

College of Engineering

Overview

Engineering has been a major program of study since its founding in 1907. Over 7,000 engineering degrees have been granted, and many of the professional engineers currently practicing in industries, consulting firms, and governmental agencies throughout Hawai'i, the mainland, and the world are graduates of the College of Engineering.

The College of Engineering offers curricula designed to challenge students to develop new modes of thinking in our ever increasing technology-based society. The programs leading to undergraduate degrees in civil, electrical, and mechanical engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. In addition, the College offers advanced degree programs at the masters and doctorate levels in all three disciplines.

Civil engineers are in demand by engineering and architectural consulting offices as well as the Hawai'i construction industry. Electrical engineers are recruited by utilities and by manufacturers of electrical and electronic equipment such as computers, instrumentation, and telecommunication devices. Mechanical engineers find work in primary and fabricated metals in Hawai'i, the aircraft industry, computer-aided design and manufacturing, and power production and transmission industries on the mainland. The application of alternate energy sources in Hawai'i and elsewhere will further the demand and opportunity for engineers in the foreseeable future.

Mission

Our strategic plan has three goals.

1. Strengthen our faculty through recruiting and retention, and recognize members' successes with support and rewards.
2. Increase significantly our undergraduate and graduate enrollment through scholarships, internships, and research assistantships.
3. Develop research centers of excellence in our acknowledged areas of strength.

Departments

- Civil and Environmental Engineering
- Electrical and Computer Engineering.
- Mechanical and Materials Engineering
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Degree Programs

Bachelor of Science

- Civil Engineering
- Electrical Engineering
- Mechanical Engineering

Master of Science

- Civil Engineering
- Electrical Engineering
- Mechanical Engineering

Doctoral Programs

- Civil Engineering
- Electrical Engineering

- Mechanical Engineering

Centers and Institutes

Center for Advanced Computing and Virtual Experiments

The **Corrosion Laboratory** in 2001, and propose to establish the **Transportation Research Center** in 2002. Our goal is to build these centers to attract more creative researchers and offer them a variety of supportive resources, including first-rate facilities, state-of-the-art equipment, highly promising students, and opportunity to engage in interdisciplinary endeavors.

The Hawaii Center for Advanced Communications is a research and education center that supports research and training on a wide range of advanced communication technologies, with a special emphasis on broadband and wireless communications. The Center's mission is to provide students with a rich and diversified education to prepare them for careers in the communications industry and academia; boost graduate and undergraduate enrollment to provide a trained workforce for industry; to promote entrepreneurial activities and to provide leadership and expertise in information technology to the University and State of Hawaii; and to provide the infrastructure for joint collaborative broadband and wireless communications research among members of the Center and with external researchers from industry and academia. The Center was established in 2000.

FACTS & FIGURES

Total Enrollment: 716 (Fall 2001)

Undergraduate: 578

Graduate: 138

Men: 568/716, Women: 148/716

Undergraduate Men: 461/578

Undergraduate Women 117/578

Graduate Men: 107/138

Graduate Women: 31/138

Minority student enrollment (Breakdowns)

Gender/Ethnic Breakdowns:

Percentage Female: 148/716

Asian/Pacific Islander: 580

Japanese: 206

Chinese: 134

Korean: 25

Filipino: 89

Hawaiian/Part Hawaiian: 45

Pacific Islander: 11

Other Asian: 27

Mixed Asian/Pacific Islander: 43

Hispanic: 8

Caucasian: 65

African American: 1

American Indian/Alaska Native: 0

Mixed: 53

Student Organizations

Student chapters of professional engineering societies are active at the college, and all students are encouraged to participate. Honorary societies are represented in all three departments. The activities of

these student organizations are coordinated by the Engineers' Council of University of Hawai'i. The following are listings for Civil, Electrical, Mechanical Engineering Organizations, as well as college-wide organizations.

College-Wide Organizations

Engineering Council of the University of Hawai'i is an organization comprised of members of all organizations in the College of Engineering. Members have the responsibility of coordinating events within the College of Engineering for all disciplines and to also promote communication between the three disciplines within the college. Events include student faculty mixers, the Graduation Recognition Ceremony, and the annual Career Week event.

Society of Women Engineers is a non-profit educational service organization dedicated to making known the need for women engineers, and encouraging young women to consider an engineering education. The organization's objectives are to 1) Stimulate women to achieve full potential in careers as engineers and leaders; 2) Expand the image of the engineering profession as a positive force in improving the quality of life, and 3) Demonstrate the value of diversity. The organization encourages students of either gender in any of the engineering disciplines to join.

Civil Engineering Organizations

American Society of Civil Engineers' objective is to encourage its members to study civil engineering and/or civil technology and to advance the civil engineering profession. Members prepare, present and discuss papers; conduct chapter activities; entertain guest speakers; and visit engineering works under construction. They become involved with community service projects requiring the collective efforts of many, and read publications of the Society. These and many other chapter activities stimulate broad personal development with an early professional consciousness while the opportunity to participate actively in their civil engineering or technology education.

