Skoltech Innovation Workshop
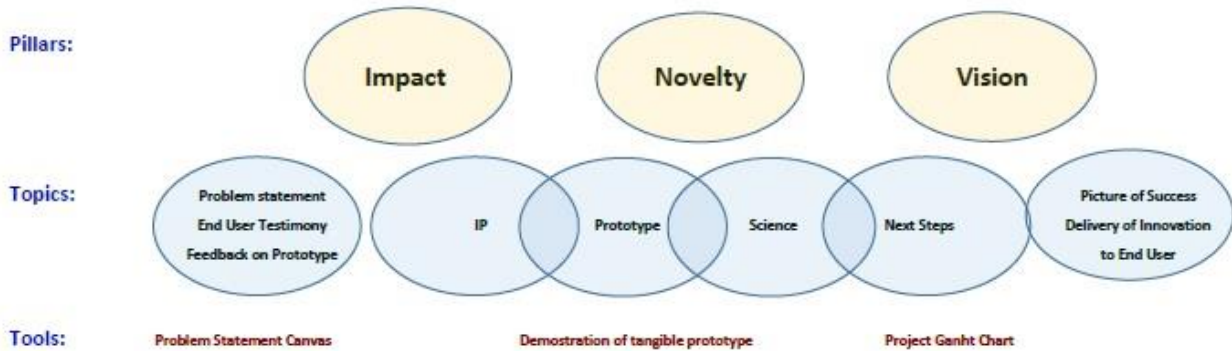
Course Syllabus (as of August 2019)

1. INNOVATION WORKSHOP ANNOTATION

Title (in English): Innovation Workshop

Title (in Russian): Мастерская Инноваций

Teaching Director: Dmitry Kulish

Course Instructors: Pavel Dorozhkin, Maxim Kiselev, Dmitry Kulish, Zeljko Tekic

Cohort Instructors: Alexander Chekanov, Kelvin Willoughby

Prerequisites: Admission to M.S. student status at Skoltech

Stream: Entrepreneurship and Innovation (E&I)

Number of ECTS credits: 6

Type of Assessment: Pass/Fail

Term: 1A (first four weeks)

Delivery Frequency: annual

Academic Level: Master

1.1. INNOVATION WORKSHOP SUMMARY

The Innovation Workshop (IW) is a one-month full-time "boot camp" MS-level course that unites the entire Skoltech incoming class with Skoltech faculty and esteemed invited mentors to create the foundational experience in Entrepreneurship and Innovation (E&I) for all. IW is designed to instill a positive "can-do" teamwork attitude in the Skoltech culture, as well as to cultivate the art of prototyping quickly, under pressure, with help from others, and based on whatever resources are at hand here and now. The core IW workflow is the iterative progression through the physical prototypes of solution of the end user problem, that are produced according to the actual live end user feedback.

Experiential inquiry-based learning leads IW student through the entire technology innovation cycle along the three pillars of innovation: (i) Impact (Problem + Feedback), (ii) Novelty of the solution (IP + Prototype + Science), and (iii) Vision for the subsequent iterations (Next Steps + Picture of Success). This work is performed in cross-disciplinary teams operating under time pressure thus creating real life experience of complex innovation project.

IW is not a business class competition and not a hard skill class. It is less about knowledge and more about developing skills and attitudes necessary to lead successful life in innovation. It is also an opportunity for students to learn more about Skoltech's basic values and meet the entire class and most of the faculty in an intensive relationship-building setting.

Skoltech Innovation Workshop Pillars, Topics and Tools

IW PILLAR	TOPIC	TOOL
IMPACT	End User Problem Statement	Problem Statement Canvas
	End User Feedback on Prototype	Get out of Skolkovo ! Test the key metrics of your PSC
NOVELTY	Intellectual Property Protection	Potential claims of the potential patent
	Tangible Prototype	Physical demonstration on Fridays
	Scientific Validation	Structured report on the scientific experiment
VISION	Next Steps	Gantt chart of the short-term plan
	Picture of Success	Value delivery canvas

1.2. INNOVATION WORKSHOP LEARNING OUTCOMES

IW learning outcomes comprise the complex structure that is defined below in accordance to the European Qualifications Framework (Recommendation of the European Parliament and of the Council of 23rd April 2008), as well as to the Publications Office of the European Union (2017: Defining, writing and applying learning outcomes, A European handbook. Luxembourg). Three overarching IW learning outcomes are gaining experience/competence in:

(i)   iterative progress through the innovation scheme, consisting of:
  • producing the problem statement for the proposed innovation;
  • performing quick prototyping;
  • obtaining end user feedback on the innovation scheme and prototype;
  • progressing through the iterative cycles of innovation.
(ii)   working in a random cross-disciplinary team (a.k.a. "leadership without leverage"),
(iii)   embracing Skoltech culture and community.

1.2.1. PRODUCING THE INNOVATION SCHEME

TRAINING FIELD: PRODUCING THE INNOVATION SCHEME

UNIT OF LEARNING OUTCOME	KEY TECHNICAL OUTCOME	KNOWLEDGE	SKILLS	COMPETENCE
The scheme of the innovation produced by the team during the Innovation Workshop, including: 1. Problem statement; 2. Tangible prototype; 3. Scientific experiment on the prototype validation; 4. Actual end user feedback on the prototype; 5. Actionable plan on the next iteration of the proposed innovation.	Present the scheme of the innovation to the mentor panel during the three Friday sessions (Quick Failure, Dry Run, The Final Cut).	**The learner knows and understands:** – rationale and method of defining innovation as the scheme progressing through the iterative prototyping; – the composition of the Innovation Scheme; – the nature and features of the Innovation scheme components.	**The learner is able to:** – build the innovation scheme; – present the innovation scheme; – act towards the planned iteration of the innovation scheme.	**The learner:** – states the problem and prototypes it; – produces tangible prototype of the solution of the problem and scientifically validates it; – presents the prototype to the end user and obtains the feedback; – prepares calendar plan of the next iteration.

