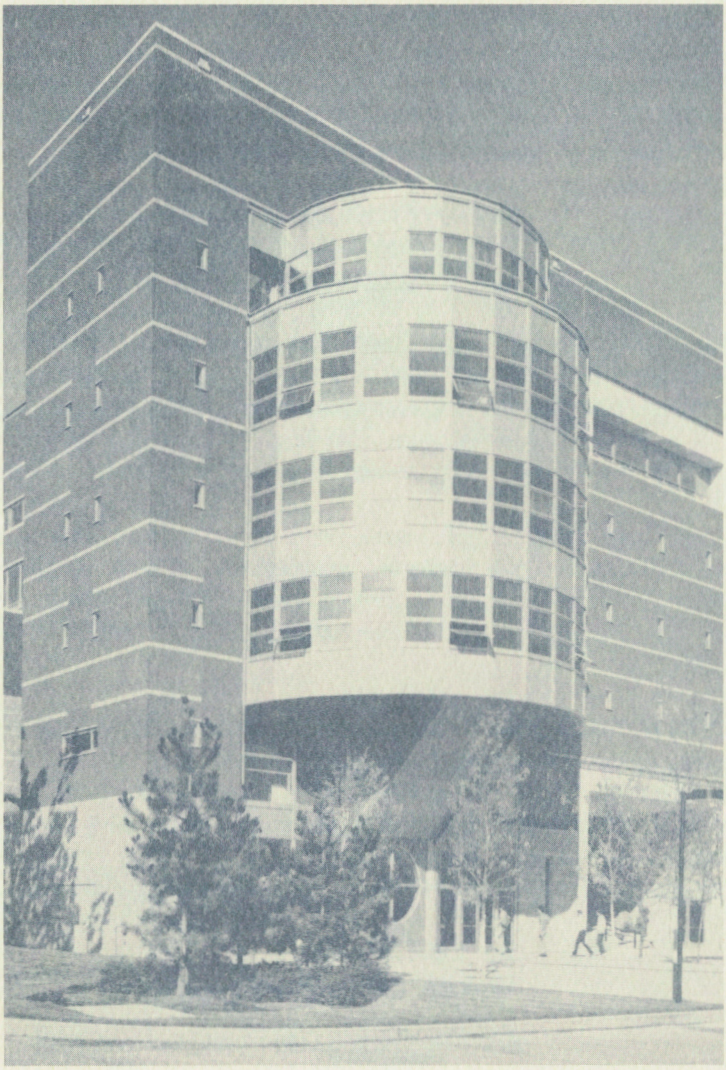
Seattle University
School of Science and Engineering
Engineering Design Center

PROJECTS DAY
MAY 25, 1990



Welcome

Three years ago we boldly launched the Engineering Design Center to provide a focal point for all three engineering programs, to expose students to engineering design projects they will face upon graduation, and to foster group learning and contribution as part of the design process. The Engineering Design Center Projects Day is the highlight of our year, where we exhibit publicly the products of a Seattle University engineering education.

The Engineering Design Center has a growing reputation which is the result of committed efforts by many people: Rolf Skrinde, the founding director of the Engineering Design Center; the companies who sponsor projects and the liaison engineers from these companies who help guide them; the faculty advisors; and, most importantly, the engineering students themselves, whose achievements we applaud and for whom the Engineering Design Center is fundamentally meant.

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

On behalf of our engineering faculty and students, may I welcome you to Projects Day 1990, our third annual reporting of senior design project results to sponsoring organizations, visitors and friends in the community. We have changed the format this year to a one-day program with concurrent sessions, which is consistent with many technical conferences.

For academic year 1989-90, I am pleased to report that 24 of our 26 senior engineering design projects are being sponsored by local industry and other organizations. We are grateful for this enthusiastic support, and as the program has matured, it has resulted in greater accomplishment per project.

As you participate with us during the day we invite you to visit our engineering classroom and laboratory facilities, including the newly renovated Electrical Engineering laboratories in the Bannan Building and our new biology facilities in the Thomas J. Bannan Center for Science and Engineering. We thank you for your support and encourage your feedback so that we can continue to improve our engineering design program.

Dr. Rolf T. Skrinde
Director, Engineering Design Center

Projects Day

May 25, 1990
Engineering Design Center

9:00 a.m. Engineering Advancement Council
10:30 a.m. Projects Day Registration

Project Presentations

Wyckoff Auditorium

11:00 a.m.

- Three-Phase Unbalanced Loadflow Analysis, page 3
- T1 Channel Signaling Access Indicator, page 3
- Element Test and Maintenance Interface Standard Cell, page 3
- Cellular Propagation Prediction for the Seattle Area, page 3

1:00 p.m.

