Karlsruher Institut für Technologie

Internationales
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KIT School of Energy

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MINTernship-Programm

Stipendien für Forschungsaufenthalte an der University of North Carolina at Charlotte (UNCC)

Das MINTernship-Programm des KIT wurde initiiert, um den Austausch von Studierenden mit strategischen Partnern zu fördern. Für 2021 besteht erneut die Möglichkeit, am *Energy Production & Infrastructure Center* (EPIC) der *University of North Carolina at Charlotte* (UNCC) einen stipendienfinanzierten Forschungsaufenthalt zu absolvieren. **Der sechsmonatige Aufenthalt beginnt planmäßig am 1. April 2021.**

Das Stipendium

Das Programm bietet nicht nur eine individuelle fachliche Betreuung im Forschungsprojekt, viele neue Erfahrungen und internationale Kontakte, sondern auch…

- ein ca. 3,5-stündiges **Vorbereitungsseminar am 21. Januar 2021 um 16:00 Uhr**.
- die Teilnahme am **Begleitprogramm der UNCC**.
- eine **monatliche Stipendienrate von USD 1.700** für die Dauer des Aufenthalts und eine **einmalige Reisekostenpauschale von € 1.300** (Flug, Transfers, Visum, Visumbeschaffung etc.).

Die Anforderungen

- Sie sind am KIT immatrikuliert und haben vor Praktikumsbeginn mindestens vier Semester studiert.
- Sie studieren Maschinenbau*, Wirtschaftsingenieurwesen, Energie-*, Elektro- und Informationstechnik, Bauingenieurwesen, Bio- oder Chemieingenieurwesen und Verfahrenstechnik mit deutlichem Bezug zur Energieforschung.
- Sie bringen die **Bereitschaft** mit, **das Praktikum (teil-)virtuell durchzuführen**
- Sie sind offen, kommunikativ und beherrschen die englische Sprache auf gutem Niveau.
- Sie werden nach Ihrer Rückkehr aus den USA an einem **verpflichtenden Feedback-Seminar** teilnehmen, das im **Oktober 2021** stattfinden wird.
- Sie werden einen zweiseitigen **Erfahrungsbericht** über den Aufenthalt bis zum **30. November 2021** einreichen.

*Mit Ausnahme des Fachbereichs Maschinenbau (sowie der Energietechnik) wird das Forschungspraktikum als Pflichtpraktikum anerkannt.

Der Bewerbungsprozess

Folgende Bewerbungsunterlagen werden **auf Englisch** benötigt:

- CV (bitte Aktivitäten außerhalb des Studiums und gesellschaftliches Engagement angeben)
- Studienbescheinigung
- Notenspiegel
- Motivationsschreiben mit folgenden Informationen (nicht mehr als eine DIN-A4 Seite): Warum möchten Sie ein Praktikum an der UNCC machen? Welche Stärken und Fähigkeiten bringen Sie mit? Welche der aufgelisteten Forschungsprojekte am EPIC interessieren Sie (bitte 3 Projekte angeben, siehe nächste Seiten)? Was erwarten Sie vom Forschungspraktikum?
- Nachweis über Sprachkenntnisse in Englisch (EFSET Zertifikat; kostenlos erhältlich unter www.efset.org/en)
- Unterschriebene Einwilligungserklärung (am Ende dieser Ausschreibung) über Weitergabe der personenbezogenen Daten an den Mittelgeber (auf Deutsch).

HINWEIS: Die Projektbeschreibungen der folgenden Seiten geben den aktuellen Stand wieder. Änderungen sind möglich.

Bitte reichen Sie Ihre Bewerbungsunterlagen zusammengefasst **in einem PDF-Dokument auf Englisch** bis zum **22. November 2020** unter minternship@intl.kit.edu ein. Sie werden spätestens am 19. Dezember 2020 über das Ergebnis des Bewerbungsverfahrens informiert. Fragen zum Programm richten Sie bitte an minternship@intl.kit.edu. Die Ausschreibung finden Sie unter www.intl.kit.edu/ostudent/9136.php.

Mit freundlicher Unterstützung folgender Institutionen:

RFS Reinhard Frank-Stiftung

UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE of ENGINEERING
ENERGY PRODUCTION AND INFRASTRUCTURE CENTER (EPIC)

UNC CHARLOTTE

Energy Production and Infrastructure Center

MINTernship Program

Transatlantic Energy Research Experience (TE-REx)

Projects available at UNC Charlotte

April - September 2021

Contact

Christina Kopitopoulou
Energy Production & Infrastructure Center (EPIC)
Christina.K@uncc.edu
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Contents