1.2.1.1. PROBLEM STATEMENT

TRAINING FIELD: PROBLEM STATEMENT				
UNIT OF LEARNING OUTCOME	**KEY TECHNICAL OUTCOME**	**KNOWLEDGE**	**SKILLS**	**COMPETENCE**
The statement of the practical problem to be solved by the Innovation produced during the Innovation Workshop.	Define and state the practical problem according to the "Problem Statement Canvas" during the team presentation.	**The learner knows and understands:** – crucial importance of the practical problem statement as the keystone of innovation; – tools and methods for defining the problem: Problem Statement Canvas; – the nature and features of the practical problems; – delineation and connection between the practical problems and the technological ones.	**The learner is able to:** – ideate and brainstorm towards the problem statement; – interview the end user to better understand the problem; – separate and link practical and technological problems; – state the problem in the Problem Statement Canvas.	**The learner:** – searches for the problem to solve by brainstorming and ideation; – validates the problem by interviewing end users; – prototypes the problem before prototyping the solution; – defines the problem in the Problem Statement Canvas.

1.2.1.2. PROTOTYPING

TRAINING FIELD: PROTOTYPING

UNIT OF LEARNING OUTCOME	KEY TECHNICAL OUTCOME	KNOWLEDGE	SKILLS	COMPETENCE
The tangible prototype of the innovation.	Present the tangible prototype of the innovation, as well as its technical description and scientific validation, during the team presentation.	**The learner knows and understands:** – crucial importance of the tangible prototype as the keystone of innovation; – the iterative circle of the prototyping: Plan, Implement, Measure, & Learn; – the concept of technical description of the prototype fit to the subsequent patenting; – proper scientific method of validating the prototype; – quick low-fidelity empathic approach to prototyping, that is based on the holistic design thinking: prototype the problem, not the solution.	**The learner is able to:** – design and plan the production of the tangible prototype in actionable descriptive statements that may be transformed into the patent claims; – validate the prototype through the scientific experiment that includes (i) orthogonal methods of testing and measuring, (ii) experiment design that isolates the single driver/ parameter, controls, (iii) comparables, (iv) results discussion, (v) statistics, (vi) conclusions.	**The learner:** – designs the prototype based on the end user feedback through holistic design thinking; – manages the cross-disciplinary team to produce the prototype; – scientifically validates the prototype and produces proper scientific report on the experiment; – produces technical description of the prototype fit for the subsequent patenting; – presents the prototype to the end user for the next iteration of feedback.

1.2.1.3. END USER FEEDBACK

TRAINING FIELD: OBTAINING AND UTILIZING END USER FEEDBACK				
UNIT OF LEARNING OUTCOME	**KEY TECHNICAL OUTCOME**	**KNOWLEDGE**	**SKILLS**	**COMPETENCE**
Well documented end user feedback: demographics, usage case (business model), testimony, advice.	Particular end user feedback is collected, analyzed, and presented during the team presentation.	**The learner knows and understands:** – crucial importance of the end user feedback as the keystone of innovation; – how to design end user feedback: problem statement, usage case (business model), metrics, testimony, advice; – how to obtain the end user feedback: scouting, contacting, influencing (EQ).	**The learner is able to:** – obtain comprehensive end user feedback to be employed for design thinking and the update of the Problem Statement Canvas; – connect to the end user through EQ tools; – follow-up and complete the end user interaction.	**The learner:** – designs, obtains, and utilizes end user feedback; – establishes mutually-beneficial lasting relationship with end users of the innovation.

1.2.1.4. ITERATIVE INNOVATION

TRAINING FIELD: PROGRESSING ITERATIVE INNOVATION				
UNIT OF LEARNING OUTCOME	**KEY TECHNICAL OUTCOME**	**KNOWLEDGE**	**SKILLS**	**COMPETENCE**
Well documented vision of iterative innovation process, consisting of the short-term plan for the next iteration and long-term vision of the delivery of the solution to the end user: next prototype design, business model, calendar plan.	Short- and long-term plans of the iterative development of the innovation is presented during the team presentation.	**The learner knows and understands:** – crucial importance of planning the next prototype based on the end user feedback as the keystone of the innovation impact; – designing the short-term plan: actionable improvements of the prototype, update of parts and teamwork needed; – designing the long-term vision of the project based on the Business Model Canvas.	**The learner is able to:** – design the next prototype based on the end user feedback; – plan and execute production of the next prototype; – produce the long-term vision of the project based on the Business Model Canvas.	**The learner:** – designs and produces the next generation prototype based on the accumulated knowledge from the previous generations; – builds actionable model of delivery of the innovation to the end user (a.k.a. usage case and business model); – keeps updating the relevance of the project through the long-term vision of the business model and calendar plan.

1.2.2. WORKING IN CROSS-DISCIPLINARY TEAM

TRAINING FIELD: WORKING IN CROSS-DISCIPLINARY TEAM				
UNIT OF LEARNING OUTCOME	**KEY TECHNICAL OUTCOME**	**KNOWLEDGE**	**SKILLS**	**COMPETENCE**
Proven ability to work in the cross-disciplinary team	High result in the IW team mutual assessment	**The learner knows and understands:** – role and balance of teamwork and leadership in the technological innovation process; – the importance of the team dynamics and ways to manage it by applying EQ; – importance of team contract and the ways of producing it.	**The learner is able to:** – balance leadership and teamwork positions while working in the team; – managing the efficient team decision making process; – apply EQ to influence and manage team dynamics; – distribute roles and responsibilities in the team: produce the team contract.	**The learner:** – efficiently balances leadership and teamwork to achieve team goals; – actively contributes to the team work; – produces, executes, and enforces the team contract; – efficiently participates in the team mutual feedback exercise.

