

## **TU/e Procedure 2<sup>nd</sup> year SENSE students 2022-2023 (cohort 2021, 1<sup>st</sup> year KTH, Stockholm)**

SENSE is a MSc. programme aiming for “Smart Electrical Networks and Systems”. This programme is part of the EIT (European Institute of Innovation and Technology) KIC (Knowledge & Information Community) InnoEnergy programme. It aims for (<http://www.kic-innoenergy.com/education/master-school/msc-sense-smart-electrical-networks-and-systems/>):

- MSc SENSE develops student skills in electrical power engineering, innovation processes and entrepreneurship in the emerging field of Smart Grids. Its industry involvement gives students a broad industrial network plus the ability to combine engineering and entrepreneurship and develop their ability to analyse possibilities and risks from both a technical and business perspective.
- MSc SENSE focuses on understanding, modelling and analysing the principles behind electric power generation, transmission, distribution and utilisation on a broad scale. Topics range from the design, operation, control and monitoring of individual components to national power systems in their entirety.
- MSc SENSE focuses strongly on entrepreneurship and creating businesses from innovations. As well as activities integrated in ‘Smart electrical networks and systems’, other events such as study visits and seminars are also provided. The programme is based on strong interaction with its industrial and research partners, who can be found all over Europe and throughout the world.

The SENSE master programme is divided in a first year at KTH, Stockholm and a second year at one of other participating universities. This document describes the educational programme for the SENSE 2<sup>nd</sup> year at the Electrical Energy Systems (EES) group of the Electrical Engineering (EE) department at the Eindhoven University of Technology (TU/e).

### **Master’s programme 2<sup>nd</sup> year SENSE at TU/e**

The educational programme consists of two parts, namely electives and a graduation project – totalling 60 ECTS (1 ECTS = 28 hours of workload). The electives aim to deepen the knowledge needed for the graduation project. Course preferences are discussed with the SENSE programme coordinator at the TU/e (dr. V. Cuk), also in view of timing since electives are given throughout the one year that SENSE students reside at TU/e.

### **Electives (15 ECTS)**

Basically, the same courses as for “regular” Electrical Engineering students are available as electives, with the restriction that the focus is on “Smart Electrical Networks and Systems” as a part of specialisation. The provisional list given in Table 1 is a preferential list with courses which fit within the KIC InnoEnergy – SENSE programme. Also a few courses which are a bit more distant from smart grid related topics are included, but they may be of interest for some specialisations. They are offered as a choice of maximum one out of two/three. Other courses outside the list can be taken instead, if convincingly motivated to be relevant for a student’s desired specialisation, and approved by the TU/e program coordinator.

Note, that courses should be selected that do not overlap with the content of courses from the 1<sup>st</sup> year at KTH. This may eliminate a few options from Table 1.

**Table 1:** Overview of elective courses for 2<sup>nd</sup> year SENSE programme at TU/e

code	credits	quarter	description
5LECO	5	Q1	Underground Power Cables
5LELO	5	Q1	Power Quality Phenomena
5CPAO	5	Q1	Numerical Methods for Electrical Engineers
2DME20			Non-linear Optimization
7LY3M0	5	Q1	Building Performance and Energy Systems Simulation
5LWE0			Control of rotating field machines
5LEBO	2.5	Q1,2,3,4	Environment and Power Engineering
5SVA0	5	Q2	High-Voltage Technology
5SEDO	2.5	Q2	Electrical energy systems in transition
5SWA0	5	Q2	Rotary permanent magnet machines
1ZM20	5	Q2	Technology Entrepreneurship
5SEE0	2.5	Q2	Planning and Operation of Power Systems
5SVB0	5	Q3	Electromagnetic Compatibility
5LEA0	2.5	Q3	Protection and Automation of Distribution Networks
5LEGO	5	Q3	Pulsed Power Technology
5SWB0	5	Q3	Advanced Power Electronics
5SEFO	5	Q3	Smart grids, ICT and electricity market
5LEMO	5	Q4	Dynamic control of power conversion in renewable energy systems
5LENO	2.5	Q4	Power system stability and dynamics

The scheduling of the courses is also shown in Table 1. Most courses are 5 ECTS. A few courses are 2.5 ECTS and for 5LEGO the theoretical part can be taken as a separate submodule of 2.5 ECTS. This allows to attend a wider range of topics, while still remaining within the 15 ECTS budget.

