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 Forschungspraktika an der University of North Carolina at Charlotte

Das MINTernship-Programm des KIT wurde initiiert, um den Austausch von Studierenden mit strategischen Partnern zu fördern. Für 2019 besteht erneut die Möglichkeit am *Energy Production & Infrastructure Center* (EPIC) der *University of North Carolina at Charlotte* (UNCC), ein über Stipendien finanziertes Forschungspraktikum zu absolvieren. **Das sechsmonatige Praktikum beginnt am 1. April 2019.**

Das Stipendium

Neben vielen neuen Erfahrungen und grenzüberschreitenden Kontakten bietet das Programm:

- Ein zweistündiges Vorbereitungsseminar für den Aufenthalt in den USA am **31. Januar 2019 um 17:00 Uhr** im

  International Students Office
  Adenauerring 2, 76131 Karlsruhe
  Geb. 50.20, Raum 005, Erdgeschoß

- Teilnahme am Begleitprogramm der UNCC.
- Eine **monatliche Stipendienrate von USD 1.700** für die Dauer des Praktikums und eine **Reisekostenpauschale** (Flug, Transfers, Visa, Visabeschaffung etc.) von **€ 1.300**.

Die Anforderungen

- Sie sind am KIT immatrikuliert und haben vor Praktikumsbeginn mindestens 4 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 **16. Oktober 2019** von ca. 19:00 Uhr bis 21:30 Uhr und am **17. Oktober 2019** von 8:30 Uhr bis ca. 12:15 Uhr stattfinden wird.
- Sie werden einen zweiseitigen Erfahrungsbericht über den Aufenthalt bis zum **30. November 2019** 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 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 **30. November 2018** unter minternship@intl.kit.edu ein. Sie werden spätestens am 21. Dezember 2018 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 Organisationen:

RFS Reinhard Frank-Stiftung

Baden-Württemberg

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

1. Assessing Space Heating Efficiency and Resiliency, Design Study	
Energy Field Research Interest (please select from one of the options below)	4. Efficient Energy Use & 3. Energy Storage and Energy Distribution
Abstract of the project	The ability to maintain thermal comfort has been one of the predominant design considerations for residential buildings. The current practice is to assume power and fuel sources (electricity, natural gas, and others) are always available to meet the needs of a HVAC system. This assumption may not be valid in the occurence of natural disaster events and other unexpected operating conditions. Therefore, it is important to be able to maintain habitable conditions in the event of extended power outage or interruption in the heating fuel supply as needs to be addressed at the HVAC system design level for improved building resilience. The goal of this project is to evaluate different residential heating systems operating in the U.S. with primary focus on energy efficiency, ability to provide comfort at severe weather conditions, and resilience at abnormal operating conditions (loss of power or fuel supply). Heating systems will be assessed in terms of their capability to provide resilience and comfort. Design approaches, equipment sizing and the impact on energy efficiency will be evaluated for the system designs based on conventional practice which does not take resilence into account, and the new designs where resilience is considered as a design criterion.
Tasks	- Prepare heating load profiles for representative single-family houses in cold climates (ASHRAE climate zones 4 and above) - Identify **3-6** heating system options based on natural gas, electricity, renewable sources, or the combination of them (i.e. gas furnace only; electric heat pump + gas backup; solar-assisted heat pump) - Perform technology assessment on the identified systems with respect to energy efficiency and resilience. - Document the findings in a formal report and

	present them to the related stakeholders
Requirements	Must have B.S. Degree in Engineering
Language Skills	Good oral and writting communication skills in English.
Software Skills	Proficient Matlab or Visual Basic for Excel
Other skills	Ability and desire to learn building simulation
Duration of the project	up to six months (April – October)
Type of research project	Energy System Modeling, Analysis, and Design Options Assessment for Buildings/Residences
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	+1-704-687-1089; +1+704-687-5066
Supervisor`s Email	nsarunac@uncc.edu; weimin.wang@uncc.edu
Faculty, Institute or Company Name	UNC-Charlotte, EPRI

