Programming for Digital and Physical User Interfaces

Class Overview: Students will enhance their fundamental programming skills, with a focus on sensor-based signals (including audio, images and other sensor signals) to demonstrate core concepts, while providing useful tools for prototyping digital and physical user interfaces. This course will introduce students to the concepts and practices of engineering interactive systems on traditional mobile and desktop computers and low-cost micro-controllers. This includes a thorough understanding of user interface software tools, such as windowing systems, toolkits, and user interface development environments, as well as novel hardware for input, output and environmental sensing. Students will also learn user interface development for web (JavaScript/HTML/CSS). Assignments will focus on data manipulation and the creation of interactive systems that leverage data from the web and from simple sensors.

We will use the Python programming language as it is a useful language for rapid prototyping and has a lot of uses, such as processing and managing data, signal processing, interface development, and even running on micro-controllers and other embedded platforms. It turns out Python is used by many companies for their product (e.g., Google, Yahoo, NASA - https://wiki.python.org/moin/OrganizationsUsingPython)

This course will largely consist of individual projects to allow students to hone their own programming skills. Students will need access to some hardware lab equipment when working with micro-controllers, but will mostly use their own computers for developing software systems and will use micro-controller kits provided to them.

This course will focus on a combination of lectures, class discussions, and hands on demonstrations. Students will be evaluated on their mini projects/assignments. Lectures and discussion will occur during the first half of class time and the second half will consist of tutorials on how to build and prototype various systems. There will be 5 individual assignments to practice these concepts. Although not required, you are allowed to work in groups to learn the material, but are required to complete and submit individual work.

Prerequisites: This course assume that students have some prior programming experience, such as CSE 142/143 or equivalent. Student should be familiar with variables, conditionals, loops, functions, and elementary data structures.

Learning Objectives:

Student will be able to:

- Demonstrate an understanding of the fundamentals of programming
- Create prototypes interactive digital and physical systems, which includes an application that responds to user and sensor input, running Python programs, and processing data.
- Use and incorporate external resources (e.g., third party software libraries or APIs)
- Apply basic computational thinking:
  - Analyzing and logically organizing data
- Formulating problems such that computers may assist
- Identifying, testing, and implementing possible solutions
- Automating solutions via algorithmic thinking
- Generalizing and applying this process to other problems

- Know how to use contemporary software development, collaboration tools, code
- Understand the following programming concepts:
  - Basic: Data types, variables, functions, conditional statements, iteration, lists
  - Data structures
  - Mapping a function onto a list
  - External libraries
  - APIs (application programming interfaces)
- Conduct data manipulation and basic signal processing
- Demonstrate the use of a basic micro-controllers and appreciate the difference in developing for embedded vs. desktop platforms

**Resources:**

**Textbooks and Notes**

- Slides/notes/handouts/videos from the lectures and tutorials: Generally made available via Canvas right after class
- A free online book: Think Python: An Introduction to Software Design by Allen Downey
- https://micropython.org/

**Grading:**

Students will be evaluated on their 5 mini projects/assignments and grades will be assigned based on if they meet the required specifications of each assignment. Students will be randomly selected to demonstrate their assignment to the instructor and TA. Students should be prepared to demo any of their assignments in class.
## Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment out/due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to course, programming refresher, Python introduction</td>
<td>A0 out</td>
</tr>
<tr>
<td>2</td>
<td>Programming constructs in Python</td>
<td>A0 due, A1 out</td>
</tr>
<tr>
<td>3</td>
<td>Data and signal processing</td>
<td>A1 due, A2 out</td>
</tr>
<tr>
<td>4</td>
<td>REST APIs, URL lib, signal processing toolkit, user interface toolkits</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Basics of micro-controllers, Arduino, MicroPython</td>
<td>A2 due, A3 out</td>
</tr>
<tr>
<td>6</td>
<td>Physical and tangible user interfaces</td>
<td></td>
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<tr>
<td>7</td>
<td>HTML &amp; CSS</td>
<td>A3 due, A4 out</td>
</tr>
<tr>
<td>8</td>
<td>Google App Engine</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Special topics</td>
<td>A4 due, A5 out</td>
</tr>
<tr>
<td>10</td>
<td>Special topics</td>
<td>A4 due</td>
</tr>
</tbody>
</table>
Example Assignments:

A0 – Python Programming Environment (ungraded)

Setup the Python programming environment and run a sample test program.

A1 - Introduction to Basic Programming: Step Counter

Develop a mobile app that counts steps. Design an interface that shows the number of steps as a user walks with the tablet in their hand. You will be using the raw data from the accelerometer and/or gyroscope to complete this task. The data will require some very simple signal processing before you can count the number of steps. Just focus on the basics in this assignment. We will do more advanced signal processing in subsequent assignments. You can use peak detection, zero crossing, or your own technique for counting. You can assume the user only holds the tablet in a fixed posture in their hands. You are welcome to assume a different placement or posture of the tablet or phone, but please be sure to document how the device needs to be held somewhere on the interface. Optional - If want a challenge, attempt to detect steps in any orientation and posture. Please have your application installed and ready to show in class on the due date and also submit your source code to Canvas.

A2 - Sampling and Processing Sensor Data: Optical Heart Rate Monitor

Develop an optical heart rate monitoring app using the built in camera on phone, tablet, or laptop. There is a technique called photoplethysmography (PPG), which consists of detecting changes in blood volume during a cardiac cycle. By illuminating the skin and measuring the observed optical changes, it is possible to extract heart rate. In this assignment, you can assume the person will be holding their finger steady on the phone's camera to simplify the signal processing. You'll need to use a light source for a second device, such as your phone. At a minimum you will need to low pass filter the data you will be extracting from the camera prior to using peak detection to extract heart rate. For the app, we ask you to both plot the heart rate signal on the interface and show the extracted heart rate in real time. Please have your application installed and ready to show in class on the due date and also submit your source code to Canvas.

A3 – Introduction to Microcontrollers and Sensors:

You will build a wireless wearable heart rate monitor using the micro-controller, Bluetooth, and PPG modules we provided in class. The aim of this project is learn how to write basic microcontroller code, interface with an analog sensor, and stream data to a mobile device using Bluetooth. Using the sample code provided in class and from your experience from the previous assignments, you will sample raw data from the PPG sensor and do some pre-processing (basic filtering) on the micro-controller itself and send this pre-proposed data in real-time to the android device using Bluetooth. On the mobile device, you will write an app that collects this data, further processes the data (peak counting or frequency tracking) to determine the heart rate. Your android app should also graph the heart rate in real time. You are welcome to architect the system how you like, but we ask that you do some processing on the micro-controller. It is
tempting to stream all the raw data from the PPG sensor to the android device and process everything there. Sometimes this makes sense, but many times with power constrained devices you want to reduce the amount of wireless transmission to conserve power. Your wearable monitor should be able to operate while someone is walking around, so your 3D printed case will be critical in holding your sensor and hardware firmly in place on your finger. You will submit your Arduino sketch or Python code file for your micro-controller, the android source, your final case design (STL file), and a video of your system working. Assignments should be submitted to Canvas.

**A4 – Creating a Web Dashboard**

TBD. Based on student’s interest and instructor’s discretion.

**A5 – Creating an End-to-end User Experience Prototype**

TBD. Based on student’s interest and instructor’s discretion.
TECHIN 521 Design Thinking Studio

Class Overview:
Students will apply their understanding of design thinking as an approach to problem solving and innovation. They will identify and employ a range of current Design Thinking methods, selecting the appropriate approaches for a specific problem context that they will develop during the class. Finally students will work in small teams to address specific current problem spaces and prescribe a set of design thinking approaches and process appropriate to developing innovative solutions. In the companion course, Design Thinking Studio, students will practice methods of each phase of the design thinking process in the context of a specific design challenge.

Course structure
The course will be structured as a series of studio sessions related to and drawing upon the weekly Design Thinking Lecture sessions. Course assignments will consist of individual and group assignments composed of design activities in a specific student-defined problem domain. Successive assignments build upon one another, culminating in production of a Design Thinking Project Brief/Project Case, which justifies the design team’s proposed solution.

