

# Summer Research Initiative (SURI) 2026 Projects

## School of Electrical, Computer and Energy Engineering (ECEE)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Nick Rolston	ECEE	Renewable Energy Materials and Devices; Batteries and Photovoltaics	ASU Research Park	U. S. Citizen or non-U. S. Citizen

**Project description:** A compelling opportunity for higher energy density batteries is solid-state electrolytes (SSEs), which offer a host of advantages over the liquid electrolytes that dominate the market today: they are leak-proof, energy-dense, flame-resistant, contain no toxic organic solvents, and can charge faster. A challenge to the commercialization of solid-state batteries is the development of a stable SSE that can support the film stresses that develop from significant expansion during cycling and can be processed with low-cost manufacturing processes. The objective of this work is to two-fold: to improve the thermomechanical reliability of SSEs and to subsequently produce safe, durable, and high-specific energy solid state batteries with a robust thin film SSE. **Students will:** Learn how to make battery materials and devices from solution using printing processes and characterize them with electronic and ionic conductivity measurements. There is also funding for additional projects to work on perovskite-based photovoltaics materials and devices. **Prerequisite skills/knowledge:** Knowledge of electrochemistry, materials science, and mechanical properties is a plus (although not required).

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Meng Tao	ECEE	Solar electrolyzer for green hydrogen production	ERC	U. S. Citizen only

**Project description:** We are constructing the most efficient solar electrolyzer in the world. It delivers 99% of the solar energy it receives to the electrolyzer, while reducing the system cost by 30%. This leads to a 50% lower cost of solar electricity for green hydrogen production. The project involves control electronics and algorithm, system integration and debugging, system modification and optimization, and performance verification. **Students will:** Work with PhD students on system development. You will also work on a simpler version of the system. The simpler system is much easier to construct, operate, and troubleshoot. It is intended for remote communities with little access to technical support. **Prerequisite skills/knowledge:** U.S. Citizen or Permanent Resident only.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Nidhin Kurian Kalarickal	ECEE	Semiconductor devices	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project will focus on design and fabrication of gallium oxide power semiconductor devices. **Students will:** The student will design gallium oxide lateral power devices in Silvaco and fabricate transistors in the ASU Nanofab. These devices will then be characterized to evaluate device characteristics. **Prerequisite skills/knowledge:** Prior cleanroom experience with handling of lithography tools is required.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Vidya Chhabria	ECEE	Chip design	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The objective of the research is to apply machine learning (LLMs) techniques to solve challenging problems in chip design. **Students will:** Develop algorithms and write software for traditional EDA applications for ground truth data generation then apply machine learning techniques to make the algorithm more scalable. **Prerequisite skills/knowledge:** Knowledge in Python and C++ is required. Courses: Algorithms, data structures, circuit design, VLSI design.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Taejoon Kim	ECEE	Post-Quantum Resiliency for Next-Generation Wireless Networks	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project investigates post-quantum resilient communication techniques for next-generation wireless networks. As quantum computing emerges as a threat to current cryptographic systems, ensuring long-term security for sensitive data transmissions becomes essential. The research applies quantum-resistant secret sharing

