TECH2X

Syllabus Example: Technology Driven Innovation Course at TH Mannheim

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TECH2X-Aligned Syllabus of TH Mannheim

Course: TDX (Technology Driven Innovation)

Semester: Master Computer Science, Master Design, Master Electrical Engineering, Master Business Engineering
ECTS: 10
Prerequisites: English (specify level)

1. Administrative Information

Element	Detail
Instructor(s):	Prof. Kirstin Kohler
Email:	k.kohler@hs-mannheim.de
Class Time:	4 h per week (4 SWS)
Location	Inno.space / maker.space

2. Course Rationale

The course builds on the universities role to take a more responsible role in the local economy, focusing on co-creation, sustainable development, and solving real-world challenges in partnership with stakeholders. It increases the student's science-based innovation and entrepreneurial capacity while fostering a collaborative mindset and systems-thinking.

T2X aims to identify disruptive applications and business models of cutting-edge technologies developed in the labs from TH-MA with the overall objective of solving social needs. As a difference from other challenge driven courses, T2X stars with the technology. Students work in multidisciplinary teams; each team develops its own concepts.

As part of the course the students also travel to CERN. The one-week experience at CERN accelerates the students' ability to think out-of-the-box and exposes the students to cutting-edge technology that serves in a multidisciplinary environment to explore the biggest secrets of our universe. In addition, it supports the students team building process.

3. Aims and Objectives

Course Goals/Aims

The course intends to foster students' entrepreneurial and technological skills, as well as providing them the ability to master a tech-driven innovation process while balancing technological capabilities, with societal needs and market potential.

Learning Objectives

The ability to master a tech-driven innovation process

- Develop novel applications and solutions for emerging technologies by researching their societal relevance and evaluating potential for positive social impact
- Analyse the gap between scientific discoveries and societal needs by applying the design thinking process and scientific method to define innovation opportunities

Entrepreneurial skills

- Interdisciplinary Teamwork:
  Collaborate effectively in interdisciplinary teams by recognizing and valuing diverse expertise and perspectives and applying shared knowledge toward a common innovation goal.
- Self-initiative/Individual-learning Competence and Critical Thinking:
  Manage own learning and project responsibilities by evolving information and reflecting critically on decisions made during an explorative innovation process.

Technological Skills

- Understanding Deep Tech and Collaboration with Researcher(s):
  - Analyse and understand emerging technologies by critically evaluating the capabilities and potential of innovative technologies.
  - Communicate the technological value by articulating the value proposition of new technologies and their applications to various stakeholders.

4. Content and Schedule

Workload	
Contact hours (lectures, coaching)	60 h
Project work	200 h
i2Planet week	40 h
Sum	**300 h**

Weekly lectures (around 1,5 h) provide methodological input on the innovation process and guide the students through the project. Additionally weekly coaching takes place during which students present their weekly project work and discuss difficulties and learnings. Coaching takes place with teams individually.

- The course starts with two weeks of **introduction and team forming**. During this early phase the students also meet their technology partner (online or in person).
- In the third course week the **excursion to CERN** takes place. During that week students get insights into CERNs experiments and labs. A significant amount of time will be spent with the i2Planet mission. This is a self-contained learning activity, which spans over several days at IdeaSquare. In the first stage of the program, students are immersed in a **narrative** where humans seek to explore an imaginary exoplanet Planet Y. They are challenged with inhabiting this exoplanet. Students get challenged based on one or more of the following themes: who and what to take on and how to reach Planet Y, organizing travel, establishing a first settlement, and fulfilling the settlement's mission. At the end of the week, the students present their solutions to the challenges.
- After coming back from CERN, **the innovation project start**. It defines the core element of the course and challenges the students to find and design a suitable technology application while applying design thinking methods. The project follows a three phased innovation process that structures the course. These phases also mark milestones in the project.
  - **Phase 1 - Opportunity identification**: Students start from a challenge-based point of view on a novel technology. They explore the technology to understand and generate the widest range of potential applications of the technology with societal impact. They explore various perspectives in terms of opportunities and look for unconventional alternatives. At the end of this phase, the students synthesize and select the most appropriate opportunity area.
  - **Phase 2 - User research**: Once the fields of application of the technology have been defined, the process involves a stage of user research, which is based on the understanding of users'

needs, problems, and desires through ethnographic research. This stage aims to identify which users' problems can be solved by introducing the technology by applying methods from design thinking.
    - **Phase 3 - Solution design**: This stage is dedicated to the development of the solution concept. Rapid prototypes to render ideas tangible, elicit user feedback, and learn from failures. During this phase, the team incrementally advances toward defining the final solution concept.
- **Dissemination:** During the last two weeks of the project, the project results are disseminated and the final presentation as well as an exhibition is prepared and conducted. The students pitch their results to a larger audience and explain their concept while showing their tangible proof of concept at the university's end of semester exhibition.