Prerequisites: none

Learning Objectives:
Student will be able to:

● Demonstrate the ability to transition from divergent to convergent design thinking methods
● Execute primary and secondary research
● Organize and conduct design critiques
● Evaluate the successes and failures of student-generated design ideas
● Employ a range of Design Thinking strategies to produce a proposal for an innovative product or service
● Develop the context-specific knowledge necessary to produce a justifiable Design Thinking Case
● Work effectively in heterogeneous design teams

Resources:

Textbooks and Notes
There is no required textbook. A selection of topical readings will provided.

Grading:

Students will be evaluated through a series of assignments designed to demonstrate their understanding and application of design thinking concepts and methods appropriate to particular problem domains. The assignments will be comprised of deliverables demonstrating students’ ability to:

● Describe design thinking methods and approaches, showing how and why they are relevant to specific problem contexts
● Explain how and when to use a particular approach to solve a design problem
● Employ design thinking methods and approaches for idea generation and refinement
● Analyze and reframe a stated design problem or prompt
● Plan appropriate team and resource formation, and prescribe both the phases and particular methods
- Evaluate design solutions through judgments and reasoning about the quality and validity of the process which produced them

Weightings:
Students demonstration of the learning objectives will be assessed through a set of individual and group assignments as follows:
- (20%) In-class project and activity presentations
- (30%) Design Thinking process documents
- (20%) Contribution to in-class and virtual discussions and critiques:
  - 10% online discussion participation documented through Canvas online discussion tool
  - 10% submission of written peer feedback on project assignments
- (30%) Final Presentation of design solution proposal

Indicative Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment(s)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Design Charrette</td>
<td>Charrette reflection</td>
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<tr>
<td>2</td>
<td>Form teams</td>
<td>Conduct secondary research</td>
</tr>
<tr>
<td></td>
<td>Identify project/user/activity,</td>
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<tr>
<td></td>
<td>Scope project</td>
<td></td>
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<td></td>
<td>Plan Secondary Research</td>
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<tr>
<td>3</td>
<td>Planning Primary Research</td>
<td>Conduct primary research</td>
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<tr>
<td></td>
<td>Practice research method(s)</td>
<td></td>
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<tr>
<td>4</td>
<td>Reflection on ongoing primary research</td>
<td>Conduct primary research</td>
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<td></td>
<td>Group reflection and discussions</td>
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<td></td>
<td>Discuss and adjust data capture</td>
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<tr>
<td></td>
<td>methods</td>
<td></td>
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<tr>
<td></td>
<td>Plan for analysis</td>
<td></td>
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<td>5</td>
<td>Debrief Primary Research</td>
<td>Individual reflections</td>
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<tr>
<td>6</td>
<td>Ideation</td>
<td>Teams will document and deliver results of three different design ideation</td>
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<tr>
<td></td>
<td>Planning for ideation</td>
<td>methods</td>
</tr>
<tr>
<td></td>
<td>Immersion in the problem space</td>
<td></td>
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<tr>
<td></td>
<td>Specific ideation framing and</td>
<td></td>
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<tr>
<td></td>
<td>methods</td>
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<td></td>
<td>Documentation of design</td>
<td></td>
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<tr>
<td></td>
<td>ideation</td>
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<tr>
<td>7</td>
<td>Prototyping</td>
<td>Team will produce prototypes designs and a structured evaluation protocol</td>
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<td></td>
<td>Selection of a design direction</td>
<td></td>
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<td></td>
<td>Develop design question</td>
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<td></td>
<td>Create low-fidelity prototypes to</td>
<td></td>
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<td></td>
<td>inform design direction</td>
<td></td>
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<tr>
<td></td>
<td>Plan for evaluation</td>
<td></td>
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<td></td>
<td>Evaluation</td>
<td>Analysis of design proposal, what works and what doesn’t, what needs to be reconsidered</td>
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<td>-----------------------------------------------------------------------------------------</td>
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<tr>
<td></td>
<td>In-class evaluations of design concepts</td>
<td></td>
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<tr>
<td>8</td>
<td>Synthesis and Documentation</td>
<td>Develop project concept pitches and prepare documentation</td>
</tr>
<tr>
<td>9</td>
<td>Design Pitches</td>
<td>Incorporate feedback and submit final deliverables</td>
</tr>
</tbody>
</table>
Overview

This course will give students an understanding and appreciation of past trends in hardware and software technology to understand how technology has changed over time. This will be in combination with techniques for enabling students to think about future technology trends and develop prototypes for futuristic ideas. An exploration of technology adoption and maturation models will ground students in the analysis skills to recognize the user and business contexts relevant to design and technology innovation. In addition, students will be encouraged to identify and explore social and cultural impacts of emerging technology platforms, such as managing privacy and security with the digitization of health records, for example.

Expectations

All students are expected to:

- come to class having finished the assigned readings;
- come to class with questions, argument and viewpoints to contribute to the discussion of those readings;
- participate fully in group discussions, neither dominating nor allowing others to carry the intellectual load;

Requirements for all students:

- A one-page summary paper each week for class readings. The electronic version of this response is due no later than 8 a.m. on the day of the lecture, submitted via canvas. Please also bring a printed copy to class for yourself.
- Final Project. The final project will be a paper 3000-4000 words in length. The choice of topic is up to your group, but will collectively explore how the history of a technology (broadly construed) and in line with the historiographic methods we have discussed in class Format is also up to your group, and I encourage you to choose whichever format is most useful in developing your professional skills. Options include: book review, grant, fellowship, or thesis proposal; bibliographic review essay; or preliminary research paper.
  - This assignment has three parts:
    - 300-500 word proposal, clearly describing the topic and how it relates to course materials and concepts, is due in class on Week 5. Please submit by email.
    - A class presentation Week 10
    - The final version, edited, revised, and proofread, is due on TBD. Please submit via canvas.
Evaluation

Discussion, Participation  15%
Summary Papers (8) 30%
Group Paper (3 parts + presentations) 55%

Please note that no late assignments are accepted, unless you have a serious reason. Discuss with me.

Readings:

1) Required books (primary texts):

TBD

All other readings will be made available online.

Meeting & Assignment Summary

<table>
<thead>
<tr>
<th>Week</th>
<th>Class</th>
<th>Focus</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>No Readings</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Exemplars and Classics</td>
<td>Readings</td>
<td>Summary1</td>
</tr>
<tr>
<td>3</td>
<td>Lock-In and Path Dependency</td>
<td>Readings</td>
<td>Summary2</td>
</tr>
<tr>
<td>4</td>
<td>Knowing the Social Body</td>
<td>Readings</td>
<td>Summary3</td>
</tr>
<tr>
<td>5</td>
<td>Design then and now</td>
<td>Project + Readings</td>
<td>Summary4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Proposal</td>
</tr>
<tr>
<td>6</td>
<td>The Information Overloads (1800-2017)</td>
<td>Readings</td>
<td>Summary 5</td>
</tr>
<tr>
<td>7</td>
<td>Case Study: Behavioral Economics, From Theory to App</td>
<td>Readings</td>
<td>Summary 6</td>
</tr>
<tr>
<td>8</td>
<td>Standardization and Classification</td>
<td>Project+ Readings</td>
<td>Summary 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+Introduction</td>
</tr>
<tr>
<td>9</td>
<td>The question of ethics, values and virtues</td>
<td>Project+ Readings</td>
<td>Summary 8</td>
</tr>
<tr>
<td>10</td>
<td>Presentations</td>
<td>Presentations</td>
<td>--</td>
</tr>
</tbody>
</table>
Final Paper: TBD

Week One – Introduction

This course is about careful reading of seminal texts. The key to success in this class will be close reading and careful discussion. Read this guide by Paul Edwards to understand how to get the most out of ‘reading a book’:

http://pne.people.si.umich.edu/PDF/howtoread.pdf

Week Two – Exemplars & Classics – How to approach the history of technology

TBD

Week Three -- Lock-In and Path Dependency

TBD

Week Four -- Knowing the Social Body

Week Five - Design then and now

TBD

Proposal Due

Week Six - The Information Overloads (1800-2017)

TBD

Week Seven -- Case Study: Behavioral Economics, From Theory to App

TBD

Week Eight -- Standardization and Classification

TBD

Introduction Due

Week Nine – The question of ethics, values and virtues

Week 10 - Presentations

PRESENTATIONS!
Key Resources for STS and History of Technology

History of Technology is a book culture; you will find that books do a great deal of the intellectual labor of the field. The various editions of the STS and history of technology handbooks are particularly useful.