1.2.3. EMBRACING SKOLTECH LANDSCAPE, FAMILY AND CULTURE

The least formal, but very important learning outcome of the IW is "seeing the big picture" of Skoltech. Innovation Workshop is the only learning activity that brings together the entire class with the entire faculty from the all CREIs. This is another reason of 100% attendance requirement: IW is designed to provide students with endless opportunities to encounter new people, new ideas and new angles of the Skoltech universe. Missing these opportunities is damaging not only to the student, but also to the community, because the non-attending students withdraw themselves from the community and hence hurt the community. Most IW participants emphasize that IW is the most efficient opportunity for Skoltech and general networking with fellow students, faculty, distinguished outside mentors and end users of innovation. Utilize and enjoy this unique opportunity!

2. INNOVATION WORKSHOP POLICIES AND REGULATIONS

As well as all other Skoltech courses and activities, IW is governed by the Skoltech Regulations. Two most often applied regulations (on the academic integrity and attendance) are cited below.

Please note the requirement of full attendance that is compliant to both regulation of Skoltech and the pedagogical nature of the IW. IW is built on the experiential group learning which means that students constantly learn from each other and provide feedback to each other. Non-attending IW is not only destroying one's learning experience, but also harming the learning experience of others by stripping them of the valuable 360 feedback. Full-time engagement in the IW, meaning at least eight hours per day, for at least five days per week over four weeks, is compulsory for all students.

All cases of absence should be managed by students according to the Skoltech regulation cited below. Teaching assistants will monitor and report student attendance and participation. Attendance will striongly influence the IW grade.

2.1. ACADEMIC INTEGRITY

SKOLTECH STUDENT ACADEMIC INTEGRITY REGULATIONS №131/8 of September 1, 2014

(2) At Skoltech honesty and integrity are fundamental values that guide and inform us as individuals and as a community. Our culture requires that each student takes responsibility for learning and for products that reflect their intellectual potential, curiosity, and capability.

(4.1) All students must carry out their tasks so that their work truthfully and honestly reflects the student's own work. The students are responsible for finding out what rules apply for solving the task and complying with the teachers' instructions on how the work of others is possible/ permissible to use...

2.2. FULL ATTENDANCE

REGULATIONS ON SKOLTECH STUDENT ATTENDANCE №131/10 of September 1, 2014

(2) A (2) Students are expected to have a full-time commitment to educational activities at Skoltech. If a student is enrolled in a class, he/she is expected to attend all scheduled in-class activities. It is ultimately the responsibility of the student to clarify and adhere to the attendance policies of a particular course by asking for clarification from the Course Instructor.

If a student is going to be absent from regular in-class activities because of a scheduling conflict of different educational activities (e.g. a conference during the term), a student needs to first discuss this with the Course Instructor(s) to seek permission to miss class(es). If the Course Instructor(s) is(are) in agreement, the student should then fill in and submit a Request for Absence form to the Education Office. This should be done at least 2 business days before the dates of absence and it must be signed by the Course Instructor (or approved electronically via e-mail).

If a student is absent from regular in-class activities because of personal reasons (i.e. due to a medical condition, unexpected family emergency, etc.), the student should email the Course Instructor and copy the Education Office. The Education Office reserves the right to request written confirmation (e.g. medical certificate) of the stated reason. For more serious situations affecting participation and attendance at Skoltech, the student should discuss with the Education Office, as soon as practical (depending upon the circumstances).

3.   INNOVATION WORKSHOP STRUCTURE AND CONTENT

The IW is structured as 4 (four) weeks of distinct activities, culminating in the Friday presentation of the team project to the mentor panel. Please see below the general integrated structure of the IW learning activities, followed by the narrative of the bird-eye view of the student path through the IW:

	WEEK 1: THE HUNCH WEEK	WEEK 2: THE PROBLEM STATEMENT WEEK	WEEK 3: THE PROTOTYPE WEEK	WEEK 4: THE ITERATION WEEK
PROJECT WORK	• Glue lectures	• Glue lectures • Brainstorming • Project Fair • Speed dating • Mentor work • Team project work • FabLab/lab work	• Glue lectures • Mentor work • Team project work • FabLab/lab work	• Mentor work • Team project work • FabLab/lab work
SUBJECT SEMINARS	• Quick Success • Ideation & brain storming • Elevator Pitch	• Leadership/ teamwork • Team brainstorming • Problem statement • Prototyping	• Leadership/ teamwork • End User feedback • Project plan&vision	• Keynote lectures
FRIDAY PRESENTATIONS	NO PRESENTATION	• QUICK FAILURE	• DRY RUN	• THE FINAL CUT

- Week 1: The Hunch Week

Innovation is simple: it equals Novelty plus Impact. You start today, here and now, by building the very first prototype of whatever you wish to innovate. The tricky part is to find your hunch, i.e. your intuitive feeling that brings you to the problem that is so dear and important to you that you wish to tackle it immediately. Then you build your quick prototype and iterate through discussing your end users needs, making scientific experiments to improve and validate your prototype, delivering your technology to the outer world, soliciting 360 degree feedback, and using it to build the next generation prototype. As an innovator you will iterate through this cycle endlessly until your prototype becomes tangible enough to make your end users chase you with the offers of money. If you think that you can not do anything today here and now, Skoltech Innovation Workshop will prove you wrong at the Quick Success class. In five hours you will solve the very practical problem by producing the complex technological and scientific result under limited guidance. Then you will go through Elevator Pitch Session that will support your ideation, structuring and presentation of your Hunch.

- Week 2: The Problem statement Week

Who has a headache today? Can you relieve this headache? Tell us exactly how you do it. This is impact of your innovation. Have you spoken to the end user of your innovation? No?! Go immediately! If you only push some technical thing onto your end users without discussing it with them, such thing can not even be called "prototype". It will remain obsolete and misleading until your end users tell you whether they see any value in it. At IW we prototype not only the product, but the problem itself. We do it by collecting 360 degree feedback on our prototype and carefully exploring the big picture surrounding it. We learn the Problem Statement Canvas that pushes us to learn as much as we can about your end users: gender, age, job, habits, interests and, most importantly, what kind of headache and why they have. How they relieve this headache today without your innovation? Why they care about your humble attempts to interrupt their lifes? Give us affidavits, demographic screenings, and statistically valid results. Apply science to studying and knowing your end users. You do your innovation for them only. During the Week 2 the project teams are formed and lots of creative confrontation happen while deciding on the project nature and team structure. Leadership/teamwork classes are provided to alleviate.