codes that encode and protect data for transmission across multiple networks. Students will build experimental network testbeds using distributed cloud infrastructure including AWS, Google Cloud, and Azure. **Students will:** Develop methods on commercial-off-the-shelf (COTS) 5G smart phones for secure data transmission and reception, integrating quantum-resistant secret sharing algorithms. Implement a multi-cloud distributed network testbed connecting AWS, Google Cloud, and Azure. **Prerequisite skills/knowledge:** Programming experience in Python, Java, C++, or MATLAB, and basic understanding of communication networks.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Chao Wang	ECEE	Point-of-care pathogen detection	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project will focus on biosensor design and validation in biological fluids to detect pathogens related to human or animal diseases (to be decided at the project initiation), including infectious diseases, cancer, or neurodegenerative diseases. **Students will:** Create nanoparticle-supported rapid electronic detection (NasRED) sensors, perform experiments using established sensing protocols, and analyze the data. **Prerequisite skills/knowledge:** Prior experience to work in a BSL-2 setting; basic understanding of biosensors or assay development.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Dragica Vasileska	ECEE	Semiconductor device physics, nanotechnology, computational electronics	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project focuses on understanding basic principles of quantum mechanics as it applies to operation of nanoscale devices. A simulation software will be developed for modeling single gate and dual gate MOS capacitors that are integral part of the state-of-the-art fully-depleted SOI device technology. Python programming language will be used for tool implementation and open-source web application Jupyter notebook will be used for the development of the graphical user interface (GUI). **Students will:** Work on device simulator development that involves solution of the 1D Schroedinger and the 1D Poisson equation self-consistently for single-gate and dual gate MOS capacitors with conventional or a stack of high-k dielectrics. **Prerequisite skills/knowledge:** Knowledge on numerical analysis, partial differential equations, python language programming and basic Jupyter notebook understanding is necessary.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Gautam Dasarathy	ECEE	LLM Routing and Multi-fidelity Systems	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Large language model systems increasingly rely on routing: deciding which model, module, or computation path to use for each input. This project develops statistically grounded routing strategies aimed at reducing inference time while maintaining accuracy. We will explore multi-fidelity bandit approaches, where inexpensive, fast LLMs provide early signals that help determine when a larger model is needed. **Students will:** Learn and implement routing algorithms, multi-armed bandit algorithms, and run controlled experiments with open LLMs. There will also be an opportunity to dive into the rigorous mathematical foundations of these methods. **Prerequisite skills/knowledge:** Python, basic machine learning, probability, linear algebra; familiarity with PyTorch or JAX is helpful but not required.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Jeff Zhang	ECEE	Computer Architecture, AI/ML Hardware and System, Energy-efficient Computing	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project focuses on designing high-performance and reconfigurable computer architectures tailored for AI and machine learning (AI/ML) workloads, addressing the growing demand for efficient and flexible computation. The goal is to co-optimize hardware and compiler toolchains to achieve superior speed, energy efficiency, and adaptability across diverse neural network models and data types. **Students will:** Work on architectural simulation, hardware design, ML development, and compiler design. **Prerequisite skills/knowledge:** C/C++, Verilog, Pytorch.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Krishnendu Chakrabarty	ECEE	Microelectronics, Applied AI - LLMs for Chip Design	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** AI-based methods for chip design, especially LLMs, for hardware design and hardware security. Design of AI accelerator architectures. **Students will:** Develop AI models (CNNs, DNNs, LLMs) for hardware synthesis and design-for-test solutions. There are also opportunities available to study AI-based attacks on hardware and corresponding defenses. **Prerequisite skills/knowledge:** Basic understanding of CNNs, DNNs, LLMs, knowledge of Python and Pytorch (or similar tools), familiarity with EDA tools for chip design.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Krishnendu Chakrabarty	ECEE	Microelectronics, Applied AI - Advanced Packaging	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Built-in self-test and built-in self-repair for advanced packaging and chip/package co-design. **Students will:** Design test solutions for fanout wafer-level packaging and hybrid bonding. The test methods will include fault detection, diagnosis (localization), and repair. **Prerequisite skills/knowledge:** Basic knowledge of VLSI design and integrated circuits, circuit simulation and timing analysis; familiarity with EDA tools.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Krishnendu Chakrabarty	ECEE	Microelectronics, Applied AI - Healthcare	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** AI-based healthcare solutions and privacy preserving AI solutions for healthcare. **Students will:** Use various AI methods (transformers, LLMs, etc.) to analyze anonymized patient data (EEG, ECG, etc.) for security vulnerabilities and identify encoding techniques to preserve privacy without impacting diagnostic accuracy. **Prerequisite skills/knowledge:** AI/ML background preferred.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Mike Ranjram	ECEE	Power electronics; power magnetics	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The development of miniaturized and high-performance power electronic converters relies on a host of critical infrastructure, including performing finite element analysis (FEA) simulations to design power magnetics and high speed power converters, programming FPGAs and microcontrollers to synthesize gating signals, and assisting in the development of hardware prototypes. **Students will:** (1) Finite element analysis simulations; (2) programming of microcontrollers and/or FPGAs; (3) PCB design and hardware prototyping. **Prerequisite skills/knowledge:** Experience with power electronics is ideal.

