ECE520.427: Product Design Lab
Class #1: Intro to PDL

Course Instructors:
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Outline: Class #1

- Motivation
  - Why we’re teaching this course
  - What this course provides for you
- Course logistics
What This Course Provides

- A dedicated time slot for developing your own product
- Guidance and incentive for producing a working product prototype
- An understanding of a formal product development process
- A solid foundation upon which to build
Course Goals

1\textsuperscript{st} half: focus on development \textit{process}, build towards “Contract Book” due around mid-semester

2\textsuperscript{nd} half: focus on design implementation, build towards working prototype due at end of semester

This is a \textbf{hands-on, project-based} course, and you will be expected to both \textbf{write} something and \textbf{do} something
Course Logistics

Course meetings
- Lecture + lab: Mondays @ 4PM - 7PM
- Occasional meetings Wednesdays @ 4PM – 5PM
- Attendance at all classes is mandatory

Course website
- etienne.ece.jhu.edu/jvogelst/courses/ECE427
Course Logistics

**Course textbooks**

- **Product Design and Development (4th ed.)** by Karl T. Ulrich and Steven D. Eppinger (required – short and sweet)
- **Engineering Design (3rd ed.)** by George E. Dieter (optional – long and boring)
- **Electronic Product Design** by Tony Ward and James Angus (optional – short and boring)

**Links to Amazon.com on course website**
Course Material: Main Topics

First half:
- The development process
- Product planning
- Identifying user needs
- Product specifications
- Concept generation
- Problem solving
- Patents and IP
- Concept selection
- Concept testing
- Product architecture
- Project management

Second half:
- Prototyping
- Tolerance design
- Robust design
- Design for testing
- Design for reliability
- Engineering statistics (design for failure)
- Industrial design
- Design for manufacturing
- Ethical issues in design
- Product development economics
Not Course Material

- We generally will not teach details of specific technologies in lecture (but we will provide technical guidance in lab sections and/or office hours)
- We generally will not lecture about business plans, sales, or marketing (although we will try to obtain some guest speakers on this subject)
Deliverables (AKA Homework)

- “Contract book” (built up gradually, first complete draft due around mid-semester)
  - Product mission statement (wk 3)
  - Customer needs list (wk 4)
  - Competitive analysis (wk 5)
  - Patent review (wk 5)
  - Product specifications (wk 4)
  - Product architecture / schematics (wk 7)
  - Project schedule (wk 7)

- Working prototype of core technology (due at the last class)
- “Utility” patent (due at the end of finals)
- No in-class exams
Grading

- Final demo of working prototype: 40%
- Contract book: 20%
- Utility patent: 15%
- Weekly assignments: 20%
- Class participation: 5%

Notes:

- The contract book will be composed of weekly assignments, but the final complete draft will be graded as a whole at the end of the class.
- All assignments except for the first one will be team assignments. We may use peer assessments of team members to scale individual team members’ grades up or down.
Product Teams

- All products will be developed in teams (1 product = 1 team project)
  - Lectures will describe a generic product development process, and you will be expected to apply this process to your team’s specific product
  - All assignments (except the first one) will be completed in teams and will relate to the team’s product

- Everyone will have an opportunity to propose a product, but not everyone can work on their own product (1 + 1 = 2)
  - Everyone will make 2-slide “pitch” for an original product idea in Class #3
  - Each student will vote for their preferred product(s) and team members in Class #3
  - We’ll create teams based on your preferences
Product Categories

What kinds of products are well-suited for this class?
- Hardware devices
- Software products
- Web-based services
- Discrete, engineered products

What kinds of products are not well-suited for this class?
- New materials (e.g. sillier putty)
- New magazines, books, or newsletters
- Intangible financial products (e.g. textbook futures)
Product Characteristics

You should try to think of novel ideas, but products do not need to be entirely new or patentable.

You should consider the following aspects of any product ideas:

- Cost to prototype core technology ($100 is good, $1000 is bad)
- Time required to develop core technology (6 wks is good, 6 months is bad)
- Materials/equipment required to develop core technology (oscilloscope is good, nuclear reactor is bad)
- Number of people required to develop core technology (3–5 is good, 10–20 is bad)

If you have a faculty or outside sponsor, they may be able to help pay for, guide development of, and supply equipment for your product.
What is “Core Technology”?  

For this course, “Core Technology” refers to the essential technical aspect(s) of a product. Examples:

- MP3 Player → firmware decoding  
  (amplified analog output not necessarily core)
- Website → DB backend and business logic  
  (pretty website not core)
- Raytracer software → raytracing algorithm  
  (GUI not core)

More is better, but prototype of core technology is minimum requirement.
Product IP

- Intellectual property (IP) can include inventions, discoveries, creations, and new technologies.

- In general, student team members will be considered as inventors for any IP developed in this class.

- In general, IP conceived or created by student teams will be owned by the teams and not subject to University technology transfer.

- In general, IP conceived or created by student teams in conjunction with graduate students or faculty sponsors as part of their research will be subject to University technology transfer.

- Specific questions can be answered by the tech transfer office on an individual basis.
Course ethics dictate that no one should divulge confidential information, but...

There is no guarantee of confidentiality, so...

If you have a top secret project, this is probably not a good forum for development.
Course Ethics

Everyone must read the course’s Code of Ethics (online)

Core principles:

- Take credit for only original ideas and work
- Properly cite work done by others
- Respect opinions of others
- Actions should not tarnish the reputation of your team or the University

The course’s Code of Ethics is adapted from the Center for Bioengineering Innovation and Design. Some material in the lecture slides is adapted from MIT’s OCW materials.
Questions?
Next Class

In class:
- Introduction to product design and development
- Phases of the product development process
- Product planning

Before class:
- Read Code of Ethics
- Start thinking of ideas for products