2026 REU Research Project List

Project Lead	Project Title	Assignment Location	REU Project Title Description
Clarke, M	Digital Twin Development for Unmanned Aircraft Systems (UAS)	Illinois	Development of digital twins of Unmanned Aircraft Systems (UAS). Over the summer, the REU student will be involved in the following tasks: 1) perform background literature of digital twins, battery modeling and drone flight safety; 2) selection of a UAS system to serve as a test bed 3) computationally model and simulate a UAS planform within the RCAIDE software framework under various flight conditions and battery energy states; 4) collect experimental flight data from onboard power electronics, including batteries at different energy states and motors 5) develop and validate digital twin framework; 6) assist in the conceptualization of a robust predictive iron-bird for examining electrified power systems 7) Documentation of weekly progress.
Goodson, K	Improve reliability and thermal performance of next-gen AI chips through fabrication of composite material with liquid metal infused in a silicon pin fin wick	Stanford	
Huitink, D	Investigation of the performance and application of encapsulated PCMs (ePCMs) for managing temperatures in a varied load environment	Arkansas	Phase change materials provide an opportunity to provide passive heat absorption and storage for managing transient heat loads associated with electrified transportation and their power electronics/electric machines. The Huitink lab has been developing novel encapsulation techniques for synthesizing sub-micron energy storage particles for ease of integration in electronics packaging and thermal management systems. In this REU effort, the scholar will investigate performance and application of these encapsulated PCMs (ePCMs) for managing temperatures in a varied load environment. The scholar will utilize various thermal characterization tools to determine latent heat properties as well as measure temperature responses in varied heat load testing.
Allison, James	Allison |Integrated Thermal Management System (TMS) Design and Spatial Packaging Optimization for Battery Electric Vehicles (BEVs)	Illinois	This project aims to develop integrated design methods androbust tools to create unique BEV thermal system designs with reduced power demand, packaging volume,energy consumption, cost, complexity, and weight while satisfying a range of cooling and heating require-ments and system constraints (geometric, topological, spatial, functional, component temperatures, work-ing fluid, component sizing (mass/weight), and safety). This project involves active collaboration withPOETS industry partners. REU students will be mentored by postdocs and/or graduate students to helpparticipate in tasks such as using MATLAB/Simulink or Python-based software tools to run simulations forBEV thermal system design. In addition, they will gain algorithmic thinking skills, experience in formulatingresearch questions and associated research plans, and gain experience using optimization and/or heattransfer/thermodynamics methods for mobile transportation applications. Experience in one or more of thefollowing domains would be beneficial for this project: 1) algorithm development/coding interest, 2) heattransfer/thermodynamics modeling and analysis, and 3) experience with MATLAB/Simulink and CAD de-sign tools (e.g., SolidWorks, Autodesk Fusion 360).

Examples of additional past projects			
Stillwell, A.	Investigating Optimal Inverter Topologies for High-Frequency Low-Inductance Motors	Illinois	High-speed motors exhibit extreme power densities needed for electric flight but require high voltage and low THD excitation beyond the capabilities of commercial motor drives. This project will explore state of the art inverter topologies for high-speed, low-inductance electric motors for electric aerospace applications. We will evaluate multilevel and current source inverter topologies and compare power density, efficiency, and output characteristics with an existing motor loss model. The final design will lead to a scaled prototype motor drive for a 4 kW high speed electric motor.
Banerjee, A.	Banerjee| Converter-Integrated Variable-Pole Induction Machine Drive for Heavy-Duty Vehicles	Illinois	This project aims to develop and design a variable-pole induction machine for a heavy-duty electric vehicle with a more holistic systems view. The research will include a detailed per-slot model of the electric machine, design of the power electronic drives, and cooling system in a system-of-systems design optimization framework. Functional integration of the electric machine and the power converter will lead to a compact, efficient, reliable, fault-tolerant, and inexpensive drivetrain suitable for a drivetrain design that has to operate in a harsh environment. The student will be required to learn and use FPGA (Field Programmable Gate Array) to control power converters that can change the pole count of an induction machine.
Miljkovic, N.	Miljkovic | Microcooler Electro-Thermal Integration on GaN Devices Enables Ultra-High Power Density Converters with Robust Indirect Embedded Cooling	Illinois	Under the guidance of peer mentors (Woo Young Park and Maureen Ramaube), the REU student will employ computational fluid dynamics (CFD) tools to conduct numerical simulations aimed at enhancing the thermal performance of the silicon microchannel cooler. The research will center around identifying crucial design parameters that influence thermal performance and subsequently minimizing the thermal resistance of the microcooler by determining the optimal values for those parameters.
Wang, P.	Wang | Multi-fidelity Modeling and Sensor Data Fusion for Partial Discharge Diagnosis and Reliability Assessment	Illinois	In this REU project, an undergraduate student will work together with the POETS research team at UIUC to analyze a large data set obtained f rom electrical motor partial discharge condition monitoring using advanced sensors and use the state-of -the-art artif icial intelligence (AI) tool to identif y key inf luence f actors and root causes f or the electric motor partial discharge failures.
Wang, P.	Senesky| Multi-fidelity Modeling and Sensor Data Fusion for Partial Discharge Diagnosis and Reliability Assessment	Stanford	In this REU project, an undergraduate student will work together with the POETS research team at Stanford to characterize the outgassing signatures during partial discharge of motor elements via small-scale chemical sensors. The work supports the proposed Year 9 activities that aim to develop multi-modal sensors (B-f ield + chemical sensing).
Smith, S.	Smith | Design of Enhanced PCMs Materials for Embedded Battery Thermal Management	Howard	The REU student will conduct simulations and optimization of candidate battery pack thermalmanagement designs under the direction of a graduate-student mentor. The student will explorethe impact of vehicle operating temperature as well as active and passive cooling designs on asmall battery pack. The summer student will generate trends and plots extrapolated from dataprovided by experiments and computations. The student will also give weekly presentationsabout their progress.