- Week 3: The Prototype Week

Are you solving the right problem? In the process of technological innovation it is important to recognize the differences between practical problems (i.e., "real life" problems of the environment, society, business, or organizations) and technical problems, and to analyze and understand the relationships between practical problems and their linked technical problems. In many cases, solving practical problem through solving the key underlying technological problem creates true durable impact. Solving the technical problem that is not truly related to the practical problem is the wasteful failure for both innovator and society. Prototyping is the method for elucidating the relationship between the practical problem and different technologies, as well as the best way of linking them. Progressing in a learning-by-doing manner through multiple prototypes of a problem is a fertile way to generate technological innovation. As soon as you seem to observe the link between technological problem and practical problem, build the prototype for serving the technological problem and see if it stands the scientific validation and the end user feedback. Perform scientific experiment validating your prototype in direct comparison with exiting solutions (competition). Then deliver it to the end user and solicit feedback. Then build the new improved prototype based on the feedback. Manage and inspire your IW team, be one good teamworker to achieve the tasks quickly and efficiently. Repeat many times and then deliver your innovation to your end user.

- Week 4: The Iteration Week

If your first prototype successfully passed both the scientific validation and the positive end user feedback, it is time to build the next generation prototype. How you see it? Is it possible and feasible for your end users to employ and exploit your technology? What is your minimal viable product (MVP)? Exactly how you produce it? Where you source what you lack? If your customer loves your project, do you expect the flood of low quality copycats that will erode your idea and even reputation? If yes, how you protect your IP? If your MVP is successful and you head straight into the mass-market, what kind of competencies and assets you need to serve the entire humanity with your successful innovation? Build your project in the Business model Canvas to figure out all these topics of the delivery of your innovation to your end user, that are crucial for building the long-term vision of your project. Manage your IW team and be one good teamworker to achieve the tasks quickly and efficiently.

3.1.   INNOVATION WORKSHOP LEARNING ACITIVITIES

1.1.1.   Glue Lectures

The IW Glue lectures have triple purpose:
- to unite student teams before and after turbulent diverse activities of the day;
- to discuss the hottest current issues of the IW;
    - to this end, students will be constantly asked "What you want to do today" (WYWTDT), "What you learned today" (WYLT), and what you plan to do tomorrow;
    - if you are not asked, but have a question or statement please raise your hand and talk;
- to constantly keep you aligned with the pillars of innovation that are taught in IW:
    - end user problem
    - prototype and its scientific validation
    - end user feedback on the prototype
    - long-term vision of the project
- the innovation process is inherently simple: find somebody who has a headache, apply your prototype to curing this headache, obtain feedback on the efficacy of your prototype and envision the next iteration prototype.
    - It is the job of Skoltech faculty and IW mentors to constantly locate and orient students along this simple path: Glue Lectures are the key tools of such orientation

1.1.2.   Quick Success Classes

Quick Success classes are the unique feature of the Skoltech Innovation Workshop that are designed to demonstrate the key principle of the "Open/Fearless Innovation" concept: one may innovate at any moment (meaning here and now) once one locates the practical problem and is motivated to solve it. In order to do that, one produces quick prototype, applies it to solving the problem, and scientifically measures the efficacy of solution.

IW Quick success classes are carefully designed to quickly propel students down this path by:
- providing the practical problem requiring immediate solution;
- guiding students through the tools and techniques of solving this problem here and now;
- providing tools and guidance for building the practical prototype;
- summarizing the learnings of quick prototyping for the practical problem, scientific validation of the quick prototype efficacy, and establishing the vision for the next generation prototype.

1.1.3. Leadership/Teamwork Seminars

Leadership and teamwork are is crucial innovation components that are crucially needed to:

- connect to the end user and properly state the problem to be solved by innovator;
- build the cross-disciplinary team to produce the innovation;
- manage the integrated innovative project to succeed.

Three key aspects of Leadership/Teamwork for Innovators will be taught in distinct Leadership Seminars of IW:

- Elevator Pitch Session
  - o Teaches ideation, structuring, and presentation skills through the personal Elevator Pitch to the group
- Innovation Team Critical Path management ("The factory game")
  - o Teaches the delicate balance between leadership and teamwork in the cross-disciplinary team progressing through the uncertain project route
- The Team contract exercise
  - o Teaches the basics of the efficient teamwork
- The EQ (Emotional Intelligence) session
  - o Teaches the basics of connecting and influencing people surrounding the innovator, from the end user to stakeholders

1.1.4. Subject Seminars

Lecturing in IW is minimal, however, there are several topics that should be explained in theoretical manner and immediately trained through the practical exercise. For such topics the dedicated subject seminars are scheduled on:

- Ideation & Brainstorming
- Problem Statement
- Prototyping & IP strategy
- End User Need & Design Thinking
- Project plan&vision

1.1.5. Project Work

The Innovation Project is the central learning activity of the IW that is carefully explained and discussed in the dedicated p3.3. of this Syllabus. In a nutshell, each student is assigned to the project team that proceeds through several well-orchestrated steps of the project that are embedded into the different activities of the IW:

- Personal Ideation & Brainstorming
  - Scouting for your Hunch in the short non-graded homework assignments of the Week 1
  - Finding your hunch during the Quick Success Classes and Elevator Pitch Session
- Team Ideation & Brainstorming
  - Brainstorming your project with your team during the dedicated Team Brainstorming Session, Speed Dating Sessions and the Quick Failure presentation
- Developing your project in your IW team by making team contract on roles and responsibilities of obtaining end user requests and feedback, building the tangible prototype in the FabLab/Lab, working with mentors, and producing the artful presentation
- Working with mentors to obtain professional discussion, advice, and review
- Presenting your integrated project during the Friday presentation Sessions

1.1.6. Friday Presentations

Friday presentation sessions are the mere parts of the IW team project that is carefully explained in pp. 3.1.5 and 3.3, however, these parts are so important that we stratify them into the separate activity. Friday presentations are the key component of IW grade and the attendance of the entire day of the Friday presentations is monitored most carefully. Please see detailed discussion of the Friday presentation assignment details and assessment criteria in pp 4.2.1 and 5.2.1.

