innovation Space
from dream to demo

innovation Space Bachelor End Project (ISBEP)
Studyguide 2020/2021 Semester 1
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TU/e innovation Space Bachelor End Project - ISBEP

You are currently in the last phase of your Bachelor program, which prepares you to become the engineer of the future. As you already know, this requires more from you than pure technological expertise. You need to be able to deal with complex societal and industrial challenges, create prototypes and develop innovations in collaboration with researchers, businesses and other stakeholders.

Within the innovation Space Bachelor End Project (ISBEP) you get the chance to work on these kinds of challenges and further develop the needed skills. You work in an interdisciplinary team on real world problems.

We are happy you will do your bachelor end project at the TU/e innovation Space. For the next semester, you will work on a problem from a company, student team or the university itself in a small, interdisciplinary team. Your team consists of three to six students, all from different departments. Imagine the possibilities when the knowledge of an electrical engineer, an industrial engineer, a mechanical engineer and an industrial designer are combined. And then, imagine what you can learn from working together with those disciplines.

As an ISBEP team, you get the opportunity to work in Matrix, an ideal building to work out concepts, have meetings and develop a prototype. Beyond a physical space, innovation Space provides a platform that interconnects motivated students, staff and industry, creating a vibrant community. During the ISBEP, you become part of this community and get the chance to join activities and workshops organized by the innovation Space. Furthermore, innovation Space will make sure you are guided in the project by a great coach.

Course structure

During your ISBEP, you work on a real world challenge that is connected to a cross-disciplinary research theme as formulated in the TU/e Strategy 2030. This means all challenges in the ISBEP need input from multiple disciplines, both from the individual and from the team as a whole. During two quartiles, you and your team go through the complete process of a project. The first few weeks are used for team alignment and problem definition, while the last months are more focussed on the actual solution. During the entire project, there are weekly sessions on Friday morning (timeslot D, starting at 9.00 sharp until 12:30). Some of these weeks are used for pitching sessions, others for process coaching.

For the detailed and up-to-date planning, check Canvas (it might change during the process). But write down the following dates in your calendar:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location (Matrix)</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 4</td>
<td>9:00-11:00 hrs.</td>
<td>1.333</td>
<td>Kickoff meeting</td>
</tr>
<tr>
<td>September 4</td>
<td>11:00-12:00 hrs.</td>
<td>1.333</td>
<td>Session with Challenge Owners</td>
</tr>
<tr>
<td>September 11</td>
<td>11:00-12:00 hrs.</td>
<td>1.260</td>
<td>Presentations Problem Definition to Stakeholders</td>
</tr>
<tr>
<td>October 16</td>
<td>10:30-12:00 hrs.</td>
<td>1.260</td>
<td>Midterm Alignment Presentations &amp; Projects Market</td>
</tr>
<tr>
<td>January 8</td>
<td>10:30-12:30 hrs.</td>
<td>1.260</td>
<td>Final Presentations &amp; Projects Market</td>
</tr>
</tbody>
</table>

Teaching method: group work, workshops, coaching on demand and feedback after midterm and final presentation. During the Friday sessions (9.00-12:30) you are expected to work together with your team (and plan meetings with your coach). Other individual- or team-activities can be planned in your own time.
Learning goals

PLEASE NOTE: The ISBEP has the same learning goals as your departmental BEP. Please check the details of the BEP objectives in the study guide and/or other information you will receive from your own department. If you encounter difficulties in this, please contact your departmental coach as well as your innovation Space coach.

After this project, all students of ISBEP will be able to:
1. Be able to identify the roles & contributions within a team.
2. Reflect on the role that they have played in the interdisciplinary team, and how their personal skills enriched the solution.
3. Apply the knowledge from different disciplines in a project & integrate them into a solution.
4. Manage a situation where there is no clear answer to their problem.
5. Identify the problem that needs to be solved and come up with a viable solution.
6. Acquire basic knowledge from other disciplines and apply it in a real-world case.
7. Identify relevant theories from their own discipline, assess their relevance, and apply them in a real-word case.
8. Identify the needs of different stakeholders, and integrate them in the viable solution.
9. Integrate the individual components (i.e., individual contributions) into a working / experiential prototype.
10. Demonstrate an awareness of what their personal contribution can be to societal issues.

Deliverables, assessment and grading

Assessment of your Bachelor End Project will be performed by your academic coach, and in some departments you will have to defend your work in front of a committee. This brings the challenge of combining your efforts for the ISBEP group with those needed for your own final report. Your academic coaches are aware of this challenge, and they will be available for discussing with you what exactly they expect from you in this project. Please contact your academic coach yourself for discussing the deadlines, deliverables and assessment criteria.
Coaching and guidance

The ISBEP is a challenging project since you are working on an interdisciplinary, real world challenge in an interdisciplinary team. Next to this, you have to communicate with a lot of different parties: the project owner, the academic coaches and the innovation Space coach. During the ISBEP, you have a tutor and two coaches to guide you. One innovation Space coach for the team and an individual academic coach within your department. The innovation Space coach focuses on the teamwork and communication (process), where the academic coach focusses on the discipline specific coaching.

