2022 SURP Faculty Mentor Applications

In-Person Research on Utica Campus			
#	**Name**	**Project Title**	**Page**
1	Vijay Ramalingam	(1) Rotaxanes	2
2	Jiayue Shen	(1) Development of a flexible sensor based on the advanced manufacturing technology	3
3	Jiayue Shen	(2) LabVIEW-based Data Acquisition system Design for Measuring a CMOS/ReRAM(resistive memory, memristor) Device	4
4	Jay Upadhyay	(1) Understanding 3D Microstructures of Porous Soil using X-ray Computerized Tomography (CT) Scan	5
5	Jay Upadhyay	(2) Relating Porosity to Mechanical Behavior of SS 316L Manufactured by DLMS Method.	6
6	Iulian Gherasoiu Harry Efstathiadis	(1) Synthesis of diamond-like carbon (DLC) films on substrates for the fabrication of high-temperature operating devices	7
7	Sivapalan Gajan	(1) Development of predictive algorithms for the performance of foundations during earthquake loading	8
8	Sivapalan Gajan	(2) Numerical simulations of cyclic load-deformation behavior of foundations during earthquake loading	9
9	Shuang Tang	(1) Generate Electricity Without Heat Engine or Generator	10
10	Shuang Tang	(2) Making Cooling/Refrigeration Without Refrigerator.	11
11	Shuang Tang	(3) How to Measure Strength/Hardness/Thermal Properties Like Playing Video Games.	12
12	Yu Zhou	(1) Research on computing and control using neuromorphic chip	13
13	Asif Ahmed	(1) Transportation Geotechnics.	14
14	Kazi Imran	(1) Stress Analysis of Fiber Reinforced Composite Materials	15
15	Lauren Endres	(1) Translational responses to DNA damage induced by oxidative stress	16

In-Person Research on Albany Campus			
#	**Name**	**Project Title**	**Page**
16	Nate Cady	(1) Neuromorphic Computing	17
17	Andre Melendez Scott Tenenbaum	(1) Quantitate markers of senescence and proliferative decline in Alkbh8 deficient human IMR-90 cells.	18
18	Andre Melendez Scott Tenenbaum	(2) Determine if AlkbhD^{Def} potentiates the Senescence Associated Secretory Phenotype.	19
19	Robert Brainard	(1) Bio Roll-Up	20
20	Robert Brainard	(2) Molecular Organometallic Resists for EUV (MORE).	21
21	Robert Brainard	(3) Micro-Structured Polymers.	22

22	Robert Brainard	(4) Bilayer Polymer Films.	23
23	Greg Denbeaux	(1) Process optimization for metal additive manufacturing	24
24	Greg Denbeaux	(2) electron exposures for EUV resist measurements	25
25	Greg Denbeaux	(3) Resist non-uniformities on the nanometer scale	26
26	Spyros Galis	(1) Near-Infrared Single-Photon Emission Microscopy Polarization-Dependent Optical Properties and Optoelectronic Devices of 2D Materials	27
27	Spyros Galis	(2) Polarization-Dependent Optical Properties of 2D Materials	28
28	Kathy Dunn Brad Thiel	(1) Developing an Undergraduate Laboratory Module in Crystal Growth and Characterization	29
29	Michael Fasullo	(1) Profiling DNA repair mutants for carcinogen resistance	30
6	Iulian Gherasoiu Harry Efstathiadis	(1) Synthesis of diamond-like carbon (DLC) films on substrates for the fabrication of high-temperature operating devices	31
Remote Research			
#	**Name**	**Project Title**	**Page**
30	Daniel Jones	(1) Analysis of Electroencephalography (EEG) Data	32
31	Yu Zhou	(2) Simulation Study of Robotic Composite Prepreg Layup Process	33
32	Andrea Dziubek Edmond Rusjan	(1) Blood Flow in the Retina of the Eye.	34
33	Andrea Dziubek Edmond Rusjan	(2) Reformulating Simple Problems from Continuum Mechanics in the Language of Geometric Mechanics	35
34	Aarthi Sekaran	(1) Novel semiconductor cleaning technology using fluid jets.	36
35	Zhanjie Li	(1) Computational simulation of cold-formed steel column members	37
36	Hisham Kholidy	(1) Network Slicing Security in the Next Generation 5G Network	38
37	Hisham Kholidy	(2) Harnessing Machine Learning for Cloud Computing Security	39
38	Ana Jofre	(1) Design and development of an interactive web-based visualization	40
7	Sivapalan Gajan	(1) Development of predictive algorithms for the performance of foundations during earthquake loading	41
8	Sivapalan Gajan	(2) Numerical simulations of cyclic load-deformation behavior of foundations during earthquake loading	42
9	Shuang Tang	(1) Generate Electricity Without Heat Engine or Generator	43
10	Shuang Tang	(2) Making Cooling/Refrigeration Without Refrigerator.	44
11	Shuang Tang	(3) How to Measure Strength/Hardness/Thermal Properties Like Playing Video Games.	45

In-Person Research on Utica Campus

Professor Vijay Ramalingam
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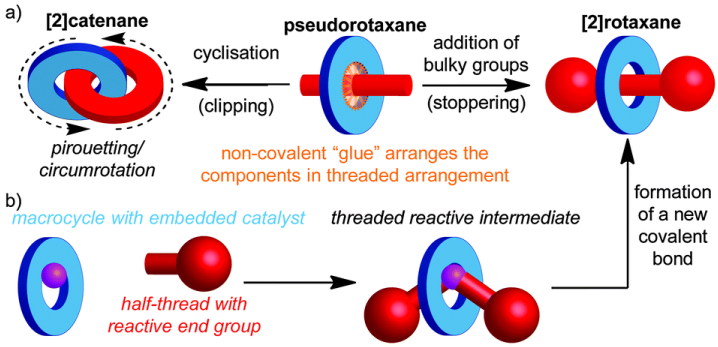
Chemistry and Biology
Assistant Professor

Project Title: (1) Rotaxanes.

