

EECE401 Senior Design I

Electrical and Computer Engineering
Howard University

Instructor

Dr. Charles Kim
[ckim@howard.edu]

Fall 2015

Senior Design I - Fall 2015

- **EECE 401** (3 credit hours)
 - Class Hours: W 1310 – 1600
 - Classroom: LKD 1002
- **Instructor**
 - Dr. Charles Kim
 - (202)806-4821
 - ckim@howard.edu
 - Office Hours (LKD3014): Open Door Policy
 - TRF 1400 – 1600
- **Highly recommended course to take along** (unless you have some background in hands-on skills of microcontroller)
 - EECE416 Microcomputer whether it is required or not
 - Final implementation usually involves sensors, controllers, and interface
- **Web ---Syllabus, Notes, etc**
 - Classes and material of previous academic years
 - www.mwftr.com/SD.html [*Note: case-sensitive]
 - Then choose 2015- 2016 academic year

“Senior Design” – brief definition

- Is
 - Culmination of EE/CpE Education, Training, etc
 - Solving a problem (or meeting needs/demands)
 - **Design *experience*** that requires adequate consideration of
 - **Knowledge**
 - **standards,**
 - **Constraints, and**
 - Should be related to the **electrical/computer engineering discipline.**
 - ***Process*** to final product (through Senior Design II)
 - Usually team-based problem solving, inventing, etc.
- Is NOT
 - Further expansion of a class project
 - Final product only

“Design” – Full Definitions

- ABET
 - “The **process** of devising a system, component, or process to meet desired needs,” which involves
 - “A **decision-making** process (often iterative), to convert resources optimally to meet the stated needs” by applying basic sciences, mathematics and engineering, adequately considering
 - knowledge, standards, and constraints related to the electrical/computer engineering discipline.”
- Industry
 - (1) “Determine that a need exists with a customer for specific goods or services and how much that customer is able and willing to pay for it.
 - (2) Then determine if the product or service is compatible with the competencies of the company and if it can be manufactured at a cost that is less than the customer will pay.
 - (3) If so, proceed by designing to match the company’s ability to manufacture, rather than basing the design on state-of-the-art technologies.
 - (4) Finally, prior to full implementation, prepare a pilot demonstration”

Course Objectives and Outcomes

- **Objectives**
 - Learn and use design process to meet needs
 - Becoming to be aware of Technology Impact to Society
 - Becoming an effective team member
 - Becoming an effective communicator
 - Enjoy Design Experiences
- **Topics of the course**
 - Engineering Design Processes
 - Teamwork
 - Communication
 - Professional (or “soft”) Skills
 - Industry Experts and Guest Speakers
- **Course Outcomes (ABET)**
 - (c) Design a system component, process, or system –
 - Throughout the class, we learn the design process and apply it and integrate to a working system which solves customers' problem
 - (g) Effective communicator –
 - Presentations and report writing will enhance verbal, written, and slide communication
 - (i) a recognition of the need for, and an ability to engage in life-long learning –
 - Awareness of the continued, non-stop learning of new technology
 - (j) a knowledge of contemporary issues –
 - Understand the issues related with the project and their impact to society and the project itself.

“Senior Design” Schedule

- Philosophy:
 - “Variable Time, Fixed Performance”
- Rough/Tentative/Soft Schedule to Follow
 - Design Processes and Components: Aug-Sep 2014
 - Selection of Design Projects & Team Formation: Sep-Oct 2014
 - Solution Presentation: Oct-Nov-Dec 2014
 - Design Implementation: Jan-Feb-Mar 2015
 - Design Evaluation: Jan-Feb-Mar-Apr 2015
 - Final Presentation: ECE Day – Apr 2015

How to Join a Team

- Each student join a project team
- All projects are originated from:
 - Industry
 - Research project from faculty
- VIP (Vertically Integrated Projects)
 - Faculty-Student Research Team
 - Real research experience
 - Multidisciplinary team
 - Graduate students, seniors, juniors, and sophomores
 - Long-term project