Add @sciencemagazine, @NYTimesScience and/or @NatureMagazine to your Twitter feed and tune into current science news to find an area, controversy, or case that interests you. Browse online resources for STS bibliographies on topics that you get excited about. The Syllabus Collection on the 4S website (4sonline.org) or the STS Wiki, (stswiki.org) both have terrific lists of readings and writing topics that can inspire.

Primary Journals:

- Social Studies of Science (SSS http://sss.sagepub.com/)
- Science, Technology, and Human Values (ST&HV sth.sagepub.com/)
- Science Studies
- Science as Culture (cultural studies of science)
- Science Communication (public understanding of science)
- Science and Public Policy (policy issues)
- Public Understanding of Science
- Minerva (gender and science)
- Configurations (science, art, and literature)

Listservs and Newsletters

Sign up for the monthly newsletter of 4S Technoscience (http://www.4sonline.org/technoscience/)

Sign up for STSGrad google group, where many conferences, events and opportunities are posted. (http://groups.google.com/group/STSGRAD)
Course Description

This project-based course focuses on the user research and evaluation components of the design process. Students learn methods to engage stakeholders and elicit their needs to provide insight for defining requirements for ethically-grounded designs and aspects of evaluation of technology designs with potential users, including usability and user experience evaluation techniques.

Learning Objectives

On the successful completion of this course, students should be able to:

1. Appreciate the importance of engaging users at all stages of the technology design process
2. Develop a plan for conducting user research that triangulates across a number of dimensions (e.g., asking vs. observing, small scale vs. large scale, breadth vs. depth)
3. Conduct a variety of methods for user research at a basic level
4. Understand the difference between empirical and analytical evaluations
5. Design and conduct an empirical evaluation, such as a lab-based usability test or a field deployment
6. Design and conduct an analytical evaluation, such as a heuristic evaluation or cognitive walkthroughs
7. Draw conclusions from and document the results of user research and evaluations

Course Overview

User research and user evaluation are fundamental skills in the design of useful, usable innovative technology solutions. This studio-based course provides students with a hands-on overview of practical methods to learn how to engage with users in the context of a technology design project and to conduct both formative and summative evaluations of designs. Emphasis is placed on both empirical and analytical evaluation techniques for web, mobile, and hardware-based user interfaces.

Weekly Course Topics

- General concepts:
- Asking vs. observing
- Empirical vs. analytical evaluation
- Recruitment and inclusiveness
- Ethics of research with human subjects
- Documenting user research and evaluation results

**Methods:**
- Week 1: Interviews
  - Analysis: Affinity Analysis
- Week 2: Questionnaires
  - Analysis: Personas
- Week 3: Observation & Contextual Inquiry
  - Analysis: Flow & Activity Analysis
- Week 4: Usability Testing
  - Analysis: Error Analysis
- Week 5: Field Deployments & Diary Studies
  - Analysis: Documenting use and user feedback
- Week 6: User Logging & A/B testing
  - Analysis: Basic descriptive statistics
- Week 7: Heuristic evaluation
  - Analysis: Documenting errors and suggested improvements
- Week 8: Secondary User Research
  - Analysis: Literature reviews

**Evaluation Criteria**

TECHIN 523 is intended to give students (1) conceptual knowledge about the need for involving users in the technology design process and (2) the fundamentals of how to conduct those methods at a basic level. The practical components of the course will be assessed through 8 weekly group or individual mini projects that each involve learning and executing a new method, with a final 2-week long project that combines multiple methods. In-class participation and documentation of process will also be assessed. An example breakdown of percentages follows:

- Mini project deliverables: 8% x 8 = 64%
- Final project deliverable: 16%
- Participation: 10%
- Process: 10%
Suggested Readings

Textbooks (recommended):

- Moggridge, B. Designing Interactions.
- IDEO Method Cards

Websites

- Jakob Nielsen on Usability & Web Design – http://useit.com
- Boxes & Arrows - http://www.boxesandarrows.com
Course Overview

The Visual, Industrial, & Interaction Design Studio course is part of the Design Thinking track for the Master of Science in Technology Innovation. The primary focus of the course is on teaching students the ability to think critically and develop appropriate project and resource planning for creating interactive and visually pleasing designs of software and hardware systems. The course will provide an overview of professional practice for developing visual design aesthetics, good interaction design techniques, and methods for creating compelling physical materials and forms for Hardware/Software products. Guest lectures and critiques will be led by visiting Academic and Industry experts in each domain. Students will be exposed to specific process, methodology, tools and deliverables for each design practice area, review case studies, and complete and critique a specific design challenge in each area related to their launch or other MSTI project. Their final project and deliverable will be a comprehensive design brief outlining the visual, interactive, and industrial design requirements for a proposed original or redesign of a hardware/software integrated product.

Course Syllabus

Learning Objectives

- Describe and apply methods and processes for conducting a design process across different mediums (visual communication, digital screen based or GUI interaction, and three dimensional, physically interactive form and materials
- Describe or demonstrate an understanding of the foundational aesthetic theory, terms, tools, and methods for professional practice in the areas of visual, interaction, and industrial design practice
- Identify how different design roles and functions are incorporated into an overall team based product design and development process
- Demonstrate the ability to balance aesthetic and analytic design practices in the context of developing a product
- Demonstrate application of basic foundational aesthetic theory and methods in visual, interaction, and industrial design practice in a team project
- Articulate the theoretical context and historical influences for their work as designers.
- Demonstrate in their understanding of a range of appropriate materials and manufacturing processes used in manufacturing.
- Communicate their design intent in a professional manner across a broad range of media as well as in verbal and written forms.
Assessment
Students' demonstration of the learning objectives will be assessed through a set of individual assignments and group projects as follows:

• Individual written summaries, reflections, and quizzes based on lecture, demonstrations, presentations and reading assignments 40%
• In-class activities, including participation and documentation of class critiques 15%
• Project presentations and deliverables 45%

TECHIN524 2018 Syllabus

Week 1
• Course Introduction: Introduction to three professional design practice areas: visual communication, interaction, Industrial Design
• Overview of incremental and final project assignments
• Reading assignment and product critique

Week 2
• Guest Lecture: Visual Communication Design: Brief History of VCD, Color, composition, Typography, Layout
• Visual Communication Design Assignment 1

Week 3
• Visual Communication Design: Branding and Design Systems:
  • Assignment 1 due: Critique and Reflection
  • Reading assignment

Week 4
• Guest Lecture: Interaction Design: Brief History of IXD; Tools for planning and developing designs for dynamic media: Information architecture, content strategy, prototyping tools, storyboarding
• Interaction Design Assignment 2

Week 5
• Interaction Design: Design of complex interactive systems: process and methods
• Interaction Design Assignment 2 due: Critique and Reflection
• IxD Design Terminology Quiz

Week 6
• Guest Lecture: Industrial Design: Designing for Form and Function; Principles of 3d formgiving
• Industrial Design Assignment 3
Week 7
- Industrial Design: Design for Manufacturing, Sustainability; Considerations for Interactive and Electronic Components, Color, Materials, Finish, Cost
- Industrial Design Assignment 3 due: Critique and Reflection

Week 8
- Integration of Design Practice areas in a product design and development project: case studies
- Planning for incorporating professional design teams in product development process.
- Review drafts of Final Design brief for feedback

Week 9
- Presentation and critique of Final Design Briefs
The course objectives are two-fold: (1) to develop an awareness and understanding of the range, scope, and complexity of issues involved in startups; and (2) to gain insight into how entrepreneurs conceive, adapt, and execute strategies to create new enterprises. The course will be taught primarily through case discussions, supplemented with lectures and guest presenters. During the course, the participants will be placed in the role of an entrepreneur asked to address issues related to new venture creation.