- HEPA Filter Disposal, page 4
- Log Length Measuring System, page 4
- Conduction Heat Transfer Experiment, page 4
- Truck Hood Hinge Redesign, page 4
- Diagnostic/Self-Test Software, page 5
- Pattern Recognition/Neural Network Feasibility, page 5
- Fault Monitor System, page 5
- Video DAC, page 5

3:30 p.m

- Accelerometer and Signal Processing Unit Interface, page 6
- Fluke Graphics Flow Visualization, page 6
- Automation of Power Machinery Lab Data Collection, page 6

Stimson Room

11:00 a.m.

- Floating Dolphin Computer Analysis, page 7
- Vehicle Restraint System for Road Simulator, page 7
- End-Notch Flexure Test for Laminated Composites, page 7
- Semi-Automated Diameter Measuring System (SAMS), page 7

1:00 p.m.

- Duty Cycle Study, page 8
- Remote Transmitter Tower Lighting, page 8
- Design Prototype and Testing of a Defibrillator Data Recording Technique, page 8
- Design and Testing of a Tape Cartridge Unit (TCU), page 8
- Free Convection Flow Test Unit, page 9
- Fatigue Test Monitoring Instrumentation System, page 9
- Automated Orientation of a Tunnel Lining Segment on an Erector, page 9

3:30 p.m.

12:00 p.m. Lunch

3:00 p.m. Break

4:15 p.m. Adjourn

Wycoff Auditorium -- 11:00 a.m.

Project Title:	**Three-Phase Unbalanced Loadflow Analysis**
Sponsor:	ESCA Corporation; Bellevue, WA
Liaison Engineer:	David Sun
Faculty Adviser:	Prof. X. S. Chen
Students:	Gary Anderson, Margaret Burnett, Richard Clark, Hieu Huang, Lorretta Lippincot

Description:
A three-phase unbalanced load flow algorithm was developed to be incorporated into ESCA's Distribution Management Systems (DMS). The project has included investigating previously developed three-phase load-flow programs, writing a program for forming the three-phase Y matrix, developing a three-phase load flow program using the Newton Raphson method,and evaluating the performance of the program.

Project Title:	**T1 Channel Signaling Access Indicator**
Sponsor:	US West Communications; Seattle, WA
Liaison Engineer:	Jack Tang
Faculty Adviser:	Prof. X .S. Chen
Students:	Abdulaziz Aldosari, Quy Do, James Monroe, Bichdung Truong, Matthew Wade

Description:
A T1 channel signaling access indicator has been designed to bridge at high impedance with the 24 interleaved channels of the 1.544 mhz T1 bipolar signal of the US West telephone system. The device monitors and locks on the T1 bipolar signal to locate and display signaling states. A microcomputer- based device with its supporting hardware and software was designed and tested under actual conditions.

Project Title:	**Element Test and Maintenance Interface Standard Cell**
Sponsor:	Boeing Aerospace and Electronics; Kent, WA
Liaison Engineer:	Todd Hill
Faculty Adviser:	Prof. Patricia D. Daniels
Students:	Helena Kheang, George Kynl, Kaz Saegusa, Mark Soto

Description:
The testability and maintainability of electronic systems is greatly enhanced by the use of a standard interface for controlling system tests. This project has continued the design of an element test and maintenance (ETM) interface standard cell. The existing design was modified to meet industry standards and Boeing's refined requirements. The design is implemented using the ChipCrafter Silicon Compiler.

Project Title:	**Cellular Propagation Prediction for the Seattle Area**
Sponsor:	McCaw Cellular Communications; Seattle, WA
Liaison:	Michael E. Riley
Faculty Adviser:	Prof. Patricia D. Daniels
Students:	Shannon Brown, Nha Doan, Alawi Kadhem, Matt Paine, Melissa Ting,

Description:
Locations of antenna sites for cellular communication are selected using a computer simulation of RF propagation. Some inaccuracies result, since the model does not account for all terrain features of a specific geographic region. The average variation between various alternative terrain models with respect to the RF propagation model has been determined and correction factors have been proposed.

Wyckoff Auditorium -- 1:00 p.m.

Project Title: **HEPA Filter Disposal**
Sponsor: Westinghouse Hanford Company; Richland, Washington
Liaison Engineers: Jerry Scott and Charles Ripley
Faculty Adsivers: Prof. Mary Rutherford and
Prof. Rolf Skrinde
Students: Cheryl Benson, Lance Jacobson,
Kevin Johnson, Jack Seipel

Description:
Many of the operations at Hanford Nuclear Reservation require that exhaust gases be filtered to remove contaminating particles. Methodology employed traditionally has been the use of High Efficiency Particulate Air (HEPA) filters. The design team developed methods of fixing particles in the filter to prevent fugitive particle emissions. They also evaluated alternatives and prepared a preliminary design of a system to process the spent filters for final disposal in a form which is certified to be acceptable to regulatory agencies.