Rotaxanes are a class of mechanically interlocked molecules, composed of a linear long chain molecule that threads a macrocyclic cavitand, which are sterically hindered on the terminal to keep the cavitand inside (it's a chemical molecule inside another molecule). These molecules have potential applications in the design of molecular switches, machines and nano-muscles because of their dynamic nature and capability to maintain permanent interlocking without covalent linkages. We like to design an efficient method for the synthesis of rotaxanes in an aqueous medium involving the use of 2+2 photocycloaddition of alkenes. The design strategy involves taking advantage of large cavitand's (CB8 or gamma-CD) ability to form a ternary complex to encapsulate two long chained alkenes simultaneously, which upon photoexcitation would yield a covalently fused cyclobutane structure with threads on either side. This would prove to be an efficient one-step synthetic route for accessing a wide range of rotaxanes via a unique, inexpensive approach.



Student Skills / Requirements: Organic chemistry I or General chemistry II

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Jiayue Shen
shenj@sunypoly.edu
Department of Engineering Technology
Assistant Professor

Project Title: (1) Development of a flexible sensor based on the advanced manufacturing technology.

Nowadays, with the rapid advancement of manufacturing technology, additive manufacturing, has attracted much attention from the sensor fabrication industry. The project aims to develop a highly flexible sensor for measuring the strain change of a soft robot. The accepted student is expected to fabricate the flexible sensor and characterize the sensor performance under the mentor's guidance.

Student Skills / Requirements:
Minimum Qualifications: Major in engineering, engineering technology, nanotechnology, or chemistry
Ability to follow basic chemical safety rules
Preferred Qualifications: Experience with Matlab or similar data processing software
Experience in advanced manufacturing

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:
☒Yes ☐No Track 1: SURP-Funded
☐Yes ☒No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Professor Jiayue Shen
shenj@sunypoly.edu
Department of Engineering Technology
Assistant Professor

Project Title: (2) LabVIEW-based Data Acquisition system Design for Measuring a CMOS/ReRAM(resistive memory, memristor) Device.

The memristor is a two-terminal resistive switching memory (RRAM) nanoscale device, which is recognized as the fourth fundamental electrical element in addition to resistors, capacitors, and inductors. By utilizing different resistance values to store information, memristors can function as low-power, highly-scalable device elements – critically essential properties for memory and field-programmable gate array applications. Currently, the device is tested and characterized via an expensive probe station. This project aims to design a LabVIEW-based data acquisition system for capturing the device performance without the assistance of a probe station.

Student Skills / Requirements:
Minimum Qualifications:

- Major in Electrical Engineering, Electrical Engineering Technology, Computer Engineering Technology, Nanotechnology Engineering or related majors
- Experience with basic microcontroller, digital circuits, and analog circuits

Preferred Qualifications:

- Experience with National Data Acquisition System
- Experience with LabView Coding.

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:
☒Yes ☐No Track 1: SURP-Funded
☒Yes ☐No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Professor Jagannath "Jay" Upadhyay
upadhyj@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (1) Understanding 3D Microstructures of Porous Soil using X-ray Computerized Tomography (CT) Scan.

Structure of soil changes with the seasons of the year resulting in variation of the mechanical and hydraulic properties of soil. Studying the 3D microstructure of soil will enhance the understanding of varying soil behavior in various climatic conditions and its effects on soil-water dynamics. Most of the infrastructures rest on soil, the condition of the soil at which infrastructures rest is very critical. This proposal aims to understand and characterize the 3D microstructure of soil, design a 3D soil model, and experimental study of transport behavior through the porous network of the soil-based microporous media. The list is the objective of the research plan

1. Using state-of-art X-ray Computerized Tomography (CT) Scan technique, the microstructure of the soil sample collected from the onsite field to obtain the fundamental porous structure of the soil.
2. Leveraging current polymer-based 3D additive manufacturing technique to fabricate scale-up, cheap, and economical 3D microstructure of the soil on a chip for experimental study.
3. Perform a series of flow experiments using thermosetting neutrally buoyant micro/nanoparticles to understand the transport behavior of those nanostructures through the porous network of the soil-based microporous media.

Student Skills / Requirements: CAD drawing, Matlab, Basic Engineering Skills

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒ No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Jagannath "Jay" Upadhyay
upadhyj@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (2) Relating Porosity to Mechanical Behavior of SS 316L Manufactured by DLMS Method.

This summer work aims to collect preliminary data to support state/federal research grant applications. The work performed under this program aims at conducting experiment work to test research hypotheses concerning porosity and mechanical behavior of SS 316L samples manufactured using Direct laser Metal Sintering (DLMS) techniques. Thus, knowledge gained from this preliminary study will support PI to understand the effects of porosity on mechanical behavior for better optimization and development of the new manufacturing process. These data will also provide a basis for multiscale numerical simulation for AM to predict the mechanical behavior of the material as well. The list is the objective of the research plan

1. Using state-of-art X-ray Computerized Tomography (CT) Scan technique, porosity and surface roughness of the sample manufactured using DLMS will be obtained.
2. Perform a series of mechanical testing experiments using Instron, torsional, rotating fatigue, and hardness tools to understand the relationship between porosity and mechanical behavior of 3D printed SS 316L samples.

Student Skills / Requirements: Willingness to operate Tensile, Fatigue, Hardness and Torsional testing tools, Excel, Basic Engineering Skills

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒ No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Iulian Gherasoiu and Harry Efstathiadis
gherasi@sunypoly.edu
efstath@sunypoly.edu
College of Engineering, College of Nanoscale Science and Engineering
Associate Professors

Project Title: (1) Synthesis of diamond-like carbon (DLC) films on substrates for the fabrication of high-temperature operating devices.

Diamond is one of the allotropes of carbon that finds increasing applications in the field of power electronics and material surface augmentation due to its outstanding properties. Despite its importance, the few deposition methods that exist are all technologically complex and expensive. This project aims to study the deposition of DLC films on appropriate substrates and correlate the synthesis conditions with the structural, electronic and optical properties of the DLC films. Synthesized films will be ultimately doped with B and P to determine the ability to modulate the film conductivity through process parameters. Besides material synthesis, the student will receive training in evaluating the results of the characterization techniques, such as SEM, X-ray diffraction, AFM and Raman spectroscopy. The results will be used to support a project proposal in the field of Carbon-based Electronics to be submitted to NSF, Electronics, Photonics and Magnetic Devices (EPMD).

