Vertically Integrated Projects (VIP)
ENGR 17912, 17920, 27920, 37920, 47920
Senior Design: ENGR 47911, 47912

Introduction Session
Spring 2020

Prof. Carla Zoltowski
School of Electrical and Computer Engineering
Purdue University
January 15, 2020
VIP Leadership Team

Carla Zoltowski, Director

Jan Allebach

Yung-Hsiang Lu, Dean’s Fellow for Entrepreneurship

Nichole Ramirez, Assistant Director
TAs

● Each team will be assigned an administrative VIP TA:

Baekdu Choi - 1/2 time
Caleb Tung
Yin Wang

● The Data Mine – VIP Learning Community TAs will help bridge Data Mine LC and VIP

Xiaoyu Xiang
Kent Gauen
iClicker Question

How many semesters have you participated in VIP?

A: this is my first one!
B: 2
C: 3
D: 4
E: 4+ and I’m never stopping
What are the goals of VIP?

- Provide undergraduate students an opportunity to work one-on-one with a faculty member and/or graduate student mentor
- Give undergraduate students exposure to faculty member’s research area
- Provide undergraduate students an opportunity to experience team-work
  - Collaboration
  - Mutual respect
  - Communication
  - Shared responsibility
  - Teaching each other
  - Leadership
- Allow undergraduate students to stretch their imagination and express their creativity
VIP Team Course Structure

First-Year
ENGR 17911/17912 or 17920

Junior
ENGR 37920

Senior Design 1st Semester - ENGR 47921

VIP Team
Different sections for each team/Crosslisted in myPurdue and Blackboard

Sophomore
ENGR 27920

Senior
ENGR 47920

Senior Design 2nd Semester - ENGR 47922
Typical elements of the VIP experience

• Weekly review meetings with the faculty advisor and/or graduate student mentor
• Weekly homework assignments to learn background for project during early part of semester
• Reading relevant research articles
• Independent learning
• Professional Development Sessions
• Participation in the Undergraduate Research Conference
• Final project presentations and review
PARTICIPATING IN THE UNDERGRADUATE RESEARCH CONFERENCE

Apply at purdue.edu/undergrad-research

Presenting an oral presentation

APRIL 15

- Selected by academic unit to deliver an oral presentation
- Submit abstract (~250 words)

DEADLINE: MARCH 1

Not selected for an oral presentation & reviewed as poster

Presenting at the poster symposium

APRIL 14

- Selected by academic unit to deliver poster
- Submit abstract (~250 words)

DEADLINE: MARCH 15

Not selected for a poster

Work with the OUR to prepare for the next conference
Professional Development

• In support of the Research Conference (Purdue or otherwise):
  • Technical Writing
  • Poster Presentations
• Working on teams (managing conflict)
• Entrepreneurship
  • Intellectual Property/ Patents
• Ethics
• Hot Topics: Deep Fakes/Data Science
• LaTeX, Git, Linux shell
• And Advisor Approved!
General Expectations

• Lectures:
  • Participate in activities/discussion
  • Not on laptop/phone unless the activity requires it
  • Bring laptop
  • Bring your iClicker (we have paper forms today, but will not in the future)

• Team:
  • Your team advisor(s) will provide an “Expectations” document that will detail their expectations for the team

• Syllabus
Learning Objectives = ABET Outcomes

Students in VIP will make progress on each of the learning outcomes listed below:

i. an ability to apply engineering design to create a product …

ii. an ability to develop and conduct experimentation…

iii. an ability to identify, formulate, and solve complex engineering problems …

iv. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, …. 

v. an ability to communicate effectively with a range of …

vi. an ability to acquire and apply new knowledge as needed…

vii. an ability to recognize ethical and professional responsibilities …
## Grading Criteria

