VIP @UniversityOfHawaii

Vertically Integrated Project (VIP) Program

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Hallmarks of VIPs

- **Vertical participation:**
  - Faculty mentor
  - Graduate students
  - Undergraduate students that stay in project for ~2 years (1 semester as sophomore, 1 semester as junior, 2 semesters as senior)
  - Hierarchical: the more experienced students work with and mentor the more inexperienced students
- **Long-term:** 5- to 10- year projects (or more)
- **Large teams:**
  - 8 to 10 students initially
  - ~15 students to be sustainable
- **Research / creative projects:**
  - Students help advisor accomplish goals
- **Interdisciplinary:** desirable

VIP Vertically Integrated Projects

VIP History

- Started at Purdue by Ed Coyle (~2005)
- Ed Coyle is now at GA Tech
- Purdue / GA Tech programs were funded through NSF grants
- VIP idea expanding to other institutions with VIP Consortium (formed 2014)
  - Led by GA Tech and Michigan
- VIP Consortium funded by Helmsley Trust
  - $5 million over 3 years for 13 institutions (ended Dec. 2017)

VIP Vertically Integrated Projects

VIP Consortium

Updated:
Fall 2017

	Institution		Institution
1	ASU	11	Purdue U.
2	Boise State	12	Rice U.
3	Colorado State	13	Texas A&M
4	Florida International U.	14	UC Davis
5	**GA Tech**	15	U. Delaware
6	Howard U.	16	U. Hawaii
7	Inha (Korea)	17	U. Michigan
8	Morehouse College	18	U. Strathclyde (UK)
9	National Ilan U. (Taiwan)	19	U. Washington
10	New York U.	20	Virginia Commonwealth U.

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Advantages of VIP

- **Why institutionalize this?**

Advantages

- Additional research/creative productivity
- Workforce development
- Additional pathway to industrial partnerships
- Additional student engagement: gives students a reason to be on campus (vs. MOOCs, etc.)
- Natural environment for multidisciplinary projects, entrepreneurship, etc.

Disadvantages

- As the program grows, resources will be needed

Overall, a VIP program should provide a net benefit

VIP Vertically Integrated Projects

Advising a VIP Team

- **What do the faculty get out of this?**

Advantages

- Expansion of research group with little additional funding
- Additional research / creative productivity
- Recruitment pool for graduate students
- Makes it relatively easy to manage a large research group
- Attractive integration of research and education for NSF and other proposals

Disadvantages

- Starting a team requires additional work
- Productivity of undergraduate students varies

Overall, advising a VIP team should provide a net benefit

Vertically Integrated Projects

Participating in a VIP Team

- **What do the students get out of this?**

Advantages

- Exposure to research / creative projects
- Team learning environment / workforce training
- Expertise in a particular area
- Possible publications / more attractive CV
- Peer mentoring

Disadvantages

- Less project breadth (students should commit to project for at least 2 years)

Overall, participating in a VIP team should provide a net benefit

VIP Vertically Integrated Projects

UH Vertically Integrated Project (VIP) Program

- VIP program now has 12 VIP teams, 200+ students
  - Electrical Engineering
  - Mechanical Engineering
  - Information & Computer Sciences
  - In talks with other depts. in CTAHR, Social Sciences
  - Expanding to include other campuses (KCC, LCC, WCC, HCC, Maui College)

VIP Student Poster Session in iLab, Nov. 2016

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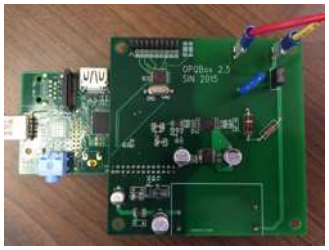
UH Vertically Integrated Project (VIP) Program

- Some success stories:
  - Teams have competed in national and international competitions
    - RobotX
    - Hyperloop Challenge
    - Mobile Microrobotics Challenge (1st in mobility, 2015)
    - Booz Allen Ideas Festival (2nd in student division, 2016)
    - National drone competition
  - Undergraduate students co-authored and authored research publications