Student Skills / Requirements: None listed

Location: ☒ Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Sivapalan Gajan
gajans@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (1) Development of predictive algorithms for the performance of foundations during earthquake loading.

The accurate prediction of cyclic load-deformation response of foundations during earthquake loading is an essential component of seismic design of buildings and bridges. A database, consisting of results obtained from centrifuge and shaking table experiments conducted in the US, Greece and Japan, has been created and is available in Digital Environment for Enabling Data-driven Science (DEEDS) website (https://datacenterhub.org/).

The objectives of this summer project are (i) to extract experimental data on key capacity, demand, and performance parameters of foundations during dynamic base shaking loading from the database and (ii) to calibrate (train) and validate (test) machine learning algorithms that may be used as predictive models for the performance of foundations during seismic loading.

Student Skills / Requirements: Sophomore or junior standing in engineering or computer science, basic math background, basic skill in computer programming (Python preferred), and proficiency in Excel (or any other plotting software)

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒ Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? One student for this project (I have a separate application for another related project)

☐Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Sivapalan Gajan
gajans@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (2) Numerical simulations of cyclic load-deformation behavior of foundations during earthquake loading

The accurate prediction of cyclic load-deformation response of foundations during earthquake loading is an essential component of seismic design of buildings and bridges. A database, consisting of results obtained from centrifuge and shaking table experiments conducted in the US, Greece and Japan, has been created and is available in Digital Environment for Enabling Data-driven Science (DEEDS) website (https://datacenterhub.org/).

The objectives of this summer project are (i) to determine appropriate and optimum mechanics-based model parameters for foundations and soils used in the experiments available in the database and (ii) to carry out numerical modeling using appropriate mechanics-based models available in a finite element modeling framework to simulate the experiments available in the database.

Student Skills / Requirements: Sophomore or junior standing in engineering, basic math background, basic skill in computer programming (e.g., Matlab, Mathcad, Python), and proficiency in Excel (or any other plotting software)

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? 1

☐Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (1) Generate Electricity Without Heat Engine or Generator.

A more realistic approach to solve the energy problem is to build generators that can make electricity everywhere as long as there is a temperature difference, such as between skin and air, between oven and floor, between fish tank and window. Obviously, traditional heat engines or generators are too large, too noisy and too expensive.
This project tries to find solid-state materials as shown in the figure that can be made into as small as a match box to generate electricity at many circumstances. Some households in developing countries are using this technology to charge their cellphone while cooking. This is called a Seebeck generator. The materials are called thermoelectric materials.

(Figure adapted from online)

Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

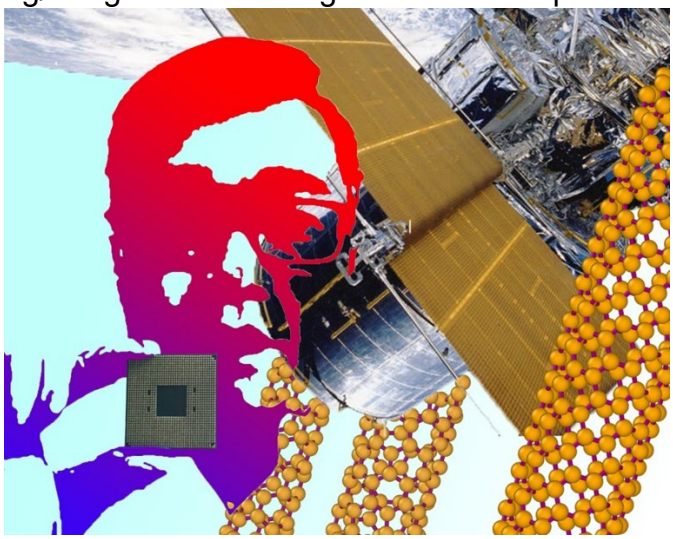
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (2) Making Cooling/Refrigeration Without Refrigerator.

The traditional refrigerators are large, expansive, noisy, and low efficiency by some criticisms, largely due to the running fluid, the compressors and the evaporators. At some extreme cases like in the space, on computer chips, on satellites, or in the ocean, we want to make supercooling without using the refrigerator. The task can be performed by modern solid-state materials. When we add a voltage to the material, it will cool one side and heat another side. This is called the Peltier cooler. This project will try to find materials that can induce cooling/refrigeration with high coefficient of performance.



Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (3) How to Measure Strength/Hardness/Thermal Properties Like Playing Video Games.

As the development of modern computers, many engineering tasks like materials synthesis, testing and measurement can be carried out at a virtual lab environment, without going to the physical lab, which is cheap, safe, and fast, just like playing a video game.

The figure is illustrating how to do the compression test to measure the elastic and plastic strength of a foam material upon compression using a virtual reality technique. The virtual lab technique is now widely used in industry and more accepted after pandemic for safety and risk control, due to its flexibility in working locations.

This project will teach you virtual lab skills and supercomputer operations, to do materials related research for academic paper publications. (figure adapted from online)

Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

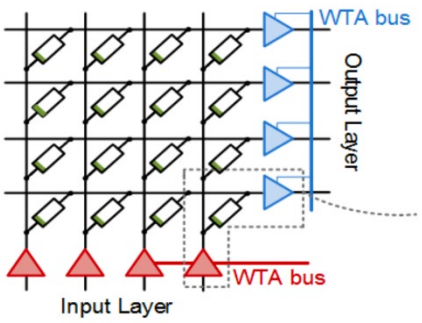
I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded
☐Yes ☒No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Professor Yu Zhou
zhouy2@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (1) Research on computing and control using neuromorphic chip

A neuromorphic chip is an IC chip which contains a matrix of memristors. Each memristor is a two-terminal IC-compatible analog device, which can be programmed to different conductance states. Simply speaking, a memristor functions like a resistor with programmable resistance. The tunable conductance states of memristors allow neuromorphic chips to be used as flash memory and to potentially carry out computations on-chip.