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Overall, the student’s accomplishments and effort, documentation, and teamwork and interactions are excellent. All of the seven (7) requirements have been satisfied.</td>
</tr>
<tr>
<td>B</td>
<td>Overall, the student’s accomplishments and effort, documentation, and teamwork and interactions are good. Six (6) of the seven (7) requirements have been satisfied.</td>
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</tr>
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<td>Overall, the student’s accomplishments and effort, documentation, and teamwork and interactions are marginal. More than two of the seven (7) requirements are missing.</td>
</tr>
<tr>
<td>F</td>
<td>Overall, the student’s accomplishments and effort, documentation, and teamwork and interactions are unacceptable. More than three of the seven (7) requirements are missing.</td>
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Grading Process

- At start of semester: Set expectations
- Mid-semester:
  - Student: self and peer evaluation
  - Advisor: assess and provide formative feedback
- Final:
  - Student: self and peer evaluation
  - Advisor: assess and determine final grade
Mid-semester Evaluation

1. List your individual accomplishments to date
   Individual Accomplishments     Location of Evidence

2. List your individual accomplishments and achievements that you will complete by the end of the semester
   Accomplishment to be completed When will it be completed?

3. Describe anything that you are struggling with related to the project.

4. Describe at least one of your strengths that has contributed to the team.

5. Describe at least one of your weaknesses that you could try to overcome.

6. Describe your impact on the project overall.

7. Any additional comments you would like to add:
Evaluation Criteria

Accomplishments and effort:
__ Quantity of project accomplishments
__ Quality of project accomplishments
__ Completion of team assignments
__ Initiative
__ Learning needed for the project
__ Overall

Documentation:
__ Individual documentation
__ Contributions to team documentation
__ Contributions to team poster
__ Use of appropriate tools (e.g., Git)
__ Overall

Teamwork and Interactions:
__ Team/sub-team meeting attendance
 (_/_)  
__ On-time attendance
__ Team/sub-team meeting participation
__ Contributes useful ideas
__ Recognizes others’ ideas
__ Focuses effort on achieving goals
__ Involves others in efforts
__ Assists others with their efforts
__ Manages time and tasks well
__ Leadership skills
__ Written communication skills
__ Oral communication skills
__ PD participation/attendance (__/10)
__ Overall
Seven (7) Requirements

1. Maintain a design notebook (**individual documentation**), either paper or electronic as required by your advisor.

2. Contribute as appropriate to **project documentation**.

3. Complete **mid-semester individual performance evaluation** by Friday, February 28\textsuperscript{th} at 11:59 pm in Blackboard.

4. Complete **final individual performance evaluation** by Friday, May 1\textsuperscript{st} at 11:59 pm in Blackboard.

Continued
Seven (7) Requirements, continued

5. Complete **mid-semester** (due Friday, February 28\(^{th}\) at 11:59 pm) **and final peer evaluation** of team members in CATME (due Friday, May 1\(^{st}\) at 11:59 pm).

6. Complete **final Purdue course evaluation** and submit screen shot of completion to Blackboard (due Friday, May 1\(^{st}\) at 11:59 pm).

7. **Participate in at least ten (10) Professional Development (PD) opportunities**, including the three (3) required activities (1. intro lecture; 2. abstract submission; 3. Oral or poster presentation), and ensure attendance is recorded in Blackboard or PD form is submitted via email by Friday, May 1\(^{st}\) at 11:59 pm.
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity/Event</th>
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<tr>
<td>Wed, January 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Introduction to VIP 5:30 pm, EE 129</td>
</tr>
<tr>
<td>Monday, Feb 17&lt;sup&gt;th&lt;/sup&gt; at 5 pm</td>
<td>Project team groups specified in Blackboard</td>
</tr>
<tr>
<td>Friday, Feb 28&lt;sup&gt;th&lt;/sup&gt; at 11:59 pm</td>
<td>Complete and submit mid-semester individual performance evaluation in Blackboard and peer evaluation in CATME</td>
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<td>Sunday, March 1&lt;sup&gt;st&lt;/sup&gt; or 15&lt;sup&gt;th&lt;/sup&gt; at 11:59 pm</td>
<td>Purdue Undergraduate Research Conference: Submit abstract by March 1&lt;sup&gt;st&lt;/sup&gt; to be considered for oral presentation or March 15&lt;sup&gt;th&lt;/sup&gt; to be considered for poster</td>
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<tr>
<td>Tuesday, April 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Submit poster for printing for Purdue Undergraduate Research Conference</td>
</tr>
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<td>Tuesday, April 14&lt;sup&gt;th&lt;/sup&gt;, Wednesday, April 15&lt;sup&gt;th&lt;/sup&gt;, Thursday, April 16&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Purdue Undergraduate Research Conference Poster Session, Oral Presentations, or Celebrate Purdue's Thinkers, Creators, &amp; Experimenters</td>
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<td>Fri, May 1&lt;sup&gt;st&lt;/sup&gt; at 11:59 pm</td>
<td>• Design notebooks and final reports due (or date determined by advisor) &lt;br&gt; • Complete and submit final individual performance evaluation in Blackboard &lt;br&gt; • Complete peer evaluation (CATME) &lt;br&gt; • Complete Purdue course evaluations and post screen shot of completion screen in Blackboard &lt;br&gt; • All PD credits must be completed and submitted by emailing PDH form</td>
</tr>
<tr>
<td>May 4 - 9</td>
<td>Finals week. In general, teams do not meet except perhaps for final review of project.</td>
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Senior Design