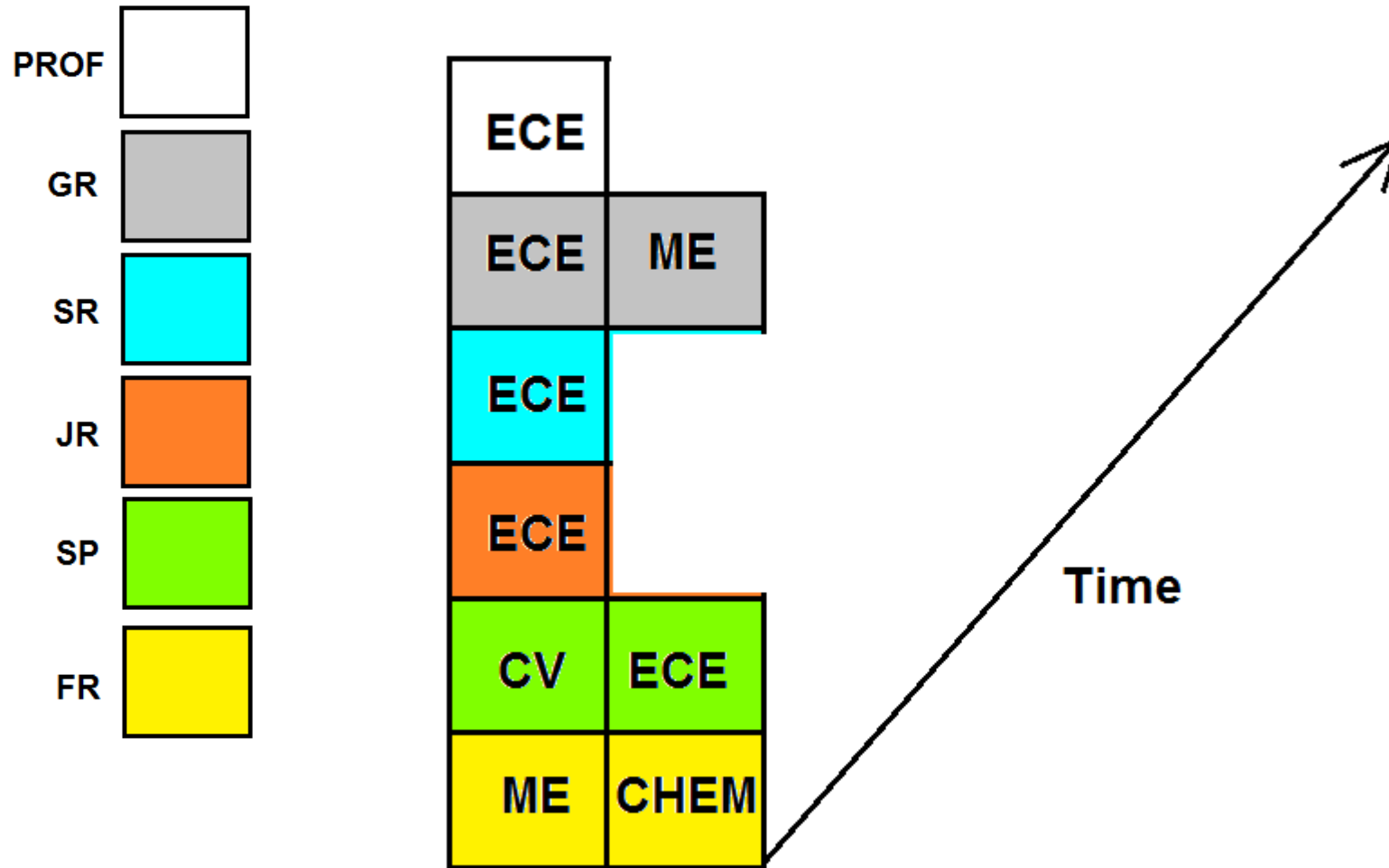
VIP - Summary



- Integration of Research, Education (Teaching & Training), and Service
- Inclusion of UG students in to Research and Innovation
- Faculty Initiated, Research Project Sprouted, Long-Term Project Based
- Vertical Mentoring from Faculty to GR to UG (SR to JR to SP)
- Students: Knowledge and skill set development for innovation from Long-term, 3- 5 year, (rather than 10-week summer long) participation
- Faculty: Exploration and Completion of long-term challenging research by multidisciplinary students
- University: Broadening university community for everyone to participate, which provides students with compelling reason to be on campus and on one's major