## School of Manufacturing Systems and Networks (SMSN)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Shenghan Guo	SMSN	Data processing and AI-augmented inline sensing for Aerosol Jet prognostics	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** This project will consist of Aerosol Jet Printing experiments, in-situ and ex-situ data collection from these experiments, and advanced data processing and AI algorithm design and training for AJP prognostic analysis. Students will have the chance of getting trained for operating an OPTOMECA Aerosol Jet machine. **Students will:** (1) AJP operations and experiments; (2) data collection with inline sensor and microscope; (3) data processing and analytics with Python/Matlab/R coding. **Prerequisite skills/knowledge:** Interest in 3D printing; proficiency in coding.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Wenlong Zhang	SMSN	Robotics and control systems - Digital Twins	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** This project involves developing digital twins and robot learning algorithms for autonomous manufacturing. **Students will:** Work on developing digital twin models of an assembly platform, and leverage high-fidelity simulations to train robot controllers for precise and adaptive actions in pick-and-place, assembly, and inspection tasks in manufacturing. **Prerequisite skills/knowledge:** Python and/or C++, reinforcement learning and/or control systems, experience in digital twin software is a plus.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Wenlong Zhang	SMSN	Robotics and control systems - Soft Robots	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** This project involves design and prototyping of soft robots for healthcare and infrastructure management. **Students will:** Work on design and fabricating inflatable soft actuators, and integrate them into soft wearable robots for human assistance and crawling robots for inspection of civil infrastructure. **Prerequisite skills/knowledge:** Mechanical design, fabrication and prototyping, sensor integration, control systems, experience in soft robots is a plus.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Xi Yu	SMSN	Robotics, Multi-robot coordination, Control and automation	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** Hardware-software co-design of under-actuated robots in highly dynamic environments. **Students will:** Design and development of: 1) hardware controlling an autonomous blimp, 2) control and coordination algorithms for blimps fleet. **Prerequisite skills/knowledge:** Experience with one of several of the following: raspberry pi, ROS system, electronic devices (sensors, DC motor, ESCs, etc.), PCB design and building, control systems.

## School of Biological and Health Systems Engineering (SBHSE)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Vikram Kodibagkar	SBHSE	Magnetic Resonance Imaging	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The project consists of developing machine learning algorithms for MRI artifact correction using k-space data. **Students will:** Use MATLAB to generate a large library of synthetic k-space data representing a variety of MRI artifacts and develop algorithms for artifact removal. Then test the algorithms on real world data. **Prerequisite skills/knowledge:** Programming experience in MATLAB.

## School of Computing and Augmented Intelligence (SCAI)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Hua Wei	SCAI	LLM, multi-agent system, Education	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This research project focuses on developing agentic AI for education, including material generation, human alignment of LLMs, and progressive learning. **Students will:** Explore LLM Agentic tools, compare the state-of-the-art industry products and conduct experiments for the comparison. Work with faculty and PhD students to enhance new workflows and systems for better education results. **Prerequisite skills/knowledge:** Knowledge of LLM and agentic AI, Python and Linux programming, quick implementation and learning skills. Familiarity with AutoGen, LangGraph, CrewAI is a bonus.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Jaron Mink	SCAI	Cybersecurity, Trustworthy Human-AI Interaction; Online Safety	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Secure and Trustworthy Human-AI Interaction: Currently, there is a lack of principled methods to construct safe and secure human-ML interaction paradigms. This set of projects will investigate how human interaction impacts ML security: How human factors can be 1) exploited to reduce security or 2) harnessed to improve security. Topics may include detecting and mitigating the effect of deepfakes, or developing ways to prevent vulnerabilities in machine learning systems. **Students will:** Develop UI to convey provenance information for media and indicators to reduce the effect of deepfakes, understand how to develop machine learning coursework to include modules on adversarial machine learning topics, or discover ways that adversarial machine learning exploits occur in practice. **Prerequisite skills/knowledge:** Computer security & privacy; Machine learning; Human Factors methodologies (e.g., experimental design, interviews, qualitative coding).

