



PhD position in Power Electronics - “Design of high-performance digitally-adaptive gate drivers for high-voltage SiC power semiconductor switches”

About the position

The Department of Electric Power Engineering (IEL) has a vacancy for a 100% position as a PhD candidate within the field of Power Electronics - “Design of high-performance digitally-adaptive gate drivers for high-voltage SiC power semiconductor switches.”

The PhD candidate will work in a 10 MNOK research project entitled “Adaptive Silicon Carbide Electrical Energy Conversion Technologies for Medium Voltage Direct Current Grids (ASiCC)”, which is funded under FRIPRO-program (Young Research Talents) by the Research Council of Norway.

The prospective candidate will work in the research group Power Electronic Systems and Components (PESC), <https://www.ntnu.edu/iel/groups/pesc#/view/about>.

The main supervisor of the PhD candidate will be Associate Professor Dimosthenis Pefitsis, <https://www.ntnu.edu/employees/dimosthp>.

The position reports to the Head of department.

Main duties and responsibilities

The ever-increasing penetration of renewable energy sources along with the plethora of digital data available in the future smart grids, necessitate the design of adaptive power electronic converters enabling optimal operation under load and source variations. The ASiCC research project aims at developing the next generation adaptive power electronic converter designs employing Silicon Carbide (SiC) power semiconductor devices for medium-voltage direct current (MVDC) distribution grids. In particular, ASiCC will deliver holistic designs of adaptive power electronic converters that will be able to continuously reach their most optimal operation under the very stochastic variations of renewable energy sources and utility-scale battery storage systems, as well as, variations of distributed loads.

The project team of ASiCC will investigate the influence of electric power grid and distributed energy sources and loads operating conditions on the design and operation of medium-voltage SiC-based power electronic converters. In addition to this, adaptive gate driver designs for shaping the switching and conduction performance of high-voltage SiC power semiconductor switches will be designed.

The PhD candidate will design and build digitally adaptive gate drivers for high-voltage SiC power semiconductor switches (e.g. SiC MOSFETs). The developed digitally adaptive gate drivers will be able to receive digital data from the converter and the MVDC grid, prioritize them based on their impact on electrical, thermal and reliable operation of the converter and properly adapt the switching and conducting operations of the semiconductors for reaching optimal system performance. Theoretical and experimental investigations of the digitally adaptive gate drivers will be carried out for various types and voltage-class SiC semiconductors and under various operating conditions.

The PhD candidate will cooperate closely with the team members of ASiCC project. Within ASiCC project, the PhD candidate will have the opportunity for 3-month research stays at three European universities, namely KTH Stockholm, DTU Denmark and Aalborg University.

Prototyping and experimental validation of the developed power electronic converters will be carried out in the Power Electronics Laboratory at the Department. The laboratory is equipped with advanced high-frequency and high-accuracy measurement instruments (e.g. high-bandwidth oscilloscopes and impedance analysers), high-power and medium-voltage variable electric power sources and electronic loads, as well as, power semiconductor modules testing (e.g. power cycling testers and I-V curve tracer) and building facilities (i.e. die-attaching and bond-wiring equipment).

Qualification requirements

The qualification requirement is completion of a Master’s degree with strong academic background with a grade of B or better in terms of NTNU’s grading scale. Applicants must hold a Master’s degree or equivalent in Electrical Engineering with specialization in power electronics. Applicants with laboratory experience in power electronics (design of power electronic converters prototypes, programming of FPGAs and DSPs etc.) will be given preference.

The appointment is to be made in accordance with the regulations in force concerning State Employees and Civil Servants Civil Servants, and national guidelines for appointment to PhD, postdoctor and research assistant positions.

NTNU is committed to following evaluation criteria for research quality according to [The San Francisco Declaration on Research Assessment - DORA](#).

Other qualifications:

Applicants must have very good English language skills, written and spoken. Applicants from non-English speaking countries outside EU/EEA/Switzerland must provide preliminary documentation of English language proficiency, in terms of an approved test. The following tests can be used: TOEFL, IELTS and Cambridge Certificate in Advanced English (CAE) or Cambridge Certificate of Proficiency in English.

Further assessment of both written and oral English language skills and the ability to communicate fluently may be conducted in the continued selection process and during any interview for all applicants, including those providing the required documentation of English proficiency.

Personal characteristics

In the evaluation of the candidates, emphasis will be placed on education, experience and personal suitability, as well as personal motivation for the position, in terms of the qualification requirements specified above.

We offer

- exciting and stimulating tasks in a strong international academic environment
- an open and [inclusive work environment](#) with dedicated colleagues
- favourable terms in the [Norwegian Public Service Pension Fund](#)

Salary and conditions

PhD candidate:

PhD candidates are remunerated in code 1017, and are normally remunerated at gross from NOK 479 600 per year. From the salary, 2% is deducted as a contribution to the Norwegian Public Service Pension Fund.

The employment contract is for three years; however, there is a possibility for extension up to four years if selected for assistantship. Appointment to a PhD position requires admission to the PhD programme in Electric Power Engineering. Applicants must be qualified for admission as PhD candidates at NTNU. See <https://www.ntnu.edu/ie/research/phd> for information about PhD studies at NTNU.

As a PhD candidate, you will have to successfully complete the PhD academic training programme; the training includes mandatory course work and other obligatory activities. Within the first three months of your employment, you must formally qualify for admission to the PhD programme at the Faculty of Information Technology and Electrical Engineering.

General information

A good work environment is characterized by diversity. We encourage qualified candidates to apply, regardless of their gender, functional capacity or cultural background. Under the Freedom of Information Act (offentleglova), information about the applicant may be made public even if the applicant has requested not to have their name entered on the list of applicants.

Questions about the position can be directed to Associate Professor Dimosthenis Pefitsis dimosthenis.pefitsis@ntnu.no or to Head of Department Prof. Ole-Morten Midtgård ole-morten.midtgard@ntnu.no.

About the application:

Applications are to be submitted electronically through this page (<http://www.jobbnorge.no>).

The application must contain:

- A cover letter where the applicant describes his/her personal motivation and how he/she intends to fill the position.
- Curriculum vitae (CV) which includes information about the candidate's prior education, work experience, academic merits and any scientific publications.
- Certified copies of academic diplomas and certificates.
- Applicants from universities outside Norway are kindly requested to send a diploma supplement or a similar document, which describes in detail the study programme and grading system.
- Names and contact information of at least two references.

Incomplete applications will not be taken into consideration.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants, and the acts relating to Control of the Export of Strategic Goods, Services and Technology. Candidates who by assessment of the application and attachment are seen to conflict with the criteria in the latter law will be prohibited from recruitment to NTNU.

The Department of Electric Power Engineering works closely with key players in the Norwegian electricity supply sector, who manage critical infrastructure. A comprehensive risk assessment of the candidates' research interests and potential activities related to national threat assessments will therefore also form basis for the final selection of candidates.

In the final assessment of the candidates, strategic considerations at the Department of Electric Power Engineering will also be taken into account.

Application deadline: August 31, 2019

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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Electric Power Engineering

Our department is Norway's leading in the field, and our vision is to be at the centre of the digital, green shift. We have excellent collaboration with business and industry as well as other universities and research organizations internationally. This gives us outstanding opportunities for interdisciplinary research with high relevance for the society, addressing industrial needs and global challenges. The [Department of Electric Power Engineering](#) is one of the seven departments at the [Faculty of Information Technology and Electrical Engineering](#).

Jobbnorge-ID: 173018, Søknadsfrist: Søknadsfristen er gått ut