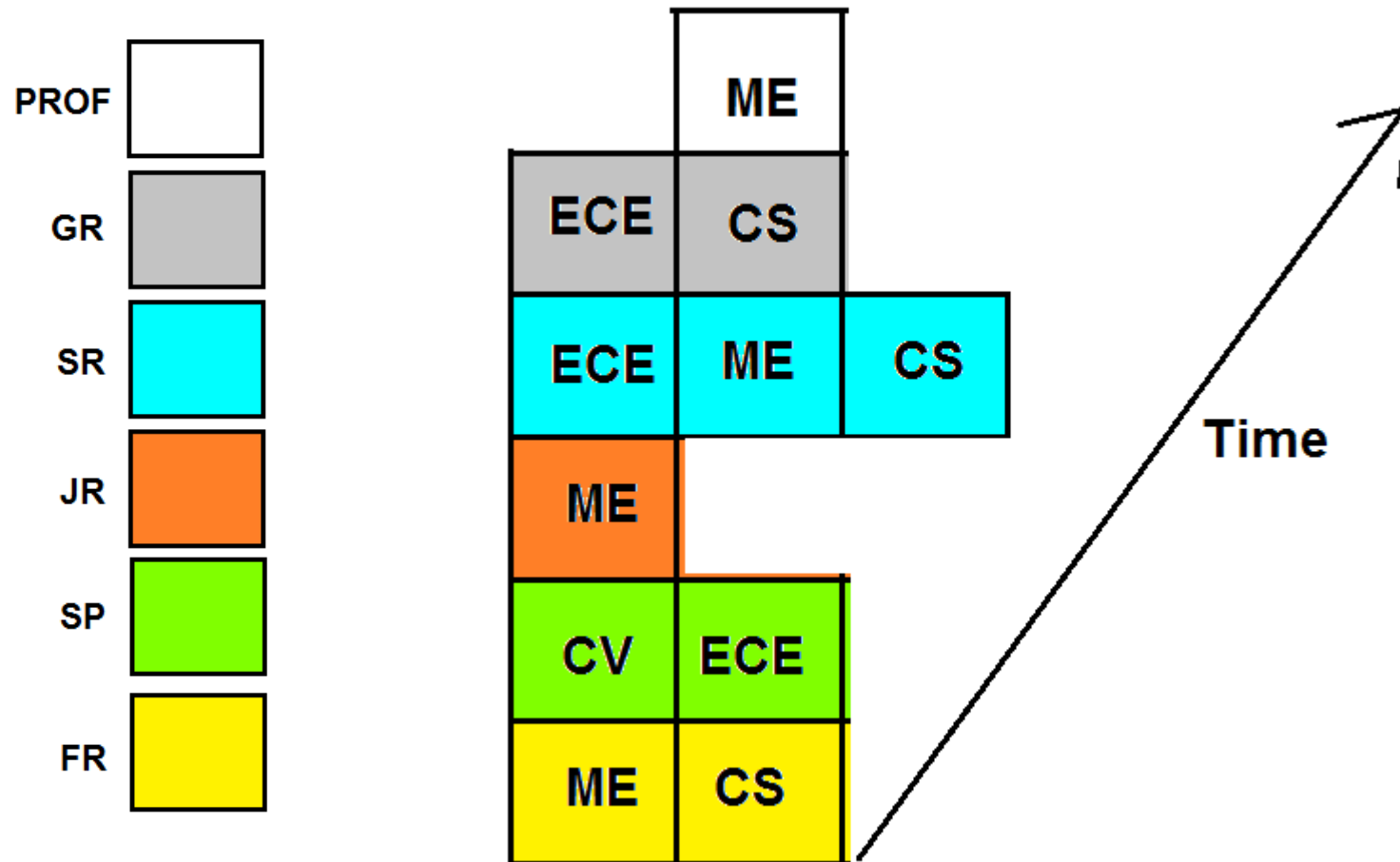
VIP team across departments/majors

- Example: ECE professor initiated VIP



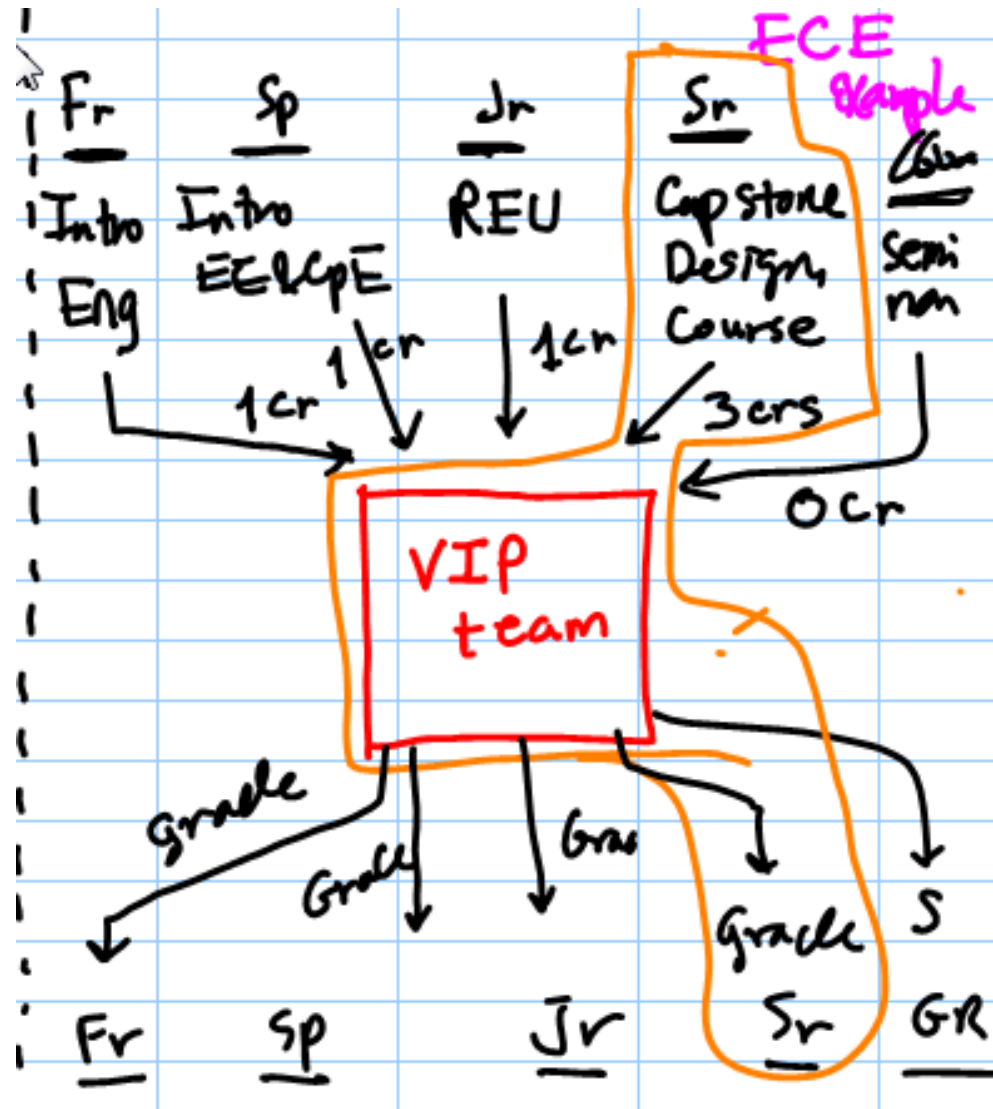
VIP team across departments/majors

- Example: ME professor initiated VIP

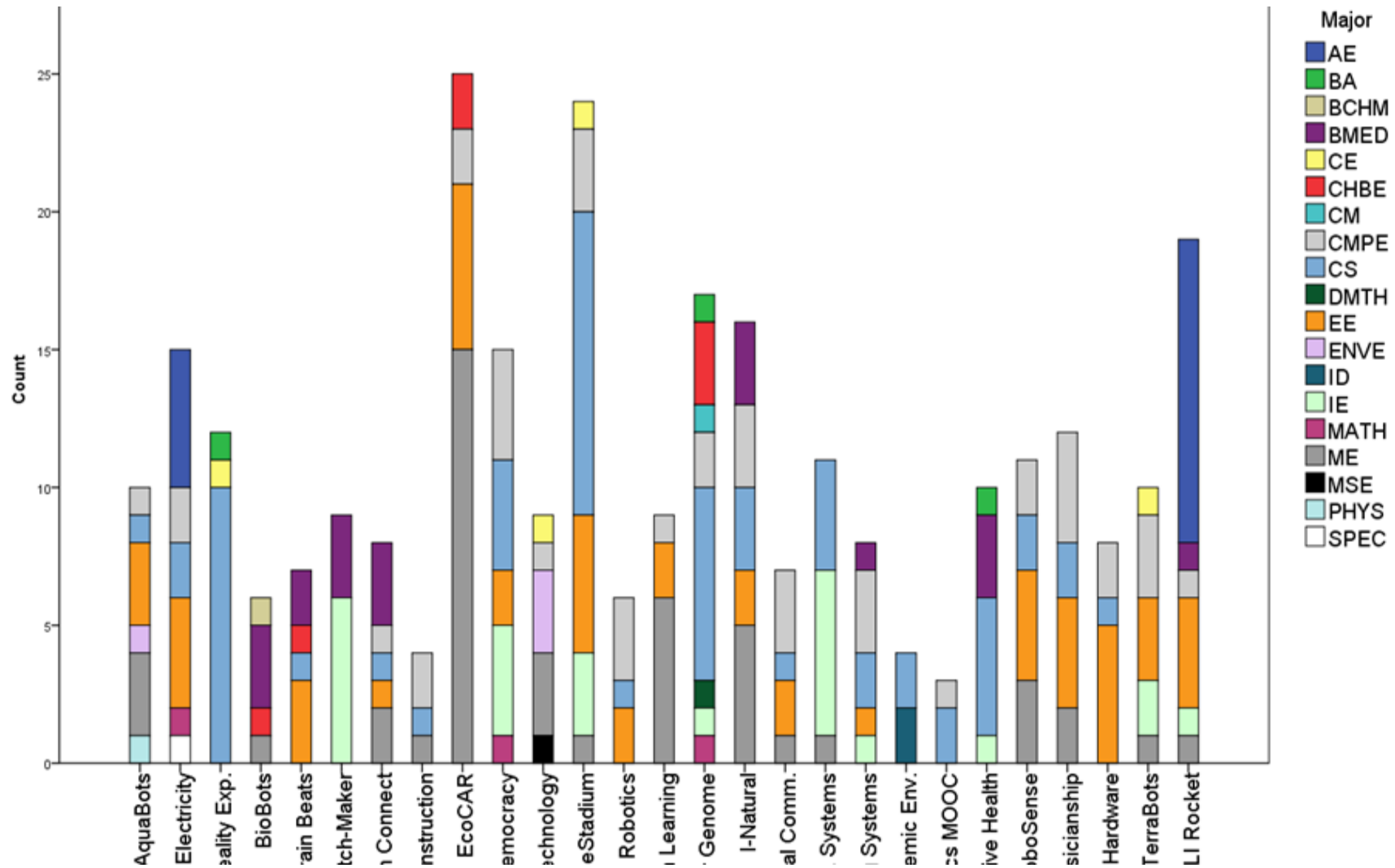


VIP Program – Credit Structure

- Relevant courses
- Grade/Credit Earning

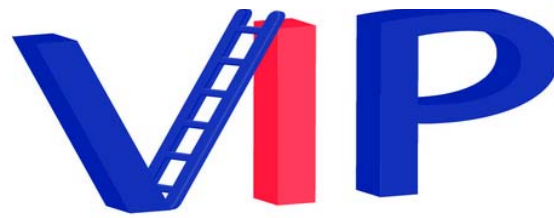


GT VIP Enrollment by Team and Major, Spring 2015



VIP Implementation at Howard

www.mwftr.com/VIPatHOWARD.html



Vertically
Integrated
Projects

VIP Program at Howard University

Howard University

Washington, DC 20059

Coordinator and PI: [Dr. Charles Kim \(CKIM@HOWARD.EDU\)](mailto:CKIM@HOWARD.EDU)

This program is sponsored by [The Leona M. and Harry B. Helmsley Charitable Trust](#) as part of [VIP Consortium Project](#) (lead institution - Georgia Tech) to drive systemic reform of STEM education.

What is VIP?:

The VIP program was created to overcome the fragmented nature of higher education, which is subdivided into research, education, service, and economic development and, for student learning, fractured and dissected into years, majors, and disciplines silos. The VIP program intends to reverse the fragmentation, and introduces a new type of long-term, depth-and-breadth learning environment that can keep students engaged and improve learning and career preparation. Under the VIP program, participating and completing a long-term practical team project provides a significant benefit for the