Chi Epsilon: Civil Engineering Honor Society. Dedicated to the purpose of maintaining and promoting the status of Civil Engineering as an ideal profession, Chi Epsilon was organized to recognize the characteristics of the individual Civil Engineer deemed to be fundamental to the successful pursuit of an engineering career, and aid in the development of those characteristics in the Civil Engineering student.

Institute of Transportation Engineers promotes interest in transportation and traffic engineering. The Institute was established to strengthen the University's program in transportation engineering by acquainting its members to various transportation issues such as congestion management, IVHS (Intelligent Vehicle Highway Systems), electric vehicles, and airport and harbor operations. The Chapter frequently invites guest speakers and plans visits to offices or project locations to help students get a better feel for these issues, as well as provide excellent opportunities to enhance their technical and communication skills.

Electrical Engineering Organizations

Eta Kappa Nu: International Electrical Engineering Honor Society - Delta Omega Chapter is actively involved in tutoring services, service projects, and faculty "get togethers." Membership is by invitation only, requires top 10% class standing, and successful completion of an eight-month pledging period.

Institute of Electrical and Electronics Engineers is an engineering interactive organization. Although their focus is on Electrical Engineering, membership is open to students of all majors. Activities such as company tours and guest speakers enhance the students' professional awareness. Other activities include sporting events, picnics and parties.

Mechanical Engineering Organizations

American Society of Heating, Refrigeration, and Air Conditioning Engineers is an organization for Mechanical Engineering majors, although other engineering majors are welcome. Functions include guest speakers and discussions about current student activities. Members also participate in monthly meetings held by the Hawai'i Parent Chapter, which allows the students to interact with senior engineers.

American Society of Mechanical Engineers is an education and technical organization endeavoring to encourage the development of new technologies, while helping to solve the problems of an increasingly technological society. The purposes of the student section are as follows: to provide an opportunity for students to begin their professional careers by joining a professional engineering society; to inform students of recent developments in the field of engineering through publication, field trips, and meetings; to promote fellowship and interactions with other student sections as well as professional sectors of the society.

Pi Tau Sigma: National Honorary Mechanical Engineering is actively involved in tutoring services, and monitoring the Mechanical Engineering Computer Lab. Pi Tau Sigma continues to uphold the high ideals of the engineering profession and stimulate interest in Mechanical Engineering. Membership is by invitation only with a grade point average requirement and a semester pledging period.

Faculty Profile

20 full time faculty

2000-2002 Publications and Paper Presentations: 4 Books, 9 Book Chapters, 67 Articles, 67 Technical Reports, 135 Conference publications

Faculty Honors and Awards

- Excellence in Teaching Award, HI Chang Chai, 2002, Carlos Coimbra, Wayne Shiroma, Michelle Teng
- Excellence in Teaching Award, HI Chang Chai, 2000, Lloyd Hihara
- Excellence in Teaching Award, HI Chang Chai, 2001, Randall Akiona, Beei Huan Chao, Tep Dobry
- IEEE Third Millennium Medal, 2000, Tep Dobry
- Outstanding Faculty Advisor Award for California, Nevada, and Hawaii, American Society of Mechanical Engineers, 2001: Mehrdad Ghasemi Nejhad
- Regents' Medal for Excellence in Research, 2002: Beei Huan Chao, Marc Fossorier
- Regents' Medal for Excellence in Teaching, 2000, Rahul Chattergy
- Who's Who in Engineering Education, 2002: David Yun
- Who's Who in Science and Engineering, 2001: David Yun

Research

- **Adaptive Damping and Positioning using Intelligent Composite Active Structures** is funded by the Office of Naval Research. It is the continuation of a work funded by the Naval Research Laboratory and Honeywell Aerospace Company. It aims at the development of basic active composite structures to be used in adaptive structures. It is specifically aims at the development of Active Composite Panels and Active Composite Struts for applications such as Stewart Platform to give both Vibration Suppression as well as Precision Positioning Capabilities.
- **Digital Media Processing** – Following Projects:
 - **The Image Sequence Processing Group** develops and explores models of human perception, and uses these models as the basis for signal, image and image sequence processing and coding techniques. Because many aspects of visual perception can be best understood in the frequency

domain, and because visual perception is spatiotemporally local, the use of joint spatiotemporal/ spatiotemporal- frequency representations is a promising approach. A second approach is to identify uniform regions in the image or sequence via segmentation, forming a representation based on the boundaries and interiors of these regions.