TEXT, READINGS, AND CASES

Format and Grading
The course will be taught via case discussions, and lectures. The grading for the class will be as follows:

- Class and Group Contribution: 30%
- Interview an entrepreneur (Group): 30%
- Lean Test Project (Group): 40%
Class and Group Contribution (30%). The expectation within this class is that everyone makes a substantive contribution to both the group project and class participation. For the group project, each member will complete after the project a confidential evaluation of the extent and professionalism of the contributions of the rest of their team that will be taken into consideration for faculty evaluation of student contribution.

For within class participation, students will submit summaries or reflections of in-class discussions, case studies and readings of their contributions and feedback after each session. To be clear for class participation, the emphasis is on the caliber of insights or questions, and not on the frequency of participation. I expect you to be prepared to be “cold called” during the case discussions.

Entrepreneur Interview (30%). You are required to interview an entrepreneur and assess the venture he or she has started. The goal is to get a comprehensive understanding of the venture creation process and the role personal agency (i.e., individual initiative, action, and decisions) plays in entrepreneurship. In this interview, you should highlight the entrepreneur’s background, how he or she recognized an opportunity to pursue, the factors that enabled the entrepreneur to grow the venture, and the reasons for exit. This is a group assignment. See the attached Appendix 1 for the interview protocol that the group should use. Use the provided questions in this protocol as your guide. Please record the interview and transcribe it; see Appendix 1 for suggestions of online services who can do this quickly and for a reasonable price. Limit your written interview report to six pages (1.5 spacing, 1 inch margins on all sides, and 12 font size). Submit your transcribed interview as part of the appendix in the report (page limits apply only for the report not the appendix). This assignment will account for 25% of your grade.

Lean Test Project (40%). As part of this course, you are required to work with a group to test in a lean manner an identified entrepreneurial opportunity. You should identify explicit hypotheses, and then design and execute a series of experiments to validate the attractiveness of the opportunity. This may often take the form of both customer interviews and developing and advertising an initial website. Your write-up should discuss the opportunity, identify your explicit hypotheses, describe your experiments, and then critically analyze the findings. Which results were supported and which were not? Assessment will be on the basis of the quality of the hypotheses, the appropriateness and creativity of the tests, and the interpretation of the findings. This report should be no more than 8 pages (plus appendices).

Please submit a 1 page memo (Idea Selection Memo) about an initial idea by DATE TBD. Note that as discussed on the first day of class, this should be only one of many ideas that you have considered, and it is recognized that your group may shift to a very different idea throughout the course of the term based on your research. However, research is time consuming, and it is thus important to pick one idea at this stage on which to prioritize for the moment. This should be just a quick executive summary to let me know that your team has chosen a need or solution to explore further, and identifying your key research steps going forward. This assignment will not be graded, but I will give you feedback to help you move forward to the next stage of the assignment.
Schedule of Deadlines [To be refined]

1. Idea Selection Memo
   Due: TBD

2. Interview with an entrepreneur
   Due: TBD

3. Lean Test Project Write-up
   Due: TBD

ACADEMIC MISCONDUCT

Admission to the University and the Technology Management MBA program carries with it the presumption that students conduct themselves as responsible members of the academic community and observe standards of conduct that are appropriate to the pursuit of academic goals. The standards include, but are not limited to, cheating, plagiarism and stealing. Breaches of this standard of conduct make students subject to disciplinary action, including expulsion from the program.

CLASSROOM AND PRESENTATION ETIQUETTE

In consideration of others in the classroom, I request you to adhere to common courtesies by turning off cell phones and other electronic devices during class. Laptop usage is for reading cases and note taking purposes only. Using a computer in class for email, instant messaging or surfing the web is not acceptable—except during official class breaks. Research has shown that such usage not only reduces the learning of the computer user, but also the learning of surrounding students. If you use computers inappropriately during class instruction, I may choose to ban computers from class sessions.

If you have any questions don’t hesitate to contact me. Please don’t until the last moment and then try to reach me. You can submit your assignments on Canvas and if there is a problem, just email to me.
DETAILED SYLLABUS

Class #1: TBD

What Makes a Good Entrepreneurial Opportunity? How are Opportunities Discovered?

Identifying new opportunities underlies the growth of firms, the ability of firms to persevere through technical and market turbulence, and the successful launching of new start-ups. In this class we will discuss what distinguishes an idea from an opportunity, introduce the DWI framework for evaluating opportunities, and explore the common paths that entrepreneurs take to discovering entrepreneurial opportunities.

Session 1: Evaluating Entrepreneurial Opportunities


Skim: B. Aulet. Disciplined Entrepreneurship. Step 0 (pp. 15-21)

Prepare: Big Beautiful Hair (To be distributed in class)

Session 2: Paths to Entrepreneurial Opportunities

In the latter portion of class, we will introduce a typologies of the common paths that entrepreneurs take in discovering entrepreneurial ideas. Before class you should have completed the creativity exercises sent to you via the “Idea Machine”. Please come prepared to talk about the ideas you generated for these exercises.

After class

Use frameworks from class to begin developing a list of possible ideas for your business planning project.
Navigating and Researching Nascent Markets

Promising entrepreneurial opportunities often involve nascent markets around new technologies or new customer needs. Such markets are often attractive as they represent new competitive landscapes and the disruption of existing sources of competitive advantage. Accordingly, it may be easier for startups to establish sizeable positions, or market laggards to navigate into a dominant position. Yet nascent markets also have many challenges, which we explore in today’s session. We also will use this as a springboard for discussing the different ways to research entrepreneurial opportunities, and how a superior understanding of an opportunity is often the initial differentiator for a first-time entrepreneur.

Session 1: The Promise and Challenge of Nascent Markets

Read: “The Story” (pp. 14 to 29) in Talking to Humans. A free PDF version may be found here: http://www.talkingtohumans.com/download (For those considering pursuing an entrepreneurial endeavor, you may wish to read the entire book).


Prepare: Hewlett-Packard: The Flight of the Kittyhawk (HBS #9-606-088)

- What are the strengths and weaknesses of the way HP structured and supported the Kittyhawk development team?
- How would characterize the way the team approached the market for the Kittyhawk? Can you pinpoint the correct and wrong turns they made?
- What, if any, are the root causes for the program’s failure? Could HP have avoided program failure by addressing these root causes?

Post-class Business Planning Project Suggestions

Skim B. Aulet. Disciplined Entrepreneurship. Steps 1 to 5 (pp. 23-81) (Note: This reading is primarily for helping you research your venture idea, and may be read over the coming weeks)
The best laid schemes of mice and men / Go often askew (Robert Burns)

There are some things you can only learn from experience. Yet with careful planning, some experience can be acquired more efficiently. Today we introduce lean entrepreneurship and the business model canvas as tools for helping you map out and then quickly and cheaply test a proposed business model. Used appropriately, these tools can help you (and potential investors) decide whether your Plan A is a go.

Additionally, today will also feature a guest lecture by an entrepreneur presenting an opportunity they are currently pursuing. This guest lecture will serve the basis of the Live-case Opportunity Analysis Memo assignment; see p. 2 of syllabus.

Session 1: Business Models and Lean Entrepreneurship


Prepare: Rent the Runway (HBS Case 9-812-077)

- Create a timeline of actions undertaken by Rent the Runway’s cofounders. Do you agree with the decision to pursue each action?
- Which actions were important in validating business model hypotheses and refining the concept?
- Can you suggest different actions that the cofounders should have taken?
- As the case ends in January 2010, the co-founders are considering whether to: (1) stick with their original plan to pursue operational improvements in 2010 before raising more capital in early 2011; or (2) accelerate fundraising in order to expand. What would you do about this decision?

Session 2: Guest Speaker
Beyond describing in what activities a venture will (and will not) engage, a business model also encapsulates economic decisions and models around pricing, costs, and profit margins. Today we talk about how entrepreneurs develop reasonable economic models, test these models, and then make adaptations based on market feedback.