This summer project aims at exploring the computing and control capabilities of a neuromorphic chip. The specific tasks include:

1. Set up the circuit to connect and program the chip with a microcontroller,
2. Test with basic hardware computing tasks using the chip,
3. Test with basic control tasks using the chip, 4) document the research process and results.

Student Skills / Requirements: Basic knowledge of electronic circuits and microprocessors, programming with Arduino.

Location: ☐Albany Campus ☒Utica Campus ☒Remote (Hybrid)

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? **One.**

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Asif Ahmed
ahmeda3@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (1) Transportation Geotechnics.

The faculty performs research on Transportation Geotechnics. Several branches of his research are utilization of climate data for pavement performance modeling, using UAV for pavement deterioration monitoring. The research is also aimed for 3D printing of the soil materials. The student will work on using the above-mentioned techniques for better Geotechnics behavior modeling.

Student Skills / Requirements: Efficient communication and writing skills. The faculty will assist the student in research. Strong MS Excel proficiency will be a bonus.

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Kazi Imran
imrank@sunypoly.edu
Utica Mechanical Engineering Technology
Assistant Professor

Project Title: (1) Stress Analysis of Fiber Reinforced Composite Materials.

Fiber reinforced polymer (FRP) composites have exceptional advantage over traditional materials for their lightweight, high stiffness and strength, high resistance to corrosion and fatigue, which results in lower total life time cost. Understanding the fracture characteristics is very important to design and analysis fiber reinforced composite structure. In this project modeling, stress and deflection analysis of fiber reinforced composites will be performed using computational tool.

Student Skills / Requirements: 3rd-year or 4th Mechanical Engineering/Technology student

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Lauren Endres
endresl@sunypoly.edu
Biology and Chemistry/College of Arts and Sciences
Assistant Professor

Project Title: (1) Translational responses to DNA damage induced by oxidative stress.

Culturing human and mouse cells to assess their capacity to respond to and recover from oxidative stress-inducing compounds, like hydrogen peroxide, t-butyl-peroxide, and arsenic. The molecular techniques used for assessment include growth-curves, colony forming assays, and COMET assay to detect DNA strand breaks with fluorescent microscopy.

Student Skills / Requirements: Proficiency with MS Office – graphing in Excel and basic slide design using PowerPoint.

Location: ☐Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☐Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

In-Person Research in Albany Campus

Professor Nathaniel Cady
cadyn@sunypoly.edu
College of Nanoscale Science and Engineering
Professor

Project Title: (1) Neuromorphic Computing

The Cady research group is focusing on the development of novel chips that are customized for neuromorphic computing applications, based on memristor (resistive memory) technology. The student working on this project will be involved in the fabrication, testing and/or simulation of these chips at the SUNY Poly site in Albany, NY. This is a team-based research project that will involve work with graduate students and other staff in Prof. Cady's research group.

Student skills / requirements: Programming experience (eg. Python) is preferable. Otherwise a general background in STEM fields is needed.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? 1

☐Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Andre Melendez/Scott Tenenbaum
jmelendez@sunypoly.edu
tenenbs@sunypoly.edu
College of Nanoscale Science and Engineering
Professor/Associate

Project Title: (1) Quantitate markers of senescence and proliferative decline in Alkbh8 deficient human IMR-90 cells.

Hypothesis: Alkbh8-deficiency results in defects in selenoprotein function which alters the redox-environment and triggers senescence.

Design: We will deplete or enforce the expression of Alkbh8 in senescent IMR90 cells using stabile shRNA knockdown or expression constructs for Alkbh8, respectively as reported for HEK293 in our published papers.

Student skills / requirements: Biology, Chemistry, Biochemistry or Biomedical Engineering Background.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? 1

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Andre Melendez/Scott Tenenbaum
jmelendez@sunypoly.edu
tenenbs@sunypoly.edu
College of Nanoscale Science and Engineering
Professor/Associate

Project Title: (2) Determine if *AlkbhD^{Def}* potentiates the Senescence Associated Secretory Phenotype.

Hypothesis: We will test the hypothesis that an Alkbh8 deficiency in human cells amplifies SASP, with SASP increased in the Alkbh8 deficient model after exposure to common ROS producing and senescence inducing agents.

Design: ***Senescence and SASP analysis.*** All studies will be done in young and old fibroblasts (IMR90s) in coordination with Project 1, following exposure to H_2O_2, UV or γ-irradiation, with measurements taken at 6, 12 and 12 hours. Using QPCR and the Meso Scale Discovery (MSD) Multi-Array® technology that utilizes electrochemiluminescence detection to monitor protein levels, we will evaluate the most abundant SASP factors from control and Alkbh8-depleted or replete IMR-90 cells.

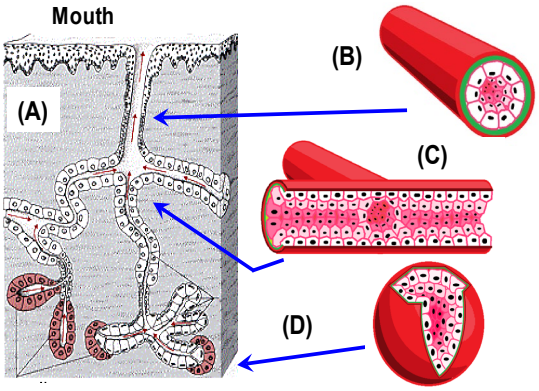
Student skills / requirements:: Biology, Chemistry, Biochemistry or Biomedical Engineering Background.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):
☒Yes ☐No Track 1: SURP-Funded
☒Yes ☐No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support? 1
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Professor Robert L. Brainard
brainar@sunypoly.edu
College of Nanoscale Science and Engineering
Full Professor

Project Title: (1) Bio Roll-Up



The goal of this project is to develop the methodology for controlling timing of self-assembly of bilayer stacks upon which cells are growing. The ultimate goal of this project is to determine how shape changes influence the biology of cells. Students will synthesize polymers and formulate polymers into photoresists, that will be coated onto silicon wafers into multiple stacks of hydrogel films. Students will study the kinetics of self-assembly of these multi-layer stacks under conditions suitable for cell growth. Students may participate in growing cells onto these stacks.

