

# Guidelines for students in the Power Electronics & EMC group

*Version: September 2021*

The Power Electronics & EMC (PE) group contributes to various bachelor and master programs at the University of Twente, most notably by:

1. Teaching courses that are focused on in power electronics and electromagnetic compatibility
2. Offering assignments that are related either to our own research themes (in Power electronics and Electromagnetic compatibility) or to our contacts with the industry
3. Organizing the Electrical Engineering master specialization Power Electronics.

Starting an assignment goes with a lot of freedom in performing the research, but also with a number of guidelines and a structure in doing the assignment. These follow the general guidelines that are set by the education program in which the student is enrolled. For a detailed description of these general guidelines, we refer to the website, study manual and/or study advisor of the considered program.

In this document the specific rules, guidelines, and the structure of doing an assignment and/or master program specialization in the PE group are presented.

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## 1. First contact

If you are considering starting a M.Sc. specialization in the PE group, you should meet or contact person:

Dr.ir. Ray Hueting

Room: Carré 2613

Phone: + 31 53 489 2754

E-mail: [r.j.e.hueting@utwente.nl](mailto:r.j.e.hueting@utwente.nl)



You are very welcome to visit or contact him directly or make an appointment with him by contacting the group's secretary; see Section 3.1.

During the first meeting you have the opportunity to introduce yourself, and talk about your background, interests, and ambitions. Ray will then outline the activities of the group, clarify the general education rules and group policies (if needed). He will bring Possibly you in contact with other group members that can give you more information about a specific part that you might be interested in.

In the Power Electronics and EMC (PE) group we do research on the hardware, controls and EMC aspects of energy conversion systems, often in the context of challenging applications. Our research focuses on five principal areas with specialized contact persons:

1. **Battery Electronics:** Apply power electronics to integrate batteries in systems and extend the lifetime of the battery. Improve reliability by new packaging technologies and EMC immunity solutions.  
Contact person: dr. Prasanth Venugopal ([prasanth.venugopal@utwente.nl](mailto:prasanth.venugopal@utwente.nl))
2. **Electromagnetic Compatibility:** Modelling of conducted and radiated electromagnetic interference and power quality. Development of measurement and test techniques to achieve EMC from PCB up to system level.  
Contact person: prof. dr. ir. ing. Frank Leferink ([frank.leferink@utwente.nl](mailto:frank.leferink@utwente.nl))
3. **Energy Access:** The theme is small solar systems with battery storage to provide off-grid electric services to 3 billion people living in energy poverty. Sustainable socio-technical solutions are expected to be scalable, regionally relevant, holistic, and leverage 21st century technologies.  
Contact person: dr. Jelena Popovic ([j.popovic@utwente.nl](mailto:j.popovic@utwente.nl))
4. **Power Electronics Technology:** investigate power semiconductor devices and advanced packaging techniques. New bandgap semiconductor material, GaN and SiC makes it possible to smaller power supplies and high performance RF amplifiers.  
Contact person: dr. ir. Ray Hueting ([r.j.e.hueting@utwente.nl](mailto:r.j.e.hueting@utwente.nl))
5. **Power and Energy Measurement Systems:** accurate measurements of electrical power flow and energy efficiencies in electrical systems for reducing the carbon footprint. New concepts are applied to improve accuracy, explore fundamental limitations and devise calibration methods.  
Contact person: prof. dr. Gert Rietveld ([g.rietveld@utwente.nl](mailto:g.rietveld@utwente.nl))

If you are considering starting an assignment in the PE group, but are not sure where to start, you can also contact Tom Hartman:

ir. Tom Hartman

Room: Carré 2.538

Phone: +31 53 489 5750

E-mail: [tom.hartman@utwente.nl](mailto:tom.hartman@utwente.nl)



He will try to put you in contact with the proper staff for you to do the assignment you deem the most interesting! More information about assignments can already be found on:

<https://www.utwente.nl/en/eemcs/pe/2.education/student%20assignments/>

Where contact persons of specific assignments can already be found. It would still be functional to put Tom Hartman in the CC so he can get an overview of students that are doing assignments within our group.