Prepare: Zipcar: Refining The Business Model (HBS# 9-803-096)

- Evaluate this potential venture and the progress that Chase has made.
- What is the business model, and how has it changed between December 1999 and May 2000? What do the data from actual operations in September say about how the business model is playing out in practice? Does this data give you comfort or concern?
- What actions should Chase take as a result of the September operating results?
- What is the strongest argument Chase should make to a potential investor about the attractiveness of the venture? What, specifically, should her elevator pitch be at the Springboard forum?
Entrepreneurship is often defined as “the pursuit of opportunities without regard to resources currently controlled.” Yet many attractive opportunities require that entrepreneurs raise outside funding. Today we discuss the venture investment landscape, including angel investors, venture capital firms, and emerging forms of venture finance. We also discuss the trade-offs that entrepreneurs face when they take outside investments.


Prepare: Evan Williams (A) (9-809-088). Please consider the following questions:

- How has Evan Williams gotten himself into this mess?
- Did Evan take the same approach to building Odeo as he did to Blogger? What are the similarities and differences?
- What are some of the problems and opportunities faced by serial entrepreneurs?
- What should Evan do now?
- Taking the investor’s perspective, would you have backed Evan at Blogger? At Odeo?
APPENDIX 1: Interview Protocol

Interview An Entrepreneur And Assess The Venture

Group Assignment

STEP 1: Contact The Person You Have Selected And Make An Appointment.

Be sure to explain why you want the appointment and to give a realistic estimate of how much time you will need.

STEP 2: Identify Specific Questions You Would Like To Have Answered And The General Areas About Which You Would Like Information. (See Suggested Interview Questions in Step 3.)

Using a combination of open-ended questions, such as general questions about how the entrepreneur got started, what happened next, and so forth, and closed-ended questions, such as specific questions about what his or her goals were, if he or she had to find partners, and so forth, will help to keep the interview focused and yet allow for unexpected comments and insights.

STEP 3: Conduct and Record The Interview (If ok with interviewee).

Recording the interview on audiotape can be very helpful to you later and is recommended unless you or the person being interviewed objects to being recorded. Remember, too, that you most likely will learn more if you are an interested listener. To help the entire group learn from and reflect upon the interview, please have the interview transcribed.

If the person interviewed being objects, ask if you can write down particularly relevant and interesting quotes to use in your report.

The Interview

Here are some suggested interview questions. Please feel free to omit questions or use other questions based on the individual’s specific background or venture. However, do be sure to touch on each of the areas in this interview guide.
Would you tell me about yourself before you started your first venture?

- Were your parents, relatives, or close friends entrepreneurial? How so? Did you have any other role models?
- What was your education/military experience? In hindsight, was it helpful and in what specific ways?
- What was your previous work experience? Was it helpful? What particular "chunks of experience" were especially valuable or irrelevant?
- Did you have a business or self-employment during your youth?
- In particular, did you have any sales or marketing experience? How important was it or a lack of it to starting your company?

How did you start your venture?

- How did you spot the opportunity? How did it surface?
- What were your goals? What were your lifestyle needs or other personal requirements? How did you fit these together?
- How did you evaluate the opportunity in terms of the critical elements for success?
- The competition? The market? Did you have specific criteria you wanted to meet?
- Did you find or have partners? What kind of planning did you do? What kind of financing did you have?
- Did you have a start-up business plan of any kind? Please tell me about it.
- How much time did it take from conception to the first day of business? How many hours a day did you spend working on it?
- How much capital did it take? How long did it take to reach a positive cash flow and break-even sales volume? If you did not have enough money at the time, what were some ways in which you bootstrapped the venture (bartering, borrowing, and the like). Tell me about the pressures and crises during that early survival period.
- What outside help did you get? Did you have experienced advisors? Lawyers? Accountants? Tax experts? Patent experts? How did you develop these networks and how long did it take?
• How did any outside advisors make a difference in your company?

• What was your family situation at the time?

• What did you perceive to be your own strengths? Weaknesses?

• What did you perceive to be the strengths of your venture? Weaknesses?

• What was your most triumphant moment? What was your worst moment?

• Did you want to have partners or do it solo? Why?

**Once you got going:**

• What were the most difficult gaps to fill and problems to solve as you began to grow rapidly?

• When you looked for key people as partners, advisors, or managers, were there any personal attributes or attitudes you were especially seeking because you knew they would fit with you and were important to success? How did you find them?

• Are there any attributes among partners and advisors that you would definitely try to avoid?

• Have things become more predictable? Or less?

• Do you spend more time, the same amount of time, or less time with your business now than in the early years?

• Do you feel more managerial and less entrepreneurial now?

• In terms of the future, do you plan to harvest? To maintain? To expand?

• In your ideal world, how many days a year would you want to work? Please explain.

• Do you plan ever to retire? Would you explain?

• Have your goals changed? Have you met them?

• Has your family situation changed?
What do you learn from both success and failure?

**Questions for Concluding**

- What do you consider your most valuable asset -- the thing that enabled you to make it?

- If you had it to do over again, would you do it again, in the same way?

- As you look back, what do you feel are the most critical concepts, skills, attitudes, and know-how you needed to get your company started and grown to where it is today? What will be needed for the next five years? To what extent can any of these be learned?

- Some people say there is a lot of stress being an entrepreneur. What have you experienced? How would you say it compares with other "hot seat" jobs, such as the head of a big company or a partner in a large law firm or accounting firm?

- What things do you find personally rewarding and satisfying as an entrepreneur? What have been the rewards, risks, and trade-offs?

- Who should try to be an entrepreneur? And who should not? *Can* you give me any ideas there?

- What advice would you give an aspiring entrepreneur? Could you suggest the three most important lessons you have learned? How can I learn them while minimizing the tuition?

- Would you suggest any other entrepreneur or other people, I should talk to? (Make sure you get their contact information).

**STEP 4: Evaluate What You Have Learned.**

Write down the information you have gathered in some form that will be helpful to you later on. Be as specific as you can. Jotting down direct quotes is more effective than statements such as "highly motivated individual." And be sure to make a note of what you did not find out.

**STEP 5: Write A Thank You Note.**

This is more than a courtesy, it will also help the entrepreneur to remember you favorably should you want to follow up on the interview.
STEP 6: Transcribe the Interview

Past groups have found that transcribing the interview makes it easier to have the group discuss and reflect on the lessons learned from the group. Here are some online transcription services (and please let me know if you have other recommendations):

- Rev.com – used and recommended by a number of groups last year. (Coincidentally and in full disclosure, I know members of their engineering team)
- Transcribe.com – have not used them, but they have major clients.
- TranscriptionPuppy.com - have not used them, but they have a puppy on their homepage. Look slightly cheaper than rev.com or transcribe.com.

Please limit your report to no more than six pages of text (1.5 spaced, font size 12). Let me know if you have any questions. Have fun!

WRITE-UP INSTRUCTIONS

The purpose of the exercise is for you to learn something directly from an entrepreneur. Here is my "suggested" outline sections for the write up you are going to submit to me for grading. You are free to follow an outline that fits your particular interview or circumstances.

I would like you to emphasize the following main points:

1. Background and experience

2. Opportunity Recognition

3. Resource Mobilization (exploiting the opportunity)

4. Entrepreneurial actions post venture formation

5. Connections to class frameworks and concepts, Other lessons, and Concluding thoughts. What have you learned about the four points above? What was most insightful for you or your team? How does this information you have collected relate to the cases/concepts/frameworks we discussed in class? What new insights did you get from this interview, if any and to what other situations might these lessons apply? Etc. This final section of your report is very important and hence I suggest that it be at least two pages and not just one concluding paragraph!

As noted above, please limit the text to six pages. Also, please attach your transcript.
TECHIN 531: Planning & Managing Hardware and Software Development Instructor: Mike Clarke
Quarter/Year: Summer 2018
Class times: [1 session/week][2h/session] - [day of week and time of day TBD]

Description:
This course offers the opportunity to step back from the immediacy of project deliverables and think strategically about how hardware and software development projects are planned and executed. Structured as a weekly seminar on different aspects of the development process, we aim to survey a variety of best practices from different organizations, allowing the student to obtain a basic understanding of each, without prescribing particular methods for all situations. Reading, writing, and discussion are significant components of this course. The student should come away with a foundation and resources to explore these topics more deeply when they have the opportunity to apply them in their future work.