- Highly recommended Meeting next week after the regular lecture
- Wed, 1/22, 6:30 – 7:20 pm in EE 117
- See syllabus for Senior Design Documents and Grading Criteria
Honors Contract

• Please email Prof. Carla Zoltowski (cbz@purdue.edu) if you are interested in completing an honors contract in VIP.
VIP Meeting Space (EE 013)

*In Basement of EE Building around corner from HKN Lounge
VIP Hardware Laboratory (EE 238)

- VIP Hardware Lab provides space and facilities for hardware development
Rules for Use of the VIP Suite

• It is **ONLY** for use by VIP students, and **ONLY** for VIP-related activities.

• It is **NOT** to be used as the personal study space for VIP students.

• **No** food is allowed. Water/drinks are only allowed in a closed container.

• **PLEASE** keep the room neat at all times. Keep the table surfaces **CLEAN**. Pick up any litter that you drop.
Other Information

- Card access
  - Initially configured of those registered on Sunday, 1/12 and updated first 4 Fridays of the semester

- You have two Blackboard sections
  - Lecture: general course announcements and resources (except for ENGR 17911 students)
  - Lab: your VIP team specific info/assignments and PD attendance

- Any errors need to be reported to the course staff within 2 weeks of the session.
- Forms for alternate PD opportunities can be submitted via Blackboard within 72 hours of the qualifying event
Planning your PD...once they are all posted

- Review the PD session opportunities, and identify a plan to meet the 10 PD requirement.
- What sessions help you be successful on your VIP team/project?
- Does your team have special opportunities (e.g., company site visit)?
- What sessions help you prepare for the Undergraduate Research Conference?
- What weeks do you have exams and/or conflicts and can’t participate? Or a topic you are not interested in---then do not come that week!
Documentation

What is it, and why is it necessary?

• Describes what you did and why, how you did it, what you found, what you might do differently, what you’re going to do next, etc.
• Used as evidence of progress, protect Intellectual Property
• Critical for transition, onboard/offboarding of team members

What it’s not:

• Meeting notes
• List of “I did”
Characteristics of Documentation

Strong

• Legible → can people understand it?

• Traceable → is each step of your work included and connected?

• Reproducible → can someone follow the documentation to reproduce your findings?

Weak

• Inconsistent

• Hard to follow

• Lack continuity
VIP Example - IPA

<table>
<thead>
<tr>
<th>Topics</th>
<th>Papers</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| Emotion Detection in Videos (real time)     | http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.549.8406&rep=rep1&type=pdf | -Using same dataset and concepts from last semester  
- good amount of difficulty                  | - still an outdated topic  
- not much application                          |
| Drowsiness Detection System                 | https://medium.com/@saurabhmanja嘸/s3alal-of-real-time-drowsiness-detection-system-using-python-ab7e1jp5If6 | - good application  
- good amount of difficulty  |
|                                             |                                                                       |                                                | - have to use facial landmarks (not successful with last semester)  
- many solutions                               |
- good amount of difficulty  |
|                                             |                                                                       |                                                | - have more difficult concepts than the others  
- many solutions                               |
|                                             |                                                                       |                                                | - simple, might not be semester long project  
- many solutions                               |