2. Modeling and Analysis of Synchronous Condensers for Grid Stability Improvement

Energy Field Research Interest (please select from one of the options below)	Renewable Energy Devices and Integration

Abstract of the project	The scope of this project is to develop models of synchronous condensers with data from the real device to be used for stability study. Two type of models will be developed, a) one for dynamic studies, and b) other for transient studies. These models are then integrated to power grid models developed for stability analysis. Further small signal stability assessment of synchronous condenser integrated power grid will be studied. The goal is to evaluate the potential of synchronous condensers to improve the dynamic and transient stability of the power grid.
	
	The scope of work is as follows:
	
	• Develop, validate and study detailed synchronous condenser models
	  ○ Develop dynamic models of synchronous condenser based on ratings and internal designs, including excitation system and other accessories.
	  ○ Develop electro-magnetic transient (EMT) models of the synchronous condenser with accessories.
	• Develop an Integrated model of power transmission system connected with synchronous condensers
	  ○ Develop a larger power grid model for stability studies to be used with dynamic simulations studies.
	  ○ Develop aggregated power grid model for stability studies to be used in real-time simulations
	  ○ Study the effect of small signal and transient stability for the synchronous condenser integrated power grid.
	
	• Perform the cost/benefit analysis of synchronous condensers as compare to other devices.

Tasks	1. Develop dynamic and transient models of synchronous condensers

	2. Develop power grid models using real-time simulators 3. Evaluate the advantages of synchronous condenser integrated power grid with renewables, such as short circuit improvement, back up generation, voltage and frequency stability improvements.
Requirements	Electrical Engineering Student preferred. Strong interest and experience in power grid modeling especially with real-time simulators. Willingness to learn independently and using new software and hardware tools.
Language Skills	English Required
Software Skills	Matlab, Simulink must. RSCAD, PSCAD, PSSE, CYME preferred.
Other skills	Interest in renewable energy system modeling
Duration of the project	up to six months (April – October)
Type of research project	Electrical Engineering, Power and Energy System Modeling
Responsible Professor	Sukumar Kamalasadan
Supervisor/Mentor of the project	Sukumar Kamalasadan
Supervisor`s Telephone Number	7046877099
Supervisor`s Email	skamalas@uncc.edu
Faculty, Institute or Company Name	The University of North Carolina at Charlotte, Siemens

3. Assistance with Streetside EV Charging Infrastructure	
Energy Field Research Interest	Energy Markets & Analytics / Efficient Energy Use
Abstract of the project	Accessibility to charging infrastructure for EV owners who are without access to private parking facilities provides an additional challenge to growing the demand for electric automobiles. Those who depend on curbside parking such as residents of economically disadvantaged communities, face considerable uncertainties in their prospects for a reliable, accessible and affordable vehicle charging source. Although existing curbside charging solutions are available, the stations are not commercially scalable. The available methods for curbside charging installations are expensive and highly dependent on custom engineered electrical distribution, metering, and physical mounting provisions. The team is funded by the DOE to work on developing a viable solution in partnership with Duke Energy.
Tasks	The student will assist with a market study intended to understand the market for curbside EV charging infrastructure in the United States, with particular emphasis on the Charlotte region.
Requirements	Literature survey; assistance in developing market study report
Language Skills	English
Software Skills	MATLAB, word processing, Excel
Other skills	
Duration of the project	up to six months (April – October)
Type of research project	Market study in support of federally funded award
Responsible Professor	Robert Cox
Supervisor/Mentor of the project	Robert Cox
Supervisor`s Telephone Number	704-687-8402
Supervisor`s Email	Robert.Cox@uncc.edu
Faculty, Institute or Company Name	UNCC / Department of Energy

