Technology Based Startups: Biomimicry Certificate

Course Name: Technology Based Startups

Course Credit: 3

Course Number: 4600:481   (as a follow through to 4600:471 Senior Design Projects)

Department: Mechanical Engineering

Pre-Requisites: None

Instructor: Gopal Nadkarni

Semester: Spring

Typical Student Profile: 3rd/Junior/Senior students in Science, Arts and Engineering from all disciplines as with an interest in technology based entrepreneurship

Summary: This is a hybrid "design thinking" plus "business fundamentals" course for students interested in starting, joining or learning about technology based startups through teams. It answers the question "How to create a technology startup to solve a human need" "How can I take my design projects and create a successful business?". We teach student teams to create/conceptualize a product based on the well-known Stanford Design Thinking approach. Then, we use a flipped classroom approach with the proven Lean Launchpad approaches to get students out of the classroom and discover customers for their product, process or service idea through field interviews.

Rationale: There has been a tremendous resurgence by the younger generation to become involved in creating/joining/being involved in startups – a model of self-sufficiency and make a societal impact. The "old" approach of teaching entrepreneurship through text book based "case studies" has given way to "learning by ideating/creating/doing/failing/pivoting/relaunching". This course offered by experienced instructors primarily to students in sciences and engineering, teaches a science based hypothesis driven practical approach that mirrors real life success. The team based approach allows team's flexibility & independence to create meaningful projects and learn to confidently shape an idea into a framework that can launch a company.

Bulletin Description: Pre-Requisite: permission. Design Thinking approaches. Invention of product prototype /proof of concept based on user interviews. Team driven creative project driven by science & technology, research IP. Validate design with customers and learn fundamentals of market validation.

Delivery Site: Akron (Main Campus)

Justification for Credit Hours: Design, Field work require 2-3 hours of sustained effort with preparation to present

Faculty: No additional faculty required.

Staffing Numbers: Existing Faculty available to teach program

Full time : 1 Part Time: 1

Program Assessment: The course has been offered since 2014 as a dual level (undergrad/grad). In recent years, it has been observed that senior graduating students are very interested to take this course, since many of their senior design projects have obvious commercial potential. Venturwell, a national foundation based out of Washington has been impressed with this program and has offered to fund the student projects for 3 years.

Measuring Student Learning:

Description: This course will provide senior students with the opportunity to extend their fundamental knowledge of entrepreneurship within the specific interdisciplinary context of technology commercialization.   Working in interdisciplinary groups the student teams/groups will be taught design thinking approaches that put the customer at the center of the creative process. Brainstorming exercises will be held to solve open ended problems on special topics (e.g. biomimicry, software, medical devices, sensors etc.) so that teams can ideate and conceptualize product, process or service based ideas that solve real problems. In some cases, students can be assigned known research technologies and learn how to come up with applications that have commercialization potential. The evaluation will include, but not be limited to, evaluation of the underlying technology, determination of potential customer value proposition(s), determination of market feasibility, examination of licensing/spin-off options, identification of potential licensees, estimation of potential market size and value, and development of recommendations for further funding, growth (or abandonment). By working in teams, students will learn how to create/invent a product prototype, learn how to listen to potential customers and come back to describe the value proposition that will make the startup successful.

Textbooks

1. Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet, Wiley 2014
2. The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company Hardcover – March 1, 2012 by Steve Blank (Author), Bob Dorf (Author)

Reference Websites How to Build a Startup : https://www.udacity.com/course/how-to-build-a-startup-- ep245

Course Objectives: There are five main objectives that coincide with the preliminary steps of the 5i model (ideate-invent-innovate-invest-impact) model.

1 **Ideate:** The student will learn how to brainstorm and ideate using well known techniques e.g. mind mapping and design thinking approaches. Focused sessions from experts will be offered as a platform to launch ideas e.g. biomimicry, medical problems etc.

