert Dietz, Carrie Leyh

An instrumented flow-through environmental study unit was designed and constructed to allow the evaluation of water contaminants on biological species. Instrumentation consisted of sensor probes, analog to digital converters, data loggers, and computers for automated data collection and analyses. The project team consisted of four CE and two Biology students.

3:40 p.m. Biaxial Fatigue Tester

Sponsor: Seattle University; Seattle, WA   ME 89.5
Liaison: Prof. Harry Majors, Jr.
Adviser: Prof. Dennis Wiedemeier (ME)
Students: Bruce Burnett, Cathy Folk, Cindy Ogg, Doug Thompson

A mechanism was designed, built, and tested to support fatigue testing of samples under combined flexural and torsional loading. The mechanism permits high speed testing and permits the magnitudes of the two types of loading to be independently varied.

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