1.1.7. Keynote Lectures

Innovation has not only theory and practice, but also a spirit. In order to share this spirit we invite distinguished innovators to provide Keynote lectures during the Week 4 of the IW.

3.2. INNOVATION WORKSHOP LEARNING CALENDAR

Innovation workshop calendar is built around the learning activities listed and discussed in p 1.2. The consciously designed peculiarity of IW is that students learn the next day schedule only by checking Canvas at the 7pm of the previous day. Such uncertainty is consciously designed to reflect the real life experience.

In certain cases, students need to perform IW-related activities outside of Skoltech campus. For such cases the clearance for the "absence with cause" may be issued by the teaching director of the course. In order to obtain such clearance, student or the group of students should email names and time of absence to the teaching director of the course with the copy to the designated TA who manages attendance. If the clearance is not obtained in the electronic form, student must attend IW activity or face penalization for non-attendance. It is student responsibility to obtain such clearance.

Whatever you plan to do during the IW day, you are expected to be heavily involved into the IW activities 9am till 6pm each day. As per Skoltech Regulations on Attendance and Academic Integrity, cited in p2, at each moment of the IW day between 9am and 6pm you should take care about making your personal valuable input to IW activities and your team project work. The generalized plan of the IW day (MON-THUR) looks as below. The Friday is the full day of team project presentations.

	WEEK 1: THE HUNCH WEEK	WEEK 2: THE PROBLEM STATEMENT WEEK	WEEK 3: THE PROTOTYPE WEEK	WEEK 4: THE ITERATION WEEK
9am – 10am	The morning Kickoff Glue • WYWTDT • Mud cards • Current topics	The morning Kickoff Glue • WYWTDT • Mud cards • Current topics	The morning Kickoff Glue • WYWTDT • Mud cards • Current topics	Cohort work as per decision of CEI faculty leading the cohort
10am – 1pm	Quick Success or Elevator Pitch	• Subject & Leadership seminars • Team project work • Speed dating	• Subject & Leadership seminars • Team project work	• Keynote Lectures • Team project work
1pm – 2pm	**LUNCH**	**LUNCH**	**LUNCH**	**LUNCH**
2pm – 5 pm	Quick Success or Elevator Pitch	• Subject & Leadership seminars • Team project work • Speed dating	• Subject & Leadership seminars • Team project work	• Keynote Lectures • Team project work
5pm – 6pm	The evening Wrapup Glue • WYLT • Current topics	The evening Wrapup Glue • WYLT Current topics	The evening Wrapup Glue • WYLT Current topics	The evening Wrapup Glue • WYLT Current topics

3.3.   TEAM PROJECT AS THE KEY IW LEARNING ACITIVITY

The Innovation Project is the central learning activity of the IW: it is designed to integrate all of the knowledge, skills and aptitudes that students will acquire throughout the IW. Students will work independently and intensively in teams, for three weeks, to develop a prototype (a.k.a "a scheme" or "a project") for technological innovation centered on a "real world" problem. These three definitions are quite synonymous and are being used interchangeably, but carry slightly different meaning:

- o "The Scheme of Innovation" is the formal collection of all parts and people necessary to produce the innovation value;
- o "The Prototype" has pretty much the same meaning, but emphasizes the transient nature of the collected people and parts;
- o "The Project" is the same collection placed in the context of learnings of the previous iterations and plans of the long-term vision of the next iterations.

Each student team for the Innovation Project will be required to develop a technological innovation "scheme" related to an actual practical problem, and to present multiple iterations (i.e., prototypes) of that scheme to a panel of Skoltech faculty and visiting mentors.

The technological innovation scheme is not meant to be a business plan, an operational plan for manufacturing a finished product, or a recipe for a start-up company (although it could incorporate elements of each of these, if useful). Rather, it is meant to be a visualized plan or articulated expression of an idea (i.e., a "scheme") for using technology to solve a clearly understood and verified "real world" problem. The scheme can include both physical (tangible) parts and non-physical (intangible) parts, but in the ideal case would incorporate both.

The technological innovation scheme (a.k.a. "The IW Project") should be built along 4 (four) pillars:

1) Problem statement: real end user affidavits, usage cases, and validations

2) Tangible prototype: the actual tangible prototype (device or service or computer simulation) and its scientific validation in solving the problem of p1 with subsequent drafting of three anchor patent claims

3) End user feedback: the real end user testimonies on the usage experience and possible usage cases

4) Vision of iterative innovation: short- and long-term plan of the project

The meaning of these elements of the scheme will be explained further by the instructors during the early part of the course, and elaborated by the mentors as the project proceeds to its second and third iterations. The textbook (Innovating, by Luis Perez-Breva) will also be useful.

Four recurring activities of the IW Project are:

1) TEAMWORK is the key to IW success. Each student is expected to be active and equal member of the project team. Balance between personal initiative and group democracy is expected. Each student is expected to take a team role and fulfil it. We expect IW students to spend the entire month of September with their teams and learn from the experience. Team work will be graded through the mutual team assessment as described in p5.2

2) PROTOTYPING is an indispensable part of innovation process. Each student is expected to find the balance between prototype complexity and viability, as well as take an active participation in building the tangible prototype of the team IW project innovation. The design and validation of the tangible (physical) prototype will be the major component of the team project grade.

3) END USER FEEDBACK is an indispensable part of innovation process. Each student is expected to find the ways to obtain and utilize the real end user feedback on the prototype produced by the IW team. Actual people affidavits and testimonies supplied by names and demographics of the end users should be provided in the project presentations. The design and quality of the end user feedback will be the major component of the team project grade. Plainly speaking, IW student must leave Skoltech to the outside word, find there the real end user of the IW innovation, carefully collect the feedback and report it back to Skoltech. For those who are failing this task, the first end user is the mentor of your IW team.