## 2. M.Sc. program Power Electronics & EMC

Power Electronics is also the name of one of the specializations in the EE M.Sc. program. Doing that specialization implies that the M.Sc. thesis project has to be carried out with the PE group, and that the course program should contain at least these M.Sc. courses that are taught by the PE group:

1. 1A: Energy Conversion: People, Planet, Prosperity [5 EC]
2. 1B: Power Electronic Converters [5 EC]
3. 2A: Electromagnetic Compatibility [5 EC]
4. 2B: Power Electronic Systems [5 EC]

Two other mandatory courses are:

5. 1B: Perspectives on Engineering Design [2.5 EC]
6. 1B: Philosophy of Engineering: Ethics [2.5 EC]

And Elective courses are:

7. Electric Machines and Drives [5 EC]
8. Advanced Semiconductor Device Physics [5 EC]

Please note the mandatory 10 EC of courses in the second quartile.

Furthermore, the remaining part of the program is established in consultation with Ray Hueting.

Therefore, before starting with the M.Sc. program you should make an appointment with him, to discuss about your course program and planning. It is recommended to do this during the last half year of your bachelor program.

One of the staff members in the PE group will then become your M.Sc. mentor, with whom you can regularly discuss about your study planning, progress, and related issues.

This information can also be found here:

<https://www.utwente.nl/en/eemcs/pe/2.education/master%20courses/>

## 3. Housekeeping

### 3.1 Secretary

Once you have settled on doing an assignment or M.Sc. program in the PE group, the next step is to visit the secretary of the group:

Ms. Lilian Hannink

Room: Carré 2.605

Phone: +31 (0)53 489 3856

E-mail: [pe-eemcs@utwente.nl](mailto:pe-eemcs@utwente.nl)



You should provide her with your contact details and inform her about the type of assignment that you are doing in the group. She will then arrange a desk and computer in the student room for you.

During the assignment you contact her for various administrative matters such as:

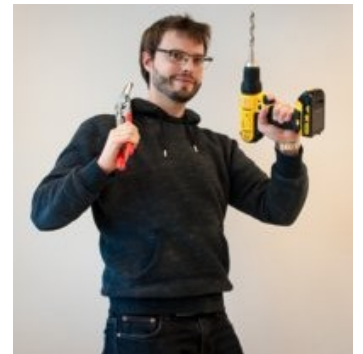
- making appointments with supervisors
- arranging access to the network printer
- scheduling presentations, booking rooms, and borrowing the group's projector
- circulating presentation announcements and other group e-mails
- website updates
- traveling arrangements
- financial declarations
- printing final thesis reports, posters, etc.
- absence and leave reporting (see Sections 3.2 and 4.2)
- keys (in case you need to work in the laboratory)
- building access outside opening hours (see Section 3.2)

### 3.2 Technician

Ir. Roelof Grootjans

Room: Carré. 2435

E-mail: [r.grootjans@utwente.nl](mailto:r.grootjans@utwente.nl)



If you want to do measurements in the lab you should discuss a measurement plan with your supervisor and provide the plan to the technician.

During the assignment you contact him for various technical matters such as:

- ordering components
- reserving a workplace and/or equipment in the laboratory
- technical support in experiments, PCB design, construction work, and ICT

### 3.3 Working hours

A regular progress of the work during the project requires that you will be present and active in the student room or lab within the normal working hours i.e., from 9:00 to 12:30h and from 13:30 to 17:30h. This is especially important when others depend on the results of your work. Please inform your daily supervisor and the secretary when you are absent for half a day or longer. Also see Section 4.2.

Outside the normal working hours (after 18:00h) you only have access to the building if you have a pass. Contact the secretary in case you need a pass.

When you leave a lab after 17:30 and you are the last one to leave, you must switch off all working equipment and switch off the lights. Also close the windows. Of course, do not switch off equipment which is labelled not be switched off.

