

Bachelor's Final Project (BEP) Manual

2023-2024

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1 General information

The Bachelor's Final Project, (*Bachelor Eind Project, BEP*) is the culmination of the Bachelor's program. Students should be able to apply the knowledge and skills they have acquired so far in this project. An independent and critical attitude is expected from students. Often students use the BEP to explore a possible research section for a Master's track or program.

1.1 Learning Outcomes

The general outcomes for the BEP are:

- Establish an independent and academic work attitude
- Perform project work as an individual with limited guidance
- Orientation on a research track for a possible Master-track or program

The general goals are translated into learning outcomes, which are further defined in terms of professional skills.

After completing the BEP:

- The student is able to make a research / design plan and to organize their activities according to this plan, under supervision.
- The student is able to perform project work on an individual basis with limited supervision.
- The student is able to ask adequate questions and has a critical attitude while analyzing the results of their research / design.
- The student is able to document their findings in a written scientific report.
- The student is able to present their findings in an oral presentation (colloquium).

The learning outcomes regarding professional skills are:

- Writing skills:
 - o The student is familiar with standard requirements (form, style) of a scientific report.
 - o The student is able to write a scientific report (in English).
- Information skills:
 - o The student knows how to evaluate search results, from a variety of sources, on their relevance and reliability, and is able to take decisions on including or excluding certain search results in his work.
 - o The student is familiar with the TU/e code of scientific conduct.
 - o The student is able to use search results correctly by means of citation, paraphrasing, quotation lists and other tools, without committing plagiarism.
- Oral presentation:
 - o The student is able to present the project for an audience of students and lecturers
 - o The student is able to adapt this presentation to the audience
 - o The student is able to present the project in English
- Planning:
 - o The student is able to make a detailed project planning for an individual project
 - o The student has insight in deviations of the time spent and is able to adapt their planning accordingly.

- Reflection:
 - o The student is able to go through a reflection cycle (thinking, deciding, acting, adjust) independently and is able to ask for support if necessary.

2 Participation

2.1 Planning

In order to successfully complete the BEP within the allotted time frame (see Section 3.2), having a good planning is essential. Sufficient time must be spent on the project. Therefore, it is advised not to combine the BEP with more than 10 credits of courses per quarter. Combining the BEP with other project work or administrative work is also strongly discouraged.

2.2 Enrolment

Because the BEP is intended as a more or less formal conclusion of the Bachelor program, it is included as such in the study program. Normally this project will take place in the second semester of the 3rd academic year. However, the student is free to choose in which quarter the BEP is started, provided the admission requirements are met.

The terms of the BEP in academic year 2023-2024 are:

| | Registration Deadline | Start date | End date |
|-----------|-----------------------|------------------|------------------|
| Quarter 1 | 9 August 2023 | 4 September 2023 | 4 February 2024 |
| Quarter 2 | 15 October 2023 | 13 November 2023 | 22 April 2024 |
| Quarter 3 | 7 January 2024 | 5 February 2024 | 8 July 2024 |
| Quarter 4 | 25 March 2024 | 23 April 2024 | 2 September 2024 |

It is not possible to deviate from these dates. Hence, it is not possible to start a project in the interim period. The deadline for registering Q1 in 2023 is 9th of August 2023.

Please note that the deadlines for a BEP at innovation Space are earlier. Check [innovation Space](#) or contact the BEP coordinator for more information.

2.3 Admission Requirements

To be able to start the BEP, the following requirements must be met at the time of application:

- All first year **courses should be completed (60EC)**.
- **A total of 120** ECTS from the BW program have been obtained

The results of the examination period that falls between the application deadline and the start date of the project are not taken into account for this purpose. If credits have not yet been registered but can be demonstrated otherwise (by means of a message from the lecturer or a printout from another administration), they will be accepted. These must be submitted to the BEP coordinator no later than the registration deadline.

2.4 Registration

- Registration for the BEP is done via Osiris under course code 4WC00. Part of the application is to specify four preferences for research Sections via the drop-down menus.
Please note that the application will initially be placed on a waiting list.

2.4.1 Specifying preferences

When registering for the BEP, the student cannot directly choose the research section within which the BEP will be conducted. In connection with the proportional distribution of students over the research sections, the student is asked to indicate 4 preferences.