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Aman Arora	SCAI	Chip design, Applied ML - Hardware Verification	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project involves applying Large Language Models (LLMs) to hardware verification. **Students will:** Employ agentic techniques such as RAG, LangGraph, etc. to improve a framework for hardware verification. Benchmark various LLMs and develop problems to benchmark them. Fine-tune LLMs for verification tasks. **Prerequisite skills/knowledge:** Digital hardware design and verification (equivalent of CSE 320 and EEE 333).

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Aman Arora	SCAI	Chip design, Applied ML - FPGA Chiplets	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project involves developing datasets and ML models for designing FPGA chiplets. **Students will:** Work with open-source FPGA tools. Write Verilog and HLS designs. Develop ML techniques to model performance of these designs. Explore the architecture space of FPGA chiplets. **Prerequisite skills/knowledge:** Digital hardware design, FPGA concepts.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Jia Zou	SCAI	Database systems, data privacy	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Unified and Verifiable Privacy Policies for Data and AI/ML Models. We target problems arising from decoupling databases and deep learning systems: (1) lack of consistent design for data and model privacy mechanisms, (2) lack of verification mechanisms for compliance with privacy regulations such as HIPAA, PCI-DSS, and GDPR. **Students will:** Propose a unified privacy model for data and model management; leverage LLM to extract knowledge from privacy regulation documentation; leverage LLM to verify compliance with target regulations. **Prerequisite skills/knowledge:** Strong coding skills.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Rong Pan	SCAI	Time series analysis, data science	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Use topological data analysis and AI to enhance time series forecasting; use multimodal data to build knowledge graphs for AD. **Students will:** Methodology development, Python coding, and data analysis. **Prerequisite skills/knowledge:** Knowledge in statistical modeling, machine learning, and the use of AI.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Ruoyu Wang	SCAI	Cybersecurity	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The project explores will develop techniques for software understanding of binary code. Binary code is extremely resistant to understanding by humans and AI techniques, and a number of promising approaches

hint at the potential to alleviate this problem. **Students will:** Understanding system security, developing new techniques in Software Understanding for both humans and AI, improving binary decompilation approaches.

**Prerequisite skills/knowledge:** Binary reverse engineering, strong programming background, expert-level Python programming.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Vivek Gupta	SCAI	Natural Language Processing, Cybersecurity, Online Safety	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Multimodal Adversarial Attacks & Defences for Agents. Modern agents (LLM/VLM + tools + data pipelines) are highly capable but increasingly vulnerable to multimodal adversarial attacks. This project will build VAD: a standardized evaluation framework to stress-test agentic pipelines with realistic attacks and prototype practical defenses. **Students will:** Implement attack generators + replay harness for agentic pipelines, design metrics (success rate, stealth, downstream impact, cost), build defenses (OCR+intent checks, filters, policy gates, monitors), produce a benchmark report. **Prerequisite skills/knowledge:** Python required; familiarity with ML/LLMs helpful; interest in security; basic knowledge of PDFs/OCR or willingness to learn.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Yan Shoshitaishvili	SCAI	Cybersecurity	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The project explores applied aspects of program analysis and vulnerability research. We'll work on techniques to find bugs in programs, prove their security applicability, and fix them. **Students will:** Developing and improving techniques in program analysis, analyzing the security of complex systems. **Prerequisite skills/knowledge:** Strong programming background, expert-level Python programming, understanding of security issues found in software, assembly language.