For safety reasons, when you work on a real setup, other than a desktop computer, always at least two persons should be present. For larger equipment, additional safety measures may apply. Please discuss this with the technician.

### 3.4 PE Presentations

Once you have joined the group for an assignment or for the master specialization program, you are more than welcome to attend the PE Presentations. These include assignment presentations by

other students and Ph.D. defences, but also the regular monthly group presentation on Friday afternoon 16:00h followed by some drinks. The latter are usually given by a staff member or Ph.D. student, and have the aim to provide each other with an overview of the work in the group, to enhance scientific discussion and cooperation, and to get feedback.

Once you have registered with the secretary you will be informed about all these presentations by e-mail. As a rule, they are attended by all employees in the PE group. Students are strongly recommended to attend them as well. Also see Section 6.

## 4. Workflow and supervision process

### 4.1 Typical workflow during the project

The assignment can typically be divided in three parts of roughly equal length, as indicated in the table below.

Phase	#weeks	Core activities	Milestones
Start-up	BA/IP: 3 MA: 8	Reading Problem analysis Planning	Halfway: assignment description & rough planning End: detailed workplan
Core	BA/IP: 4.5 MA: 12	Analysis Design Simulation Measurement Report planning	Halfway: presentation (only for MA) End: report outline & writing plan
End	BA/IP: 3 MA: 8	Refinement, Report writing, Slides preparation, Wrap-up	1–2 weeks before end: report (& demo) End: presentation

### 4.2 Start-up phase of the project

At the start of the project the supervisor(s) and the student agree on the type of project, the global planning, etc. An appointment will be made for at least one progress meeting.

Based on the information provided by the supervisor in the first meeting, the student will read relevant literature in order to get a detailed understanding of the motivation, technical background, and goal of the assignment.

Before the first progress meeting the student will deliver a one-page written description of the assignment, clearly stating the motivation of the project and the goals that should be achieved. Also, a rough planning should be made. In case the assignment is not carried out full-time, this should include a list of courses that are attended, other side activities, and possible holiday leave. This is very important, because the project should be completed within the time that is prescribed by the guidelines of your education program. Therefore, it is of utmost importance that you inform your supervisors as soon as possible once there turn out to be unforeseen circumstances that may delay the completion of your project. Otherwise, such delay may influence your final grade. Illness should be reported to the secretary and daily supervisor.

The first progress meeting will then provide feedback on how well the given assignment is understood by the student. Once the supervisors have agreed on this description and rough planning, the assignment is settled. The assignment description form should then be filled out by the student, signed by the supervisors, and handed over to BOZ and to the secretary. She will publish it on the PE website.

In the second half of the start-up phase the student analyses the problem, identifies, and explores possible approaches and solutions, and extends the assignment description to a detailed workplan.

This workplan should summarize the results of the start-up phase and provide a detailed planning for the remainder of the assignment. It should not be more than six A4 pages.

### 4.3 Core phase of the project

The main research work is carried out in the core phase of the project, based on the workplan that was written in the start-up phase. This is where you perform more detailed theoretical analysis, design, simulations, and measurements.

Halfway through the master thesis project a group presentation will be given. The purpose of this presentation is two-fold. For the supervisors and other members of the PE group it gives an overview of the research that has been done so far and will be done in the remainder of the assignment. For the student it is a good way to receive feedback and possible new ideas (from people that are not directly involved in the project), and an opportunity to enhance their presentation skills. In order to be effective, the presentation should contain a brief description of the motivation and goal of the assignment, the results that have been obtained so far, and the remaining activities that are planned. Ideally the presentation should not contain more technical background information than is required for understanding these aspects, and it should provoke discussion. The presentation itself should last about 15 to 30 minutes, and there will be time for 15 to 30 minutes of discussion (both during and after the presentation). Contact the secretary and PE Presentation chairman for scheduling this presentation. Possibly discuss the presentation in advance with your daily supervisor.