A choice can be made from the 7 research sections in the department:

| | Code | Research Section |
|----------|-------------|----------------------------|
| 1 | 4WC01 | Processing and Performance |
| 2 | 4WC02 | Mechanics of Materials |
| 3 | 4WC04 | Microsystems |
| 4 | 4WC07 | Energy Technology |
| 5 | 4WC13 | Power and Flow |
| 6 | 4WC09 | Dynamics and Control |
| 7 | 4WC10 | Control Systems Technology |

More information on research within the sections can be found on the department's website: <https://www.tue.nl/en/our-university/departments/mechanical-engineering/research/sections/>

Other possibilities for your BEP include conducting a BEP at innovation Space (ISBEP) or a BEP at a company or student team.

BEP at innovation Space

Starting Q1 and Q3, students can choose to do a BEP at innovation Space (ISBEP). This means doing a BEP project that is partly conducted in a group with other students. The application process for an ISBEP is different from a traditional BEP with our department:

- The ISBEP projects are available in advance and are presented in a 'pitch event'. Students need to register for this event in time. Check innovation Space or contact the BEP coordinator for more information.
- Until a few days after the event, students can register for this challenge in Osiris. Not interested? There is still time to register for a regular BEP.

- In addition, the student registers in the regular way via Osiris (4WC00) with four preferences, of which the first preference should be ISBEP group.
- Innovation Space will check with the BEP coordinator whether the entry requirements are met and if so, sign the student up for the preferred project.
- Each ISBEP project also has a supervisor from the department. He/she will take care of the assessment.

Please note: if an ISBEP project is chosen, it is **not** possible to keep a traditional BEP as a second preference and switch later on. The other way around is also not possible: to choose a research section as first preference and the ISBEP as a second preference.

Keep in mind that the ISBEP is subject to a time slot. More information about ISBEP can be found on the [innovation Space education guide](#).

BEP at a company or student team

Another option is conducting the BEP at a company or student team. Below you will find the requirements for this and the necessary arrangements that need to be made in time:

- The project is feasible within two quarters with a time commitment appropriate to 10 ECTS (280 hours).
- The assignment is coherent and of sufficient level, **not** an assortment of small jobs.
- The assignment has to be supervised by a member of the academic staff of department of Mechanical Engineering (UD/UHD/HL). This person can check the level of the assignment beforehand and will give the final grade.

Please note: Arranging a TU/e supervisor is the responsibility of the student.

- The appointment between student team/company and student supervisor, should be known to the BEP coordinator **no later than the day of the application deadline** of the respective quarter. An email with the (teacher) supervisor in the cc is sufficient.
- The student needs to register for the BEP in the regular way via Osiris with four preferences, of which the first preference should be the research section to which the supervisor belongs.
- If an internship contract is required, students can use the documents for internship in the master. <https://educationguide.tue.nl/programs/internships-and-graduation-projects>

2.4.2 Allocation

After the application for the BEP is closed, all registrations are checked for admission requirements. Subsequently, the students are divided among the research sections based on the indicated preferences. It is not possible to assign all students to their first preference because the supply of projects is not as large as the demand in all sections. Therefore, it is important to think carefully about all 4 preferences.

After students are assigned, the contact persons in the sections distribute the available projects to the assigned students. This is usually done in the first week of the quarter.

3 The Project

3.1 What can you expect?

Students will be given an assignment brief that relates to an issue from the ongoing research work in the section. This may be related to the research of an academic staff member or PhD, or it may be a question from a company with which you are collaborating. Assignments can vary greatly in nature. For example, assignments can be theoretical, experimental or numerical, or a combination of all three.

The assignment usually does not contain a strictly formulated problem definition. The student determines, in consultation with the supervisor, the problem definition, goals and steps to be taken, make a planning for this and organize the necessary activities. The first weeks are therefore mainly needed to find out what the ultimate goal is, the approach that should lead to it and to get familiar with the material. Sometimes it is necessary to first familiarize yourself with new material or skills.

During the course of the project the student may conclude that the predetermined goals are not feasible or have already been achieved. In these cases, the goals and planning are adjusted in consultation with the supervisor, considering the time still available and the amount of work/time already put into the project.

Obtained results will be analyzed and tested for their value. Based on the analysis, conclusions can be drawn and recommendations for follow-up research made. All this will be recorded in a scientific report.

