

Guidelines theses and projects

Research projects as part of curricula in Materials

Type		Duration	Assessment	ECTS
Capstone Project 327-0511-00 (formerly Praktikum V)	group	1 day per week during the 5 th semester	Ungraded (report + presentation)	6
Bachelor's thesis 327-0620-00	individual	6 weeks (Regl. 17) 8 weeks (Regl. 20)	Graded (report + presentation)	10 (Regl. 17) 12 (Regl. 20)
Master project I or II Research project 327-1210-00 327-1211-00	individual	8 weeks	Ungraded (report)	12
Master's thesis 327-9000-00	individual	6 months (full time)	Graded (report + presentation)	30

Exchange students can register for projects of different duration (e.g., 5 credit project = 1 month duration or 20 credit project = 4 month duration). The duration depends on their home institution's requirements. These course units can be found in the [course catalogue](#).

For each thesis or project paper undertaken during the course of studies, students need to submit a [declaration of originality](#) (German: [Eigenständigkeitserklärung](#)).

The assessment form can be found [at the end of this document](#) or can be downloaded directly from [the website](#).

Links

- All registration forms can be found under mat.ethz.ch/studies/forms-and-documents
- Directive [Working scientifically and the declaration of originality](#) / Weisung [Wissenschaftliches Arbeiten und Eigenständigkeitserklärung](#)
- [ETH Zurich Guidelines on scientific integrity](#) / [Richtlinien der ETH Zürich zur wissenschaftlichen Integrität](#)
- [Citation etiquette](#)

Capstone Project / Schlussprojekt (327-0511-00)

Format

Research project carried out in a group of 2 or 3 students in one of the D-MATL research groups. It precedes the Bachelor's thesis and as such is a preparation for the first individual research project. The project is usually carried out for 1 day per week during the 5th semester. Limited opportunities to carry out the project before the start of the 5th semester may be available.

Learning Objectives

Students are able to

- deepen and expand their knowledge of a material science topic in a team and under guidance;
- plan, safely conduct and interpret experiments in a team to clarify and solve a material science problem;
- systematically collect, process and analyse data;
- contribute constructively to the team and take responsibility for subtasks;
- present the results of the work in oral and written form in a comprehensible, clear and convincing way for a specialist audience.

Organization

The collection and distribution of the final project is organized by the person responsible for the learning unit (currently: Dr. Martin Willeke and Prof. Jörg Löffler). The student simply registers for the final project in myStudies.

Supervision

It is the responsibility of the research group to supervise and guide the students allocated to their group. Since it is their first time working on a research question and in a research group, supervisors are expected to guide the students through the research process and regularly discuss the results and further steps with them. The students can be expected to have general lab skills including safety training, some experience in report writing (both acquired during the lab courses on the BSc level) and general project management skills (acquired during the group projects on the BSc level). In addition, they all have the same technical background provided by the BSc courses (1st to 4th semester).

Report

The report must be written in the form of a short scientific publication. The students all received [basic instructions for report writing](#) at the beginning of their BSc studies. The report is corrected by the direct supervisors of the project before the final version is submitted to the person responsible for the learning unit.

Assessment

In addition to submitting a report, each team presents their findings (5' presentation + 5' discussion). The final project is ungraded. The "pass/fail" is submitted by the person responsible for the learning unit upon completion of the course.