students and the faculty advisors in terms of the continuity, technical depth, and disciplinary breadth involved in the project. This project of VIP Program will start from the ECE department with the projects by the majority of ECE students and ECE faculty, gradually include other majors in the CEACS, and expand to the University. The first one and a half year will be dedicated to preparation and launch of the VIP program in the ECE department. The next 1-year period will become the year of "growth and expansion" by which the VIP program will be expanded to other departments in the CEACS. The last period of a half-year will become a period for "moving toward self-sustenance" from which the VIP program extends to the entire university by the established program and schedule without additional financial. Howard University is a [VIP Consortium](#) member.

Charles Kim – Howard University

Existing VIP Teams

- Slate8: Sign language to English (Dr. Chouikha)
- Funktioneers: GSM Electronic Lock System (Dr. Bofah)
- Intruder: Hardware Trojan Detection (Dr. Salmani)
- UCC: Underwater Circuit Connector (Dr. Kim)
- Watchmen: Smart Watch for Banking Alert (Dr. Kim)

Howard VIP Teams – Spring 2015

Team [SLatE8](#): Sign Language to English (Team advisor: Dr. Mohamed Chouikha) : [Individual Conceptual Designs](#) + [Team Top Design](#) + [Storyboard](#) + [Presentation File](#) [This team won the Open Round of the [Intel-Cornell Cup 2015 Competition](#) and was selected as a Finalist (with free lodging and \$1500 award and Intel Atom boards) for the competition slated at NASA Kennedy Space Center on May 1- 2, 2015. Previous Howard teams' Intel-Cornell Cup participation is found [here](#).]



Marcos Celestonio (Brazil student), Claude Ndzami-Kolloh, Renika Montgomery (Civil), Reginald Etienne, Yonatan Yilma, and Sarad Dhungel [Not present are one CS student (Prajwal Dungal) and one Math student (Roshil Paudyal)]



Cornell University
Systems Engineering

Intel-Cornell Cup

News

2015 Award Winners

- **Third Place**

www.mwftr.com/VIPatHOWARD.html

Slate8

Howard University

Ever wonder what it is like to communicate without speaking? You can try using hand gestures or home signs, but the problem is that they are not universal. You need to learn a sign language that everyone understands, but unfortunately there doesn't exist any. Even a widely accepted language like the American Sign Language (ASL) is barely understood by anyone outside the hearing impaired community. This is a problem all the hearing-impaired people face in their everyday life.

Our Project slate8 would help hearing-impaired people communicate conveniently with people unfamiliar with American Sign Language (ASL), and hence bridge the communication gap. This will also raise their self-confidence as they can better adapt into the broader community. The system will employ Intel atom board with a camera to stream video as input, which is then converted into text/voice using real-time image processing algorithms.