- **Compression of Volumetric Data using the Derivative of Gaussian Transform:** The Derivative of Gaussian Transform (DGT) was developed based on receptive field profiles in the human visual system. One application of this transform is data compression. The luminance component from a subset of the Visible Male dataset (above right) was assembled into a volume, and compressed using a three-dimensional version of the DGT. The original and reconstructed volumes after 30:1 compression are shown to the right, pseudocolored to emphasize their structure.
- **Hawaii Corrosion Laboratory:** In this project, researchers study the corrosion mechanisms of metal-matrix composites and advanced material systems comprised of metal alloys in contact with organic-matrix composites in a wide range of natural conditions offered by Hawaii's unique climate. Advanced materials have typically been developed for superior mechanical and physical properties, but not for resistance to environmental degradation. A solid understanding of these materials' corrosion mechanisms and performance in natural environments is crucial before the materials can be effectively used in the development of state-of-the-art equipment. (Dr. Lloyd Hihara)
- **Integrated Aircraft Health Management:** develops dual-use advanced technology applicable to military aircraft and commercial air transportation. For the United States Department of Defense, the program supports Warfighter Sustainment Advanced Technology development that addresses total ownership cost reduction, expeditionary logistics, and warfighter protection and enhanced safety. The technology enables reduced operating costs through life-extension of legacy systems and improved diagnostic tools that will decrease the number of unnecessary parts removals. For the flying public, the program supports improved affordability and safety throughout the commercial air transportation industry. Specifically, airline gate delay and air turnback/diversion costs will be reduced due to improved system health monitoring and prognostics. Additional cost reductions and safety improvement will result from new condition-based maintenance practices enabled by advanced IAHM technology.
- **Laboratory of Intelligent and Parallel Systems,** encompasses a broad spectrum of on-going activities in 3D image processing and visualization.
- **Optical Communications Laboratory:** As part of the Hawaii Center for Advanced Communications, the primary objective of the Optical Communications Laboratory (OCL) is advanced research in optics and lasers for communication and remote sensing. Through innovations in system design and signal processing, the OCL explores new possibilities in the areas of free-space communications, wavelength division multiplexing, and optical sensory applications.
- **Semi-autonomous Underwater Vehicle Intervention Mission:** The primary research objective is to develop a Semi-Autonomous Underwater Vehicle for Intervention Missions (SAUVIM). SAUVIM is for 6,000m depth. It has a robotic arm, various on-board sensors, batteries, VxWorks real-time controller, multi CPUs, and various advanced software. Unlike the fly-by autonomous underwater vehicles (AUV), SAUVIM will have a manipulator work package. It will require an advanced control system and a precise sensory system to maintain high accuracy in station keeping and navigation. Most intervention missions, including underwater plug/unplug, construction & repair, cable streaming, mine hunting, and munitions retrieval- require physical contact with the surroundings in the unstructured, underwater environment. Such operations always increase the level of risk and present more difficult engineering problems than fly-by and non-contact type operations. For these intervention operations, the vehicle requires a dexterous robotic manipulator; thus the overall system becomes a high degree-of-freedom (dof), multi-bodied system from the coupling effects of the high degree of accuracy even in the presence

of unknown, external disturbances, i.e. undersea currents. All these issues present very complex engineering problems that have hindered the development of AUVs for intervention missions. Currently, the state-of-the-art in machine intelligence is insufficient to create a vehicle of full autonomy and reliability, especially for intervention missions.

Community Service – Outreach Program

The College of Engineering's Outreach Program is the bridge that has brought together the College and the community. Over the past year, the College has sponsored several major events and visited dozens of schools in its efforts to educate the community, especially the younger generation, about engineering.

Tests of Engineering Aptitude, Mathematics and Science (TEAMS) Competition: This event attracted 18 public and private high school squads from around the state for a one-day academic competition designed to help students build skills in problem-solving skills and teamwork.

Central and Honolulu Districts' Middle School Robotics Competition: This event was held in conjunction with the Hawaii State Department of Education and included the use of Fischertechnik robotics kits from Europe, which contained the blocks, gears, wires, motors and software needed to build and control each robot. In the first contest, each team was faced with the task of constructing an elevator robot, while the second contest involved building a robot that could maneuver through a 4 by 3-foot maze. Laptop computers connected to the robots controlled their movements. The competition was the result of robotics workshops that were held for middle school teachers during the summer of 2000. (The idea for these workshops came from the late Dr. Deane Kihara, mechanical engineering professor.)

College of Engineering Ambassadors have made an impact at a few dozen schools around the state. "Introduce a Girl to Engineering Day" at Sacred Hearts Academy brought together over 300 high school freshman and sophomores for a dynamic panel of engineers.

High School Engineering Internship Program allows high school juniors to have the unique opportunity to experience a higher level of academics. Each student was assigned faculty and student mentors, and worked with such projects as the Semi-Autonomous Underwater Vehicle for Intervention Missions, and the Microwave Millimeter-wave Research Lab.

Extramural Grants and Awards (2001 – 2002)

Research Awards: 36 Grants, \$4,921,917

Nonresearch Awards: 7 Grants, \$310,624

Prominent Alumni

- Aaron Oki, Deputy Manager, Semiconductor Products Center, TRW
- Donald Kim, former UH Regent and President of R.M. Towill
- Michael Chun, President, Kamehameha Schools
- Ronald Ho, Principal, Ronald N.S. Ho & Associates
- Sam Callejo, Governor's Chief of Staff