Rubric for Capstone Project

Learning objectives Schlussprojekt Students will be able to...	For a satisfactory performance ("pass") the students must be able to...	For an intermediate performance the students must be able to...	For a good performance the students must be able to...
deepen their knowledge of a material science topic <i>in a team</i> and <i>under guidance</i> (by identifying and specifying challenges) and extend it (by developing creative ways of solving partial aspects)	understand and implement <i>most</i> of the instructions, and <i>help</i> to design solutions	understand and <i>fully</i> implement the instructions and <i>suggest</i> possible solutions.	need instructions only <i>selectively</i> and to implement them <i>beyond expectations</i> , and to work out solutions directly
plan, safely carry out and interpret experiments <i>in a team</i> in order to clarify and solve a material science problem	* <i>under constant</i> guidance	* <i>under selective</i> guidance	* <i>practically without</i> guidance
systematically collect, process and analyse data	* <i>without gross errors</i>	* <i>mostly correctly</i>	* <i>without errors</i>
contribute constructively to the team, reflect on team processes and take responsibility for subtasks	(self-) critically analyse their processes <i>retrospectively</i>	(self-) critically analyse their processes when <i>faced with problems</i>	(self-) critically analyse their processes on an <i>ongoing basis</i>
present the results of the work in oral and written form in a comprehensible, clear and convincing way for a <i>professional</i> and <i>lay</i> audience	present the results of the work, <i>after several</i> corrections by assistants, in accordance with the criteria	present the results of the work, <i>after a single</i> correction by assistants, in accordance with the criteria	present the results of the work, <i>without</i> correction by assistants, according to the criteria

Bachelor's thesis (327-0620-00)

Format

Individual research project of 6 (Regl. 2017) or 8 (Regl. 2020) weeks duration, i.e., 30 or 40 working days. It completes the education on the BSc level. The report must be written and submitted within the allocated time (i.e., 6 or 8 weeks). The presentation can take place shortly after.

The project can be carried out part-time or in a block. If carried out part-time students often work 2 or 2.5 days per week on the project for most of the spring semester, take a break for the exams and wrap-up their project after the end-of-semester examinations.

Learning Objectives

The students are able to

- deepen and expand their knowledge in the subject area of the Bachelor's thesis under guidance and with the help of specialist literature;
- plan, safely conduct and interpret goal-oriented experiments to clarify and solve a materials science problem;
- systematically collect, process and analyse data;
- present the results of the work in oral and written form in a technically correct manner for a specialist audience.

Organization

Students organize their own project by contacting a research group/professor of their choice and asking for opportunities. The supervisor must be a professor at D-MATL or one of the associated professors. If a student wants to carry out a project in a research group outside D-MATL (e.g., in another department, at Empa, at PSI or even abroad), he/she must find a professor at D-MATL to co-supervise and grade the thesis.

Before the start, the student needs to submit the registration form to the study administration office (studieren@mat.ethz.ch). The time frame of the project (part-time or full-time) as well as the start and end date must be indicated on the form. The form must be signed by the supervising professor and the student. The project title or topic should be indicated on the form, but is not binding.

The student must also enroll for the Bachelor's thesis in myStudies.

Supervision

A professor is responsible for the project. However, day-to-day supervision is often carried out by a doctoral student or postdoc. The students can be expected to have general lab skills including safety training and to be familiar with report writing and basic literature search (acquired during the lab courses on the BSc level), plus general project management skills (acquired during the group projects on the BSc level). In addition, they all have the same technical background provided by the BSc courses. However, they have never carried out an individual research project before and may work on a topic that is completely new for them.

The supervisor is expected to clearly define the task and specify expectations at the beginning and to regularly discuss with the student and indicate whether the expectations are met. The student is also given feedback during the preparation of the written report.

Report

The report must be written and submitted within the allocated time (i.e., 6 or 8 weeks). The students are used to follow the IMRAD structure of research papers and received [basic instructions for report writing](#) at the beginning of their BSc studies. The length of a typical report ranges between 20 to 30 pages.

Please indicate what citation style is used in your field of research/group.

Since this is the first individual report that the students write for a longer project, they can be expected to receive feedback at least once during the writing process (e.g., with regards to structure, data analysis, the use of language and grammar). Final corrections by the supervisor should mainly concern technical errors.

Assessment

The Bachelor's thesis is graded. The assessment includes not only the written thesis, but also the work in the lab, the process of writing and the presentation.

Please use the provided rubric for grading. The different parts of the work should be weighted as follows: Lab work (50%) + written work incl. process of writing (25%) + oral presentation (25%)

The grade must be submitted by the professor no longer than four weeks after the end of the project.