4) PRESENTATION is the key vehicle for IW grading (as well as in real life). It should be performed according to the guidance in p3.1.6.

The key recurring topics of the IW project discussion are assorted below:

- Problem statement: one of the core ideas behind the Innovation Project is that innovators need to learn how to identify problems, articulate problems, and prototype problems, in order to identify appropriate and feasible solutions to the problems. In the process of technological innovation, it is important to recognize the differences between practical problems (i.e., "real life" problems of the environment, society, business, or organizations) and technical problems, and to analyze and understand the relationships between practical problems and their linked technical problems. Prototyping is a method for doing that;

- Practical Problems: The practical problem in the scheme could be a medical problem, an ecological problem, an urban infrastructure problem, a social problem, a business financial problem, an entertainment industry problem, a transportation problem, a land-use problem, an agricultural issue, or any number of practical daily problems that people face in, for example, commuting, traveling long distances, living in apartments, eating, sleeping, communicating with friends, learning, managing time, paying bills, obtaining information, or keeping their possessions secure … among many other things.
  - The key thing is that the problem must be a real problem that real organizations or real people actually face, or a problem in the natural environment that is of genuine concern.

- "Parts" of a Technological Innovation Scheme: The scheme's "parts" could include, for example: a physical gadget (e.g., a programmed Arduino device) for demonstrating the feasibility of a critically important technical function for the innovation; some interview notes from people who experience the practical problem; a conceptual model of a service solution for a practical problem; copies of patents or patent data; photographs of expressions or examples of the problem; samples of potential products that could be a solution; results from the scientific literature that suggest components of either a problem or a solution; a software application; modules of a software application; a proto model for an organization to implement the practical solution; a diagram of a technical system; a published technical standard; an example of an existing organization that could be a delivery vehicle for the solution; the specification of an experiment required to test a component of a solution; a video of an interview with experts;

an audio-visual illustration (e.g., a short movie) of part of a solution being implemented; a conceptual model of a procedure; interview data from potential customers; a selection of physical tools required to test or improve a prototype; evidence of successful applications of components of the innovation in a different context; or even highlights of a potential business plan that may be treated as a "part" of the total solution.

- In short, the parts that need to be assembled by each team for each iteration of the scheme could be almost anything—either tangible or intangible, and either half developed or fully developed—that helps to progress deep understanding of the problem and its potential solutions.

- o "People" of a Technological Innovation Scheme: in the same manner as diverse parts are required to complete the innovation scheme, the diverse people are needed, sometimes defined as "stakeholders": end users, partners, suppliers, mentors, employees, investors etc.

- o Multiple Iterations (Prototypes) of the Scheme: Each Innovation Project team will need to progress through three iterations of their scheme, with each iteration (i.e., prototype) of their scheme representing a more robust articulation of the underlying problem and its potential solutions. Thus, the teams will produce a preliminary version of the whole scheme of their innovation during the first week of team work. This process will be repeated twice, with each iteration producing a richer understanding of the complementary technological and non-technological aspects of the innovation. Assessment of the teams' work will focus heavily on the progress they reveal each week in prototyping their identified problems.

- o Presentation of Each Iteration of the Scheme: every Friday, for three consecutive weeks, each team will be required to make a live presentation of the current iteration (i.e., prototype) of its scheme:
  - The 1st presentation (the 2nd Friday of September) is dubbed "Quick Failure", because it is expected to be challenging for the team. Many teams change their project after the 1st presentation;
  - The 2nd presentation (the 3rd Friday of September) is dubbed "Dry Run";
  - The 3rd presentation (the 4th Friday of September) is dubbed "The Final Cut".

- o Final project report is another crucial vehicle for grading that is separate from the Friday presentations: it should be prepared under the guidance in p5.2.

3.4.   INNOVATION WORKSHOP TEXBOOKS

Required Textbook:

"Innovating: A Doer's Manifesto for Starting from a Hunch, Prototyping Problems, Scaling Up, and Learning to Be Productively Wrong" (MIT Press) by Luis Perez-Breva. ISBN 9780262035354. This book is available from the Ebsco eBook Collection in Skoltech's online Library, accessible at the following URL:

http://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1470564&site=ehost-live

The Ebsco eBook Collection is available to all Skoltech students within the Skoltech network, or remotely via proxy. You can visit the Skoltech library here: https://www.skoltech.ru/en/education/library/

Recommended Textbook:

"Disciplined Entrepreneurship", Bill Aulet, Wiley. ISBN 9781118692288

4.   INNOVATION WORKSHOP ASSIGNMENTS

4.1.   NON-GRADED HOMEWORKS

There will be several non-graded homework assignments that are the opportunities for you to develop your hunch and skills. Please use these opportunities!

- Mud cards (200 words)
  o Innovation Workshop is designed to be highly interactive experience in which you have an opportunity to immediately influence the processes in which you participate. When you have something actionable to request, please write the mud card. Please do not simply praise the IW faculty (they are self-confident enough), but do not simply criticize either. Make requests/suggestions in the CAP manner, meaning Courteous + Positive + Actionable:
    - Do not say "Yesterday class was bad"
      - Say "In order to improving yesterday class lets do XXX and measure the success by YYY"
    - Beyond improving your experience MUD CARDS have another crucial importance: it is your experience in providing and obtaining feedback
      - IW instructors will read Mud Cards daily and discuss them in the morning Glue lectures
    - Please write max 200 words
- The problem you see around you or in your Quick Success class (200 words)
  o This homework is designed to facilitate your personal ideation and search for your own hunch that will further feed into your team decision making towards the IW project. The more robust you start the better project you will produce.
- The technological solution for the problem you have observe in the previous homework (200 words)
  o This homework is logical and practical continuation of the previous homework.
- The reports of team meetings with mentors (3 bulletpoints, 200 words)
  o This homework is to summarize your learnings from the mentor meetings.
  o Each team will need to produce two mentor meeting reports per each mentor per week.