## School of Engineering of Matter, Transport and Energy (SEMTE)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Aditi Chattopadhyay	SEMTE	Structural Health Monitoring, Multiscale Modeling, Multifunctional Materials and Adaptive Structures	Tempe	U. S. Citizen only

**Project description:** Understand the physical scale-dependent mechanical & dynamic properties of meteoritic materials and gain insight into their deformation mechanisms and fracture & impact dynamics. **Students will:** Assist in conducting ballistic impact and quasi-static compressive tests on meteorite samples coupled with digital image correlation techniques, and performing microscopy on the fragments from impact. **Prerequisite skills/knowledge:** Students from mechanical or aerospace engineering; some experience in hands-on experiments is a plus. Junior status would be preferable, but motivated sophomores who meet the requirements will also be considered.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Feng Yan	SEMTE	Thin film photovoltaics and photodetectors via emerging chalcogenides materials	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This research project focuses on thin-film solar cells and photodetectors. **Students will:** Thin film deposition and device fabrication, characterization. **Prerequisite skills/knowledge:** Knowledge of materials science and engineering, semiconductor device physics, electrical engineering.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Leixin Ma	SEMTE	Machine learning-aided modeling and design, Computational mechanics	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Shape-morphing structures can continuously deform into complex 3D shapes, enabling transformative applications in soft robotics, biomedical devices, and advanced manufacturing. This research project seeks to develop a data-driven, physics-informed framework to reduce the dimensionality of the inverse design problem and accelerate the discovery of optimal designs. **Students will:** Develop and apply a physics-informed hypergraph neural network to model the dynamics of shape-morphing structures for applications in soft robotics and biomedical devices. Compare neural-network-generated designs with results from traditional finite element simulations and validate through 3D printing and experimental testing. **Prerequisite skills/knowledge:** Matlab and Python programming. Knowledge in machine learning and finite element simulations.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Linqin Mu	SEMTE	Critical minerals, sustainable battery materials, advanced characterizations	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Mu group is dedicating in designing sustainable materials for rechargeable batteries, and developing electrochemical method to directly extract critical minerals from various water resources. Leveraging comprehensive characterization methods, Mu group aims to design high-performance and low-cost materials for Li/Na batteries. **Students will:** Learn how to use electrochemical method to directly extract critical minerals from different water resources. Be trained on how to make a battery and evaluate battery performance. Be involved in different types of X-ray characterization methods. **Prerequisite skills/knowledge:** Materials science engineering, chemistry, characterization methods.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Eileen Seo	SEMTE	Polymer chemistry, materials synthesis, sustainability, nanotechnology	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** My research group leverages nanotechnology to design stimuli-responsive, functional polymeric and hybrid nanocomposite materials at the interface of polymer chemistry, self-assembly, and additive manufacturing. Our overarching goal is to establish fundamental structure–property–processing relationships that enable the development of sustainable polymer materials. **Students will:** Work with a graduate student mentor to learn how to synthesize polymers via controlled polymerization mechanisms and nanoparticles via sol gel methods. Learn how to characterize polymers, nanoparticles, and polymer nanocomposites using NMR, size exclusion chromatography, UV-Vis spectroscopy, dynamic light scattering, dynamic mechanical analysis, and optical microscopy. Learn 3D printing. **Prerequisite skills/knowledge:** Knowledge about polymer chemistry, nanoparticle synthesis and functionalization, and materials characterization.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Jiefeng Sun	SEMTE	Robotics, control, embedded systems, mechanical design	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project aims to develop reinforcement learning (RL) controllers for a custom-built, high-degree-of-freedom (DOF) quadruped robot capable of agile and dynamic behaviors such as leaping and turning. The focus is on leveraging the robot's extra body DOFs to achieve enhanced maneuverability and stability during rapid motion. **Students will:** Work on reinforcement learning–based control, including environment setup, policy training and optimization, sim-to-real transfer strategies, and hardware implementation. **Prerequisite skills/knowledge:** Knowledge of reinforcement learning and robotics (kinematics and dynamics); proficiency in Python/C++; experience with Isaac Lab and/or MuJoCo. Prior experience implementing learning-based controllers on hardware is preferred.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Beomjin Kwon	SEMTE	Mechanical properties of nanomaterials, computational simulation	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project aims to develop and validate a robust numerical model for metal-coated carbon nanotube (CNT) fibers, specifically to characterize their mechanical and electrical properties. By addressing the complexities of their random nano-micro structures, this work will establish a predictive numerical framework for these novel CNT-based electric transmission fibers. **Students will:** Develop intricate geometry models for the metal-coated