Project Title: **Log Length Measuring System**
Sponsor: Weyerhaeuser Company; Tacoma, Washington
Liaison Engineer: David Ringles
Faculty Adviser: Prof. Dennis Wiedemeier
Students: Bill Doerr, Dan Gendreau, Dave Merill,
Scott McCarthy, Valentine Gnanarajah

Description:
The goal of this project was to develop a log length measuring system that is accurate to $\pm$ 0.5 inch in 40 feet. This measuring system should operate with existing log delimbers over delimber feed speeds ranging from 300 to 1,000 feet per minute. The system must endure the aggressive environment encountered at logging sites.

Project Title: **Conduction Heat Transfer Experiment**
Sponsor: Seattle University; Seattle, Washington
Liaison Engineer: Prof. Jack Mattingly
Faculty Adviser: Prof. Jack Mattingly
Students: Walid Doghli, John McAvoy, Hans Paller,
Anh Truong

Description:
The project consisted of designing and constructing a conduction heat transfer measuring experiment to be used at Seattle University. The experiment will minimize radiation and convection effects so that steady state, one dimensional conduction heat transfer can be measured. The experiment would also be useful in measuring the thermal conductivity and diffusivity of unknown materials. This equipment will supplement the heat transfer lab and increase the student's comprehension of conduction heat transfer.

Project Title: **Truck Hood Hinge Redesign**
Sponsor: Kenworth Truck Company; Renton, Washington
Liaison Engineers: Ludi Giese and Bridget Brewer
Faculty Adviser: Prof. Lewis Filler
Students: Shannon Flanagan, Ryan Larson,
Brian Lennon, Fredric Soulier

Description:
The Kenworth conventional tilt hood hinge mechanism was redesigned in order to simplify both installation on the production line and adjustment on the line and in the field. The redesigned hinge must be adjustable with the hood closed, be self-aligning, and be compatible with current hood and frame design. Manufacturing cost is a prime consideration.

Project Title: **Diagnostic/Self-Test Software**
Sponsor: Advanced Technology Laboratories; Bothell, Washington
Liaison Engineers: Donn Franklin and Bob Pederson
Faculty Advisers: Prof. Alvin Moser
Students: Ali Alkuwari, Abdolreza Amindavar, Kenneth Rabold, Rachelle Staub, Gaylord Stewart

Description:
The team designed, coded and tested software to carry out self test operations on a digital board containing multiple processors and buses, extensive memory and peripheral devices. The goal was to detect hardware faults and provide diagnostic information through a communications port for at least 80 percent of the componenst on-board.

Project Title: **Pattern Recognition/Neural Network Feasibility**
Sponsor: David Taylor Research Center; Bremerton, Washington
Liaison Engineers: Jeff George and Bob Kollars
Faculty Adviser: Prof. Alvin Moser
Students: Frank Bilodeau, Lee Christensen, Barbara Kelley, Gary Mullin

Description:
The team has implemented and evaluated the efficacy of a system to recognize occurrences of specified audio patterns. The implementation uses a recently introduced IC with neural network and fuzzy logic concepts. Hardware for signal preconditioning has been built. Software drives the neural network board and evaluates results.

Project Title: **Fault Monitor System**
Sponsor: Honeywell, Marine Systems Division; Everett, Washington
Liaison Engineer: Patrick Kelly
Faculty Adviser: Prof. Paul Neudorfer
Students: Robert Austin, Joseph Mack, Lanh Nguyen, David Pietromonaco, Nigel Sharma

Description:
An automatic multi-channel fault monitoring system has been designed for various environmental and life/burn-in tests on equipment manufactured by Honeywell. The system, which is controlled by an IBM PC through a commercially available interface, continuously monitors units under test for faults in voltage, current or continuity.

Project Title: **Video DAC**
Sponsor: Seattle Silicon; Bellevue, Washington
Liaison Engineer: Bruce Byrkett and Jay Kuhn
Faculty Adviser: Prof. Paul Neudorfer
Students: Andrew Allen, Hanchye Ho, Tuan Nguyen, Mathew Woo

Description:
An 8-bit video digital-to-analog converter (DAC) has been developed to be added to the library of modules available in ChipCrafter, Seattle Silicon's silicon compiler software product. The video DAC is capable of taking previously stored digital video information and converting it into an analog video signal that meets standard specifications.