Blog: <http://blogs.cornell.edu/cornellcup2015slate8/>

Howard VIP Teams – Spring 2015

Team **Funckioneers**: Global Mobile Network-Based Electronic Lock with Voice Encryption (Team Advisor: Dr. Peter Bofah) - [Individual Conceptual Designs](#) + [Team Top Design](#) + [Storyboard](#) + [Presentation File](#) [This team participated in the Open Round of the [Intel-Cornell Cup 2015](#). [Previous Howard teams' Intel-Cornell Cup participation](#)]



www.mwftr.com/VIPatHOWARD.html

Cherith-Eden Clements, Corbin Jackson, Darrel Smith, and Michael Robinson

Howard VIP Teams – Spring 2015

Team **Intruder**: Hardware Trojan Detection & Prevention for Health-Care Computer Systems (Team Advisor: Dr. Hassan Salmani) - [Individual Conceptual Designs](#) + [Team Top Design](#) + [Storyboard](#) + [Presentation File](#) [This team participated in the Open Round of the [Intel-Cornell Cup 2015](#). Previous Participation of [Howard teams in the Intel-Cornell Cup competitions.](#)]



www.mwftr.com/VIPatHOWARD.html

Jonathan Lopera, Justin Powell, Jonnetta Bratcher, Candace Ross, and Naja Green



- First Place in the 2015 ECE Day

Charles Kim - Howard University

Paper Publication

Hardware Trojan Prevention for Protection of Medical Devices and Personal Health Records

Jonnetta Bratcher, Naja Green, Jonathan Lopera, Justin Powell, Candace Ross

Hassan Salmani, PhD, Principal Investigator

hassan.salmani@howard.edu

This paper is going to be presented as a poster at IEEE 36th Sarnoff 2015, NJ, US.

www.mwftr.com/VIPatHOWARD.html

Howard VIP Teams – Spring 2015

Team [Watchmen](#): Smart Watch for Banking Alert (Team Advisor: Dr. Charles Kim) - [Individual Conceptual Designs](#) + [Team Top Design](#) + [Storyboard](#) + [Presentation File](#). Howard Android Wear [presentation by Jared Alexander](#) (Industry advisor; Capital One Labs).

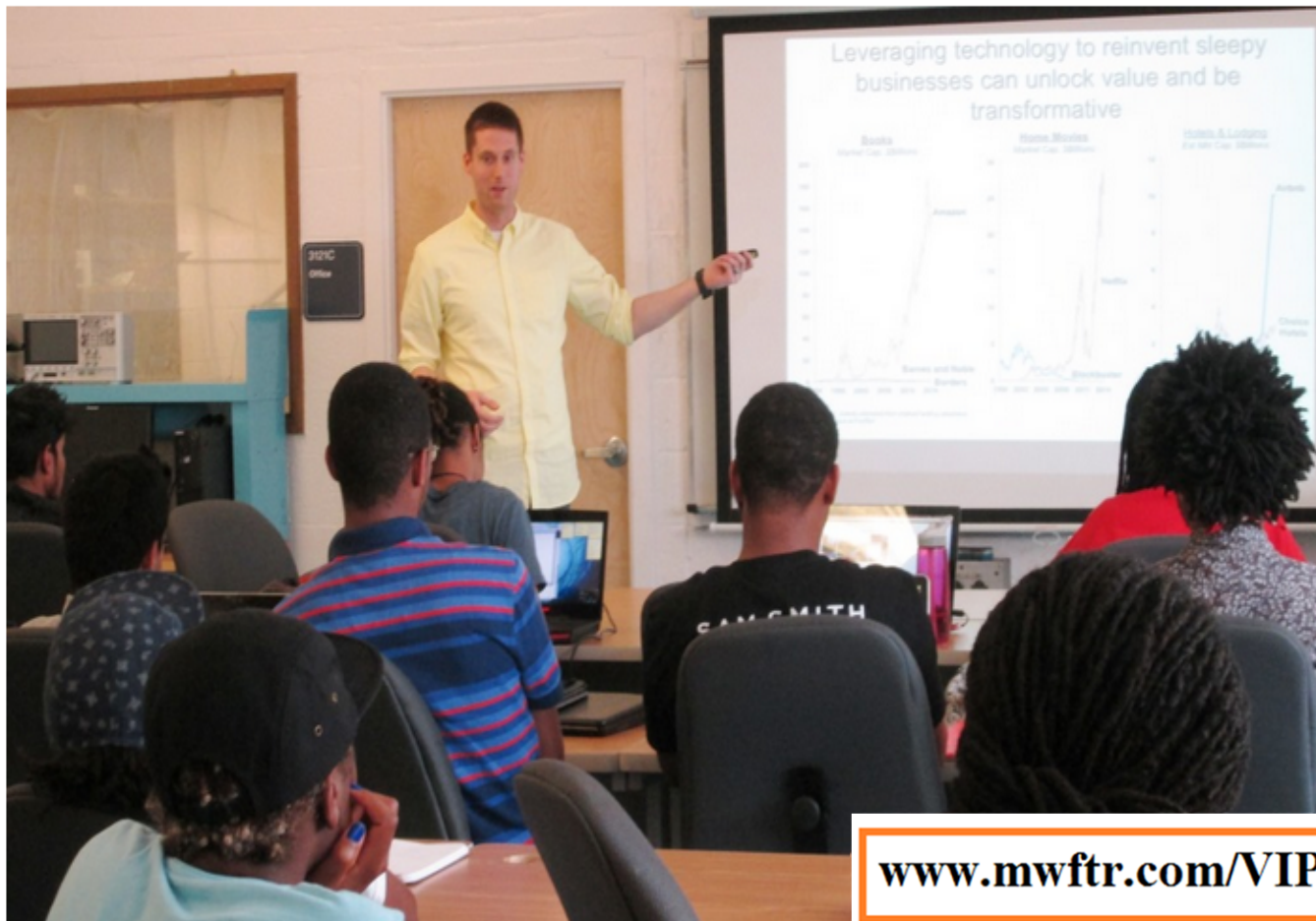


Jordan Monette, Isa Edwards-El, Dhuel Fisher, and Derrick McElwee [Now shown is Derrick Anang - A grad student]