4. Comprehensive Comparative Evaluation of Energy Storage Technologies

Energy Field Research Interest (please select from one of the options below)	Energy Storage and Energy Distribution
Abstract of the project	There have been a plethora of energy storage technologies that have been proposed such as Li-ion, Na-X, Zn-air, C-ion, and other technologies such as Flow Batteries, Pumped Hydro, super capacitors etc. This project is to develop a comprehensive landscape of these technologies and perform comparative evaluation for utility power grid applications.
Tasks	1. Perform literature and commercial review of various energy storage technologies 2. Develop simulation models of representative three chemistries – Li-ion, C-ion, and one more 3. Investigate power converter interface solutions most suitable to these energy storage technologies 4. Perform simulations of these energy storage technologies interfaced with grid under various use scenarios, and if possible help test some of them in the laboratory 5. Create a comprehensive comparative evaluation report, a presentation, and a paper (that can be published)
Requirements	Electrical engineering knowhow with specialization in power and energy systems Expertise in modeling and simulations in Matlab Simulink Hands on experience in developing and testing power electronic systems
Language Skills	English
Software Skills	C, C++, Matlab Simulink
Other skills	Collaborative mind set
Duration of the project	up to six months (April – October)
Type of research project	Modeling, Simulations, Analysis, and Experimental Verification

Responsible Professor	Dr. Madhav Manjrekar
Supervisor/Mentor of the project	Mr. James Gafford
Supervisor`s Telephone Number	+1 (704) 687-0299
Supervisor`s Email	jgafford@uncc.edu
Faculty, Institute or Company Name	Dr. Madhav Manjrekar Energy Production & Infrastructure Center (EPIC), University of North Carolina - 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; Energy Markets and Analytics
Abstract of the project	The goal of this project is to develop a roadmap to be used during the integrated resource planning process to support investments that enhance grid resiliency, improve reliability and maintain affordability. Reliability is commonly a part of utility planning and often focus on expected disruption events using well-known metrics. However, a new emphasis is gaining ground in the aftermath of large weather-related events: resilience, which emphasize the impact of high-consequence, low-predictability events. There is an appeal to develop metrics that can help guide resiliency-based investments. The project team proposes such a study in the context of North Carolina emphasizing resiliency in the face of large-scale region-specific extreme weather events. The proposed project will result in a road map that will combine an analysis of technological improvements with economic valuations to inform and guide investment decision-making to enhance grid resiliency while improving reliability and maintaining affordable energy for North Carolinian communities.
Tasks	Assistance in developing a risk-based (stochastic) life-cycle cost analysis and comprehensive cost-benefit analysis of grid-modernization options (hardening, distributed energy resources, etc.) Student will help in defining the economic elements of the previous study. This includes: • Literature survey / research to identify the initial characteristics of impacts, probabilities, and level of risks associated with high-consequence low-probability (HCLP) events in terms of significance levels as high, medium, and low. • Development of technical metrics for the consequences of power outages and their probabilities • 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. Badrul Chowdhury
Supervisor/Mentor of the project	Dr. Chowdhury and his doctoral students
Supervisor`s Telephone Number	704-687-1960
Supervisor`s Email	b.chowdhury@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 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. Novel Peer to Peer (P2P) Energy Trading and EV Charging Applications using Advance Optimization Algorithms

Energy Field Research Interest (please select from one of the options below)	1. Energy Markets and Analytics 2. Renewable Energy Devices and Electric Vehicles 3. Optimization techniques
Abstract of the project	In future the utilization of energy predictions systems (incl. electricity price, renewable energy and load forecasting models), distributed power generation and consumption algorithms will be integrated into the community-based neighborhood energy infrastructure. This will enable the distributed power prosumers to participate actively to the established / central power markets and peer to peer energy markets. Thus accurate and well-performing energy forecasting tools are vital for the utilities, energy traders, power plant operators and most importantly future prosumer market participants. This project proposes to investigate the determining the drivers of well-performing optimization algorithms which are used to determine the pricing behavior of future local energy markets. The model will include stationary and mobile (EVs) energy storage units to optimize the power flow and trading. Therefore in the final state an effective optimization algorithm will be developed. The models will optionally be tested in a smart gird simulation and power hardware-in the-loop (PHIL) environment in the Duke Energy Smart Gird Laboratory. Note: The first version of the local market modelling using various optimization algorithms was developed with a KIT exchange student in the last term. The model will be extended to the EV charging and energy storage scenarios. Therefore, the next student will focus on further development of existing algorithms but most importantly the main target will be the development of new optimization algorithms and integration of local energy storage units and EV charging scenarios to the existing peer to peer