At the end of the core phase, a rough outline of the thesis report (or paper) should be written (also see Section 5) and discussed in a supervisor meeting. This is done to assure that the report will be well structured (so no valuable time is lost by completely rewriting an ill-structured report), and moreover, it serves as a checklist to make sure that all the necessary research work has been done (i.e., enough material has been collected to “fill out” the sections in the report). Upon approval of this outline, the student should make a plan for writing, reviewing, and revising the chapters.

### 4.4 End phase

During this period, some last refinements in the project work can be done. In case of experimental work, a demonstration to the supervisors should be scheduled.

The report should be written according to the writing plan. Discussions about the report/paper are mainly done by the daily supervisor. The rest of the supervisors will read and comment on the report/paper only once or twice. Also see Section 5. Once approved by all supervisors, the final version of the thesis report/paper should be submitted to the secretary for printing, at least one week before the end of the project.

The final presentation marks the last day of the project. Also see Section 6. It is strongly recommended that the outline of the presentation is discussed with the daily supervisor one week in advance, and that the final presentation slides are discussed with the daily supervisor at least two days in advance. Possibly a rehearsal presentation is done with the daily supervisor and some colleague students.

### 4.5 Progress meetings and other supervisor communications

In general, you will have a regular contact with your daily supervisor.

Including the meetings already mentioned before, there should be meetings with all supervisors approximately once every three to four weeks. These meetings are scheduled either at the end of the previous meeting or upon initiative of the student. The student prepares for the meeting by writing a short progress report (not more than three A4 pages), which contains at least:

1. an overview of the goals that were set during the previous meeting

2. an overview of the goals that were achieved and possible problems that were faced after the previous meeting, and possibly some explicit questions about the assignment
3. an overview of the goals and planning for the next period

The progress report should be submitted to the supervisors at least two days before the meeting, so that they have sufficient time to read it.

It is the responsibility of the student to make sure that these meetings take place, and that sufficient progress is made. Nevertheless, it is important that you keep the communications lines with your supervisors open. Make sure that your up-to-date contact details are available at the secretariat, read and respond to e-mails that are sent to you, and report possible illness or leave to the daily supervisor and secretary. Also see Sections 3.2 and 4.2.

#### 4.6 Project completion

A project is only completed, and a grade will only be given when all requirements have been fulfilled:

- A complete and approved version of your thesis report/paper should be available in hardcopy and softcopy at the secretariat
- All written software code, collected literature and simulation/measurement data, word processor files, and the files of your presentation should be made available to your daily supervisor for archiving, organized in an appropriate directory structure, on a CD, USB stick, or network drive
- Your workplace in the student room (and possibly in the lab) has been tidied up
- All keys have been returned to the secretary.

Besides that, in case of a master thesis presentation, the student has to make sure that all the necessary paperwork with BOZ and the exam board has been arranged, in order to receive the degree certificate directly after the presentation. Also see Section 6 and the rules of your education program.

### 5. Reporting

Make an early start with producing concepts of the chapters of your thesis report. These concepts are discussed first with the daily supervisor. Once the daily supervisor agrees, the (chapters of the) report are discussed with all committee members. At this stage, the text should be free of spelling and grammar errors. Reading (parts of) a report takes time. Giving it to your supervisors one day before a meeting is therefore not acceptable. The final report must be completely ready (approved by the committee and complete with a cover) not later than one week before the oral presentation.

Before you start the actual writing, it is important to make an outline of the complete report, as indicated in Section 4.3. Make use of what you have learned in the course on technical writing. A detailed document (by Prof. Frank Leferink) on writing reports/papers are available on the PE website.

<https://www.utwente.nl/en/eemcs/pe/2.education/student%20assignments/manuals/guide.pdf>

All reports are written in English.

The report/paper originals become property of the PE group. As indicated in Section 4.6, you have to deliver these to the secretariat and your daily supervisor before completion of the project.