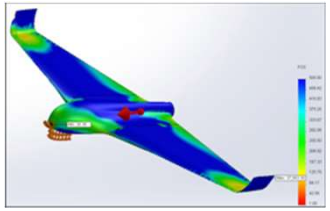
Examples of VIP teams

Astronomical technology

Space and aerial technology



Power quality monitoring

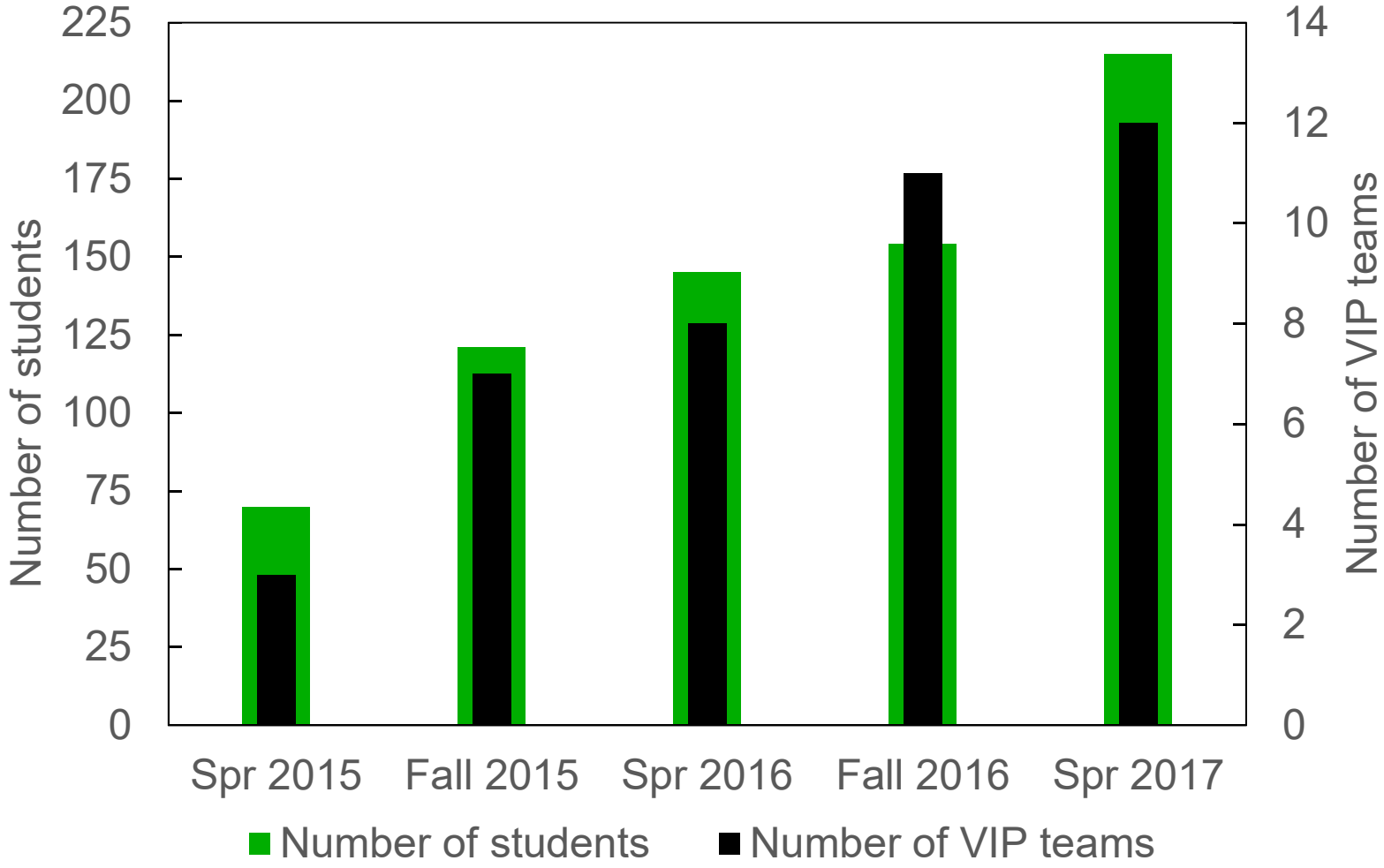


Fixed-wing drones

VIP Program website:
https://sites.google.com/a/hawaii.edu/uh-vip/

Vertically Integrated Projects

UH Vertically Integrated Project (VIP) Program



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UH VIP Program

- Students should stay in a team for at least 2 years
  - Freshman / sophomores allowed to change teams if they want to work on a different project.
  - Juniors should stay in the same project as seniors.
- Students enroll in VIP project courses (ENGR 196, 296, and 396) http://www.catalog.hawaii.edu/courses/departments/engr.htm
  - These courses are open to all majors.
  - VIP students take the appropriate VIP course, then it substitutes into the curriculum of their department.
  - Examples:
    - EE: ENGR 196/296/396 directly substitute for EE 196/296/396.
    - ME: ENGR 296 replaces ME 213. ENGR 396 counts as a technical elective.
    - ICS: ENGR 196/296/396 counts as a technical elective.
- VIP website: https://sites.google.com/a/hawaii.edu/uh-vip/