3.2 Starting the project

As indicated above (2.4.2), the assignment of projects usually takes place in the first week of the quarter. After the project is assigned to the student, the student must take further steps with the supervisor of the project. This is usually the academic staff member who offered the project. The supervisor is responsible for daily supervision but can delegate this to, for example, to a PhD student. The supervisor also ensures that the student has access to the necessary facilities. At the end of the project, the supervisor takes care of the assessment of the work. More information on this can be found in Chapter 4.

3.3 PRV information skills training III (IS3) please note: **MANDATORY**

The PRV Phase III Information Skills training (IS3) is a **mandatory** component of the BEP. This training can be very useful when starting the project and doing a literature and/or background study. Therefore, it is recommended that this training be taken as early as possible in the project phase. This two-hour training will focus on searching for sources and correctly referencing and citing other work and using databases and software to facilitate this. Students enrolled for a BEP will also be enrolled for the canvas page of IS3. If you need to complete IS3 before or after your BEP period, please contact the BEP coordinator BEPcoordinator.ME@tue.nl.

Important: If the training has not been followed by the completion of the project, **the project grade will not be awarded until this requirement is met.**

3.4 Time investment and duration

The time investment for the BEP within these two quarters is **10 ECTS** (280 hours).
The BEP has a maximum duration of 2 quarters.

Within the period of two quarters the BEP requirements should be fully completed. This means that:

- the project work should be fully completed
- the final presentation should have been given
- the final report is checked
- the PRV Phase III Information Skills training (IS3) is completed
- the assessment form is handed in to the education administration

For students who start their project in quarter 4, the interim period is counted as the second quarter.

Failure to complete the project within the two-quarter period due to careless planning or insufficient effort is not grounds for granting a delay. In this case, the project will be completed with a fail.

Only in the case of personal or unforeseen circumstances in the project can a delay be granted. Delay is possible only in timely consultation with supervisor, BEP coordinator and/or academic advisor.

4 Completion

The BEP is concluded with a final report and a final presentation (colloquium). In it, the activities carried out, results and analyses and conclusions from them are presented.

4.1.1 Information Skills

To successfully complete the BEP, you are required to take and satisfactorily complete the PRV Phase III Information Skills training (IS3). If the training has not been attended at the completion of the project, the project grade will not be awarded until this requirement is met.

4.1.2 Report

The final report has a size of +/- 25 pages. It follows the format of a scientific report. The report has a clear structure that makes it clear what the project assignment was, what steps were taken, what results were found, what the analysis of the results revealed, and what conclusions and recommendations resulted. Tips for writing the report can be found in the support file on Canvas.

Title page

The first page of the report has to state the following information:

- title of the report
- student's name
- student IDNR
- research group and department
- name of the bachelor's program
- names of the university supervisor and other supervisors
- date

Plagiarism and academic integrity.

Students should avoid plagiarism in their reporting. The proper use of references and citations is of great importance in this regard. This is addressed in the information skills training.

In addition, the student should take note of and conform to the Code of Scientific Conduct (Appendix V) when conducting and recording their project work. The student submits the signed Declaration of Code of Scientific Conduct (Appendix VI) as a separate pdf file along with their report via the link below.

The report should be submitted to the supervisor for review. The supervisor will check the report for plagiarism using Ouriginal. The criteria on which the supervisor will assess the report are included in the rubric (see appendix III).

The final/assessed version of the report is to be submitted digitally as a PDF via this link:

<https://tuenl.sharepoint.com/sites/MEStudentreports/>

The statement of code of conduct for scientific practices is to be submitted digitally as a PDF via email to CSA (me.csa.me@tue.nl)

The final grade will **not** be processed until the report and the statement of code of conduct for scientific practice have been submitted. All documents should be turned in separately, but all should be labeled as BEP reports.

4.1.3 Confidential reports

Confidential reports are also to be submitted via Studentreports. In that case mention 'confidential' in the title or on the front page of your report and submit [the confidential report form](#). The BEP coordinator will then save the report in an extra secure environment. In case of an confidential report you are also required to upload a public summary of your report. In principal the TU/e always grants report confidentiality for 2 year. In special cases this can be extended to 5 year. Indefinite confidentiality is not possible.

4.1.4 Colloquium

The colloquium is a presentation on the project with a duration of up to 20 minutes: 15 minutes for the presentation and 5 minutes for questions and discussion. The target audience for the colloquium are fellow students, PhDs and staff from the section in which the project was carried out. The invitation for an audience is the responsibility of the student. In some research sections, the colloquium is organized in a group. A reference to tips on preparing the colloquium can be found in the support file on Canvas.

