

Proposed College Research Themes

Themes

1. Engineering for a Sustainable Hawaii
2. Exploration Engineering
3. Engineering for a Secure Hawaii and US
4. Engineering in support of Dual-Use technologies
5. Biomedical Engineering

Engineering for a Sustainable Hawaii

Engineering to support a sustainable Hawaii takes many forms: *Renewable Energy*: photo-voltaic devices, thermal, deep ocean water heat exchange, fuel cells, *Resource Management*: drinking water (water treatment and supply, dam's and watershed etc), solid and liquid waste disposal (sewers, landfill and combustion), recycling and re-manufacturing, *Food Production*: supplying the infrastructure for biotechnology in both land based and ocean based agriculture, *Transportation*: mass transit, alternative fuels, pavements and road structures, *Affordable Housing*: including low cost materials and energy efficient design and *Coastal Infrastructure*: including all efforts to build an infrastructure that will help Hawai'i mitigate the effects of Global Warming. The College of Engineering should develop capabilities in some key arenas to support the State's ability to respond to each of these critical needs.

Exploration Engineering

The College will leverage the three big-science strengths of UH: Ocean exploration, earth exploration and resource assessment using near space, deep space exploration. UH is one of US leaders in exploration of the oceans. This exploration requires sophisticated engineering practice that the College has been developing expertise. We will continue to build this capability. Hawaii is home of a space launch facility in PMRF in Kauai. Engineering in conjunction with SOEST is developing a launch and satellite design capability HSFL (Hawai'i Space Flight Laboratory) for micro and small satellites with application to resource mapping of the earth. UH has a leadership role in astronomy. Many of these new telescopes require sophisticated engineering that the College needs to support. Each of these exploration industries is forming its own economic development niche in terms of the professional base that is being attracted to Hawaii to develop the industry. The College of Engineering should work to enhance these developing industries.

Engineering for a Secure Hawaii and US

Hawaii's geographic position ensures that it is representative of many of the natural hazards and potential disasters that can befall the US (earthquakes, hurricanes, tsunamis and floods). Its position in the middle of the Pacific ensures that it also plays a major role in the national security of the entire US as far as threats from Asia are concerned. These threats range from threats posed by unfriendly nations all the way to the spread of disease. The University in a partnership between the College of Engineering and SOEST have a DHS funded national research Center CIMES (National Center for Island,

Maritime and Extreme Environment Security). The College will leverage this Center and work with additional UH faculty to build areas of nationally competitive expertise in the analysis, mitigation and response to both natural and manmade hazards and potential disasters.

Dual-Use High-Technologies

The military presence in Hawaii provides for a large component of the economic opportunities available in Hawaii. The most natural place for the development of Hawaii's future economic diversification therefore surrounds the harnessing of underlying technologies that are being developed for military applications, and developing them for civil applications. These areas include computation, modeling and simulation capability, software/hardware co-development, communication and information technologies, wireless and radar platforms, sensors, optics, and materials research including nano-electronics and mechanics and corrosion. The University is home to a Navy UARC (University Affiliated Research Laboratory), that can accept contracts from the DoD. This will be an invaluable mechanism to accelerate UH's growth of contracts in the Dual-Use and arena. The College should develop capabilities that reflect those of local companies and national defense contractors that have significant presence in Hawaii.

Biomedical Engineering

The College is already working with the JABSOM School of Medicine and some other medical institutions in Hawaii and intends to increase its involvement with the JABSOM. The development of sensors for the analysis of the human body is a natural collaboration that the College can and is undertaking with the School of Medicine. Imaging sensors as well as signal processing are crucial components of this effort. For tele-medicine, the ability to transmit real-time data over extended distances, and to master numerous aspects of tele-presence present many of the same challenges as will be encountered in our exploration engineering objectives.

Examples of Specific Arenas for Faculty Focused Research Efforts by Theme

Engineering for a Sustainable Hawaii

- Renewable energy
- Re-manufacturing/recycling
- Infrastructure to mitigate sea level rise
- Water supply

Dual Use High-Technologies

- Robotics – underwater and planetary missions – security related missions

- Modeling and Simulation
- Engineering in support of optical devices
- Communications
- Remediation of environmentally damaged sites
- Robotics

Biomedical Engineering

- Applications of robotics and MEMS
- Sensors

Engineering for a Secure Hawaii and US

- Disaster mitigation
- Remote/autonomous sensor/data collection design (space, land and sea)

Exploration Engineering

- Spacecraft design
- Autonomous robotics especially with underwater and planetary applications
- Electronic devices and signal processing/controls in support of astronomical instruments