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VIP Advisor Responsibilities

- Mandatory responsibilities:
  - Manage and mentor team members.
  - Grade undergraduate students (should be enrolled in ENGR course or senior design courses).
  - Reporting of team information to VIP program director (A. Ohta):
    - Student rosters (to be submitted every semester)
    - VIP evaluation form (1-page form to be completed every semester)
  - Have team participate in VIP poster session (annually, possibly every semester).
  - Ensure sustainability of team:
    - Apply for continued external funding for team (as necessary)
    - Maintain sufficient team size (~8 to 10 students or more) to ensure knowledge continuity
- Optional responsibilities:
  - Collaborate on projects / proposals related to VIP
  - Participate in VIP program with other UH campuses
  - Develop shared tools and modules for VIP program

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Starting a VIP Team

- Get access to the VIP website, create website for team. Contact Aaron Ohta (aohta@hawaii.edu) for website access.
- Get access to the VIP advisor Google Drive folder. Contact Aaron Ohta (aohta@hawaii.edu) for access.
- Recruit students (right now there is no formal recruiting or application system, but we are working on this).
- Get CRNs for ENGR 196 / ENGR 296 / ENGR 396, as applicable. To do this, contact Lori Yuu (loriyuu@hawaii.edu) or Tep Dobry (tep@hawaii.edu).
- Have students register for the appropriate ENGR course. Senior students will take their major's senior design course (if applicable).
- Keep track of the student roster (we aggregate this data). Student roster forms are available in the VIP Google Drive folder.

Vertically Integrated Projects

Suggestions for Running a Team

- We want to give the VIP faculty advisor as much autonomy as possible, but here are some suggestions:
- Have a weekly meeting time for the entire team.
- Split teams up into sub-teams. Ideally, there will be one senior-level student in charge of each sub-team.
- Make sure each student has some task that he/she “owns.”
- Have all students document their work in a notebook/wiki/repository. If it is not documented, they do not receive credit.
- Consider giving lackluster students important tasks, so they will rise to the occasion (but have a backup plan in case they don’t).
- Ask your fellow VIP advisors for help as needed. We have things like peer evaluation forms, syllabi, etc.

VIP Vertically Integrated Projects

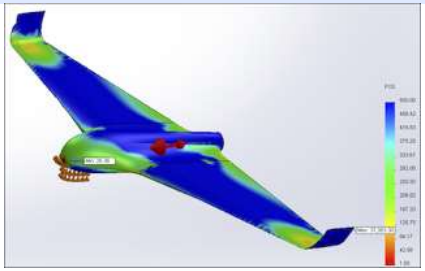
UH VIP Teams (Overview)

Autonomous Vehicles

- Space & Aerial Robotics
- Kanaloa
- Unmanned Aircraft Systems (UAS) Applications and Security
- Fixed-Wing UAVs

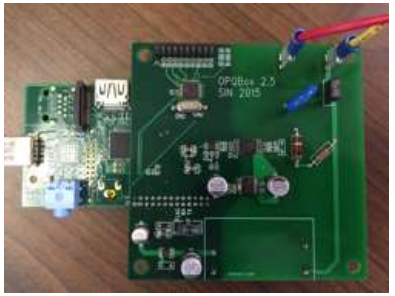
Other

- Smart Needle
- Manoa Astronomical Technologies
- Microrobotics
- Rapid Prototyping
- Liquid-Metal Electronics



Renewable Energy

- Smart Campus Energy Lab
- Open Power Quality
- Renewable Energy Design



VIP Vertically Integrated Projects

UH VIP Summary

- We are in the middle of shifts in engineering education
- Should result in a better student experience
  - Emphasis on design / practical aspects
  - Use of research to improve education, student engagement
  - Use of technology to improve education
- The VIP program is our effort to distill these shifts into a beneficial student experience

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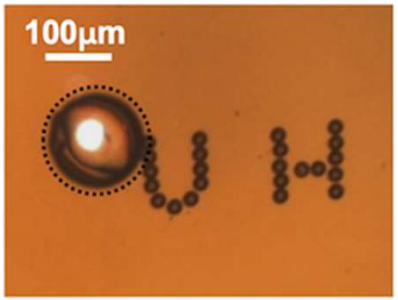
UH VIP Teams (Spring 2015)

Microrobotics (A. Ohta)
Design of optically controlled microrobots and their control systems towards the goal of assembling cells into functional tissues.