1. Project Title: Evaluation of Synchronous Condenser capabilities	
Energy Field Research Interest	Power System
Abstract of the project	This is a continuation of a 2019 project. The past project's scope was to develop models of synchronous condensers with data from the real device to be used for stability study. Two type of models were developed, a) one for dynamic studies, and b) other for transient studies. These models were then integrated to power grid models developed for stability analysis. Further small signal stability assessment of synchronous condenser integrated power grid were studied. The goal was to evaluate the potential of synchronous condensers to improve the dynamic and transient stability of the power grid. In this work, the capability of synchronous condenser for improving the grid and the analysis of the condenser parameters is tested. The models are developed and evaluated using the dynamic simulation software and assessed for various test conditions.
Tasks	Developing grid and condenser models and assessing the performance
Requirements	Knowledge in power and energy system modeling.
Language Skills	English proficiency
Software Skills	Matlab, PSCAD, Simulink, DSPACE, PSSE
Other skills	Knowledge on control and power electronics
Duration of the project	up to six months (April – October)
Type of research project	Renewable Energy Devices and Integration
Responsible Professor	Sukumar Kamalasadan
Supervisor/Mentor of the project	Sukumar Kamalasadan
Supervisor`s Telephone Number	7043057016

Supervisor`s Email	skamalas@uncc.edu
Faculty, Institute or Company Name	University of North Carolina at Charlotte

2. Project Title: Planning an Affordable, Resilient, and Sustainable Grid in North Carolina	
Energy Field Research Interest	Energy Storage and Energy Distribution; Power System Resiliency
Abstract of the project	The goal of the project is to focus on metrics for resiliency that would help to guide investments in grid modernization. These metrics will focus on the social and economic impact of power outages. Work will focus on examining the impacts of major storms in the North Carolina region, with a focus on also examining how such metrics can be generalized to different regions.
Tasks	Literature survey; power system simulations; smart grid technology assessment; resiliency assessment and improvement.
Requirements	B.S degree in Electrical Engineering with concentration in power and energy; some travel to relevant meetings may be required for project
Language Skills	English
Software Skills	Matlab, python, power analysis software
Other skills	Good communication skills
Duration of the project	up to six months (April – October)
Type of research project	Engineering study related to the power industry
Responsible Professor	Dr. Robert Cox
Supervisor/Mentor of the project	Drs. Cox and Chowdhury and their doctoral students
Supervisor`s Telephone Number	704-687-8402
Supervisor`s Email	Robert.cox@uncc.edu
Faculty, Institute or Company Name	UNC-Charlotte

3. Project Title: Demand side management of grid-connected residential PV systems

Energy Field Research Interest	Efficient Energy Use & Energy Storage and Energy Distribution
Abstract of the project	With the decreasing cost of photovoltaics (PV) and rising concerns on environmental problems caused by fossil fuel use, solar PV has been the fastest growing distributed power generation technology. However, the intermittent nature of solar energy and the dynamic electric loads make it a challenge to match PV power generation and residential loads. The common approach of exporting surplus PV power to the grid and importing deficit power from the grid may not be economically favorable to house owners, and also for the power grid operation. Therefore, active demand side management and distributed electrical storage are prevalent strategies that can contribute to the maximization of self-consumption and economic benefits to house owners. This project intends to focus on the active demand side management, especially on the air-conditioning (AC) loads. Based on the predicted PV power generation and AC loads, power management can be optimized to maximize self-consumption and economic benefits to the house owners without sacrificing occupants' comfort. The scenarios with and without battery storage will be investigated. The prediction uncertainty will be considered in the optimization strategy.
Tasks	• Literature review • Estimation of the residential heating and cooling loads • Development of the demand-side management control algorithm • Implementation of the optimization model and simulation • Document research findings.
Requirements	Must have B.S. Degree in Engineering

Language Skills	Good oral and writting communication skills in English.
Software Skills	Proficient in Matlab
Other skills	Optimization and thermal resistance-capacitance modeling (preferred)
Duration of the project	up to six months (April – October)
Type of research project	Modeling, simulation and optimization
Responsible Professor	Dr. Nenad Sarunac and Dr. Weimin Wang
Supervisor/Mentor of the project	Dr. Nenad Sarunac and Dr. Weimin Wang
Supervisor`s Telephone Number	
Supervisor`s Email	nsarunac@uncc.edu; weimin.wang@uncc.edu
Faculty, Institute or Company Name	University of North Carolina - Charlotte

4. Project Title: Arc Fault Detection using Artificial Intelligence (AI)	
Energy Field Research Interest	Power Conversion and Power Electronics
Abstract of the project	With the rise of electricity usage, the number of electrical equipment is also increasing rapidly and causing a major concern about the electric safety. Series AC arc is one of the most threatening reasons that can compromise the electric safety. It causes fire and results in a lot of property damage along with personnel damage. Although conventional arc fault circuit interrupter can detect arc faults but their accuracy ranges from 50-60%. The recent development of artificial intelligence provides new ideas for arc fault detection with high accuracy. This project will focus on developing an artificial intelligence-based algorithm to detect series arc fault as well as identify type of the faulty load. The algorithm will be trained and tested using real load currents and will be embedded in edge computing devices for practical applications.
Tasks	• Literature review on series ac arc fault detection algorithms • Developing AI based arc fault detection algorithm • Training the AI algorithm with real data • Fine tuning the hyper-parameters for performance boosting • Testing the algorithm with real data • Embedding the algorithm in edge computing hardware for real-time testing • Summarize the findings in a presentation and an IEEE format paper
Requirements	M.S. student in electrical engineering or computer engineering; familiarity with Artificial Intelligence (AI), principles of power electronics and power distribution.
Language Skills	Strong oral and written communication skills.
Software Skills	AI programming
Other skills	
Duration of the project	up to six months (April – October)