Weekly Schedule and Topics

Week	Date	Topics Covered	Assignment Dues	Phases
W 12	18.03.26	Kick- Off: Team forming; project & technology introduction		Team-building & Introduction
W 13	25.03.26	System thinking		
W 14	29.3.-02.04.26	Travel week: i2Planet @CERN, Geneva		
W 15	08.04.26	Tech exploration, meet the researchers		Opportunity identification
W 16	15.04.26	Methods for opportunity exploration		
W 17	22.04.26	Methods for opportunity identification		
W 18	29.04.26	Intermediate presentation: Phase 1 milestone	Definition of application field	
W 19	06.05.26	Methods for user research		User research
W 20	13.05.26	Methods for user research continued		
W 21	20.05.26	Method input on low-fidelity prototyping & testing		
W 22	27.05.26	*Lecture Free at TH-MA // Prototyping Intense workshops*		
W 23	03.06.26	Intermediate presentation: Phase 2 milestone	System specification	Solution design
W 24	10.06.26	Mid-fidelity prototyping		
W 25	17.06.26	Expectation for final deliverables	Due Date Team Poster / Project Poster	
W 26	24.06.26	Time for Project Work	Due Date Demonstrator / Video	

W 27	01.07.26	Final presentation: Phase 3 milestone and iEXPO participation with booth	Due Date Project Presentations & Exhibition	Presentation & Dissemination
W 31	17.07.26		Due Date Project Report	

5. Instructional Design

5.1 Learning Activities/Methods

The course is interdisciplinary, following a challenge-based pedagogy. The main learning happens through solving a real-life innovation challenge as a team. The conducted process is experimental (iterative, prototyping based). Students work in collaboration with scientists/tech partners. The learning activities are guided by the innovation process.

The learning in this course will be achieved through a variety of methods:

- Lectures: The course is very practical oriented / hands-on. Theoretical input is provided in short sessions. Newley introduced methods are applied in the context of the student projects.
- Group work: The students are responsible to navigate through the innovation process by themselves, with the guidance of coaches in a self-responsible way. Students learn to navigate and jump between exploring the feasibility, exploring the problem solution fit.
- Coaching sessions: The teams are accompanied by coaches, who talk to the students weekly to check their project progress and consult them respectively. Each coaching session is guided by two coaches.
- i2Planet week: The i2Planet week also follows an experimental approach. The week is enriched with deep dives and lectures regarding different, inspirational topics provided by CERN scientists in addition to lab visits.

5.2 Educators Role

Withing the course various educators are involved with various roles:

- The main contact for the students is a teaching assistant, who is responsible for the course organization and serves as a main contact.
- In addition, one professor is associated with the program, who provides the lectures.
- The teams are accompanied by coaches, who talk to the students on a regular basis and consult them depending on their project status. Two coaches support the students weekly (the teaching assistants or professor are also part of the coaching sessions).
- Additionally, the crew of IdeaSquare completes the learning experience of the students through their input and expertise during the i2Planet learning unit.

5.3 Grouping Strategies

The student teams will have a size between 4-5 people. Each student team get its own technology assigned. Students are assigned to teams by the course organizers in the first week of the semester. The students can express their wish regarding one of the introduced technologies. The team forming is done by the educators in a thorough process, with the aim to create teams with a high diversity (balancing disciplines, personalities, gender, knowledge in processes and technology etc.)

Students will work in the teams for the entire project (including in the i2P challenge)

5.4 Location/Environment

- **In presence:** All lectures will take place at inno.space (Building K, room 019). Students get access cards and allow to enter inno.space at any time between (7:00 and 20:00) to conduct project work in their teams according to their availability and team alignment. Prototyping activities take place in the maker.space (Building K, room 20).
- **Online:** Coaching will be conducted via MS Teams with teams individually. It will take place on a fixed schedule every week, which will be aligned with the teams in the first week of the semester.
- **Travel week** to IdeaSquare (CERN, Geneva): The course will travel to Geneva in the third week of the semester to participate in the i2Planet learning experience. The costs for accommodation and transportation are covered by the university.

5.5 Materials and Resources

- The slides from lectures are shared via MS Teams. Additionally references to literature or other sources are provided on project demand or referenced in the slides.
- Mural templates are provided to the students to support their activities. The usage of Mural for their project documentation is mandatory. Also results/progress in the project is shared with the coaches via Mural.

6. Project Outcomes and Assessment

Students' main deliverables (project outcome) at the end of the course are:

- A report specifying the (societal) problem as well as the concept of the tech-driven solution that is solving the problem
- The presentation of the tech-driven solution
- A representation of the solution which demonstrates the main functionalities in a comprehensive way. The representation can have various forms (Examples are: a functional prototype, a simulation, a video)
- A video and posters of the solution and a poster of the team

Grading is conducted as a continuous assessment.

Grading Breakdown

Assessment component	Expected quality	Percentage of Final Grade
Learning journey	- The students engage into the innovation process - The intermediate working artefacts presented during the coaching sessions and milestone presentations should demonstrate their ability to learn from failures, analyze technology, collaborate as a team, and show self-initiative	30 %
Project outcome	- The deliverables should demonstrate depth in the analysis and in the solution - The outcomes should demonstrate the understanding of the process and include a full scan of the opportunities in which the technologies can be utilized	50 %
Participation	- 80% of attendance is mandatory. More than two unexcused absences will result in a drop in your final grade	20 %

	- Active and constructive contribution to class discussions active engaging with the material	

7. Policies and Expectations

Academic Honesty

- All work submitted must be your own original work. Any instance of plagiarism or academic dishonesty will result in a failing grading

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