www.mwfr.com/VIPatHOWARD.html

Industry's Class Visit: On September 17, Mr. Jared Alexander, a senior mobile developer of [Capital One \(Labs\)](#), came to the class and presented on [Android Wear](#) and, as possible project, its application to banking transactions. [The link](#) (on YouTube) to the promo video Mr. Alexander showed in the presentation. Also, here is the link to Mr. Alexander's rough [Android Wear prototype for next train time](#).



Howard VIP Teams – Spring 2015

Team [UCC](#): Underwater Circuit Connector (Team Advisor: Dr. Charles Kim) - [Individual Conceptual Designs](#) + [Team Top Design](#) + [Storyboard](#) + [Presentation File](#). Niobium Connector design requirement presentation by Jim Windgassen (Industry advisor; Northrop Grumman).



Kerri Chambers, Akim Mahadiow (Civil), Joshua Ajayi, De'Shawn Woods, and Crepin Mahop. [Not present are Trey Morris (Grad), Mpho Musenga (Grad), David Nesbeth (ECE/CS), Nicholas Hunter (ME), and Sydney Hall (ECE, Sp)]

Industry's Class Visit: On September 10, 2014, Mr. Gregory West and Mr. Jim Windgassen, both of Northrop Grumman, came to the class and introduced the [Niobium Wet Mate Electrical Connector project](#).



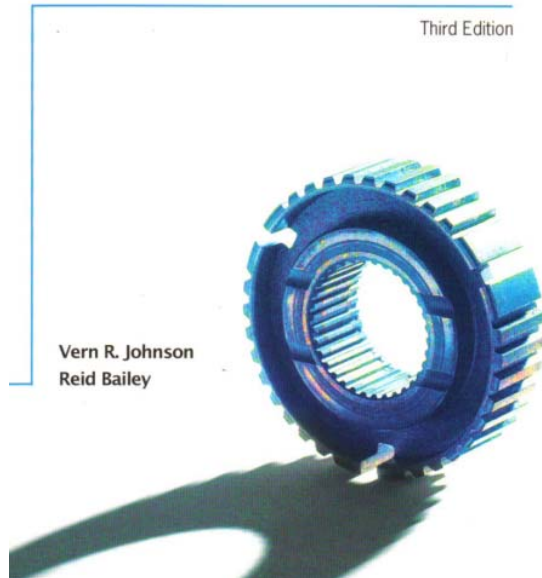
www.mwfr.com/VIPatHOWARD.html

New Teams under Formation

- New VIP Project Candidates
 - Dr. Marcus Alfred: NASA funded project
 - Presentation on September 9
 - Ms. Imani Oakley and Dr. Kim: Toy Drone project
 - Presentation on September 2
 - Dr. Ahmed Rubaai: Power Electronic Inverter for Renewable Energy Sources

Main Text and Resources

Becoming a Technical Professional



- Becoming a Technical Professional
 - by Vern Johnson and Reid Bailey
 - published by Kendal/Hunt Publishing Co.
 - 3rd Edition
 - ISBN 13:978-0-7575-2765-4
 - Written for first-year engineering students
 - Process/Idea is same for seniors with actual application & implementation of the process & idea.
- Resources
 - Niku, Creative Design of Products and Systems, Wiley

Engineering Design – Topics and Objectives

- Topics

- Engineering Design Overview
- **Problem Formulation**
- **Problem Solving**
- **Solution Implementation**
- The Art and Science of Creativity
- Project Management
- Technical Presentation
- Technical Writing

- Objectives

- Understanding an engineering design **process**
- Understanding **the 3 phases** of design and how design is an adaptive, systematic process
- Applying a design process to meet a set of **needs**
- Design under constraints
 - **Budget**
 - **Time**
 - **Regulation/Standards**

Course Grading and Expectation

- **Expectation**

- Attendance
- Active Participation (class and team activities out of the class)
- Assignments
- Active interaction with VIP team advisor
- Everything counts
- Professional manner
- Teamwork

- **Grading**

- **Individual Score (I):30%**
 - Attendance (10%): only on-time arrival counts
 - Homework +Others (10%)
 - Final Exam (10%)
- **Group Score (G): 70%**
 - Team activities (20%)
 - Team Assignments (20%)
 - Grade by team advisor (30%)
- **Peer Evaluation Score (P): 0 – 1.0**
- **FINAL SCORE (F)**
 - $F = I + G * [0.6 + 0.4 * P]$