CNT fibers, utilizing Representative Volume Element (RVE) principles and Monte Carlo methods to represent their random microstructures. Conduct high-fidelity numerical simulations on ASU's supercomputing resources.

**Prerequisite skills/knowledge:** Knowledge of electric conduction, mechanical tensile test, basic solid mechanics, finite element method, Python.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Kunal Garg	SEMTE	Robotics, control theory, multi-robot systems, Applications of AI in path planning	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Prediction of failures in real-world robotic systems either requires accurate model information or extensive testing. In this work, we will investigate the sim-to-real gap for various robotic platforms such as manipulator arm, ground vehicles as well as aerial vehicles, from the perspective of falsification, using existing testing pipelines for simulation while working with limited data from the true system. **Students will:** Work with PhD student to design experiments for a given robotic platform for data collection, perform experiments for data collection and retrain or fine-tune policies to fix the predicted failure modes. **Prerequisite skills/knowledge:** Strong coding background, a good math background (control theory, optimization, probability, statistics), working knowledge of ML and NN training, hands-on experience with ROS/ROS2.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Daniel E. Rivera	SEMTE	Control systems engineering, system identification, application to behavioral medicine interventions	Tempe	U. S. Citizen or Permanent Resident

**Project description:** Control systems engineering is being increasingly used as a means to develop "just-in-time" adaptive interventions to improve on healthy behaviors (such as increased physical activity, weight management, and smoking cessation). These control systems, based on dynamic representations of health behavior theories and Model Predictive Control, can be improved through the use of machine learning techniques such as reinforcement learning (RL). **Students will:** Become familiarized with current computational platforms (based on MATLAB w/Simulink and Python) that implement existing solutions. Drawing from expertise in numerical methods, data science, dynamical systems, and control engineering, stage and implement approaches that can be compared to benchmarks.

**Prerequisite skills/knowledge:** Knowledge of differential equations, numerical methods, and dynamical systems. An introductory controls course is strongly recommended. Working knowledge of MATLAB w/Simulink and Python.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Jian Li	SEMTE	Semiconductors	ASU Research Park	U. S. Citizen only

**Project description:** Fabricate and evaluate organic electronic and optical devices. **Students will:** Fabricate and evaluate organic electronic and optical devices. **Prerequisite skills/knowledge:** Basic understanding of organic semiconductors and skills for device fabrications.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Kumar Ankit	SEMTE	Structural materials for advanced fission and fusion reactors	Tempe	U. S. Citizen only

**Project description:** Evaluate the corrosion behavior of structural materials in liquid metals and molten salts. **Students will:** Assist in analyzing the experimental data from corrosion tests conducted in liquid metals and molten salts, perform image analyses to identify depths of attack and phase fractions, compile the results for a journal publication. **Prerequisite skills/knowledge:** Students from mechanical or materials science engineering; some experience in hands-on experiments is a plus.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Kumar Ankit	SEMTE	Impact of water vapor on corrosion behavior of Fe- and Ni-based alloys	Tempe	U. S. Citizen only