### 6. Presentations

Bachelor, master, and individual projects are completed by giving a presentation. Make sure that the written report is completed one week before and that the items listed in Section 4.6 are finished by the time of the presentation, so that the final grade can be given directly afterwards. In case you have finished all the other courses in your M.Sc. program, and the examination board has given a



conditional approval of your examination (see the examination rules of your program), you will then receive the degree certificate as well.

Another condition for doing the grading is to make sure that the supervisors are available on the day of the presentation. The secretary can help with that, as she has access to the agendas of all staff members. Also, she will help to book a suitable room for the presentation. (Make sure that the size of the room suits the number of people that you are expecting!) Typically, the main supervisor will make sure that the external examiner (the committee member from a research group other than PE) is available on that day.

Presentations are given in English, with PowerPoint (or a similar software package) and a projector. Giving a good presentation requires proper preparation. Not everyone is a talent by nature, but everyone can learn the basics of good presentations. Attend presentations by other students and by staff members and guests in the PE Presentations (see Section 3.4). This not only broadens your view on the area of PE and EMC, but also helps to get an impression of what is expected from you in your own project. Moreover, attending technical presentations and paying attention to what is good and not so good in these presentations is an easy and helpful way to develop your own presentation skills.

For shorter (bachelor and individual) projects the timeslot for a presentation is 20–30 minutes, followed by 10 minutes discussion. For master thesis projects the timeslot is 30–40 minutes, followed by 15 minutes discussion. Presentations must not be shorter or longer than the abovementioned timeslots, so limit the number of slides in your presentation.

The target audience of all presentations are the staff members and students in the PE group (possibly including those who are considering doing a project in the PE group). Although family members are welcome at these presentations, the content should not be at the level of a general or nontechnical audience. On the other hand, presentations should mainly focus on the headlines of the project and not go too much into detail. A presentation could globally follow the ordering of topics in the report. However, certain topics might be skipped or more briefly summarized than others if that improves the clearness of the presentation. Moreover, illustrations from the report are certainly not automatically suited for a presentation with a projector. Use lines of a proper width and omit unnecessary details, so that the illustrations can be read in the back of the lecture room (even when the beamer appears not to be as bright as anticipated).

Take care to talk loudly and clearly. This indicates that you are confident on what you are telling and that you believe that a good piece of work is being presented. Moreover, it will keep the audience awake. In case of experimental work, a demonstration could be given in the laboratory after the presentation.

As indicated in Section 4.4, it is strongly recommended that the presentation is discussed (and possibly rehearsed) in advance with the daily supervisor and some colleague students.

Keep in mind that the presentation is part of the project and hence considered for your final grade, and that therefore, it should be of a good technical content.

## 7. Finally...

As we indicated in the beginning of this document, doing an assignment comes with some rules and guidelines, but also with a lot of freedom, and hence fun! Despite the rather specific task that is formulated in most assignments, the guidelines that are set for carrying out this task, and the help that you get from your supervisors and others, the course of the assignment is mainly determined by what you make out of it.



If this document leaves questions that are not answered by the accompanying rules of your education program, please contact one of your supervisors or the study advisor of your education program.

Possible inaccuracies, ambiguities, gaps, or other flaws can be reported to the editor of this document:

Tom Hartman: [tom.hartman@utwente.nl](mailto:tom.hartman@utwente.nl)

Good luck with your assignment(s) and/or master program!

## 8. MSc in Electrical Engineering – Thesis Assessment (191211219)

<b>Student Name:</b>		
<b>Student Number:</b>		
<b>MSc Specialization:</b>		
<b>Research group(s) to which credits will be allocated:</b>		
<b>Confidential?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes	