Student skills / requirements: No experience necessary, but strong background in chemistry and biology required.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

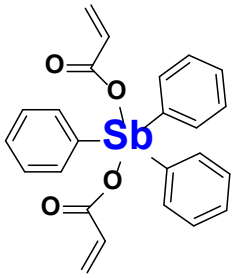
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Robert L. Brainard
brainar@sunypoly.edu
CNSE
Full Professor

Project Title: (2) Molecular Organometallic Resists for EUV (MORE).

The goal of this project is to develop organometallic compounds that can be used as high resolution photoresists in the microelectronics industry to fabricate future integrated circuits. Students will synthesize and/or characterize compounds containing main-group metals. These compounds are designed to undergo chemical reactions when irradiated with 13.5 nm extreme ultraviolet light resulting in a change in solubility.



Student skills / requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

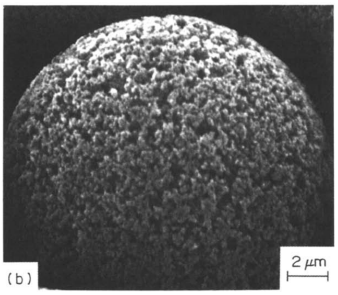
If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Robert L. Brainard
brainar@sunypoly.edu
College of Nanoscale Science and Engineering
Full Professor

Project Title: (3) Micro-Structured Polymers.



The goal of this project is to design and synthesize polymers with specifically-designed microscale morphology for microelectronics applications.

Student skills / requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Robert L. Brainard
brainar@sunypoly.edu
College of Nanoscale Science and Engineering
Full Professor

Project Title: (4) Bilayer Polymer Films.

Students will formulate polymer solutions and spin coat them into 2-layer stacks. Students would then study the chemical interactions between these two layers using Fourier-transform infrared spectroscopy (FTIR), water contact angle, and/or changes in solubility. This project is aimed at developing a mechanistic understanding of the chemical interactions between two polymer films.

Student skills / requirements: No experience necessary, but strong background in chemistry, particularly organic chemistry.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Greg Denbeaux
denbeag@sunypoly.edu
College of Nanoscale Science and Engineering
Associate Professor

Project Title: (1) Process optimization for metal additive manufacturing

We have developed a novel metal additive manufacturing system (3D printer). It needs programming of stages for automated sample fabrication and optimization of the process conditions for the metal deposition.

Student skills / requirements: hands on tool operation and programming for motor control

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? - **2**

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Greg Denbeaux
denbeag@sunypoly.edu
College of Nanoscale Science and Engineering
Associate Professor

Project Title: (2) Electron exposures for EUV resist measurements

We are studying the effect of low energy electron exposures in EUV resists. This project will use an electron gun and vacuum system for exposing and measuring the effects of the low energy electrons on the fundamental chemistry of EUV photoresists.

Student skills / requirements: skills or willingness to learn hands on experimental procedures for vacuum chambers and resist processing

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? - **2**

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Greg Denbeaux
denbeag@sunypoly.edu
College of Nanoscale Science and Engineering
Associate Professor

Project Title: (3) Resist non-uniformities on the nanometer scale

We are studying the effect of molecular distributions and segregation on the performance of EUV photoresists. These multi-component materials may segregate leading to local sensitivity variations of the resist leading to defectivity in the semiconductor manufacturing processes. We are studying how to mitigate this effect.

Student skills / requirements: skills or willingness to learn hands on experimental procedures for spin coating resists and atomic force microscopy

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? - **2**

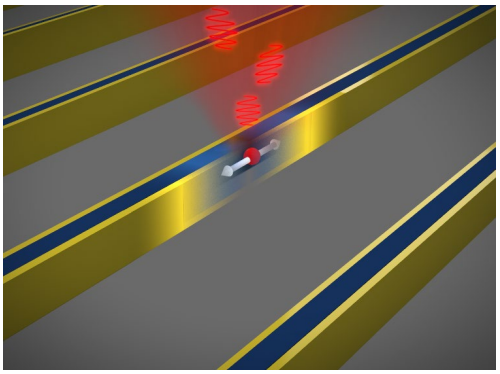
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Spyros Galis
galiss@sunypoly.edu
Nanoengineering, College of Nanoscale Science and Engineering
Associate Professor

Project Title: (1) Near-Infrared Single-Photon Emission Microscopy Polarization-Dependent Optical Properties and Optoelectronic Devices of 2D Materials

The overarching objective of this project is to provide valuable team-driven research experiences for an undergraduate student through participation in our current National Science Foundation (NSF) research project "QuIC-TAQS: Multifunctional integrated quantum photonic processor for quantum connectivity." Our project aims to advance fundamental understanding in developing and characterizing solid-state quantum emitters capable of operation at the technologically important low attenuation telecom band. (Related Work)



Student skills / requirements: Senior Physics/ Engineering student

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

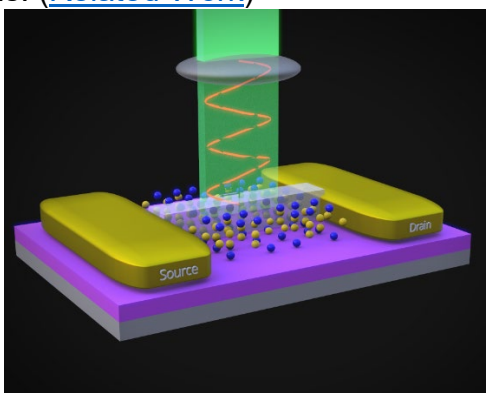
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Spyros Galis
galiss@sunypoly.edu
Nanoengineering, College of Nanoscale Science and Engineering
Associate Professor