Rubric for Bachelor's thesis

	Learning objectives BSc thesis Students will be able to...	For a satisfactory performance the students must be able to...	For an intermediate performance the students must be able to...	For a good performance the students must be able to...
<i>overarching</i>	<i>independently</i> deepen and broaden their knowledge in a material science topic <i>under guidance</i> and with the help of <i>specialised literature</i>	understand and implement <i>most</i> of the instructions, and <i>help</i> to design solutions	understand and <i>fully</i> implement the instructions and <i>suggest</i> possible solutions.	need instructions only <i>selectively</i> and to implement them <i>beyond expectations</i> , and to work out solutions directly
<i>realization of project</i>	<i>independently</i> plan, safely carry out and interpret goal-oriented experiments to clarify and solve a material science problem	* <i>under constant</i> guidance	* <i>under selective</i> guidance	* <i>practically without</i> guidance
	<i>independently</i> and systematically collect, process and analyse data	* <i>without gross</i> errors	* <i>mostly</i> correctly	* <i>without</i> errors
	reflect on their own knowledge and skills and <i>independently</i> deepen their knowledge in specific subject areas of materials science	(self-) critically analyse their processes <i>retrospectively</i>	(self-) critically analyse their processes when <i>faced with problems</i>	(self-) critically analyse their processes on an <i>ongoing basis</i>
<i>report</i>	present <i>own</i> ideas and results of work in oral and written form in a comprehensible, clear and convincing way for a <i>professional</i> audience	submit the report, <i>after substantial</i> corrections by assistants, in accordance with the criteria	submit the report, <i>after correction</i> by assistants, in accordance with the criteria	submit the report, <i>after minor</i> corrections by assistants, according to the criteria
<i>presentation</i>		present the work adequately and answer convincingly to <i>some</i> of the questions	present the work clearly and comprehensibly and answer convincingly to <i>most</i> of the questions	present the work in a very comprehensible, clear and convincing way, plus answer convincingly to <i>all</i> the questions

A satisfactory performance would correspond to grade 4, an intermediate performance to grade 5 and a good performance to grade 6. The first column mentions the corresponding sections in the [assessment form](#).

Regl. 2012: Master Project I and II (327-1210-00 or 327-1211-00)

Regl. 2023: Research Project (327-1210-00)

Format

Individual research project of 40 working days (8 weeks) duration. The report must be written and submitted during the allocated time. The presentation can take place shortly after.

The project can be carried out part-time or in a block. Students often combine part-time work during the semester (besides attending classes) with a block of full-time work during the semester break.

Learning Objectives

Students are able to

- apply their broad knowledge in materials synthesis, properties, characterization and processing independently to a new materials science problem;
- rely on scientific literature to make informed interpretations and choices in the lab;
- independently plan and correctly carry out experiments;
- systematically and independently collect data using various methods, process and analyse complex data sets using quantitative methods and create models based on these;
- present own ideas and the results of the work in oral and written form in a comprehensible, clear and convincing manner for a specialist audience.

Organization

Students choose and organize their own project. They contact a research group/ professor of their choice. The supervisor must be a professor at ETH Zürich, this means that the project can also be carried out in another department without co-supervision by a D-MATL faculty member. If a student wants to carry out a project outside ETH Zürich, he/she must find a professor at D-MATL to take over the responsibility for the project.

Before the start, the student needs to hand in the registration form at the study administration (studieren@mat.ethz.ch). The time frame of the project (part-time or full-time) as well as the start and end date must be indicated on the form. The form must be signed by the professor and the student. The project title or topic should be indicated on the form, but is not binding.

The student must also enroll for the project in myStudies.

Supervision

A professor is responsible for the project. However, day-to-day supervision is often carried out by a doctoral student or postdoc. The students can be expected to bring general lab skills including safety training, general project management skills and most of them carried out a longer individual research project on the Bachelor level. They may still work on a topic that is completely new for them.

Report

Students are expected to hand in a report by the end of the project. Please indicate what citation style is used in your field of research/group and inform the students of specific additional requests.

Assessment

Projects are ungraded. Besides submitting a report, the research group may request an additional final presentation. Please use the provided rubric for assessing the thesis. The "pass/fail" must be submitted by the professor no longer than two weeks after submitting the report.