- **Grades**

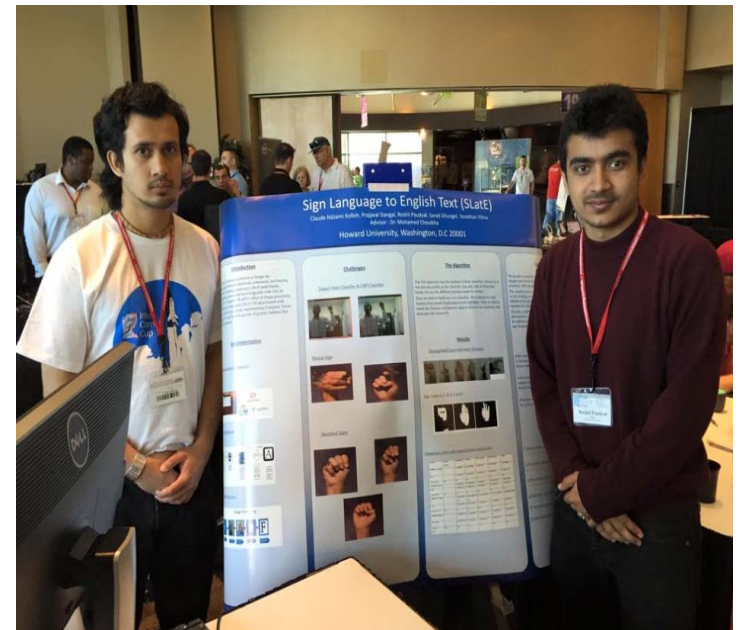
- **A: 90 – 100**
- **B: 80 – 89**
- **C: 70 – 79**
- **D: 60 – 69**
- **F: 0 - 59**

Intel Cup 2016 ?

- Intel-Cornell Cup presented by Intel
 - USA national contest for embedded systems
 - Howard teams success
 - College-level embedded design competition created to empower student teams to become the inventors of the newest innovative applications of embedded technology.
 - Intel Atom board based Design and Implementation
 - Teams of 3-5 students will create detailed design plans, a working prototype, and a final presentation that effectively demonstrates the capabilities and robustness of their ideas.
 - 1st round: Internal
 - 2nd round: Applications and final report entries will be “blind” reviewed by a team of experts and all judging criteria is made openly available to all contestants
 - 3rd and final round: Competition in May
 - VIP team can apply and compete

Team Slate 8 [2015]

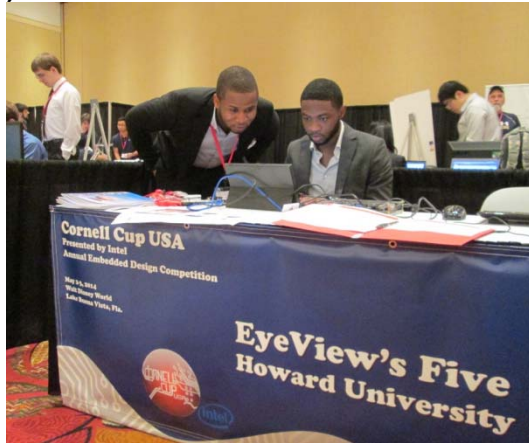
- Team members: Sarad Dhungel, Claude Ndzami-Kolloh, Yonatan Yilma, Prajjwal Dangal, and Roshil Paudyal



Charles Kim – Howard University

Eye-View Navigation Team [2014]

- Team members: Emmanuel Ademuwagun (Microsoft), Yusuf Siyanbola, Zachary Spence (Tuskegee grad school), Patrick Buah (Intel), and Jordan Wren.



Howard's Success in Cornell/Intel Cup 2013

- 2013:
 - 2 proposals were submitted
 - Both teams were selected each as a finalist
 - **Water Purification:** Eric Turner, Henok Mazegia, and Ade Akinsiku
 - **Smart Backpack:** Paul Alade, Ellwood Lane, Jennifer Okafor, Samuel Omosuyi, and Kalonji Bankole
 - Team Sigma (“**Smart Backpack**”) earned the Honorable Mention award



Howard's Success in Cornell/Intel Cup 2012

- 2012:
 - 2 team proposals were submitted
 - 1 (“Green lighting”) was selected as the finalist
 - Chidi Ekeocha, Shamir Saddler, Ameer Baker, Isaac Collins, Ravi Jaglal
 - 1 (“Blind Assistant”) was selected as a wild card
 - Gerard Spivey, Joshua Durodola, Antonio McMichael, Keir Morris, Christopher Urquhart
 - The “Blind Assistant” won the Wild Card Winner in the Final Competition in May 2012



Charles Kir

Things to do for the next few weeks

- Visit the VIP at Howard webpage
- Know, learn, and study about the existing and new projects and team
- Recruit other students (of juniors and sophomores of Engineering, Computer Science, etc.)
- In September: Application for a team to choose
- Team selection is determined by the coordinator and project team advisors