4.2. FRIDAY TEAM PRESENTATIONS

For the Friday presentation IW teams should make use of a Powerpoint presentation (or equivalent software), but no slides or other written documents should be submitted for assessment. Each of the three team presentations will be assessed by Skoltech's faculty solely on the basis of the quality of the live presentation itself, according to the pre-determined assessment criteria described below in p5.2.1.

The title (max 35 characters) and the brief description (max 300 characters) of the "Quick Failure" presentation should be submitted by the project team to Canvas by Thursday, September 12 noon. The same applies to the case when the team decided to changes the project after the "Quick Success" feedback. Team failure to do so will lead to 0 (zero)% score for the corresponding week for the entire team.

The Friday presentation must consist of 6-10 slides covering 6 key topics of the project mentioned above. It is advisable to use the graphic tools listed in the chapter 1.1. of this syllabus, however, the choice of the optimal way of presentation always remains the decision and the responsibility of the project team. Each topic mentioned below should be presented by the dedicated team member in 1 minute. Together with 4 minutes for prototype presentation it puts the total length of the IW project presentation at 10 minutes:

Slide #	Slide Title	Slide recommendations
1	*Problem statement for the project*	• Present affidavit of the actual end user with name and demographics • Problem Statement Canvas with embedded affidavits of the actual end users
2	*Prototype/scheme of the solution of the problem*	• Combine illustrations and verbal explanation: consider technical description of your prototype in the form of patent claims • Stage the creative demonstration of your prototype during your presentation – be theatrical, but scientific
3	*Scientific validation of the tangible prototype in solving the problem*	• Provide experiment design, method, results, controls, comparables, and statistics.
4	*End User feedback on the tangible prototype*	• Present name and demographics of the actual end user providing feedback • Present feedback testimony of the end user including usage cases, metrics, advice, and discussion
5	*Plan and Vision of the next steps of the project*	• present Gannt chart of the preparation of the next iteration (agile "Sprint") of the prototype/scheme. The "Quick Failure" and "Dry Run" iterations are clearly 1 (one) week long, while "The Final Cut" iteration length is defined by the team and may be up to several years long • present long-term vision of the project using Business Model Canvas
6	*Team pictures and roles*	• be creative and artful

Please note that the iterative nature of IW learning requires that the evolution of each pillar of the Project since the previous iteration is emphasized both in team discussions and presentations. Such evolution will be the sizable component of the IW team grade.

4.3. WEEKLY TEAM MUTUAL ASSESSMENT (CONFIDENTIAL PERSONAL PEER EVALUATION)

All assessment in the Innovation Workshop will be based on team work and the contribution of individual students to team activities in the Innovation Project.

Each student will be allocated to an interdisciplinary team (typically six people) for the Innovation Project. Each team will receive a single team score at the end of each week based on its Friday presentation of the Innovation Project. A weight for each student's contribution to his or her team's work will then be calculated using confidential peer reviews organized within each team. Each team member will receive an individual score at the end of each week based on the aggregate team score weighted by his or her confidential peer assessment score. This score will be displayed in Canvas.

Each student in the IW course will be required to weekly evaluate each of his or her fellow team members for their contribution to the team activities. It is compulsory. The confidential peer evaluation scores, using the Peer Evaluation Form, will need to be submitted by each student before midnight on Saturday following the Friday Presentation. Failure to submit a peer evaluation by Saturday 23:00 will lead to 0 (zero)% score for the corresponding week.

This arrangement is designed to provide an incentive for all students to contribute responsibly to team activities, and to help ensure that everybody receives a fair grade. Each team member will be expected to contribute equitably to his or her team's work.

4.4. TEAM PROJECT FINAL REPORT

The final task in the Innovation Project is that each team must produce a written report of the whole Innovation Project that should include three main components:

- The STORY of your team's Project from the first iteration ("Quick Failure" Friday) of the Technological Innovation Scheme to the third iteration of the Technological Innovation Scheme ("The Final Cut" Friday)
- Discussion of the LESSONS that your team has learned from doing the Project
- Statement and explanation of the STRATEGIC DECISION that needs to be made by the team, going forward after the end of the Innovation Workshop.

Each team should submit one single team report to the appropriate team-assignment location on Canvas. Only one person from each team needs to submit the report to Canvas. There is no required minimum or maximum length for the report. You may include as many appendices (tables, charts, diagrams, supporting data, photographs, etc.) as you like.

The team report is worth 20% of your team's total grade for the Innovation Project. There is no standard expected format for the assignment, and your team is free to be creative in its design and form of expression for the report. However, it is important that the report is comprehensive in its coverage of your team's Technological Innovation Scheme (a.k.a. The IW project) and that it effectively describes the evolution of the various iterations of the Scheme. It is also important that you provide empirical evidence for the main claims and propositions contained in the final iteration of your Scheme. As you describe the evolution of each pillar of your Technological Innovation Scheme, make sure that you properly articulate the evolving relationship between its four key elements, namely: the practical problem, the practical solution to the practical problem, the technical problem generated by the practical solution, and the technical solution to the technical problem.

After you have completed documenting the story of how your team evolved through multiple iterations of your Technological Innovation Scheme, you must identify some lessons learned as a result of doing the Project and from reflecting about the process of doing the Project. Your lessons might concern, for example: new insights about the nature of technological innovation; observations about leadership and team work; a fresh understanding of the relationship between business and science; a new understanding of how to connect technology with business planning; lessons about how to communicate technological ideas; enhanced perception of what it takes to mobilize new technology to help solve practical problems; or, new insights about the nature of problems. Many other insights are also possible.

Finally, you should articulate what strategic decision, or decisions, your team would need to make to move to the next stage in your project (i.e., after the end of the Innovation Workshop). For example, should you move ahead to establish a start-up to commercialize the ideas embedded in your Technological Innovation Scheme? Or, should you work together as a team to go through several more iterations before your Scheme is ready for commercialization? Or, should you completely abandon your idea and work on something quite different? Or do you need to solve some technical problems before embarking on a start-up? Or, should you work in the lab for several months to develop a technical "solution" that could be licensed to another company? In other words, you should articulate what is the way forward for the future of your Project (should you wish to continue with it beyond the end of the Innovation Workshop).