To support you and your team in the ISBEP we offer the coaching, but we also organize special events (innoApproach workshops) to which you as an ISBEP student can subscribe voluntarily. innoApproach workshops are a great way to develop your professional skills extracurricular to your study program. Workshops range from project management to prototyping to user testing. The full planning is available in the online studyguide.

Tasks and responsibilities

The ISBEP is a group project, under supervision. Here we explain the different responsibilities of the different actors involved in the project:

The student
The student is expected to be dedicated, spend time and meet all deadlines. In addition, we expect from you a professional attitude: you work both autonomously and in cooperation with your group members. Combining these roles can be difficult sometimes, so discuss this with your coach or tutor.

We expect you to be respectful in your communication and cooperation; you make appointments and keep them; you learn from feedback and provide others with constructive feedback. You are the project owner, project manager and project member of your own BEP, meaning that next to performing the research, you are also responsible for all organizational tasks (scheduling meetings, handing in forms, etc). You are expected to report weekly to the coaches. This requires proactivity from you.
It is important in an interdisciplinary project to know what your role could be, and the role of your fellow students. Below you find descriptions of the different majors and their expertises/added value in the projects. Note that these descriptions are examples, and not limited to what is described:

**Major AP:**
Applied Physics students are like investigators. They know how to look for regularities and patterns in a wide variety of phenomena, are able to construct and test universal models for existing or new observations, and they are trained to transfer the acquired knowledge into technological applications. They have a broad variety of skills, predominantly related to carefully conducting experiments including data analysis and modelling, a critical attitude and solution-focused way of working, the construction and communication of complex ideas, as well as a wider understanding of how technology works. This broad skill set of a physics student is in high demand for a diverse palette of application areas, which makes them extremely suitable for operating in a multidisciplinary student team. Especially the open-ended setting during ISBEP perfectly resembles the daily life of a physics student in research teams and engineering projects, where unique ideas and experimental or theoretical progress frequently lead to new challenging open-ended directions in their research or engineering.

**Major AT:**
AT students are exactly at the intersection between EE and ME. AT specializes in anything related to automotive. This includes (combustion and electric) engines, thermodynamics, electromagnetics, power electronics and control systems. Automotive is a field that fully complements the technological and societal challenges facing the automotive industry.

**Major BME:**
In an ISBEP BME students could play a role in applying knowledge of Life Sciences, the measurements on living systems and interpretation of data from these measurements, translate (biomedical) problems in an experiment, process or model and evaluating the added value of a product in medical diagnostics or treatments. Of course they are also able to structure project work (as they gained a lot of experience with working in a group) or evaluating the ethical implications of the project (for example when patient data are used).

**Major CE&C:**
The role of the CE&C student focuses on the application of knowledge about Molecular Systems and Materials Chemistry and/or Chemical and Process Technology acquired during the bachelor program Chemical Engineering and Chemistry. The CE&C student should spend 280 hours on the elaboration the CE&C aspects individually, with the aim to understand and optimize materials properties or processes. 120 hours are spent on multidisciplinary activities and group work.

**Major CSE:**
The main focus of the Computer Science & Engineering student in an ISBEP team is on software and software development. This is broader than programming per se and should be done in close cooperation with the team. Among others it includes requirements elicitation, formulation of specifications as well as system integration. Typically in a project, in interaction with team members and stakeholders, supporting software, data logging facilities and reporting tools need to be developed to get a better understanding of the underlying problem and to guide a more precise analysis of the proposed solution.
Major EE:
EE students combine aspects of applied physics, mathematics and computer science. All of which are applied to the development or analysis of electronic systems e.g. control systems, smart power grids, antenna systems, signal processing or PCB design. EE students are trained at a high abstraction level. This allows them to capture relevant aspects of a system and translate it to a model. The field embraces both analog and digital systems in which hardware and software are equally important.

Major ID:
ID students are doers. They know how to conduct a design process that involves multiple stakeholders (e.g. engineers, social scientists, (potential) users and clients). Through active engagement, academic research and the creation of well-communicating experiential prototypes they can develop creative design propositions and innovations that involve technological developments, user, societal and business insights. Consequently, ID students must be involved from the early stages (fuzzy front end) of the technological development, to explore desirability (user value) and viability (business/societal value). By using technology simulations, they can gather insights that help determine and further a system’s technical feasibility. NOTE: ID students will not make your technological design look good (Formgiving or Visual Communication at SIINTLUCAS) or production ready (IDE, IPD or IPO).