Assessment Criteria	Grade and notes
<b>Scientific Quality (50%)</b> <ul style="list-style-type: none"> <li>• Interpret problem and translate it to more concrete research questions or design specifications.</li> <li>• Find and study relevant literature and HW/SW tools and critically assess their merits.</li> <li>• Work in a systematic way and document findings effectively.</li> <li>• Work in correspondence with the level of the elective courses.</li> <li>• Original work of sufficient depth, relevant to the chair.</li> </ul>	
<b>Organization, planning, collaboration (20%)</b> <ul style="list-style-type: none"> <li>• Work independently and goal oriented under the guidance of a supervisor.</li> <li>• Seek assistance if required and beneficial for the project.</li> <li>• Benefit from the guidance of your supervisor by scheduling regular meetings, providing progress reports and initiating topics to be discussed.</li> <li>• Organize work by making a project plan, executing it, adjusting it when necessary, handling unexpected developments and finish in time.</li> </ul>	
<b>Communication (30%)</b> <ul style="list-style-type: none"> <li>• Write a Master thesis that motivates the work in a context, communicates the work and its results in a clear, well-structured way to peers.</li> <li>• Give a MSc presentation with similar qualities than the thesis targeting both fellow-students and chair-members.</li> </ul>	
<b>Final Grade based on 50-20-30 % weighting:</b>	

<b>Committee members</b>	<b>Name</b>	<b>Signature</b>
<b>1. Chair</b>		
<b>2. Second examiner</b>		

**Date of the examination:**

### **Scientific Quality (50%)**

- 4: there are errors or omissions that could have easily been prevented by using standard theory at the level of (elective) master courses.
- 5: there are errors or omissions that could have been prevented by using standard theory at the level of the (elective) master courses.
- 6: work has been done at the level of the elective courses, but this has not led to new insights.
- 7: work has been done at the level of the elective courses, and this has had a clarifying effect in the area of the assignment.
- 8: work has been done at the level of the elective courses, and new insights have been gained that are useful in the chair's current research. Maybe (in time) publishable.
- 9: theoretical treatment goes beyond the level of the elective courses, and the result is very useful for research in the chair and can (eventually) be used for a non-trivial publication.
- 10: Brilliant results. The beginning of a new research theme in the chair.

### **Organization, planning, collaboration (20%)**

- 4: The supervisors have tried to give guidance to the process, but this has apparently been ignored by the student.
- 5: The supervisors have tried to give guidance to the process, but the student has not picked this up.
- 6: Significant guidance has been necessary, and the supervisors have had to raise these issues before action was taken.
- 7: Guidance has been necessary, but this has been sought by the student.
- 8: The student showed a lot of initiative, was able to adjust his/her own schedule and figured out most practical issues by him/herself.
- 9: The assignment and planning were defined by the student and the project was executed according to the planning.
- 10: The assignment was initiated, defined and planned by the student. The project was executed according to the planning and unexpected events did not lead to delays. The candidate contributed to the work of other students as well..

### **Communication (30%)**

- 4: The report was essentially written by the supervisors. The supervisors did not recognize the work in the presentation. In some cases questions were not understood, even after reformulation and wrong answers were given.
- 5: Several report versions have been necessary. The final version is not coherent and contains serious spelling and grammatical errors. Presentation was badly structured. Some of the answers during the Q&A session were incorrect.
- 6: Several versions of the report have been necessary to arrive at an acceptable result. The structure needs some improvements but the quality of the content is sufficient. The presentation made sense to the supervisors, but others had a hard time following it. Most of the questions were answered correctly but some were not addressed appropriately.
- 7: The structure of the report was determined in consultancy with the supervisors and limited advice concerning readability was given. The presentation was a valid representation of the work. Some answers during the Q&A session could have been answered in a better way.
- 8: The structure of the report was mainly determined by the student. Some changes were required in formulations, charts, etc. The presentation was enjoyable for both experts and others. Questions were answered well in almost all cases.
- 9: The structure of the report was completely determined by the student and only marginal corrections concerning readability were needed. The presentation gave new insights to both experts and non-experts. In the Q&A session, the questions were answered well.
- 10: report was made essentially without relevant feedback by the supervisors. The presentation was given with great style, clarity and effectiveness. The Q&A session convincingly showed that the student masters the subject matter with strong argumentations.