After you have identified the strategic decision, or strategic choice, that you need to make you should explain WHY that decision or choice is appropriate. In other words, explain why your team ought to move forward in the way you have articulated. The team report is an opportunity for you and your fellow team members to pull everything together to make a unified expression of your work in the Project.

5.   INNOVATION WORKSHOP ASSESSMENT AND GRADING

Assessment of IW student performance is the complex transparent quantitative system that will be constantly shared in Canvas during the course upon the Skoltech regulations.

All assessment in the IW course will be done by CEI faculty based on team activities for the Innovation Project. CEI faculty will obtain feedback from project mentors and TAs to make the grounded decision.

The final grade for the Innovation Workshop for each student will be either "Pass" or "Fail." However, the calculation of the final Pass/Fail grade will be based on quantitative scores received by the students for their substantive work during the IW course (based on the quality of team-work, weighted by peer evaluations of each individual student's contribution to the team's work). As per current Skoltech practice, the PASS grade is awarded to the student whose aggregate score exceeds 40% out of 100% possible.

5.1.   GENERAL ASSESSMENT PROCEDURES AND CRITERIA

Assessment Procedures

- Each of the three team presentations will be assessed by Skoltech's faculty solely on the basis of the quality of the live presentation itself, according to the pre-determined assessment criteria described elsewhere.
- Each student in the IW course will be required to weekly evaluate each of his or her fellow team members for their contribution to the team activities. It is compulsory. Failure to submit a peer evaluation will lead to an F grade ("Fail") grade for the course. The confidential peer evaluation scores, using the Peer Evaluation Form, will need to be submitted by each student before midnight on Saturday following the Friday Presentation.
  - Each Monday following the Friday presentation each student will find in Canvas an individual grade for the Innovation Project based upon their contribution to the work of their team. A weight for each student's contribution to his or her team work will be calculated using confidential peer reviews organized within each team.
- Each team must submit a written report on the whole innovation project, via Skoltech's Canvas online learning management system, by 7:00pm on Saturday 29 September.

In summary, there will be 5 (five) separate assessment items in this course:

ACTIVITY TYPE	ACTIVITY GRADE %
The team grade for the "QUICK FAILURE" PROJECT PRESENTATION, multiplied by the personal W2 TEAM MUTUAL ASSESSMENT SCORE, multiplied by the personal W1+2 ATTENDANCE %	20
The team grade for the "DRY RUN" PROJECT PRESENTATION, multiplied by the personal W3 TEAM MUTUAL ASSESSMENT SCORE, multiplied by the personal W3 ATTENDANCE %	25
The team grade for "THE FINAL CUT" PROJECT PRESENTATION, multiplied by the personal W4 TEAM MUTUAL ASSESSMENT SCORE multiplied by the personal W4 ATTENDANCE %	30
The team grade for THE IW PROJECT FINAL REPORT, multiplied by the personal W4 TEAM MUTUAL ASSESSMENT SCORE, multiplied by the personal W4 ATTENDANCE %	25

5.2. GRADE COMPONENTS ASSESSMENT CRITERIA

5.2.1. FRIDAY TEAM PRESENTATIONS

The title (max 35 characters) and the brief description (max 300 characters) of the "Quick Failure" presentation should be submitted by the project team to Canvas by Thursday, September 12 noon. The same applies to the case when the team decided to changes the project after the "Quick Success" feedback. Team failure to do so will result in zero midterm grade for the relevant week to the entire team.

As per guidance on the Friday presentations provided in p4.2.1, the assessment criteria for the presentations are as follows:

COMPONENT OF THE FRIDAY PRESENTATION	ACTIVITY GRADE %
Problem statement for the project	**20**
Prototype/scheme of the solution of the problem	**20**
Scientific validation of the efficacy of the tangible prototype in solving the problem	**5**
End User feedback on the tangible prototype	**20**
Plan and Vision of the next steps of the project	**5**
Evolution of each pillar of the Project since the previous iteration	**30**

5.2.2. PROJECT FINAL REPORT

Assessment Criteria for the Team Final Project Report as per report guidance from p4.4:

COMPONENT OF THE FINAL PROJECT REPORT	ACTIVITY GRADE %
Comprehensiveness of the report and the Scheme	**25**
Strength of project progression between iterations of the team's IW Project	**25**
Logical structure of the report	**25**
Quality of expression and style of the report	**25**

5.2.3. WEEKLY TEAM MUTUAL ASSESSMENT (CONFIDENTIAL PERSONAL PEER EVALUATION)

During the weekly mutual team evaluation each student is asked to provide the contribution in percent (%) of each team member to the team project. Please be responsible for the honest and comprehensive evaluation of your peers. Please remember that if you fail to submit the evaluation, you personally will receive 0 (zero)% evaluation for the week.

5.2.4. ATTENDANCE GRADE COMPONENT

ATTENDANCE GRADE: IW attendance metric is clearly not the measure of innovation ability, however, discipline and attendance are so reflective of the IW participation and correlated with IW learnings, that they will be an important component of the student IW grade. Students absent without permission will be penalized accordingly, and the penalties will be serious enough to potentially prevent a student from passing the course. Clearly, students who missed the critical share of the IW classes will receive 0% grade irrespectively of their project and team assessment scores.

The attendance will be tested by TAs and technical means on a random basis – approximately 3 times per day. Each of IW student has the grace opportunity to miss several such checkings, after that the penalties will be applied.

The critical share of the IW classes that students can not miss and the grace number of missed attendance testings, that student may bear before being penalized, will be announced in the beginning of each IW week.

5.3. GRADING

As per current Skoltech regulations, Grading will be done by inputting the scores into the Canvas. The final grade will be automatically calculated in Canvas based on all grade component input. Students will be able to observe their progress and their current standing in Canvas.