The default language for the report and colloquium is English.

4.1.5 Evaluation

After you upload your BEP report to Studentreports SharePoint, you will receive an invitation by email to complete an evaluation about the BEP. The results of the evaluation will be used to improve the set-up of the BEP and will be processed by the quality assurance officer. Of course, the evaluation is anonymous.

4.2 Checklist for completion

Colloquium

- Make arrangements with your supervisor about the date of the presentation. Find out whether there are fixed times within the research section (in groups) or whether this is done individually.
- In case of an individual presentation, arrange a room and equipment yourself and invite the people you want to be there (at least your supervisors should be present).

Report

- Make arrangements with your supervisor about when you will submit the final version of your report for review and in what form (digital/hard copy).
- Find out if your research section also wants to have copies for their own archives.

Upload the following documents as a PDF using this link:

<https://tue.nl/sharepoint.com/sites/MEStudentreports/>

- Final version of the report

Email the following documents as a PDF to me.csa.me@tue.nl:

- Signed statement code of conduct for scientific practice (Appendix V)
- Assessment form

Assessment Form

The submission of the assessment form is the responsibility of the supervisor. The form should be submitted as a PDF to me.csa.me@tue.nl.

5 Assessment

The supervisor assesses the BEP report. The assessment is based on the following criteria:

- Planning and organization
- Self-reliance and professional behavior
- Capacity of Analysis
- Reporting: content, form and handling of scientific information
- Colloquium: content and structure

The assessment rubric can be found in Appendix III. The supervisor/assessor determines a grade for each of the above aspects. The final grade is rounded up to a whole or half digit. The BEP is completed with a passing grade when the final grade is 6.0 or higher. The grades are entered on the assessment form (Appendix II).

Professional Skills

The following professional skills are also assessed in the BEP:

- PRV13: Collaborating-3
- PRV23: Presenting-3
- PRV33: Writing-3
- PRV43: Reflecting-3
- PRV53: Planning-3
- PRV63: Information Skills-3

The requirements to obtain a passing grade for the professional skills are incorporated into the rubric. PRV63 is also assessed through the PRV Phase III Information Skills training (IS3).

Appendix I: Contact persons

Contact persons for the different research sections

| | Section | Contact | Professor |
|--------------|---|------------------------|---|
| 4WC01 | Processing and Performance of materials | M. (Markus) Hütter | Prof.dr.ir. P.D. Anderson |
| 4WC02 | Mechanics of Materials | J.J.C. (Joris) Remmers | Prof.dr.ir. M.G.D. Geers |
| 4WC04 | Microsystems | R. (Regina) Lutge | Prof.dr.ir. J.M.J. den Toonder |
| 4WC07 | Energy Technology | B.P.M. (Bart) van Esch | Prof.dr.ir. D.M.J. Smeulders |
| 4WC13 | Power and Flow | B.P.M. (Bart) van Esch | Prof.dr.ir. N.G. Deen Prof.dr. J.G.M. Kuerten Prof.dr. L.P.H. de Goey |
| 4WC09 | Dynamics and Control | A.A.J. Lefeber (Erjen) | Prof.dr. H. Nijmeijer Prof.dr.ir. N. van de Wouw |
| 4WC10 | Control Systems Technology | N. (Nancy) Wagemakers | Prof.dr.ir. M. Steinbuch Prof.dr.ir. W.P.M.H. Heemels |

Contact information innovation Space

| Group | Contact | Professor |
|------------------|--|-------------------------------|
| innovation Space | BEP-coördinator or via isbep.innovationspace@tue.nl | Depends on ISBEP Challenge |

Appendix II: CODE OF SCIENTIFIC CONDUCT

Preamble

In 2018, the Netherlands Code of Conduct for Research Integrity has been adopted by a large number of Dutch research institutes, including TU/e. This TU/e code offers a more concise version, which also considers the specific characteristics of scientific activities at a technical university. The TU/e code therefore includes norms for design-oriented activities, and it restricts the confidentiality of data and research results in the interests of researchers (e.g., PhDs, post-docs, PDEngs). Where at other points there are differences in nuance or formulation, the Netherlands Code of Conduct for Research Integrity prevails.