The students should register both to enrol the courses and to take the exams via the OSIRIS system (both actions have a deadline per quarter, indicated on the OSIRIS course information). Furthermore, this academic year 2022-2023, the administrative costs arrangement also applies for master students, i.e. after the deadline for registration, master students have to pay 20 euro per course to be registered for that course under specific conditions. See the OER articles 3.7 and 3.8 for more details. Here, you can find more information about enrolling for courses and examinations and the deadlines: <https://educationguide.tue.nl/studying/planning/enrolling-courses-and-examinations/>

### Graduation project (45 ECTS)

The graduation project is either proposed by the student or suggested from the available options from the Master Marketplace (<https://master.ele.tue.nl/>). It can be external at a company or internal at the university. In either case, supervision from the TU/e is required. Except for the duration of the graduation project, all requirements posed on “regular EE students” apply. This includes the requirement on formal procedures, on the reporting and on the panel that grades the graduation work.

The topic of the graduation project needs to comply with the program of SENSE. If the topic of the graduation project is not defined by the EES group, or lies outside the scope of the research that is carried out in the EES group, then the graduation project needs to be approved by the TU/e coordinator of the SENSE program. Upon approval, the coordinator can delegate the supervision to another capacity group within the Department of Electrical Engineering (but not in other departments). Capacity groups have the right to refuse the coaching of projects of SENSE students if the student has a curriculum or transcript that is viewed incompatible or inadequate to carry out the graduation project.

After agreement on the topic, place and supervision, a graduation registration form needs to be filled (<https://educationguide.tue.nl/programs/graduate-school/masters-programs/electrical-engineering/curriculum/graduation-project/graduation-project-ee-registration-form/?L=2>). A student is allowed to start his/her graduation if a maximum of two electives remain – this includes the first-year courses at KTH as well. This contract defines the starting date for the graduation project, mid-term evaluation, and expected graduation date. The starting date should ideally be at the beginning of Q2.

Approximately 11 weeks after the start of the project, a graduation panel should be formed, and a mid-term presentation should be organized, to obtain feedback of the whole panel for the remainder of the project. The panel is composed by the examination rules of the Electrical Engineering faculty, and should consist of:

- the graduation professor (needs to be a full professor), as the chair of the committee
- a supervisor (an assistant professor, associate professor or a full professor) from the EES group
- a KTH delegate as it is a dual-degree MSc program
- additional advisors are optional, e.g. company supervisor(s) and/or PhD student supervisor

The final product is a graduation paper, in line with the IEEE publications format with a length between 8 and 12 pages. More details on paper requirements can be found at:

<https://educationguide.tue.nl/programs/graduate-school/masters-programs/electrical-engineering/curriculum/graduation-project/?L=2>

The project and the paper are judged by a panel. The paper should be delivered to the panel at least one week prior to the presentation date.

After finalisation of the graduation work and paper, the panel meets with the student, giving him/her the opportunity to present and defend the graduation work. At the end of the meeting the grade is determined by the voting members of the graduation panel. The standard EE requirements and grading sheet are used for evaluation. The graduation defences are organized in sessions of one or two days to allow for the presence, preferably in person, of the KTH panel delegate. Note, that SENSE candidates, according to TU/e registration regulations, need to finalize all obligations related to their master study before September 1.

The presentation date should be done at least 10 working days before the examination committee meeting date. A list of examination committee meetings and graduation dates is available at:

<https://educationguide.tue.nl/programs/graduate-school/masters-programs/electrical-engineering/graduation-deadlines/?L=2>

Registration for a graduation date is done via the OSIRIS system, first by selecting the examination date and then also later by making a “qualification request” (via the Progress of the graduation), with deadlines indicated on OSIRIS.

The closing date for registration for the final examination is about four weeks before the date the examination committee meets. In this meeting the student is discussed, and it is checked whether all Master obligations (including those from KTH in the 1<sup>st</sup> year) have been fulfilled. It is also decided, whether a cum laude (with distinction) applies. This requires at least 9.0 for graduation project, unweighted average of at least 8.0 over all courses and assignments (including those obtained at KTH) and no grade below 6.0.

## Timeline 2022-2023, TU/e

**September 2022:** Intake students by STU; meeting with SENSE coordinator EES-group on proposal electives and planning 2<sup>nd</sup> year: 15 ECTS electives; 45 ECTS graduation. Typical planning (slight modifications can be considered when taking electives in Q3 and Q4):

- Quarter 1 (Sep-Nov): 15 ECTS or 10 ECTS electives + searching for a graduation project
- Quarter 2,3 and 4 (November-July): 45 ECTS graduation project and finalizing any courses

**October/November 2022:** Update information on individual status regarding electives and chosen graduation project topics

**February/March 2023:** Update information remaining electives / graduation project & contract

**April/May 2023** Mid-Term presentation of the graduation work to the graduation panel/selection of the panel members (different from the SENSE MEET event)

**May/June 2023** Presentation status graduation at KTH;

**July/August 2023** Final defence at TU/e and decision exam committee

**September/October 2023:** Graduation ceremony