

BSc graduation assignment in cooperation with companies

# The bachelor graduation assignment Mechanical Engineering (ME) / UT & UT-VU

In the Mechanical Engineering (ME) bachelor programmes of the University of Twente (UT) and the Vrije Universiteit (VU), in the third year, students do their graduation. Graduation assignments in collaboration with a company are encouraged. The goal of the bachelor (BSc) assignment is for the students to experience the full research cycle: deducing a research question, writing a research proposal, conducting research, writing a paper, and discovering the interest of research.

In a company assignment, students can translate between contents from the educational programme and a real-life case, and interact with engineers from professional practice. We focus on cooperation with companies in and around the university regions. In such cooperation, companies can get a small research done and connect with technical students.

## Assignments in collaboration with companies

Companies can offer small research questions, on topics useful for the company, in the field of Mechanical Engineering. The assignment ideally has some empirical part in which the student generates actual results to analyse. These results can be obtained from an experiment, a prototype, a research-based design, a computer model, or similar. If the research is purely a literature study, there should be a clear product at the end (e.g. recommendation, comparison, new design).

The university supervisor helps to assess and finetune the proposal and set an appropriate level. The assignment must provide the students with the possibility to prove that they can develop research independently, doing research for the first time, and having about 10 weeks for the execution of the research (about 250 hours of actual research/lab time).

Mostly two students work on one assignment. The students can cooperate in doing the literature research and setting up experiments, the analysis is individual. Each student has their own research question and writes an individual research paper. Students for example work on a variation of the same research question or different sub-questions. The research could deliver a paper that has added value, but given that it is student research, different outcomes are possible.

Students can do their assignment at the location of the company and/or at university, in mutual consultation.

Preparation	Companies provide assignment suggestion(s) & finetuning with the university	Nov - Dec 2024
	Deadline for sending assignments - by university-supervisor	10 January 2025
Initial	Assignment publication to students + student's preferences + allocation	4-13 February 2025
	Assignment market for students - with university and company supervisors	7 February (afternoon)
Discovery	Assignment discussion - students meet with company supervisor	17 - 28 February
	Literature review + writing Research Proposal - hand in draft (mid-term) and final	March - mid-April
Execution	Students conduct research + write research paper / make research-based design at location of company and/or university	22 April - end-June 2025
	Students hand in Research Paper for grading by university supervisor	1 July
Final	BSc Conference at UT - students present their projects	2+3 July / 27 August 2025

### Timeline -- period February - June 2025





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## Cooperation between the company and the university for the assignment

The company supervisor and the university supervisor act as a 'tandem' in the preparation and guidance of the project. Various ways for company involvement are possible, from taking place at the company and an engineer taking charge of the daily supervision of the student, to the company having a question/problem which is investigated at the university.

In preparing the assignment, consider how you can set it up such that students can get results and a complete paper. If the focus of the assignment is experimental measurements, the students should not lose time on building a set-up. If the assignment is focused on building a model or set-up, that can be a good piece of research and a complete story.

The university supervisor will be available to provide course-related counsel and information, and if possible visit your company. During the assignment, the university supervisor will focus and guide on the approach, academic level and progress. The university will also monitor if the assignment provides appropriate opportunities for a student to prove competencies. The university supervisor has the final responsibility for the scientific level and grading of the project. Assignments should be disconnected from the company's operations to prevent planning-related issues for the student.

## The role of the company supervisor and university supervisor

#### Preparation

- The company provides a draft assignment as an idea or suggestion for research. On the topic, a university supervisor
  is involved and in touch with the company's engineer. Together the company supervisor and university supervisor
  finetune the assignment, to fit the company's ideas and educational requirements, and provide a short summary of the
  assignment (about 100 words) that the university supervisor submits for publication to the students.
- The tasks for students to be done at the location of the company and the time involved are indicated. Typically this is
  for conducting research: doing experiments, measurements, collecting data. Supervision by company and university is
  to be agreed. Writing the research proposal and research paper can be done at the company or at university.
- At the assignment market for students before the start of the assignment, the company and university supervisors can give further background on the assignment and meet with interested students.

### **Project phases**

- When students are allocated to the assignment, the company supervisor has a meeting with the students to explain
  more about the background of the assignment and the possible directions it can take.
- During writing of the research proposal, the university supervisor gives feedback on the draft research proposal. The company supervisor can also be asked for feedback. The university supervisor grades the proposal and indicates if the student is ready to start the execution phase.
- During the execution of the assignment at the company's location, the company supervisor guides the students, is available for questions, reviews the project's progress and gives feedback. Desired is having weekly meetings, and adopting the students as a new colleague. The company facilitates the students to carry out the research and provides relevant required information. Any necessary facilities must be available so the student does not lose time.
- The company and university supervisors give feedback on one or more draft versions of the research paper before the students hand in the final documents.

#### Examination

- The student finishes the assignment with an examination. The exam consists of a final presentation and oral examination at the BSc Conference at the university.
- The grade given by the university supervisor will reflect the quality of the report, the final project results, the management of the project, the quality of the presentation and the discussion at the final presentation. The university supervisor is part of the committee grading the students at the BSc conference, and a professor participates in the exam and represents the examination board.
- The company supervisor is invited to attend the student's examination. The company supervisor can advise the
  university supervisor on specific grades, e.g. the grade for the project management and the progress of the student.