Project Title: (2) Polarization-Dependent Optical Properties of 2D Materials

Anisotropic layered GaTe has emerged as a potential material for polarization-sensitive devices and applications. In this project, we investigate the anisotropic optical properties of chemically-grown GaTe nanomaterials using polarization-resolved Raman and photoluminescence spectroscopic techniques for a multitude of different thicknesses and laser excitation wavelengths. (Related Work)



Student skills / requirements: Senior Physics/ Engineering student

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Kathy Dunn / Brad Thiel
dunnka@sunypoly.edu
thielb@sunypoly.edu
College of Nanoscale Science and Engineering
Associate Professor / Professor

Project Title: (1) Developing an Undergraduate Laboratory Module in Crystal Growth and Characterization

The student in this project will work with two faculty members to develop a series of undergraduate laboratory experiments that will form the core of a year-long laboratory course in a newly developed materials science curriculum. These experiments will center on learning to use a laboratory-scale Czochralski crystal puller as the basis for exploring the processing-microstructure-properties paradigm. While conditions for growing ideal silicon crystals are well-established, we aim to use this tool with more complex systems to demonstrate the effects of non-ideal conditions, particularly in binary systems with complex phase fields such as SiC. The effects of growth conditions on the phases developed and their assembly into a microstructure, as well as the presence of defects and impurities on engineering properties will provide ample parameter space for student exploration and learning opportunities. The student will identify growth conditions that will produce interesting and useful microstructures for subsequent microstructural analysis and characterization using techniques such as scanning electron microscopy, atomic force microscopy, X-ray diffraction, electrical and mechanical testing. This project would be ideal for a curious hands-on learner with an interest in physics, inorganic chemistry, chemical engineering, or materials science and engineering. The techniques described here can form the foundation for a career in materials analysis or engineering education.

Student skills / requirements: Student should have hand's-on experience with laboratory equipment in materials science, physics, chemistry, or similar.

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):
☒Yes ☐No Track 1: SURP-Funded
☐Yes ☒No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Michael Fasullo
fasullm@sunypoly.edu
College of Nanoscale Science and Engineering
Professor

Project Title: (1) Profiling DNA repair mutants for carcinogen resistance.

We have now profiled the yeast genome for carcinogen resistance, but many genes still need to be confirmed. We will use flow cytometry to perform competition assays between wild type and mutant strains in the presence of toxins. The student will gain experience in flow cytometry, yeast genetics, and toxicology.

Student skills / requirements: None listed

Location: ☒Albany Campus ☐Utica Campus ☐Remote

I am willing to accept students from the following tracks (Yes/No):
☒Yes ☐No Track 1: SURP-Funded
☐Yes ☐No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit

Professors Iulian Gherasoiu and Harry Efstathiadis
gherasi@sunypoly.edu
efstath@sunypoly.edu
College of Engineering, College of Nanoscale Science and Engineering
Associate Professors

Project Title: (1) Synthesis of diamond-like carbon (DLC) films on substrates for the fabrication of high-temperature operating devices.

Diamond is one of the allotropes of carbon that finds increasing applications in the field of power electronics and material surface augmentation due to its outstanding properties. Despite its importance, the few deposition methods that exist are all technologically complex and expensive. This project aims to study the deposition of DLC films on appropriate substrates and correlate the synthesis conditions with the structural, electronic and optical properties of the DLC films. Synthesized films will be ultimately doped with B and P to determine the ability to modulate the film conductivity through process parameters. Besides material synthesis, the student will receive training in evaluating the results of the characterization techniques, such as SEM, X-ray diffraction, AFM and Raman spectroscopy. The results will be used to support a project proposal in the field of Carbon-based Electronics to be submitted to NSF, Electronics, Photonics and Magnetic Devices (EPMD).

Student Skills / Requirements: None listed

Location: ☒ Albany Campus ☒Utica Campus ☐Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Remote Research

Professor Daniel Jones
dkjones@sunypoly.edu
Engineering Technology
Associate Professor

Project Title: (1) Analysis of Electroencephalography (EEG) Data.

We are collecting EEG data from 80-100 student participants in the newly-established EEG laboratory. Signals are measured with 256 sensors at 1,000 Hz while participants provide emotional response to photographs. This project aims to analyze the data to understand neural activity of the brain in response to the images.

Student Skills / Requirements: General computer skills for analyzing data, preferably Matlab or Excel (or a desire to learn), motivation to work independently.

Location: ☐Albany Campus ☐Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

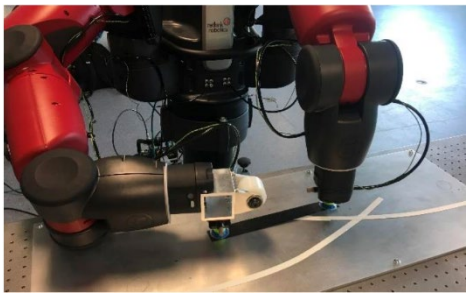
If you have funding for Track 2 students, how many do you plan to support?

☐Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Yu Zhou
zhouy2@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (2) Simulation Study of Robotic Composite Prepreg Layup Process.



Robotic composite prepreg layup processes use robot manipulators to pick and place prepreg plies (fabrics pre-impregnated with resins) to produce composite laminates. It is a rising automated composite manufacturing process. One major challenge is to control the robot manipulator to apply the layup force uniformly during the continuous process of placing and compacting each prepreg ply, throughout the layup process of each laminate, and throughout the process of mass production, in order to attain consistent product quality. This summer project aims at developing a simulated robotic prepreg layup process to facilitate the computer simulation research of feedback control approaches for real-time layup force control during a robotic prepreg layup process using a Baxter robot.

The specific tasks of this summer project includes 1) understanding how the Baxter robot works and how it is controlled through programming, 2) tuning up the computer simulator of the Baxter robot, 3) programming the simulated Baxter robot to carry out the simulated robotic prepreg layup process, 4) providing the program interface for plugging in feedback force control algorithms, 5) testing a basic feedback force control algorithm with the simulated process, 6) documenting the research process and results.

Student Skills / Requirements: Python programming, Ubuntu OS, and basic understanding of how robot manipulators work.