Major IE:
The role of the IE&IS student focuses on analyzing the business aspects of the proposition that is being developed. Depending on the project, this may include aspects such as: analyzing the market potential, reviewing the suitable business models, researching the supply chain or the interaction with the product. All topics of the bachelor education program can be relevant, so students choose together with the team and their mentor the most suitable focus and scope for their project.

Major ME:
Students in Mechanical Engineering combine experience with design processes with knowledge in the engineering fields of solid mechanics, fluid mechanics, dynamics and control. Therefore, the role of the ME student can be quite diverse, ranging from modelling and subsequent analysis of parts of a project to combining the results of different parts of the projects into one design. Moreover, they can play a role in experimentation and numerical simulation of various processes, using modern software tools in solid mechanics, fluid mechanics and dynamics and control. Depending on the specialization of the student and the possibilities of a project, a more advanced contribution stemming from one of these fields can be made.

Major PT:
The Psychology & Technology student can use knowledge of psychology to help people use technology as effectively as possible. Furthermore, they can use psychology to design completely new applications like sociable robots, brain computer interfaces or motivational rehabilitation technology for healthcare.

Major SI:
Sustainable Innovation students study innovations from a technical, economic and social perspective, so that society can consume and produce in a more sustainable way. Within an ISBEP SI students can contribute to a socio-economic analysis focusing on business models, stakeholder analysis, and governance issues.
The Challenge Owner
The Challenge Owner is the representative of the company or institute who initiated the challenge. You and your team will have to justify everything you did towards the Challenge Owner. As ISBEP team, it is your responsibility to seek feedback and organizing feedback with the Challenge Owner.

The (departmental) BEP coordinator
The (departmental) BEP coordinator is the contact person for all organizational matters concerning the BEP, you can find his/her contact details on the TU/e website of your major. The BEP coordinator is the first contact person for you about the departmental regulations and guidelines about BEP. The departmental BEP studyguide (and/or website) will also contain a lot information.

The ISBEP coordinator
The ISBEP coordinator supports the organization from the side of innovation Space. Students normally have no contact with him/her.
Fraude and plagiarism

It is strongly prohibited to commit fraud. With any suspicion of fraudulent behaviour, the exam committee of your department will be contacted to decide whether or not fraud occurred and will decide on the punishment. Punishments can range from failing the course till terminating your enrolment at the TU/e. Fraud includes any behaviour or negligence on your part that makes it impossible for the examiner to form a correct judgement of your knowledge, insight and skills, or that is aimed at intentionally manipulating the examination process.

Contact details innovation Space

Head Coach TU/e innovation Space (Responsible Teacher): Peter Ruijten (p.a.m.ruijten@tue.nl)
Coaching & project process innovation Space: Alan Wever (a.z.wever@student.tue.nl)
General questions: education.innovationspace@tue.nl

Please contact your BEP Coordinator or Academic Coach for questions regarding assessment criteria/activities, deliverables, deadlines etc., from your respective programs!

Covid-19 update

We are looking forward to starting the academic year with renewed energy at our home in the Matrix building. We believe having face-to-face meetings are important for the development of the projects. Thus, so long circumstances allow it, we will provide a physical space for you to meet in room number 1.333 (see floor plan below). Furthermore, you will have access to some Matrix Workspaces. Below you find an overview of the different workspaces with a short explanation. Huub and Edwin, technical coordinators at innovation Space, can provide advice and technical support for making your prototype.

Please be aware that the circumstances around Covid-19 can change in any moment. We will keep you informed of any developments and changes in the accessibility to Matrix and its facilities. For questions regarding workspaces, e-mail innovationspace@tue.nl.
Matrix Workspaces

Because you follow a course within innovation Space, you have access to the Matrix Workspaces. Below you find an overview of the different workspaces with a short explanation. Huub and Edwin, technical coordinators at innovation Space, can provide advice and technical support for making your prototype.

For questions regarding workspaces, e-mail innovationspace@tue.nl.

The Heavy Assembly (MA 1.100) is equipped for 3D printing, developing and testing electronics and PCB's, and has dedicated areas for project assembly or prototype testing.

In the Prototyping Workshops (dusty, greasy & clean, ground floor), students can find machines and technical assistance to work with wood, iron and other materials.

The Light Assembly (MA 1.260) is a flexible space where students can work in teams on their designs and prototypes. Also, it is a space for presentations, exhibitions and other education events. There is also space available for storage of prototypes and materials.

At the Service Desk (first floor) you can borrow tools for small prototyping and it is the place to be for questions regarding innovation Space resources.