**Project description:** Evaluate the corrosion behavior of structural materials. **Students will:** Analyze the role of different water vapor contents on the oxidation behavior of Fe- and Ni-based alloys, evaluate microstructural characterization data, perform image analyses to measure oxide thicknesses, compile the results for a journal publication. **Prerequisite skills/knowledge:** Students from mechanical or materials science engineering; some experience in hands-on experiments is a plus.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Lin Li	SEMTE	Computational Materials and Mechanics	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This summer project examines how small interstitial atoms affect the structure and mechanical behavior of high-entropy alloys by modifying local chemical ordering, dislocation interactions, and grain-boundary cohesion. **Students will:** Use computational tools, such as density functional theory, molecular dynamics, and machine-learning potentials, to study microstructural evolution and mechanical stability. **Prerequisite skills/knowledge:** Programming experience in MATLAB and/or Python, familiarity with HPC workflows, and a basic understanding of materials mechanics.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Minglei Qu	SEMTE	Advanced manufacturing	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This project aims to fabricate 316L+NbC metal matrix composites (MMCs) for high-temperature applications using the laser powder bed fusion (LPBF) additive manufacturing process. 316L stainless steel is widely used in energy, biomedical, chemical, and marine industries. The project seeks to establish process-structure-property relationships for these additively manufactured MMCs. **Students will:** (1) Fabrication of 316L+NbC with LPBF machine. (2) Microstructure characterization with scanning electron microscopy. (3) Tensile testing. **Prerequisite skills/knowledge:** Knowledge of metal additive manufacturing. Hands-on skills on microstructure characterization and tensile testing.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Ryan Milcarek	SEMTE	Industrial electrification, energy management, and efficiency	Tempe	U. S. Citizen only

**Project description:** Electrification of some industrial processes are already economical in the state of Arizona (e.g., electrifying forklifts) while others need further analysis and development. This SURF project will use techno-economic models to assess the feasibility of current electrification strategies for industrial clients. **Students will:** Evaluation of multiple electrification strategies that are applicable in industry and assessment of the current capital costs and energy savings to evaluate the return on investment. **Prerequisite skills/knowledge:** Basic concepts from thermodynamics and energy conversion are beneficial.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Sui Yang	SEMTE	Self-assembly, 3D printing for nanophotonics and photonic chip	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The project focuses on combining self-assembly and advanced 3D nanoprinting to create next-generation optical materials and on-chip photonic structures. Students will gain hands-on experience in nanofabrication, optical characterization, and computational design of photonic devices. **Students will:** Solution based self-assembly/3D printing, optical simulation and characterization. **Prerequisite skills/knowledge:** Ideally some experiences in solution phase based self-assembly and printing, or basic optics knowledge. But not required.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Wanxin Jin	SEMTE	Robotics, Dexterous Manipulation, Robot Learning	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The project seeks to develop learning, control-theoretic, or hybrid methods to solve multi-fingered dexterous manipulation. **Students will:** Learning, control, perception algorithm design, hardware experiments. **Prerequisite skills/knowledge:** Python, hardware experiment experience.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Zach Berkson	SEMTE	Sustainability, adsorption, reaction kinetics, nanostructured materials	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** Recovery of metal cations from acidified solutions is crucial for efficient recycling of electronics and batteries, as well as mining processes. Recently, our group has found that inorganic nanoporous ion-exchange materials can be designed for stable and selective ion-exchange. This project will explore the adsorption properties of different metal cations under different conditions to discern the driving forces for selectivity. **Students will:** Measure adsorption isotherms for a range of metals on inorganic oxides of different compositions and pore sizes. If successful, also use advanced spectroscopic methods (FTIR, UV-vis, solution and solid-state NMR) to analyze interactions of cations with the sorbent surface. **Prerequisite skills/knowledge:** Student should have a basic knowledge of chemistry lab procedures and safety. Experience with adsorption phenomena and prior experimental lab experience are a plus.