Type of research project	Project for Electrical Engineering Department Student.
Responsible Professor	Tiefu Zhao
Supervisor/Mentor of the project	Tiefu Zhao (UNCC supervisor) Peter Luessen (industry advisor from LS Energy Solutions)
Supervisor`s Telephone Number	704-687-0939
Supervisor`s Email	Tiefu.Zhao@uncc.edu
Faculty, Institute or Company Name	Tiefu Zhao Assistant Professor, Department of Electrical and Computer Engineering Associate, Energy Production and Infrastructure Center (EPIC) University of North Carolina at Charlotte EPIC 1160, 8700 Phillips Rd, Charlotte, NC 28223 Tel: 704-687-0939 Email: Tiefu.Zhao@uncc.edu

5. Project Title: Impacts of Integrating Residential Solar Energy on Utility Costs and Prices: A Tale of Two Countries

Energy Field Research Interest	Energy Markets and Analytics
Abstract of the project	In this project, we compare the economic performance of US and Germany electricity systems depending on PV and possibly residential stationary battery storage (SBS) and electric vehicles. We consider differences in German and US price alternatives as well as alternatives for allocating grid costs for grid integrating residential solar PV, possibly considering with and without SBS and EV. We will consider additional prices including net metering, net purchasing (differs from net metering in that unlike net metering, feed-in generation need not be paid the retail rate), and gross metering/Buy All Sell All (where households supply all solar generation to the utility, so self-consumption is not allowed and so there is no incentive to have battery storage). This could help the utility studied by incorporating battery storage and considering pricing and cost allocation for a range of prices beyond what US utilities use.
Tasks	1. Compare the parameter values for the U.S. and Germany in the GAMS model representing household optimization with neiher PV nor SBS, with PV only, and with both PV and SBS. 2. Review the German and US solar energy price alternatives 3. Compare the various pricing alternatives 4. Perform case studies
Requirements	Must have B.S degree in Engineering or related field. Background in energy economics is a plus.
Language Skills	English
Software Skills	Matlab, Python
Other skills	Good communication skills
Duration of the project	Up to six months (April – September)
Type of research project	Engineering/economics/market study related to the power industry

Responsible Professors	Dr. Peter Schwarz; Dr. Badrul Chowdhury (UNCC); Dr. Wolf Fichtner (KIT)
Supervisor/Mentor of the project	Dr. Badrul Chowdhury
Supervisor`s Telephone Number	704-687-1960
Supervisor`s Email	bchowdhu@uncc.edu
Faculty, Institute or Company Name	UNC Charlotte

Energy Field Research Interests:

1. Power Conversion and Power Electronics
2. Renewable Energy Devices and Integration
3. Energy Storage and Energy Distribution
4. Efficient Energy Use
5. Fusion Technology
6. Nuclear Energy and Safety
7. Energy Markets and Analytics

Informationen zum Datenschutz und Einwilligungserklärung

Folgende personenbezogenen Daten werden vom KIT zum Zwecke der Stipendienvergabe erhoben: Ihre Kontaktdaten, die Lebenslaufdaten sowie Qualifikationsnachweise (die Bewerbungsunterlagen) und Ihre Bankverbindungsdaten. Diese Daten werden vom KIT im Rahmen der geltenden datenschutzrechtlichen Bestimmungen verarbeitet, soweit und solange dies für den Zweck der Abwicklung der Stipendienvergabe erforderlich ist.

Ich erkläre hiermit bis auf Widerruf mein Einverständnis damit, dass an den Mittelgeber, die Reinhard Frank-Stiftung, Mönckebergstr. 11, 20095 Hamburg die von mir eingereichten Bewerbungsunterlagen durch das KIT weitergegeben werden. Des Weiteren erkläre ich mein Einverständnis, dass meine Unterlagen an Energy Production & Infrastructure Center (EPIC) der University of North Carolina at Charlotte weitergegeben werden, damit vor Ort ein Praktikumsplatz angeboten werden kann, der meinen Qualifikationen entspricht.

Diese Einwilligung kann bis zur Weitergabe der Daten jederzeit dem KIT gegenüber widerrufen werden.

Nach bereits erfolgter Weitergabe an die Reinhard Frank-Stiftung bzw. an EPIC sind entsprechende Ansprüche - z.B. auf Löschung der Daten bei der Reinhard Frank-Stiftung bzw. beim EPIC - direkt an die Reinhard Frank-Stiftung bzw. an EPIC zu richten.
Die Einwilligung ist freiwillig. Aus der Verweigerung der Einwilligung oder ihrem Widerruf entstehen keine Nachteile, insbesondere nicht hinsichtlich der Vergabe und Bewilligung von Stipendien.

Vorname	**Name**
Ort, Datum	**Unterschrift**