Location: ☐Albany Campus ☐Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Andrea Dziubek and Edmond Rusjan
dziubea@sunypoly.edu
edmond@sunypoly.edu
College of Arts and Sciences
Associate Professors

Project Title: (1) Blood Flow in the Retina of the Eye.

Mathematical modeling of the blood flow in the eye has the potential to help medical professionals detect diseases sooner, better understand their dynamics, and to design better treatments. Students will apply state of the art analytical and numerical methods in physically based mathematical modeling of the blood flow in the retina of the eye. Specifically, they will work on the analytical solutions of the Poiseuille flow through the vascular tree network coupled to the numerical solution of the Darcy flow through the porous medium. The aim is to publish the results in an academic journal.

Student Skills / Requirements: Differential Equations, Calculus III, Linear Algebra, Physics, and Programming in Unix environment, familiarity with Python or Julia an advantage.

Location: ☐Albany Campus ☐Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professors Andrea Dziubek and Edmond Rusjan
dziubea@sunypoly.edu
edmond@sunypoly.edu
College of Arts and Sciences
Associate Professors

Project Title: (2) Reformulating Simple Problems from Continuum Mechanics in the Language of Geometric Mechanics.

Many phenomena in engineering and physics are described by continuum mechanics. Building on the foundation of tensor calculus and exterior calculus, geometric mechanics reformulates mechanics, in particular Lagrangian and Hamiltonian mechanics, in the language of geometry. Geometric mechanics provides a unifying framework for many seemingly disparate physical systems, such as N-particle systems, rigid bodies, fluids and other continua. Students will work on reformulating simple problems from elasticity, fluid dynamics, electrodynamics, (or general relativity) in the language of geometric mechanics. The aim is to publish the results in an academic journal.

Student Skills / Requirements: Differential Equations, Calculus III, Linear Algebra, Physics, familiarity with Vector and Tensor Calculus and LaTeX an advantage.

Location: ☐Albany Campus ☐Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

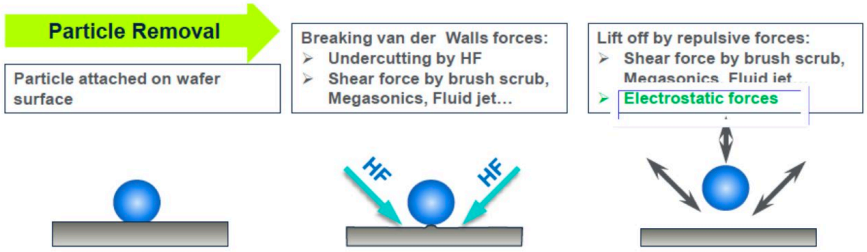
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Aarthi Sekaran
sekaraa@sunypoly.edu
Mechanical Engineering
Assistant Professor

Project Title: (1) Novel semiconductor cleaning technology using fluid jets.

Post-CMP (chemical-mechanical planarization) cleaning in semiconductor industry, entails the removal of very small contaminant particles from silicon wafers without damaging these minute wafers. One of the promising candidates for effective post-CMP cleaning is based on water jets. This environmentally friendly method uses the momentum of the water jet to overcome the forces holding the particle to the surface and carry the particle away. The implementation of this concept is challenging given the size of the fluid jets (a few micrometers) and particles (a few nanometers to micrometers). Successful implementation would require precise control and consequentially a complete understanding of the mechanics of these jets. The nature of technology is also of interest to GlobalFoundries (https://gf.com/) and specifics of the project would involve input from the company.
This project will involve carrying out CFD (computational fluid dynamics) of this process to determine the optimum jet parameters (nozzle size, shape and velocity of the fluid) to ensure particle removal without damage to the underlying wafer.



Student Skills / Requirements: The student should be a mechanical engineer (2nd and 3rd year) with a basic understanding of engineering physics and some experience with coding. Student should be comfortable with standard tools such as Microsoft Word and Excel and be open to using new software.

Location: ☐Albany Campus ☐Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Zhanjie Li
liz1@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (1) Computational simulation of cold-formed steel column members.

Computational modeling has been greatly advanced in recent years. High-fidelity computational modeling that has been validated has a great advantage in providing reliable prediction of structural behaviors and yet saves a lot of costs compared to full-scale experimental tests. Particularly for cold-formed steel (CFS) member analysis, sophisticated shell models have been greatly validated in the past with tests for nonlinear collapse analyses. However, there are lots of modeling parameters involved in the analysis. All of these require a guidance and provisions to efficiently yet reliably conduct computational modeling for CFS members. In particular, how the analysis should be conducted as a replacement of test-based design procedures, i.e., analysis-based test approach, could be potentially implemented into American Iron and Steel Institute (AISI) standards. As a commencing effort for possible codification of testing by analysis in the AISI standards, the objective, by starting from the member level, is to provide the needed background work for stub column by analysis, provide a guidance for conducting computational modeling of CFS members through a series of numerical examples, and then summarize the recommended provisions related to all the modeling parameters above. ABAQUS package will be chosen as the beginning computational model tool based on extensive experiences in our past research.

Student Skills / Requirements: Student should be familiar with structural analysis, MATLAB coding, and Excel, computational modeling

Location: ☐Albany Campus Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

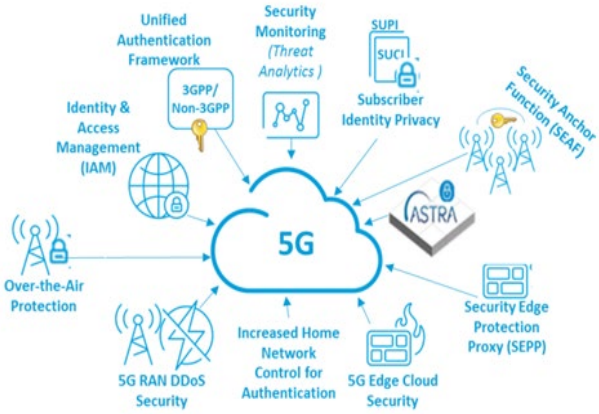
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Hisham Kholidy
kholidh@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (1) Network Slicing Security in the Next Generation 5G Network.