Learning Objectives:

The general aims of this course are to develop an appreciation for the different approaches to managing the various aspects of hardware and software development projects, in particular common challenges and risks to be aware of, and ways that these can be addressed.

Upon the successful completion of this course, the student should be able to demonstrate a general understanding for the methods and terminology for planning and managing a development project from concept to production. The student should also be able to consider the development project within the broader context of organizational and business objectives, and to communicate project aims, schedules, status and risks to various stakeholders.

Readings:
There is no textbook for the course, but selected topical readings will be assigned and provided each week.

Suggested reference books include:

Grading and Assignments:

The chart below indicates the distribution (relative weight) of each component of the various class assignments in your overall grade in the course, and gives a brief description of each component.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance and Class Participation</td>
<td>15%</td>
<td>Your attendance and participation in class discussion is an essential part of this course and will enhance the learning experience for yourself and others.</td>
</tr>
<tr>
<td>Reading Reflections</td>
<td>45%</td>
<td>Along with each collection of assigned readings, you will also receive a set of questions and things to think about while you read. You will write a concise and thoughtful response to these questions, typically about 500 words.</td>
</tr>
<tr>
<td>In-class Assignments</td>
<td>40%</td>
<td>There will be eight in-class assignments throughout the course, each worth 5% of your grade.</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>
Schedule:

A summary of the weekly course schedule is as follows (weekly order subject to change):

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 18</td>
<td>Intro and overview</td>
</tr>
<tr>
<td>June 25</td>
<td>Managing technology development teams: methodologies, tools, and metrics</td>
</tr>
<tr>
<td>July 2</td>
<td>Managing requirements, design specifications, and architecture</td>
</tr>
<tr>
<td>July 9</td>
<td>Managing releases, feedback, changes, and quality</td>
</tr>
<tr>
<td>July 23</td>
<td>Managing up and across: communicating with stakeholders about schedules, budgets, and risks; product roadmaps</td>
</tr>
<tr>
<td>July 16</td>
<td>Managing manufacturing and supply chain; Design for Manufacturability</td>
</tr>
<tr>
<td>July 30</td>
<td>Field trip: manufacturing facility</td>
</tr>
<tr>
<td>August 6</td>
<td>Managing core competencies and growth: building and structuring teams; outsourcing</td>
</tr>
<tr>
<td>August 13</td>
<td>Final review and synthesis</td>
</tr>
</tbody>
</table>
FINANCE and ACCOUNTING for ENTREPRENEURS

OBJECTIVE

This course is designed to introduce you to the basic concepts in Accounting and Finance. Accounting and Finance can be viewed from two perspectives – that of the individual (or investor) and that of the firm. Individuals make consumption and saving decisions, and must decide how willing they are to wait to consume and how much risk they will take when saving. Firms make investment and financing decisions and must determine how much to invest and what to invest in. They must also decide how to allocate the rights to control the firm and to whom to allocate the firm’s future cash flows. Individuals, as part of their savings and consumption decisions, provide the firms with capital to invest and receive cash flow and control rights in return. These interactions between individuals and firms take place in capital markets. Our study of all these decisions will involve understanding how capital markets function.

This course will not make you an accounting or finance expert. But after successful completion of the course, you should have a more in-depth understanding of and be able to critically evaluate information you get from popular business news sources like the Wall Street Journal and CNBC. And my hope is that you will feel like the playing field has been leveled and that you deserve a seat at the business table. Accounting and Finance are the only subjects you can’t get away from in life or business, so I will illustrate the fundamental concepts with a view toward your using them in real life – personal and business.

CLASS MATERIALS AND ASSIGNMENTS

There are no materials required to purchase for this course; however, there are some materials you may be interested in reading to further your knowledge of certain elements of the class. These suggested readings include:

Corporate Finance: The Core by Jonathan Berk and Peter DeMarzo, Pearson Education, 2011

ASSESSMENT

Assessment will be through the Knowledge Checks, Group Cases, and Participation, determined as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Due Date</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily class work and participation</td>
<td>Daily</td>
<td>15%</td>
</tr>
<tr>
<td>Weekly knowledge checks</td>
<td>Weekly</td>
<td>40%</td>
</tr>
<tr>
<td>Spencer Sporting Goods group case</td>
<td>Wednesday, 4/25</td>
<td>15%</td>
</tr>
<tr>
<td>HP Printer Part group case</td>
<td>Wednesday, 5/23</td>
<td>15%</td>
</tr>
<tr>
<td>Hampton Machine Tool group case</td>
<td>Wednesday, 6/6</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

SCHEDULE

- **Wednesday, March 28**: Accounting Terminology
- **Wednesday, April 4**: Introduction to Financial Statements
- **Wednesday, April 11**: Ratio Analysis, Projections and Cash Budgeting
- **Wednesday, April 18**: Ratio Analysis, Projections and Cash Budgeting
- **Wednesday, April 25**: Financing the Business: Debt vs Equity
- **Wednesday, May 2**: Financing the Business: Debt vs Equity
- **Wednesday, May 9**: Capital Budgeting – The Time Value of Money
- **Wednesday, May 16**: Capital Budgeting – Decision Making
- **Wednesday, May 23**: Fundamentals of Valuation
- **Wednesday, May 30**: Fundamentals of Valuation
TECHIN 533: CORPORATE AND IP LAW FOR TECHNOLOGY INNOVATORS

Summer Quarter 2018
Jesse S. Kindra
Room 449, William H. Gates Hall, 206.616.3674, jkindra@uw.edu

SYLLABUS

Registration & Related Information

Class Times: Thursdays 10:00–11:50 a.m.; Room #, address.

Office Hours: By appointment.

Grading will be based on the following: (a) In-class participation (10%); (b) Completion of weekly reading and writing assignments (250 to 500 words which is approximately 1-2 pages) (45%); and (c) Final project will require a paper (750 to 1,000 words which is approximately 3-4 pages) (45%) on a topic to be assigned.

This course will cover a significant amount of information on corporate and intellectual property law in a very fast paced manner. The classroom structure will consist of outside speakers from local law firms/organizations who will discuss specific areas of law and leave time for the class to participate by asking relevant questions. In order to be prepared and to keep up with the topics, it will be necessary to complete readings prior to class and then synthesize information through post-class writing assignments. A final paper related to basic corporate and IP law concepts will be required.

Texts & Materials

Various readings will be provided prior to class.

Topics/Assignments below:

<table>
<thead>
<tr>
<th>DATE</th>
<th>LECTURER</th>
<th>TOPIC</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 21, 2018</td>
<td></td>
<td>No Class</td>
<td>TBD</td>
</tr>
<tr>
<td>June 28, 2018</td>
<td>(a)-(b) Jesse Kindra</td>
<td>(a) Class Introductions;</td>
<td>TBD</td>
</tr>
<tr>
<td>Date</td>
<td>(a) Corporate Basics – Choice of Entity and Other Formation Issues;</td>
<td>(b) Copyright and Open Source</td>
<td>TBD</td>
</tr>
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</tr>
<tr>
<td>July 5, 2018</td>
<td>(a) Trademarks and Branding for Startups;</td>
<td>(a) Founders Issues and Equity Allocation</td>
<td>TBD</td>
</tr>
<tr>
<td>July 12, 2018</td>
<td>(b) Corporate Governance and Finance</td>
<td>(b) Fundraising – VCs</td>
<td></td>
</tr>
<tr>
<td>July 19, 2018</td>
<td>(a) Patent Landscape Analysis vs. Infringement Analysis vs. Validity Analysis vs. Validity Analysis vs. Clearance Opinion;</td>
<td>(b) What do term sheets look like?</td>
<td>TBD</td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Notes</td>
<td></td>
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<td>-----------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------</td>
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</tbody>
</table>
| August 2, 2018  | (a) Ownership of Intellectual Property (policy and agreements such as CDAs, license agreements, etc);  
                  (b) Patent Prosecution – Outside Counsel Perspective on Sections 101, 102, 103, 112 and working with a client | TBD                        |
| August 9, 2018  | (a) Patent Portfolio Management Strategies;                              | TBD                        |
|                 | (b) Patent Litigation Overview                                          |                            |
| August 16, 2018 |                                                                        | Final Paper Due – NEED DEADLINE |
The purpose of this course is to enhance your ability to build effective teams—that is, teams capable of extraordinary performance. Accordingly, this course will equip you with tools to (1) establish strong, shared commitment to a compelling team purpose, (2) bring about collective buy-in to concrete performance objectives, (3) promote team member adherence to a set of suitable work rules and roles, and (4) foster the interpersonal trust and respect crucial to mutual team member support and, ultimately, extraordinary team performance.

