1. Annotation

The course is designed to equip you with knowledge, skills and experiences required to deliver new successful tech-based products/services. The core of the course is a structured Product Innovation Process featuring user-focused & iterative product design, as well as the combination of marketing, design, and engineering perspectives.

Within this hands-on immersive course you are to run a team-based projects. This will enable you to put into practice the course tools and techniques as well as to create your own "product innovation" professional portfolio. The projects will be done in collaboration with real startups/ventures facing the challenges of a new product design. (If you have your own idea/startup you would like to run as the course project, please contact instructor).

In this course we will balance key concepts and methods of generating and testing customer-centric products and business ideas (e.g. Customer Development & Lean Startup, Design Thinking, Business Model Innovation) with the "deep dive" into prospective technologies and markets in the areas of Internet of Things, Smart & Connected Devices, Digital, New Materials, Manufacturing Technologies, Industry 4.0.

2. Structure and Content

Course Prerequisites

Innovation Workshop or special instructor’s permission

Course Academic Level

Master-level course suitable for PhD students
<table>
<thead>
<tr>
<th>Topic</th>
<th>Summary of Topic</th>
<th>Lectures (# of hours)</th>
<th>Seminars (# of hours)</th>
<th>Labs (# of hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key concepts and methods of the structured and iterative innovation process. Prospective technology markets and technologies.</td>
<td>Introduction to Customer-Centered Innovation and Product Design. Key concepts and methods of the structured and iterative innovation process: Customer Development, Lean Startup, Design Thinking, User Research, Business Model Innovation, Design Sprints. Prospective markets and areas for customer-centered innovations enabled by technologies.</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Concept (solution) ideas generation. Business Model drafting and business opportunity assessment.</td>
<td>Concept (solution) ideas generation. Business Model drafting and business opportunity assessment.</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>New products and innovations marketing.</td>
<td>New products and innovations marketing, market validation, “marketing mix” ideation for the prospective product &amp; service.</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Rapid prototyping.</td>
<td>Tools and technologies for rapid prototyping and experimentation with users. Low and hi fidelity prototypes.</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>User tests: why, what, how.</td>
<td>User tests: why, what, how. Getting insights from user tests and converting them into actionable product/service enhancing steps.</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Business storytelling.</td>
<td>Business storytelling. How to pitch your prototype, product/service, prospective business.</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

3. Assignments

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Assignment Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Project</td>
<td>Intermediate and Final presentations of teams projects</td>
</tr>
<tr>
<td>Homework</td>
<td>Written reports (and in-class report out presentation)</td>
</tr>
</tbody>
</table>

4. Grading

**Type of Assessment**

Pass/Fail

**Grade Structure**
<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Activity weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Project</td>
<td>40</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>20</td>
</tr>
<tr>
<td>Team Feedback</td>
<td>20</td>
</tr>
<tr>
<td>Attendance</td>
<td>10</td>
</tr>
<tr>
<td>Class participation</td>
<td>10</td>
</tr>
</tbody>
</table>

Grading Scale

5. Basic Information

**Attendance Requirements**
Mandatory with Exceptions

**Maximum Number of Students**

<table>
<thead>
<tr>
<th></th>
<th>Maximum Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall:</td>
<td>40</td>
</tr>
<tr>
<td>Per Group (for seminars and labs):</td>
<td>5</td>
</tr>
</tbody>
</table>

**Course Stream**
Entrepreneurship and Innovation (E&I)

**Course Delivery Frequency**
Every year

**Students of Which Programs do You Recommend to Consider this Course as an Elective?**

<table>
<thead>
<tr>
<th></th>
<th>Masters Programs</th>
<th>PhD Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Science</td>
<td>Computation and Data Science and Engineering</td>
<td></td>
</tr>
<tr>
<td>Energy Systems</td>
<td>Engineering Systems</td>
<td></td>
</tr>
<tr>
<td>Materials Science</td>
<td>Life Sciences</td>
<td></td>
</tr>
<tr>
<td>Mathematical and Theoretical Physics</td>
<td>Materials Science and Engineering</td>
<td></td>
</tr>
<tr>
<td>Petroleum Engineering</td>
<td>Mathematics and Mechanics</td>
<td></td>
</tr>
<tr>
<td>Photonics and Quantum Materials</td>
<td>Petroleum Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td></td>
</tr>
</tbody>
</table>

