Karlsruher Institut für Technologie

Internationales
International Students Office

Adenauerring 2
76131 Karlsruhe
www.intl.kit.edu

KIT-Zentrum Energie
KIT School of Energy

Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen
www.energie.kit.edu

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 2020 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 am 1. April 2020.**

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 für den Aufenthalt in den USA am **22. Januar 2020 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, Visa, Visabeschaffung 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 sind offen, kommunikativ und beherrschen die englische Sprache auf gutem Niveau.
- Sie werden nach Rückkehr aus den USA an einem verpflichtenden Feedback-Seminar teilnehmen, das am **21. Oktober 2020** von ca. 19:00 Uhr bis 21:30 Uhr und am **22. Oktober 2020** von ca. 8:00 Uhr bis ca. 13:00 Uhr stattfinden wird.
- Sie werden einen zweiseitigen Erfahrungsbericht über den Aufenthalt bis zum **30. November 2020** 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** unter minternship@intl.kit.edu ein. Die Bewerbungsfrist wurde verlängert bis zum **31. Dezember 2019**. Sie werden spätestens am 10. Januar 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 ENGINEERIN
ENERGY PRODUCTION AND INFRASTRUCTURE CENTER (EPI

CONTENT

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

For questions please contact:
Christina Kopitopoulou: Christina.K@uncc.edu

1. Evaluation of Synchronous Condenser capabilities

Energy Field Research Interest (please select from one of the options below)	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. Demand side management of grid-connected residential PV systems

Energy Field Research Interest (please select from one of the options below)	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 writing 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

3. High Efficiency Battery Inverter for Energy Storage Integration

Energy Field Research Interest (please select from one of the options below)	Power Conversion and Power Electronics
Abstract of the project	LS Energy Solutions (Formerly Parker EGT Division) is an industry leader in the energy storage market. The energy storage industry has significant need to develop a modular 1500 V battery inverter with high efficiency at wide load range, smaller form factor while still maintaining cost competitive as a building block for larger utility energy storage integration projects. The Wide Bandgap (WBG) devices provide a promising solution to improve power converter efficiency and power density and operate at higher switching frequencies and temperatures. The project will focus on the modeling, simulation, control, and part of the prototype development of a high efficiency and high reliability WBG based power converter to address a major technical challenge for the renewable and energy storage industry.
Tasks	• Literature review on SiC battery inverters • SiC based battery inverter system modeling, control and simulation • Inverter system design (including power stage, gate driver, controller, thermal and packaging) • Support full power testing and demonstration of battery inverter • Summarize the findings in a presentation and an IEEE format paper
Requirements	M.S. student in electrical engineering; familiarity with principles of power electronics and power distribution, familiarity with power electronic simulations.
Language Skills	Strong oral and written communication skills.
Software Skills	Matlab/Simulink or other power electronics simulation software
Other skills	Will prefer hands on experience in electrical engineering
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

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

Energy Field Research Interest (please select from one of the options below)	Energy Markets and Analytics
Abstract of the project	In this project, we focus on German and US price alternatives as well as alternatives for allocating grid costs for grid integrating residential solar PV with without residential battery storage. 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. Review the German and US solar energy price alternatives 2. Compare the various pricing alternatives 3. 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 – October)
Type of research project	Engineering/economics/market study related to the power industry
Responsible Professor	Dr. Peter Schwarz; Dr. Badrul Chowdhury (UNCC); Dr. Wolf Flichtner (KIT)
Supervisor/Mentor of the project	Dr. Peter Schwarz; Dr. Badrul Chowdhury and their students
Supervisor`s Telephone Number	704-687-1960
Supervisor`s Email	Pschwarz@uncc.edu; b.chowdhury@uncc.edu
Faculty, Institute or Company Name	UNC-Charlotte

5. Planning an Affordable, Resilient, and Sustainable Grid in North Carolina

Energy Field Research Interest (please select from one of the options below)	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	Must have 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

6. Prescriptive Analytics for Outage Prediction and Management in Electric Power Distribution Systems

Energy Field Research Interest (please select from one of the options below)	Energy Storage and Energy Distribution Efficient Energy Use Energy Markets and Analytics
Abstract of the project	The project addresses the need to develop a fully visible, controllable, and resilient electric power distribution system. Specifically, the project aims at increasing situational awareness of the distribution system by leveraging sensed information across multiple systems (SCADA, Advanced Metering Infrastructure, Outage Management System, etc.). Data analytics techniques, coupled with system modeling are used to exchange relevant information and insights that can be promptly acted upon, resulting in improved decision-making. The application of focus is outage prediction and management.
Tasks	The research assistant (RA) will assist the project team in developing the distribution system model, in analyzing available historical measurement (from 2 year of an actual distribution feeder) and weather data, and in developing real-time prediction and detection techniques.
Requirements	Electrical engineering major preferred but not required Power systems background preferred Data analysis and machine learning preferred
Language Skills	Good oral and written technical english
Software Skills	Experience with data analytics and machine learning techniques desirable, understanding of electric power systems preferred, experience with Matlab, Python, or other coding language preferred
Other skills	Good team player
Duration of the project	six months (April – October)
Type of research project	Multi-disciplinary with College of Engineering and College of Computing & Informatics
Responsible Professor	Valentina Cecchi
Supervisor/Mentor of the project	Valentina Cecchi
Supervisor`s Telephone Number	704-687-8730
Supervisor`s Email	vcecchi@uncc.edu
Faculty, Institute or Company Name	Valentina Cecchi, UNC Charlotte, EPIC, ECE Dept.

7. Online Economic Dispatch for Grid-connected Residential PV-Battery Systems

Energy Field Research Interest (please select from one of the options below)	Energy Storage and Energy Distribution
Abstract of the project	The strategy of battery charging and discharging has a great impact on annualized cost. Previous studies usually assume a simple control strategy. Under the simple control strategy, the battery is charged whenever the PV power generation is greater than the load requirement and the battery is not full; the battery is discharged whenever the PV power generation is less than the load requirement and the state of charge of battery is higher than the minimum. This simple control strategy unlikely leads to the optimal solution with respect to cost minimization. For example, in the existence of time-of-use tariff or demand cost, it is desired to discharge the battery during the peak hours instead of the off-peak hours but this goal cannot be realized with the conventional operation strategy. Thus, a real-time optimal dispatch strategy of the battery is needed to consider 1) the reduction of peak demand and thereby the demand charge; and 2) the energy arbitrage. In this study, an optimization model will be formulated and implemented to minimize the cost of operating PV-battery systems. The optimization problem will be resolved for several different scenarios according to the tariff structure and whether an electrical vehicle is used. In particular, the impact of battery size and the uncertainty of predicted PV and load profiles on the optimal solution will be investigated.
Tasks	Literature review, optimization model development, implementation and simulation. Documentation of research findings.
Requirements	Preferable a Master student with interest and background in PV-battery systems and controls
Language Skills	Strong communication in English speaking and wiriting
Software Skills	Proficient Matlab
Other skills	Optimization
Duration of the project	up to six months (April – October)
Type of research project	Modeling and simulation
Responsible Professor	Weimin Wang
Supervisor/Mentor of the project	Weimin Wang
Supervisor`s Telephone Number	704-687-5066
Supervisor`s Email	Weimin.wang@uncc.edu
Faculty, Institute or Company	Weimin Wang, PhD Faculty Engineering Technology Department

Name	Associate - Energy Production and Infrastructure Center University of North Carolina - Charlotte

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**