Wyckoff Auditorium -- 3:30 p.m.

Project Title: **Accelerometer and Signal Processing Unit Interface**
Sponsor: Sundstrand Data Control; Redmond, Washington
Liaison Engineer: Steven Grlj
Faculty Adviser: Fr. Lammert Otten
Students: Sirak Araya, John Lindau, Tim Pickett, Mark Taeschner, Christopher Taylor

Description:
A wire-wrapped interface board has been designed and built to replace an interface board in the signal processing unit (SPU). This board incorporates an application specific integrated circuit (ASIC) to replace eight counter IC's. The new design is compatible with existing hardware and software.

Project Title: **Fluke Graphics Flow Visualization**
Sponsor: The John Fluke Manufacturing Company; Everett,Washington
Liaison Engineer: Howard Voorheis
Faculty Adviser: Mr. H. Ward Silver
Students: Jawad Alissa, Imron Siregar, Mike Ramirez, Dan Thonn, Bichduyen Truong

Description:
Printed-circuit boards are placed in a special wind-tunnel and the wind speed and temperature are then digitized and stored on floppy disks. The design team has developed a suite of Lotus 1-2-3- spreadsheet programs, or macros, which present data in graphical format for the design engineers. This involves transferring the data from the Fluke microcomputers to IBM-DOS format and analyzing the data in a Lotus 1-2-3- spreadsheet.

Project Title: **Automation of Power Machinery Lab Data Collection**
Sponsor: Seattle University; Seattle, Washington
Liaison Engineer: Xusheng Chen
Faculty Adviser: Mr. H. Ward Silver
Students: Flint Deskins, Kourosh Farivar, Kris Henry, Kareem Greiss

Description:
Using an MS-DOS compatible microcomputer, automated software control programs are being developed to operate electronic instruments during Power Laboratory experiments at Seattle University. LabWindows software has been used to develop the program to control the instruments using the IEEE-488 bus. Drivers for each instrument will be coordinated to allow automatic data collection during lab experiments.

Stimson Room -- 11:00 a.m.

Project Title: **Floating Dolphin Computer Analysis**
Sponsor: Washington State Department of Transportation; Seattle, Washington
Liaison Engineers: Joel Colby and Ron Paananen
Faculty Adviser: Prof. Richard Schwaegler
Students: Paul Brienen, Kyle Buslach, Jacob Ha

Description:
Washington state ferries use a number of floating dolphins to guide ships as they dock. Buoyancy for the dolphins is provided by steel and polyethylene tanks. Presently there is no system to predict precisely the attitude of a floating dolphin under a variety of conditions. A computer program developed by the design team will provide that needed tool.

Project Title: **Vehicle Restraint System for Road Simulator**
Sponsor: PACCAR Technical Center; Mount Vernon, Washington
Liaison Engineer: Hal Brown
Faculty Adviser: Prof. Ray Murphy
Students: Peter Bergus, Chris Jellen, Scott Torve, Chris Blakeslee, Mike Jones

Description:
A vehicle restraint system was designed to be used for tests on the PACCAR Technical Center's road simulator. The simulator replicates actual road motions on the vehicle being tested, through controlled vertical inputs to each wheel, for ride, vibration, and endurance testing. The restraint system is designed to hold the vehicle on the simulator without interfering with the required test motions.

Project Title: **End-Notch Flexure Test for Laminated Composites**
Sponsor: Boeing Commercial Airplanes; Renton, Washington
Liaison Engineer: Dodd Grande
Faculty Adviser: Prof. Harry Majors Jr.
Students: Stan Cari, Jeff Qunell, Mark Larson

Description:
The end notch flexure test (ENF) is a unique and relatively new method of testing for mode II fracture toughness of composite materials. The design team performed a laboratory investigation of the ENF and redesigned the test fixture. Objectives of the project were to determine the accuracy of beam bending assumptions used in the analysis, the effects of specimen geometry on these assumptions, and the effect of specimen width on test results.

Project Title: **Semi-Automated Diameter Measuring System (SAMS)**
Sponsor: Weyerhaeuser Company; Tacoma, Washington
Liaison Engineer: David Ringlee
Faculty Adviser: Prof. Jack Mattingly
Students: Bob Anderson, Ken Dickenson, Greg Hansen, Tom Larsen, Glen Mitchell

Description:
The objective was to design, test and produce a hand held mechanical-electrical device with an associated electronic data storage system to measure log diameters. Currently, log diameters are measured by tape measures or rules and the length is either writtten by hand or keyed into a data recorder. Washington State Scaling Rules require two diameters to be taken the first across the narrowest portion, and the second at 90 degress to the first.