**Course Tags**
Entrepreneurship and Innovation (E&I)

6. Textbooks and Internet Resources

<table>
<thead>
<tr>
<th>Required Textbooks</th>
<th>ISBN-13 (or ISBN-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cindy Alvarez. Lean Customer Development: Building Products Your Customers Will Buy, 2014</td>
<td>9781449356354</td>
</tr>
<tr>
<td>Bill Aulet, Disciplined Entrepreneurship Workbook, 2017</td>
<td>9781119365792</td>
</tr>
</tbody>
</table>
7. Facilities

8. Learning Outcomes

**Knowledge**

Understanding and Mastering Iterative Innovation Process as well as its application for digital products/technologies
- Market and marketing
- Primary market research
- Product design and development
- User research
- Project management and team work

**Skill**

Develop and Master skills in:
- Effective communication
- Effective listening
- Effective meetings
- Managing expectations
- Business Communication Excellence
- Teamwork and leadership
- Formulating objectives and goals
- Project management

**Experience**

- Teamwork
- Project based work
- Users interaction
- Prototyping

Do you want to specify outcomes in another framework?

Knowledge-Skill-Experience is good enough

9. Assessment Criteria

**Select Assignment 1 Type**

Homework

**Input Example(s) of Assignment 1 (preferable)**
Assignment 1a: Teams forming
1. Within your project teams agree upon:
   Roles and Responsibilities ("CEO" + other)
   Your personal targets within the project (e.g. getting new skills, creating your portfolio....)
   Team targets within the project (web site of the new product, wireframe app prototype....)
   Decision making process you will use in the team
   Team communication and project progress tracking and documenting (Trello?)
2. Document this into your Team Charter, be ready to present and discuss it in the class

Assignment 1b: Competitor analysis
1. Review existing/alternative solutions to the problem you are trying to solve
2. Prepare report on the results, be ready to present and discuss it in the class

Assessment Criteria for Assignment 1
Completeness and quality of the prepared materials. Quality of the in-class report outs and discussions showing understanding of the process.

Select Assignment 2 Type
Team Project

Input Example(s) of Assignment 2 (preferable)
Assignment 2a. Create your project progress report:
- Slide 1: Project title, team members (+ roles, photos)
- Slide 2: Design challenge
- Slide 3: Project target (and "tangible" outcome)
- Slide 4: Existing/alternative solutions review (summary of task 1)
- Slide 5: What will you do next

Assignment 2b: Be prepared for customer interview
Based on your current problem + client segment + hypothesis make preparations:
- Develop the format of interview
- Create exact list of questions (most important part of this assignment)
- Find approach for "list" of participants
- Submit one page document, put more efforts on questions.

Assessment Criteria for Assignment 2
Quality of presentation and further discussion. Quality of the materials showing understanding of the process.

Select Assignment 3 Type
Team Project

Input Example(s) of Assignment 3 (preferable)
Prepare and upload before class materials describing (for your project):
- Persona
- Use cases
- Storyboard
You can use templates from the lecture, or find any you prefer

Prepare a prototype for user-tests.
1. According to the brainstorming exercise collect the most important features for your solution.
2. Create storyboard/use-case where client will face with these features - make a short document which contains this story (.doc or .pptx)
3. Create a clickable prototype with help of Marvel POP and add the link to it in the document (you need to create free account in marvel, then an option to copy the link of your project will appear).
4. Think and add in the document the list of people who you can approach to test the prototype (early adopters)
5. Submit the document before class

**Assessment Criteria for Assignment 3**

| Quality of the materials showing understanding of the process. Quality of presentation and further discussion. |

**Select Assignment 4 Type**

| Team Project |

**Input Example(s) of Assignment 4 (preferable)**

| Final presentations of the team projects |

**Assessment Criteria for Assignment 4**

| Quality of the materials, presentations and discussion showing understanding of the overall process of user-centered product design, tools and techniques, team work and communication. |

**10. Additional Notes**

| Free Style Comments (if any) |

This is teams and project based class to provide you with real-world, hands-on, immersive learning about what it takes to successfully create new technology based products, businesses or startups that benefit society. It’s not about how to write a business plan or prepare investor pitch. The result is not a publication or a deck of slides. Instead, it is the experience of being an entrepreneur - learning from the marketplace by talking to customers, partners, and competitors; working as a team to overcome failures and embrace successes; encountering the chaos and uncertainty of creating a startup – all under the guidance and support of the class and the instructor.

**Additional notes:**
1. As a part of your final grading you will be asked to grade your own and your teammates’ participation on the course project (peer-to-peer review).
2. To get “pass” level you are to get 50 and above grading points.
3. Work done within the course is purely for educational purposes, considered public domain (unless explicitly specified and agreed to by the instructors).