Rubric for Master research project(s)

Learning objectives MSc project Students will be able to...	For a satisfactory performance (“pass”) the students must be able to...	For an intermediate performance the students must be able to...	For a good performance the students must be able to...
apply their broad basic knowledge independently to a new problem in materials science	* with <i>constant</i> guidance and <i>participation</i> in the development of solutions	* with <i>selective</i> guidance and <i>personal</i> contribution when <i>proposing</i> solutions	* <i>practically without</i> guidance and direct development of solutions
interpret scientific literature critically and on the basis of this plan and carry out experiments independently	* <i>under constant</i> guidance	* <i>under selective</i> guidance	* <i>practically without</i> guidance
systematically and independently collect data using various methods, process and analyse complex data sets using quantitative methods and create models based on these data	* <i>without gross</i> errors	* <i>mostly</i> correctly	* <i>without</i> errors
apply their knowledge creatively and critically in interdisciplinary, open-ended projects with the aim of understanding the design and processing of materials and thus contributing to the solution of important social problems	(self-) critically analyse their processes <i>retrospectively</i>	(self-) critically analyse their processes when <i>faced with problems</i>	(self-) critically analyse their processes on an <i>ongoing basis</i>
present <i>own</i> ideas and results of work in oral and written form in a comprehensible, clear and convincing way for a <i>professional</i> audience	submit the report, <i>after substantial</i> corrections by assistants, in accordance with the criteria	submit the report, after correction by assistants, in accordance with the criteria	submit the report, <i>after minor</i> corrections by assistants, according to the criteria
	present the work adequately and answer convincingly to <i>some</i> of the questions	present the work clearly and comprehensibly and answer convincingly to <i>most</i> of the questions	present the work in a very comprehensible, clear and convincing way, plus answer convincingly to <i>all</i> the questions

Master's Thesis (327-900-00)

Format

Individual research project of 6 months or 28 weeks¹ duration. The report must be written and submitted during the allocated time. The presentation should take place no later than two weeks after the submission of the report.

Part-time work is not possible for the Master's thesis.

In case the student cannot work full-time (e.g., financial reasons or family situation), he/she must obtain an official permission by the Vice Rector for Study Programmes. In that case, the student must contact the study administration office as early as possible to discuss the submission of the request.

Learning Objectives

Students are able to

- familiarise themselves with a specific field of research in materials science with little guidance and follow current developments over a longer period of time;
- apply their broad basic knowledge to a new problem in materials science that is open-ended and develop creative approaches to solutions;
- rely on scientific literature to make informed interpretations and choices in the lab;
- systematically and independently design experiments, collect data using various methods, process and analyse complex data sets using quantitative methods and create models based on these;
- present own ideas and the results of the work in oral and written form in a comprehensible, clear and convincing manner for a specialist audience.

Organization

Only students who fulfill the following criteria are allowed to begin with their Master's thesis:

- a. successful completion of the Bachelor programme;
- b. additional course requirements that were assigned upon admission must have been fulfilled.

Students choose and organize their own project. They contact a research group/ professor of their choice. The supervisor must be a professor at D-MATL or one of the associated professors. If a student wants to carry out a project in a different research group (within the ETH domain or internationally), he/she must find a professor at D-MATL to co-supervise and grade the thesis.

Before the start, the student must register for the Master's thesis in myStudies. The starting date, the title of the thesis as well as the supervisors need to be specified when registering. The thesis supervisor will need to confirm the registration in eDoz.

The Master's thesis must be completed within 28 weeks. The director of studies may grant an extension upon the presentation of good reasons.

Supervision

A professor is responsible for the project. However, day-to-day supervision is often carried out by a doctoral student or postdoc. Since the Master's thesis is the final research project of their education, the students can be expected to work more independently and come up with their own suggestions for experiments.

The supervisor is expected to regularly discuss with the student and indicate whether the expectations are met.

Report

Students are expected to hand in the report for the Master's thesis by the deadline. Please provide them with an example from your field of research or group or refer them to a general publication on

¹ The 28 weeks are composed by: 26 weeks of actual work, plus 2 weeks for the compensation of holidays, sick days and other short absences.

the writing of reports² in case there are questions. An electronic copy of the report must also be submitted to the D-MATL Study Administration.