Stimson Room -- 1:00 p.m.

Project Title:	**Duty Cycle Study**
Sponsor:	Puget Sound Power and Light Company; Bellevue, Washington
Liaison Engineer:	Robert St. Andre
Faculty Adviser:	Prof. Gary Erickson
Students:	Jose Lau, Sang Ngo, Rekha Rabadia, Michael Rooney

Description:
The duty cycle of microwave transmissions has been recorded and correlated with locally recorded weather information. Data was stored and analyzed using a personal compter. This information wll be used to assist the Federal Communications Commission in determining the yearly average power transmitted by a site.

Project Title:	**Remote Transmitter Tower Lighting**
Sponsor:	Puget Sound Power and Light Company; Bellevue, Washington
Liaison Engineer:	Robert S. Andre
Faculty Adviser:	Prof. Gary Erickson
Students:	Don Houghton, Gordon Oberg, Dale Splett, Gail Verzani

Description:
Transmitting towers are provided with warning lights to avoid problems with aircraft operating in the area. Many of these towers are in remote locations, and replacement of lights is costly, and in some cases, dangerous. A remote lighting system was designed to facilitate replacement of tower lights.

Project Title:	**Design Prototype and Testing of a Defibrillator Data Recording Technique**
Sponsor:	Physio-Control Corporation; Redmond, Washington
Liaison Engineer:	Steve Firman and Jeff Parke
Faculty Adviser:	Prof. Robert Heeren
Students:	Patrick Henderlong, Giang Hoang, Michael Huynh, Mohsen Namazi, John Stafford

Description:
The design task is to take serial digital signals output from an off-the-shelf Physio-Control commercial product, time annotate them, and interface these signals to one channel of a battery operated digital audio tape (DAT) recorder. New digital recording technology has been investigated, and a commercially available recording unit has been selected.

Project Title:	**Design and Testing of a Tape Cartridge Unit (TCU) Simulator**
Sponsor:	Sundstrand Data Control; Redmond, Washingtonc
Liaison Engineers:	Jon Groenewegen and Gary Kersten
Faculty Adviser:	Prof. Robert Heeren
Students:	Thomas Campbell, Arthur Jenkins, Espiritu Saldivar, Terry Carter

Description:
A simulated tape cartridge unit has been developed to emulate the electrical loading and sensor feedback functions of a MK50 tape cartridge unit (TCU). This simulated cartridge fixture will preclude damage to the certified tape cartridge unit which often occurs when trouble-shooting defective circuit card assemblies.

Project Title: **Free Convection Flow Test Unit**
Sponsor: Boeing Commercial Airplanes; Everett, Washington
Liaison Engineer: Rich Hernandez
Faculty Adviser: Prof. Stephen Robel
Students: Elgin Anderson, Tim Chan, Christine Hahn, Joe Harrington, Michiel Hoogstede

Description:
The objective of this project was to design and build a test unit to measure heat transfer from electrical circuit cards in an enclosed area which is without forced air cooling. The circuit cards contain electrical components which are susceptible to damage from heat and electromagnetic interference (EMI). A shielding screen is required to protect the cards from EMI damage. The size of screen mesh on an EMI shielding screen, the spacing of the cards, and the wattage of the cards can be varied on the test unit and the resulting heat flow measured.

Project Title: **Fatigue Test Monitoring Instrumentation System**
Sponsor: Battelle, Pacific Northwest Laboratories; Richland, Washington
Liaison Engineer: Prof. Harry Majors Jr.
Faculty Adviser: Prof. Peirre Gehlen
Students: D.L. Huges, S. Lim, S. McGar, A.D. Sta. Maria

Description:
The project consisted of developing a system to monitor a materials specimen during testing to detect the first stages of failure. The system, utilizing state of the art Fluke IEEE-488 high speed data acquisition, consists of instrumentation that integrates the Fluke IEEE-488 with software that interprets the acquired data for purposes of plotting and for system shutdown at initial indications of specimen failure.

Project Title: **Automated Orientation of a Tunnel Lining Segment on an Erector**
Sponsor: The Robbins Company; Kent, Washington
Liaison Engineer: Michael Stapleton
Faculty Adviser: Prof. Lewis Filler
Students: Tom McCullough, Jondra McKay, Raymond Snaring, Sherry Vevea

Description:
The erector is a robotic arm that receives a tunnel lining segment for placement on the tunnel wall. The project consisted of selecting suitable instrumentation to determine proper orientation of the segment with respect to the erector and to write logic for a programmable controller in order to activate the erector for proper loading of the segment on the erector.

Seattle University
Engineering Advancement Council

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