Space and Aerial Robotics (W. Shiroma / Z. Trimble)
Design, fabrication, testing, and analysis of space and aerial robotic platforms.

Rapid Prototyping (D. Garmire)
Rapid construction of circuits, packaging, and complete systems.

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More Information

UH VIP Teams (Fall 2015)

Smart Campus Energy Lab (SCEL) (A. Kuh)
Design, fabrication, and deployment of environmental sensor modules that collect weather data in order to analyze spatial and temporal impacts on renewable energy sources.

Manoa Astronomical Technologies (MAT) (Z. Trimble)
Develops precision instruments and telescope components for astronomical applications.

Liquid-Metal Electronics (A. Ohta / W. Shiroma)
Design, fabrication, testing, and analysis of various reconfigurable electronic devices using liquid metal.

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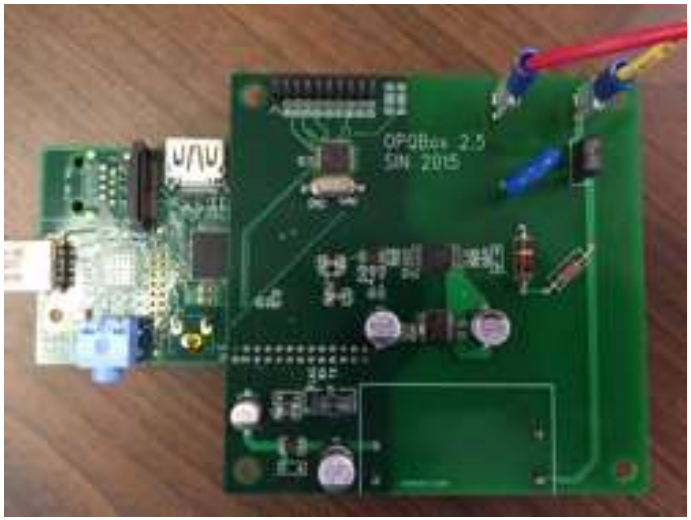
UH VIP Teams (Spring 2016)

Open Power Quality (OPQ) (P. Johnson)
Development of open source power quality monitors for under $50 that can be widely deployed into consumer households to provide useful data on the impact of distributed renewables on the "health" of the power grid.



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UH VIP Teams (Fall 2016)

Unmanned Aircraft System (UAS) Applications and Security (Y. Dong)
UASs have become a cost-effective technology in recent years, but current UASs are weak in security protection. In this VIP project, we will get familiar with UAS application developments and further secure UASs.

Renewable Energy Design (R. Ghorbani)
As intermittent renewable generation is integrated into the power grid, solutions for cost optimization and grid stability must be developed. Distributed sensor and actuator networks must be developed which provide effective, secure and economically sound solutions.

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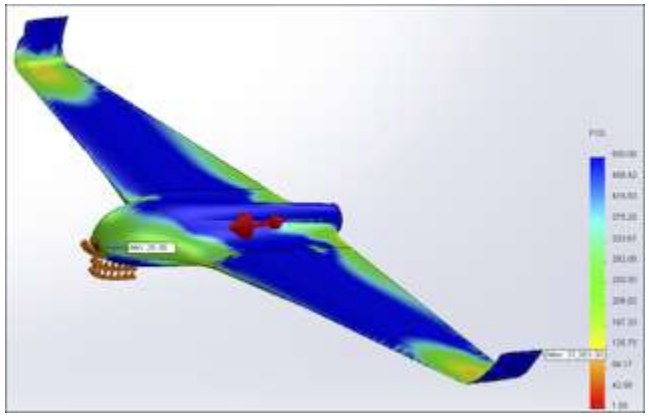
UH VIP Teams (Fall 2016)

Fixed-Wing Autonomous Unmanned Aerial Vehicles (M. Nejhad)
Design and build a fully autonomous electric Unmanned Aerial Vehicle (UAV) to survey and monitor a 4,000-acre macadamia nut farm on the Big Island of Hawaii.



Kanaloa (RobotX) (Z. Trimble)
Autonomous ocean surface vehicle

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UH VIP Teams (Spring 2017)

Smart Needle (B. Konh)
A smart actuated needle has been developed to help the accuracy of brachytherapy. Advanced thin shape memory alloy wires apply force to the body of the smart needle to bend it inside tissue, giving surgeons extra control.

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