The breadth of this course is immense relative to the amount of time we have together. Thus, our pace will be brisk. The aim is to introduce you to key concepts and ways to apply them that you can further assimilate and develop as you build your student teams.

**Class Format.** Sessions will involve various combinations of lectures, participant presentations, concept and case discussions, and experiential exercises. The course is designed as a workshop. Everyone is expected to actively and thoughtfully participate.

**Course Requirements.** Course credit will be determined by performance as follows:

**In-class Participation:** You must attend each course session fully prepared to engage others in various cooperative learning activities. Please read all articles and cases and attempt to answer case questions in advance of the sessions for which they have been assigned. Participation points will be gained according to the quality and quantity of your contributions. You will also contribute to a team presentation.
**Team Charter Project:** Each team is expected to develop and submit a “living” student team charter. More information on this requirement will be presented via Canvas and when we meet in class.

**Evaluation Details**

- Team presentation (15%), Contribution to class discussions demonstrating advanced preparation (15%), Contribution to team activities (15%)
- Team Charter Project (55%)
- Students must earn 75% to receive credit for the course.
SESSION 1  IMPORTANCE AND CHALLENGES OF TEAMWORK

Session Overview
We will discuss the criticality of teams, in general, and your student teams, in particular. Major challenges to effective teamwork will be identified. Team development processes will be highlighted.

Readings (listed in alpha order)
- Colvin, “Why dream teams fail”
- Janis, “Groupthink” (*Psychology Today* classic!)
- Soll, Milkman, & Payne, “Outsmart your own biases”

General Study Questions
1. What do you generally like *best* about working in teams? What do you think you will like best about working in your student team? Overall, what are the main benefits of teamwork?
2. What do you generally like *least* about working in teams? What concerns you most about working in your student team? Overall, what are the main drawbacks of teamwork?

Exercise
1. “Who Are We?” Exercise: Prepare to work intensively with your teammates prior to the course. Exercise directions will be distributed via Canvas. The deliverable is due during our first session.
2. *Decision-Making Exercise*: Materials will be distributed in class.
SESSION 2 KEYSIONES OF EFFECTIVE TEAMWORK

Session Overview
We will discuss fundamental building blocks of teamwork effectiveness. Team decision-making processes will be emphasized.

Readings (listed in alpha order)
- Duhigg, “What Google learned in its quest to build the perfect team”
- Garvin & Roberto, “What you don’t know about making decisions”
- Katzenbach & Smith, “The disciple of teams…” (*HBR* classic!)

Case and Case Questions
- The Satera Team at Imatron Systems, Inc.

Case Questions
1. Who are the Satera Team’s stakeholders, and what do they expect of the team?
2. What team process breakdowns are apparent, and what are the root causes of the breakdowns?
3. What can Pinto do *now* to get the team on track?
4. What could Pinto have done differently to avoid the breakdowns?

Exercise
- Teamwork Exercise: Materials will be distributed in class.
Session Overview
We will continue our discussion of keystones of teamwork effectiveness. Team performance improvement processes will be highlighted. Another major focus of this session will be on leveraging course principles to develop the charter (or contract) for your team.

Readings (listed in alpha order)
- Darling et al., “Learning in the thick of it”
- Halvorson, “Get your team to do what it says it’s going to do”
- Toegel & Barsoux, “How to preempt team conflict”

Case and Case Questions
- Harry and Learning Team 28

Case Questions
1. Who are Team 28’s stakeholders? What do they expect of the team?
2. What team process breakdowns are apparent, and what are the root causes of the breakdowns?
3. What can Team 28 members do now to get back on track?
4. What could team members have done differently to avoid the breakdowns?

Exercises
- Teamwork Exercises: Directions will be distributed in class.
- Team Charter Exercise: Directions will be distributed in class.
Session Overview

Consequential process problems emerge in most project teams. Thus, we will discuss how to diagnose and address process problems that arise in ongoing teams. You will reflect on your student team’s experiences in light of the teamwork principles covered earlier and the additional concepts discussed in class to make adjustments necessary to boost your team’s effectiveness. New topics that will be covered include project management and virtual teamwork.

Readings

- Ford, Piccolo, & Ford, “Strategies for building effective virtual teams”

Case

- Santora & Neufeld, “Virtual Teams at Ivey”

Case Questions

1. Drawing from the case data and your experiences with your student team and making reasonable assumptions, who are likely to be the major stakeholders of Santora’s learning team, and what are their likely expectations of the team?

2. Given your stakeholder analysis, what could be the core ideology (core purpose and short list of values) and major goals of the team?

3. Based on the core ideology and major goals you specified and reasonable assumptions about team members’ personalities, what team processes pertaining especially to the virtual aspects of teamwork should be developed?

4. Given the processes you described, what technologies should be utilized and what major intangible resources (in terms of the People, Structure, or Culture Frame issues or factors) should be developed to support those processes?

Exercise

- Teamwork Exercise: Materials will be distributed in class.
SESSION 5  REBOUNDING FROM SET BACKS IN PROJECT TEAMS

Session Overview
Many project teams are beset by significant adversity at some point in their life cycle. Thus, we will discuss how to develop team resilience. Resilience is the capacity to adapt in response to significant adversity, where adapting involves rapid recovery, growth, and positive change.

Readings
- Alliger et al., “Team resilience: How teams flourish under pressure”

Case and Case Questions
- TBD

Case Questions
- TBD

Exercise
- Teamwork Exercise: Materials will be distributed in class.

SESSION 6  CREATIVITY AND INNOVATION IN PROJECT TEAMS

The purpose of this session is to help you address the specific teamwork challenges that may emerge during the prototyping phase of your launch project, which occurs in the fifth quarter of the Master of Science in Technology Innovation program. During the fifth quarter, your team will engage in rapid prototyping as function of ongoing conversations with target users, mentors, and faculty advisors in order to refine your team’s ideas.
Course Overview: You will work in your Launch Project groups to plan and prepare for your Launch Project. Comprehensive planning and development of your project will help lead to a successful Launch Project. The Pre-Launch Studio is an opportunity to imagine yourself as the Technical Project Manager, Systems Engineer, and/or Software Development Lead for your project. You will consider the resources and timeline for your Launch Project to succeed.

Prerequisites: This course assumes that students have taken the following courses: TECHIN 510 (Programming for Digital and Physical User Interfaces), TECHIN 512 (Sensors and Circuits), TECHIN 513 (Managing Data and Signal Processing), TECHIN 514 (HW/SW Lab 1), TECHIN 515 (HW/SW Lab 2), and TECHIN 523 (User Research and Evaluation Studio).

Contact Information:
- Prof. John Raiti  jraiti@uw.edu
- Prof. Linda Wagner lw1mhcid@uw.edu
- TA TAemail@uw.edu

Course Goals:
- To present design goals and decisions as well as implementation results in both verbal presentation and written documentation.
- To have you work in a team to learn about coordinating such groups.