2 **Invent:** The student will learn how to form a cohesive team that narrows down the idea, fleshes out the scope based on initial customer interviews and makes a proof of concept/prototype

3 **Innovate:** The student will learn how to conduct detail market understanding and customer discovery of the ecosystem to see whether there is a genuine demonstrated need from customers. They will learn how to derisk their ideas using scientific formulation and testing of business hypothesis using the Lean Launchpad model. They will learn how to bring their product-market fit interview results back for critical feedback every week.

4 **Invest:** learn the various steps to funding and testing your idea so that valuable time and money is not spent chasing ideas that are not viable. They will learn how to propose the final market application (product) with a value proposition that fills real unmet market needs, that has been derisked and ready for the next steps i.e. go-to-market strategy. 4

5 **Impact:** The students will understand the societal drivers that power successful startups including concepts of first to market, scale and unfair advantages. They will learn the basics of pitching the value proposition to seasoned entrepreneurs.

Grading Scheme:

- Ideation/Concept Creation: 10 points
- Product prototype: 15 points (minimum two iterations)

- Customer Discovery Interviews: 40 points (minimum 25 interviews)
- Final Presentation: 10 points
- Final Report :   15 points
- Attendance: 10 points

90-100 Points: A
80-90 Points : B, B+, A-
60-80 Points: C- to B-
<60 Points: D
<50 Points: F

Assignments: Student teams will be required to present the results of their project work and their customer discovery every week in the Class Presentation session. Every student will to present as part of their team and will be given critical feedback.

Final Presentation: Teams are required to prepare a final presentation to the judging team with external judges in the format of a incorporated company requesting funding with a defined go-to-market model and business plan with metrics on cost, validated customer need and a prototype that they can demonstrate.

Attendance: The instructor will use the textbook along with other web resources to supplement the learning experience. To get the most out of the course full and active participation is encouraged in every class. Attendance will be considered mandatory unless there are valid verifyable reasons for missing the class (e.g. medical absence or job interview's). For every unexused absence class there will be one grade point dropped.

Example of Course Outline (Focus on Biomimicry Applications)

Week	Lecture Topic (90 min)	Student Activity & Deliverables (60 min)	Learning Outcomes
1	Introduction to Technology Based Entrepreneurship	Entpreneurial Skill Profiling, Team Formation, Mind Mapping	Learning strengths/weaknesses and goals for seeking to be an entrepreneur
2	Great Lakes /BRIC Guest Speaker	Brainstorming / Presentation	Learning how to brainstorm and Present
3	Biomimicry Concepts 1	Brainstorming, Presentation	Building on concepts taught in classroom
4	Biomimicry Concepts 2	Brainstorming, Presentation	Building on concepts taught in classroom
5	Biomimicry Concepts 3	Term Project Selection/Scoping	Selection of project/product/process/service based on Biomimicry Concepts & planning
6	Business Model Canvas: Product Market Fit	Customer Discovery /Planning Selection Workshop	Discussion of Value and Product Market Fit
7	Value Proposition Hypothesis Building, Pains & Gains	Student Presentation: Technology, Value Proposition & Hypothesis	Clarity on what is my product, who are my customers and why will they buy?
8	How to Select & Interview Customers	Interviewing/Listening Skills Practice	Understanding on how to listen, live interview session and step by step analysis
9	Ecosystem, Value Chain, Work Flow	Student Presentation: Learnings 1	Understanding on value flow, and how product/idea/solution fits into the ecosystem
10	Market Size, Channels, Relationships	Student Presentation: Minimum Viable Products/Prototypes Evaluation/Discussion	Clarity on estimating market size, scalability, and how to reach the customer for products being discussed with feedback
11	Key Activities, Resources	Student Presentation: Learnings 2	What does a startup need to do after finding product market fit?
12	Costing, Revenue, Building a Business Model		How to develop a cost and revenue model
13	Competitive Position, IP	Student Presentation Learnings 3	Understanding how to protect IP/Competitive position
14	How to Pitch, Funding/Funding Pathways	Practice Presentations	Learning how to pitch, and understanding funding pathways
15	Final Presentations	Report Due	