FIR Filters recap:
1. Image Smoothing
   - smoothing filter reduces noise, but loses some information about the image in the process
   - very common and there are many implementations of them
   - simplest is an algorithm that takes nine pixels in a square, averages their values, and puts this new value in place of the center pixel
     - can easily be scaled up to a five by five matrix, and then dividing each value by 25 to get the new value

   - other methods of image smoothing weight the pixels directly to the vertical and horizontal of the center so that they have a greater effect on the new value, since they are closer
   - many smoothing filters also weight the pixel values closer to the center to have a greater effect
   - those strategies help preserve information in the image that normally be lost

\[ f(i,j) = \frac{1}{9} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \]

- in the case of images with RGB values instead of a grayscale image, this process is done three times, once for each value, and the new three values represent the new color values for the RGB pixel
Advice from a VIP student’s documentation:

**Remark:** REALLY IMPORTANT to document pictures, videos, and the procedures taken throughout experiments because this might someday be used to win a debate over a patent.
Strategies and Tools

Consistency is key:
- Content
- Timeliness
- Maintenance

Tools:
- Confluence
- Google docs

Organization: What components to include?
- Header (name/date)
- Method or steps
- Findings
- Graphics, equations, code segments
- Reflection (challenges, etc.)
- Next steps
Questions?

(Don’t wait until after lecture to ask – many other people likely have the same question.)
How did you learn about VIP?

A. Class presentation or email
B. Learning Community
C. Friends
D. Team Advisor Recruited Me
E. None of these
Senior Design Evaluation

- In addition to the above requirements and expectations, senior design students must complete the following documents (templates are posted on the VIP website):
  - **VIP Senior Design Project Proposal**: Must be completed individually by each senior design student during the first semester of Senior Design to ensure he/she has an appropriate project and role. This is to be submitted at the mid-semester and final evaluations during the first senior design semester instead of the Individual Performance Evaluation rubrics.
  - **VIP Senior Design Project Description**: Must be completed during the second semester of Senior Design by each project team. This is to be submitted at the mid-semester and final evaluations during the second senior design semester instead of the Individual Performance Evaluation rubrics.
Senior Design Evaluation, cont.

- **VIP Senior Design Reflection, Outcomes Matrix, and Rubric document**: An index of how the course outcomes have been met over the two semesters and where evidence for this mastery can be found (notebook, project documentation, etc.). This is to be submitted at the mid-semester and final evaluations both senior design semesters instead of the Individual Performance Evaluation rubrics.

Both the Senior Design Project Proposal/Description and the Senior Design Reflection, Outcomes Matrix and Rubric document will be used by the advisor(s) and VIP admin to approve the satisfaction of the course outcomes and in determining the course grade.
## Senior Design Grading

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Overall Rating for Outcome</th>
<th>Weight</th>
<th>Rating x Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>(rate each indicator on a scale from 1 to 4, where 4 is “Excellent”, 3 is “Good”, 2 is “Adequate/Acceptable”, and 1 is “Inadequate/Unacceptable”)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. An ability to apply engineering design to create a product that meets the specified needs of this engineering design experience with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</td>
<td></td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>ii. An ability to develop and conduct experimentation, analyze and interpret data, and use engineering judgment to draw conclusions related to the development of the product of this engineering design experience.</td>
<td></td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>iii. An ability to identify, formulate, and solve complex engineering problems arising from this engineering design experience by applying principles of engineering, science, and mathematics.</td>
<td></td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>iv. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives associated with this design experience.</td>
<td></td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>v. An ability to communicate effectively with a range of audiences appropriate to this design experience in both a written report and oral presentation.</td>
<td></td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>vi. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies to complete the engineering design experience associated with this course.</td>
<td></td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>vii. An ability to recognize ethical and professional responsibilities associated with this engineering design experience and make informed judgments which must consider the impact of the product of this engineering design experience in global, economic, environmental, and societal contexts.</td>
<td></td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

**Total**