Assessment

The grading should be done by all those involved in the supervision. The professor ensures that the grading is consistent within his/her research group.

Please use the provided rubric for grading. The different parts of the work should be weighted as follows: Lab work (50%) + written work incl. process of writing (25%) + oral presentation (25%)
It is recommended that the supervisor provides a more detailed, written feedback in addition to the grade.

Rubric for Master's thesis

	Learning objectives MSc thesis Students will be able to...	For a satisfactory performance the students must be able to...	For an intermediate performance the students must be able to...	For a good performance the students must be able to...
<i>overarching</i>	independently familiarise themselves with a specific field of research in materials science and follow current developments over a longer period of time	achieve the LO with the resources provided by the supervisor (group seminars, direct exchange, etc...)	achieve the LO with the resources provided by the supervisor, the group and Departement (seminars, direct exchange, etc...)	achieve the LO independently of the resources provided by the group (draws supervisor's attention to other sources)
<i>realization of project</i>	apply their broad basic knowledge independently to a new material-scientific open-ended problem and develop creative approaches to solutions	* <i>under constant</i> guidance	* <i>under selective</i> guidance	* <i>practically without</i> guidance
	independently interpret scientific literature and, on the basis of this, independently plan and cleanly carry out experiments	* <i>under constant</i> guidance	* <i>under selective</i> guidance	* <i>practically without</i> guidance
	systematically and independently collect data using various methods, process and analyse complex data sets using quantitative methods and create models based on these data	* <i>without gross</i> errors	* <i>mostly correctly</i>	* <i>without errors</i>
<i>repo</i>	present <i>own</i> ideas and results of the work in oral	submit the report, after <i>substantial</i>	submit the report, after correction by	submit the report, after <i>minor</i>

² For example: G. M. Whitesides, Writing a Paper, Adv. Mater. 2004, 16, No. 15
https://intra.ece.ucr.edu/~rlake/Whitesides_writing_res_paper.pdf

	and written form for a <i>professional and interdisciplinary</i> audience in an understandable, clear and convincing way	corrections by supervisor, according to the criteria	supervisor, according to the criteria	corrections by supervisor, according to the criteria
<i>presentation</i>		present the work adequately and answer convincingly to <i>some</i> of the questions	present the work clearly and comprehensibly and answer convincingly to <i>most</i> of the questions	present the work in a very comprehensible, clear and convincing way, plus answer convincingly to <i>all</i> the questions

A satisfactory performance would correspond to grade 4, an intermediate performance to grade 5 and a good performance to grade 6. The first column mentions the corresponding sections in the [assessment form](#).

Beurteilung / Assessment BSc & MSc Thesis

It is not mandatory to fill out this form, but it may be used for evaluation purposes together with the rubric provided in the Guidelines for the Supervision of Theses and Projects.

Name / Name:

Titel der Arbeit / Title of Thesis:

Verantwortlicher Betreuer / Supervisor D-MATL:

	Anteil / Percentage	Note / Grade
Durchführung / Realization of project		
Erarbeiten und Anwenden der Theorie / Understanding and application of theory		
Kritisches Nachvollziehen gegebener Ideen / Critical comprehension of given ideas		
Einbringen neuer Ideen, Eigeninitiative / Contributing new ideas, proactivity		
Zeitplanung, Selbstorganisation / Time management, organization		
Labor- und Programmierarbeit / Lab and programming work		
Datenanalyse / Data analysis		
Einsatz / Commitment		
Zusammenarbeit und Kommunikation / Collaboration and communication		
Selbstreflexion und Anpassung / Self-awareness and adaptability		
	Total 50%	
Bericht / Report		
Argumentation und Interpretation / Reasoning and interpretation		
Struktur, Verständlichkeit und Vollständigkeit / Structure, intelligibility and completeness		
	Total 25 %	
Präsentation / Presentation		
Folien und Präsentation / Slides and presentation		
F&A / Q&A		
	Total 25%	

Datum / Date

SCHLUSSNOTE / FINAL GRADE

Unterschrift des Betreuers /
Supervisor's signature

Detaillierte Begründungen und Bemerkungen auf der Rückseite
Use reverse for more detailed explanations and remarks