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## Mechanical Engineering programmes in Twente and Amsterdam

The Mechanical Engineering programme focuses on designing, improving and maintaining all kinds of machines, devices and installations, as well as structures and processes. The different aspects are integrated into several projects in which students participate during their bachelor programme. The student finishes with the final bachelor graduation assignment. The assignment compasses a practical project of 10 weeks resulting in a research paper.

The three-year bachelor programme Mechanical Engineering is provided by the University of Twente and in collaboration with the Vrije Universiteit Amsterdam. Herein we offer more students the possibility to apply for a technical bachelor at a university in their region, and cater for the demand for academically-trained professionals in the labour market.

The <u>UT bachelor programme</u> takes place in Twente, the <u>UT-VU bachelor programme</u> in Amsterdam and partly in Twente. The courses and projects are related to relevant themes: Manufacturing, Energy Transition and Sustainability, Maintenance, Technology of Healthcare, Thermal & Fluid Engineering.

After graduating, the students can continue into the master Mechanical Engineering at UT or other masters.

### Connecting between the educational programme, students and professional practice

Students are supported to take up experience in professional practice before starting a master or a professional career. Companies work on developments and various applications in areas of Mechanical Engineering. In practice, students learn how the academic programme relates to real-life applications and can experience 'the next level' in the company. We cooperate with companies in the university regions to facilitate connections with technically highly educated talent.

## Goals of the bachelor graduation assignment Mechanical Engineering

The main goal for the student is to learn how to execute a research assignment on the basis of a research question defined first, and following a suitable methodology, all under supervision. It is the first time that the student works on a more substantial research problem where the results have to be written down in a research paper and a paper reflecting on the scientific and societal dimensions and implications of the work. The paper has to be presented and defended in public at the BSc conference in the last week of the project. Next to the scientific and engineering aspects, the student should also develop a time-effective and critical attitude towards the planning and execution of the assignment.

With the goal of the bachelor assignment to show competence as a Mechanical Engineer at bachelor (BSc) level, therefore the student should -by fulfilling the assignment- show the following abilities:

- Analyze a problem with some complexity in the field of Mechanical Engineering
- Prepare, execute and analyze experimental and/or theoretical research in Mechanical Engineering (problem analysis, theoretical and experimental approach, solution of the problem and result analysis)
- Write a scientific paper describing the results
- Give an oral presentation of the results to an audience of peers and answer questions on the subject
- Organise the project in a self-sufficiently manner, and collaborate and communicate with stakeholders
- Reflect on the impact of their work on society

Also the student gets acquainted with a future work area of mechanical engineers, supporting future career orientation.

# **Bachelor Mechanical Engineering - UT & UT-VU**





### Assignment agreement, insurance and costs

A three-party 'assignment agreement' will be signed between the student, company, and university. This is to address issues like insurance, working hours, allowance. We provide a format to record arrangements for these aspects.

It is desired that the assignment will not result in any extra costs for the student, therefore the company is asked to compensate for travelling and accommodation costs, mostly realised by an internship compensation. Extra costs for doing the research need prior agreement. When the students are working at your company, your company is liable accidents, we therefore request your organisation's accident insurance also to cover the student's assignment. The university (the student) provides the <u>three-party assignment agreement</u> (three-party: company-student-university) to identify arrangements for the above-mentioned aspects. This format is used as the preferred standard.

## Report and confidentiality

To finish the assignment, the student writes a research paper describing the project in 8 pages, excluding appendices. The research paper will be a chapter in the BSc Conference proceedings, that will be shared with other students. If a paper contains confidential information, we understand your company does not want to disclose this. However, for educational reasons and external audits, it is important to have the paper available at the university's disposal.

We strive to make public all information resulting from the student project. As such, this information should be available for publication by the student and supervisor. Normally, the thesis will be added to the UT library public repository. Having the right to publish the report and the outcomes of work is important for the student's career and résumé, and serves as an inspiration for other students. Furthermore, it shows the type of work our students do and with which companies. It is therefore important to produce a report that can be published. A research paper is by default publicly available.

The university's aim is to avoid confidentiality agreements (NDA's) as much as possible. We request the company to discuss in an early stage of the assignment the approach for the research paper with the university supervisor.

To fulfil the interests of all parties, the following arrangements are possible (in order of preference):

(1) The report does not contain confidential information. Confidential information will after consultation be removed from the paper. This arrangement is preferable if the removed contents are of little importance for the assignment.

(2) Confidential information will be incorporated in a separate non-public annex. This non-public annex will be kept in embargo for maximum one year. The main paper will be disclosed and needs therefore to be understandable on its own.

(3) The main paper (including appendices) will be kept on embargo for a maximum of one year after the examination date. During this embargo, the paper will be available to the examination board and the supervisor, and if requested to the accreditation committee. Besides the report, the student delivers a public report and presentation containing at least the research methodology. To avoid disclosure of confidential information in the booklet or in the presentation, the student needs to consult the supervisor beforehand to agree upon the material to be presented. If in exceptional situations a twoyear confidentiality may be required, a written argumentation for that purpose should be submitted to the university.

The university provides a format to identify arrangements for the above-mentioned aspects.

For additional information, please contact us:

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Read more on company collaborations with our Mechanical Engineering programme: www.utwente.nl/company-u/