	neighborhood trading models.
Tasks	Literature research; Investigation of the US and Germany Power markets; Understanding and further improvement of existing wind power, solar power and electricity price forecasting algorithms using advance data analytics and machine learning techniques; Understanding and further development of existing local market pricing mechanisms which is applied to local P2P energy transactions. Development of a basic electrical demand forecasting model. Development of optimization algorithm. Implementation of the P2P energy trading scenarios in Matlab/Simulink and RT Lab environments.
Requirements	Fundamental knowledge about the power markets Basic knowledge about smart grids Preliminary programing experience preferably in Matlab and Python Basic knowledge/ experience in optimization
Language Skills	Fluency in German and English
Software Skills	MATLAB / Simulink /Python
Other skills	Good team player
Duration of the project	six months (April – October)
Type of research project	
Responsible Professor	Dr. Umit Cali
Supervisor/Mentor of the project	Dr. Umit Cali
Supervisor`s Telephone Number	704-687-6038
Supervisor`s Email	ucali@uncc.edu
Faculty, Institute or Company Name	UNC Charlotte, EPIC (partially in KIT)

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

Energy Field Research Interest (please select from one of the options below)	3: 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	Knowledge of lithium-ion battery (preferred)
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 Name	Weimin Wang, PhD Faculty Engineering Technology Department Associate - Energy Production and Infrastructure Center University of North Carolina - Charlotte

Energy Field Research Interestes:

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

9. Integrated co-simulation transmission and distribution model

Energy Field Research Interest (please select from one of the options below)	Power Conversion and Power Electronics; Data Analytics
Abstract of the project	Utilities model their grid by using different simulation platforms to perform a variety of required simulations. This diversity in software becomes a bottleneck to engineers that currently need to keep several working models for different system simulations. This is especially prominent in transmission and distribution simulation platforms. This project is the first step in creating an integrated co-simulation transmission and distribution model, utilizing a database accessible from multiple simulation platforms. It aims to develop a database that holds all data needed from (initially) two software platforms and a translator to convert the database into the desired format to run in a specific simulation software. It can then be expanded to multiple translators and a user interface that allows an engineer to decide what information is needed and which software is it intended to run in.
Tasks	1. Meet with Duke Energy mentor and EPIC faculty advisor on regular intervals to understand problem motivation, typical engineering software work flow, and scope of the alternative software work flow. 2. Create an example power system model in two different power analysis software environments. 3. Develop a common model data base and link to the two software simulation environments through supported interfaces to demonstrate interoperability of models and data. 4. Demonstrate and validate solutions from the power system simulations using the data base.
Requirements	Required: B.S. Degree in Electrical or Computer Engineering Expected: Educational or work experience programming with script languages for commercial software tools and familiarity with the concept of an application programming interface (API) Preferred: Educational or work experience with one or more power systems analysis software tools. For example: Siemens PSS/E
Language Skills	Good oral and written technical English

Software Skills	See requirements section
Other skills	Ability to manage abstract models of physical systems. Good interpersonal skills.
Duration of the project	up to six months (April – October)
Type of research project	Modeling and simulation for the utility industry
Responsible Professor	Dr. Michael Mazzola
Supervisor/Mentor of the project	Kat Sico, Engineer I, System Ops Engineering, Duke Energy, Inc.
Supervisor`s Telephone Number	704-687-7851
Supervisor`s Email	mmazzola@uncc.edu
Faculty, Institute or Company Name	EPIC, UNC Charlotte and Duke Energy, Inc.

Energy Field Research Interestes:

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
Robin Moose : Robin.Moose@uncc.edu

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**