The major deliverable for the Pre-Launch Studio will be the Launch Project Description document which will contain the following sections:

- **Project Description:**
  - Summary
  - Statement of Problem
  - Design Objectives
  - Business Case
  - Technology - Proposed Hardware and Software
  - Projected Budget
  - Gantt Chart
  - References
The **Statement of Problem** will contain a description of:

- the problem and the need for a solution
- proposed solution

The **Technology** section will focus on an in-depth analysis of the hardware and software requirements and development plan for your Launch Project:

- **Preparation**:
  - Hardware Development Plan
    1. What are the new hardware features?
    2. Which subsystems (parts) are extensions of pre-existing hardware?
    3. Which parts are COTS?
    4. Which parts of the product need to be prototyped?
    5. What is your prototyping plan?
      a) What materials; which machines; and in what order?
      b) Plan for series of low fidelity prototypes and iterating towards high fidelity ones.
  - Software Development Plan
    1. Backend
    2. Frontend
    3. Debugging
    4. Testing
    5. Implementation
  - Consortium resources (people, equipment, access to lab space)

**Learning Objectives:**

Students will be able to:

- Effectively plan the business, user experience, and technology aspects of a project
- Learn strategies to make effective project pitches

**Example Project Description**

- [https://docs.google.com/document/d/1d1zbO_jwpBkJjFYey-ZsrzoPte-0JRJ2rf7z_sflb1HY/edit?usp=sharing](https://docs.google.com/document/d/1d1zbO_jwpBkJjFYey-ZsrzoPte-0JRJ2rf7z_sflb1HY/edit?usp=sharing)

**In-class activities**

- Based on [Advocacy](https://example.com) by John Daly
- Previous Capstone Project Case Studies
### Schedule:

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<th>Week</th>
<th>Topic</th>
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<td>1</td>
<td>Introduction</td>
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<td>June 18</td>
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<td>2</td>
<td>• Ideas</td>
<td>• Chapters 1-2</td>
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<td>June 25</td>
<td>• Gantt Chart Rev. 1 due</td>
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<td>• Capstone Project Case Studies</td>
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<td>• Messaging Part 1</td>
<td>• Chapters 3-4</td>
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<td>July 2</td>
<td>• Branding</td>
<td>• Progress Report 2 due</td>
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<td>• Alliances</td>
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<td>• Story</td>
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<td>• Decision makers</td>
<td>• Chapters 7-8</td>
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<td>July 16</td>
<td>• Networking</td>
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<td>• Timing</td>
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<td>• Messaging Part 2</td>
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<td>• Progress Report 7 due</td>
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<td>• Capstone Project Case Studies</td>
<td>• Progress Report 8 due</td>
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- **Grading:**
  - 15% Participation
  - 30% Launch Project Description Report (group submission)
  - 35% In-class group activities
  - 20% Individual Weekly Written Progress Reports

- **Grading Scale:**

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TECHIN 541 Launch Seminar

Course Overview: This seminar focuses on design and software/hardware industry trends and career outlook.

Prerequisites: This course assumes that students have taken the following courses: TECHIN 540: Pre-Launch Studio

Contact Information:

- Prof. John Raiti  jraiti@uw.edu
- Prof. Linda Wagner  lw1mhcid@uw.edu
- TA  TAemail@uw.edu

Course Goals:

- Students develop a personal career vision and plan based on their experience, interests and skills.

Learning Objectives:

Students will be able to:

- Identify their career development and goals
- Identify potential companies
- Assess personal strengths, skills, interests and values that influence the career search
- Identify marketable skills and demonstrate how to convey the value of transferable skills to employers
- Utilize networking strategies to identify future employment alternatives
- Construct a professional resume that clearly outlines student’s unique skills and qualifications
- Write a concise cover letter and a professional thank you letter
- Research resources to assist with the employment search
- Effectively use online professional networking sites
- Demonstrate an understanding of the dynamics of interviewing and effectively present their unique contributions in a mock interview setting
- Determine transitional issues for post-graduation endeavors and manage career advancement
- Identify pros/cons of forming or working at a startup
### Schedule:

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| 1     | Sept 26 | - Introduction  
                   - Course Expectations/Assignments  
                   - Job Search – The Big Picture  
                   - Creating professional resume |
| 2     | Oct 3  | - Technology Innovation Guest Lecturer                                |
| 3     | Oct 10 | - Professional Resumes  
                   - Career Fair Tips-How to successfully attend a career fair |
| 4     | Oct 17 | - Technology Innovation Guest Lecturer                                |
| 5     | Oct 24 | - Researching Employers  
                   - Online Image and Branding                                           |
| 6     | Oct 31 | - Technology Innovation Guest Lecturer                                |
| 7     | Nov 7  | - Interview Tips  
                   - 30 second elevator speech                                             |
| 8     | Nov 14 | - Technology Innovation Guest Lecturer                                |
| 9     | Nov 21 | - Job offer/negotiation                                               |
• **Grading:**
Students' demonstration of the learning objectives will be assessed through a set of individual assignments and group projects as follows:
Outlining a comprehensive career development plan (50% of grade) to include
  ● A self-assessment of strengths and growth areas
  ● Identification and analysis of opportunities
  3-5 potential future employers that would be a fit or of interest
  ● Professional Resume, Targeted Cover Letter/Resume, LinkedIn Profile

Written summaries and reflections from guest lectures and facilitated by Technology Innovation Industry experts (50% of grade)

• **Grading Scale:**

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Course Overview: Working in small teams, students take an idea from concept to prototype and get a product ready for market.

Prerequisites: This course assumes that students have taken the following courses: TECHIN 540: Pre-Launch Studio.

Contact Information:
- Prof. John Raiti     jraiti@uw.edu
- Prof. Linda Wagner   lw1mhcid@uw.edu
- TA                  TAemail@uw.edu

Course Goals:
- Working in small teams, students take an idea from concept to prototype and get a product ready for market. Students can either work on an idea developed by students, or tackle a challenge facing a top company or nonprofit.

Learning Objectives:
The MSTI launch project is designed to immerse students in the entrepreneurial process. Working in small teams, students will take an idea from concept to prototype and get a product ready for market. Students can either work on an idea developed by students and the student team, or tackle a challenge facing a top company or nonprofit.

In the Autumn quarter, students will engage in rapid prototyping and get feedback from target users, mentors and faculty to refine their ideas. GIX houses a staffed, state-of-the-art fabrication and makerspace that allows students to build almost anything. Upon successful completion of the course, students should be able to demonstrate:
- the quality and creativity of their Launch Project work for potential employers

Project Website:
Every team is required to keep a project website. Check out "Project Pages" to get some website ideas from past team projects. Teams can use any hosting service they like. Students will document everything and put it on the website (notes, testing, debugging, pictures, videos, etc).

Weekly Lab Notebooks:
Each team is required to keep a lab notebook on their website and will be required to update it on a weekly basis. This should include their designs, notes for that week, status, plan for that week, what each team member is doing, etc.
- **Schedule:**

<table>
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<tr>
<td>1 Sept 26</td>
<td>• Introduction</td>
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<td>2 Oct 3</td>
<td>• Preliminary Design Review (PDR), Budget, and Preliminary physical prototype.</td>
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<td>3 Oct 10</td>
<td>• Milestone quality prototype #1 due</td>
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<td>5 Oct 24</td>
<td>• Iterating and Prototyping</td>
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<td>• Milestone quality prototype #2 due</td>
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<td>• Iterating and Prototyping</td>
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<td>• Iterating and Prototyping</td>
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<td>9 Nov 21</td>
<td>• Milestone quality prototype #3 due</td>
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<td>10 Nov 28</td>
<td>• Final presentations</td>
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Grading:
Students will be asked to complete 3 milestone quality prototypes for their large project with 20% of the grade being attributed to each milestone.

- Prototype #1 = 20%
- Prototype #2 = 20%
- Prototype #3 = 20%
- Students will also be asked to give a final presentation/demo accounting for 30%.
- Digital Portfolio 10% of your grade.

Grading Scale:

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Course Description

Individual graduate projects for the Masters of Science in Technology Innovation program.

Learning Objectives

Varies

Course Overview

The Special Projects course allows the MSTI program to offer 1 credit of supervised independent project work to individual students in order to flexibly address the academic and professional development of individual students.

Course Topics

Varies

Evaluation Criteria

Varies

Suggested/Required Readings

Textbook (required): no required text

Textbooks (recommended) TBD

Websites, Journal Articles:
Course Description

Individual graduate study for the Masters of Science in Technology Innovation program.

Learning Objectives

Varies

Course Overview

The Independent Study course allows the MSTI program to offer credit(s) of supervised independent study work to individual students in order to flexibly address the academic and professional development of individual students.

Course Topics

Varies

Evaluation Criteria

Varies

Suggested/Required Readings

Textbook (required): no required text

Textbooks (recommended) TBD

Websites, Journal Articles: TBD