## School of Sustainable Engineering and the Built Environment (SSEBE)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Nariman Mahabadi	SSEBE	Subsurface Exploration using Robotic sensing and AI	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** This research project develops advanced technologies for subsurface exploration using robotics, acoustic waves, and artificial intelligence. The goal is to create high-resolution, non-invasive methods for detecting underground features such as voids, utilities, buried infrastructure, contaminated zones, and geotechnical hazards. **Students will:** Help design, assemble, and operate robotic sensing platforms; collect acoustic and ultrasonic data; and assist in developing machine-learning models that improve subsurface imaging and anomaly detection. **Prerequisite skills/knowledge:** Basic experience with Matlab or Python programming, General understanding of physics or signals, Interest in robotics, sensing, or AI tools.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Ravi Yellavajjala	SSEBE	Sustainable materials	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The goal of this project is to develop new biobased materials to mitigate shrinkage in 3D printed concrete. **Students will:** Be responsible for synthesizing new biobased materials that absorb and release water into the concrete matrix in a regulated manner. Perform shrinkage studies and prepare a report at the end of the 8 weeks program. **Prerequisite skills/knowledge:** Civil Engineering student with previous lab experience and a strong interest in MS/PhD programs.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Ravi Yellavajjala	SSEBE	Metal AM	Tempe	U. S. Citizen or non-U. S. Citizen

**Project description:** The goal of this project is to predict fracture in Metal additive manufactured samples. **Students will:** Be responsible for generating fracture data and training ML models to predict fracture initiation in additively manufactured steel components. Submit a report at the end of the 8 weeks program. **Prerequisite skills/knowledge:** MS student in structural engineering or related area with an intention to join our PhD program.

## School of Sustainable Engineering and the Built Environment (SSEBE)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Paul Westerhoff	SEBE	Sustainable Water Treatment Using Advanced Materials	ISTB4	U. S. Citizen or non-U. S. Citizen

**Project description:** This research project develops and evaluates advanced materials and processes to remove emerging contaminants such as nutrients, PFAS and toxic metals from water. The student will work alongside a

multidisciplinary team to synthesize novel adsorbents, develop sensors for atmospheric water harvesting, and test photochemical methods that enhance treatment efficiency and sustainability. **Students will:** Assist in laboratory experiments focused on developing and testing advanced materials for water treatment. Prepare and characterize samples, conduct water quality analyses, collect and interpret data, and contribute to experimental design discussions. **Prerequisite skills/knowledge:** Students should have a basic understanding of chemistry, environmental engineering, or materials science principles. Prior laboratory experience is helpful but not required. Familiarity with data analysis tools (e.g., Excel, MATLAB, or Python) and good documentation practices are desirable.

## The Polytechnic School (TPS)

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Mo Jiang	TPS	Energy and medicine systems, Chemical production, Material recycling	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** Creating new pathways for scalable, fast production of precise crystals, leveraging raw materials from non-conventional mixture. **Students will:** Get to learn and contribute to advanced flow chemistry platform.

**Prerequisite skills/knowledge:** Basic chemistry lab, or basic process modeling.

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Xin Xu	TPS	VR course development on energy materials	Polytechnic	U. S. Citizen or non-U. S. Citizen

**Project description:** The research project aims to develop a 10-min VR course "Material Edge: Ceramics for the Extremes". The course is organized into short, engaging segments that transition from a macroscopic engineering system into a fully simulated extreme environment, and then into a 3D fly-through of the material's microstructure.

**Students will:** Work with the PI to develop a short 10 min VR course on ceramics materials under extreme conditions. Review background materials, storyboard the 10-minute module, develop VR scenes, design interactive end-of-module activities, and prepare supplementary educational materials. **Prerequisite skills/knowledge:** Preferred knowledge on materials science (crystal structures, ceramics defects, etc.) and VR development tools such as Blender, Unity, Unreal Engine, etc.

## Academic and Student Affairs

Faculty Name	FSE	Program/Expertise Area	Campus/Worksite	Student Eligibility
Suzan Allaham	ASA	AI impact on first year students	ASU Tempe Campus	U. S. Citizen or non-U. S. Citizen

**Project description:** AI impact on first year students. **Students will:** Get to learn and contribute to pedagogical impacts of ai on education. **Prerequisite skills/knowledge:** Basic Python Knowledge.