This TU/e Code is organized around five central values that jointly characterize good scientific conduct. From each of these values certain behavioral norms and principles follow, of which the most important are listed below. This Code is meant to be inclusive of the variety of research, design and educational activities at TU/e, and to leave room for differences in disciplinary context.

Adherence to this code of scientific integrity is the responsibility of all scientists, engineers and students at TU/e, whether they work individually or in groups. They may expect to work in an institutional environment that is supportive of fulfilling this responsibility, through various institutional policies and regulations on scientific integrity. Supervisors and group leaders have a special responsibility to teach junior staff members what is acceptable scientific conduct, and to function as examples of such conduct. Institutional responsibilities include: to create a climate that stimulates regular discussions about correct practices in research, design and education (especially when there seems to be a conflict between the principles of the code, or a conflict between principles and actual practices); and to facilitate accessible, unbiased and confidential procedures for reporting and investigating possible violations of the TU/e Code and for taking adequate measures in case they have occurred.

Code

TU/e expects its academic staff and students¹ to respect the following five central values of scientific integrity and to conform to the norms and principles that follow from them for their research, design and educational activities:

1. Trustworthiness

Academic staff and students ground their views as academics on scientific evidence. This entails that:

- They do not fabricate, falsify or suppress evidence. The selective omission of research results is reported and justified.
- In presenting results of their activities, they do so with the corresponding uncertainties.
- In scientific communication, they strive for precision and nuance.
- They do not present as established facts speculations, personal opinions and claims that go beyond available evidence.

2. Intellectual honesty

Academic staff and students respect standards of quality in their field and they respect the achievements of others. This entails that:

- They acknowledge and respect intellectual property and authorship. Plagiarism is unacceptable.
- They only claim authorship if they have made a genuine contribution.

¹ This includes guests of TU/e who have access to the university's facilities.

- They carry out peer-review tasks seriously and make assessments solely on scientific grounds.
- They only accept tasks for which they have the necessary expertise.
- In educational activities, they accurately present available knowledge in the discipline.

3. *Openness*

Open and unbiased communication is essential for science and engineering. For academic staff and students, this entails that:

- They contribute actively to an academic climate in which insights and criticisms are welcome from all, regardless of academic rank and personal characteristics.
- They give room to others to develop or take their own intellectual stance in research, design and education.
- Whenever they publish research results, they present their research such that its results may in principle be replicated.
- They make accessible, after publication, all information needed for intersubjective testing of design results and design processes.
- They make accessible, after publication, research data for re-use by colleagues.

4. *Independence*

Academic staff and students operate in a context where academic freedom and independence are of great importance. Where needed, they guard this independence against commercial, political and personal interests. This entails that:

- In research, they choose their methods and criteria primarily to realize scientifically valuable goals.
- With external sponsors of scientific research, they arrange that all relevant results of this research may be published within a specified, reasonable amount of time.
- They report interests that may potentially conflict with the independence of research activities.
- They avoid situations in which reasonable doubt concerning the objectivity of their scientific judgements may arise.

5. *Societal responsibility*

Science and engineering are vital for the health and well-being of people and for a sustainable economy. They may also be the cause of harm and risks. For academic staff and students this entails that:

- They actively seek, within the limits and standards appropriate to their field, to contribute to society through research, design, knowledge dissemination and/or public debate.
- In their research and design, they adhere to the ethical codes for activities in which human subjects and animals are involved.
- They report possible harm and risks of scientific and technological developments to the relevant authorities; in case of doubt, they consult ethical advisory bodies or signal the need for such ethical advice.

Possible cases of violations of this code of conduct should be reported to relevant supervisors or to the confidential officer for scientific integrity at TU/e. See <http://www.tue.nl/en/research/scientific-integrity/>. The website also contains information about the complaints procedure.

Appendix III Declaration concerning the TU/e Code of Scientific Conduct

The following declaration is to be completed and submitted as a separate PDF via email to me.csa.me@tue.nl.

Declaration concerning the TU/e Code of Scientific Conduct for the Bachelor's Final Project

I have read the TU/e Code of Scientific Conduct.

I hereby declare that my Bachelor's final project has been carried out in accordance with the rules of the TU/e Code of Scientific Conduct.

Date

.....

Name

.....

ID-number

.....

Signature

.....

See:

The Netherlands Code of Conduct for Scientific Integrity, endorsed by 6 umbrella organizations, including the VSNU, can be found here also. More information about scientific integrity is published on the websites of TU/e and VSNU.