The fifth generation cellular network (5G) is up to 100 times faster than 4G. The 5G is creating never-before-seen opportunities for people and businesses. The 5G can help create a smarter, safer and more sustainable future. 5G deployments face several distinct security risks that organizations should be aware of.



This proposal uses the machine learning, and modeling and analysis techniques to provide the following capabilities (i) a dynamic vulnerability analysis and threat modeling approach based on the 5G attack vector. (ii) a secure approach to slice the network services.

Student Skills / Requirements: Programming using Python, C, C++, and/or Java with some experience about server setup and/or cloud computing.

Location: ☐Albany Campus Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☐Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Hisham Kholidy
kholidh@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (2) Harnessing Machine Learning for Cloud Computing Security.

Security is a top concern which still solidly in first place in the field of cloud computing. Thus we needed research on cloud computing security. Modern cloud service providers often provide security during unwanted traffic over cloud systems. The main goal of this project is to practically employ some machine learning techniques to select the suitable responses against cloud network attacks. Among the goals also is to develop multi criteria decision making approach to help user select the best cloud providers in terms of cost, performance, and security.

Student Skills / Requirements: Programming using Python, C, C++, and/or Java with some basic computer network experience and/or cloud computing.

Location: ☐Albany Campus Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

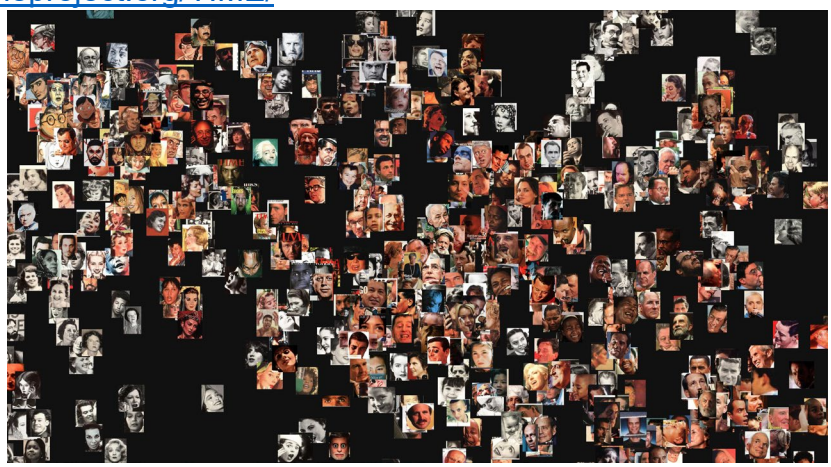
☐Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Ana Jofre
jofrea@sunypoly.edu
Communications and Humanities / College of Arts and Sciences
Assistant Professor

Project Title: (1) Design and development of an interactive web-based visualization.

The goal of this project is to edit and customize a web-based interactive visualization of a collection of about 9000 images. The visualization uses software developed at Yale's digital humanities lab that sorts images using an unsupervised clustering algorithm, allowing viewers to explore visual relationships between the images. A current version of this visualization is available here: https://magazineproject.org/TIME/pixplot/, and a screenshot is included below. This project is part of a bigger project in which we have examined an archive of TIME magazine, and are creating a web resource that makes our data and research findings accessible to the public through visualizations and interactive narratives. Last year, a SURP student helped develop one of the visualizations that will be part of this resource, and I am looking for another to student to help with another visualization this year. More information about the bigger project can be found here: https://magazineproject.org/TIME/



Student Skills / Requirements: Front end web development: Good command of CSS and JavaScript. Ideal student will also have design skills.

Location: ☐Albany Campus Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Sivapalan Gajan
gajans@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (1) Development of predictive algorithms for the performance of foundations during earthquake loading.

The accurate prediction of cyclic load-deformation response of foundations during earthquake loading is an essential component of seismic design of buildings and bridges. A database, consisting of results obtained from centrifuge and shaking table experiments conducted in the US, Greece and Japan, has been created and is available in Digital Environment for Enabling Data-driven Science (DEEDS) website (https://datacenterhub.org/).

The objectives of this summer project are (i) to extract experimental data on key capacity, demand, and performance parameters of foundations during dynamic base shaking loading from the database and (ii) to calibrate (train) and validate (test) machine learning algorithms that may be used as predictive models for the performance of foundations during seismic loading.

Student Skills / Requirements: Sophomore or junior standing in engineering or computer science, basic math background, basic skill in computer programming (Python preferred), and proficiency in Excel (or any other plotting software)

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒ Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? 1

☐Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Sivapalan Gajan
gajans@sunypoly.edu
College of Engineering
Associate Professor

Project Title: (2) Numerical simulations of cyclic load-deformation behavior of foundations during earthquake loading

The accurate prediction of cyclic load-deformation response of foundations during earthquake loading is an essential component of seismic design of buildings and bridges. A database, consisting of results obtained from centrifuge and shaking table experiments conducted in the US, Greece and Japan, has been created and is available in Digital Environment for Enabling Data-driven Science (DEEDS) website (https://datacenterhub.org/).

The objectives of this summer project are (i) to determine appropriate and optimum mechanics-based model parameters for foundations and soils used in the experiments available in the database and (ii) to carry out numerical modeling using appropriate mechanics-based models available in a finite element modeling framework to simulate the experiments available in the database.

Student Skills / Requirements: Sophomore or junior standing in engineering, basic math background, basic skill in computer programming (e.g., Matlab, Mathcad, Python), and proficiency in Excel (or any other plotting software)

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☒Yes ☐No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support? 1

☐Yes ☐No Track 3: Volunteer

☐Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (1) Generate Electricity Without Heat Engine or Generator.

A more realistic approach to solve the energy problem is to build generators that can make electricity everywhere as long as there is a temperature difference, such as between skin and air, between oven and floor, between fish tank and window. Obviously, traditional heat engines or generators are too large, too noisy and too expensive.
This project tries to find solid-state materials as shown in the figure that can be made into as small as a match box to generate electricity at many circumstances. Some households in developing countries are using this technology to charge their cellphone while cooking. This is called a Seebeck generator. The materials are called thermoelectric materials.

(Figure adapted from online)

Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

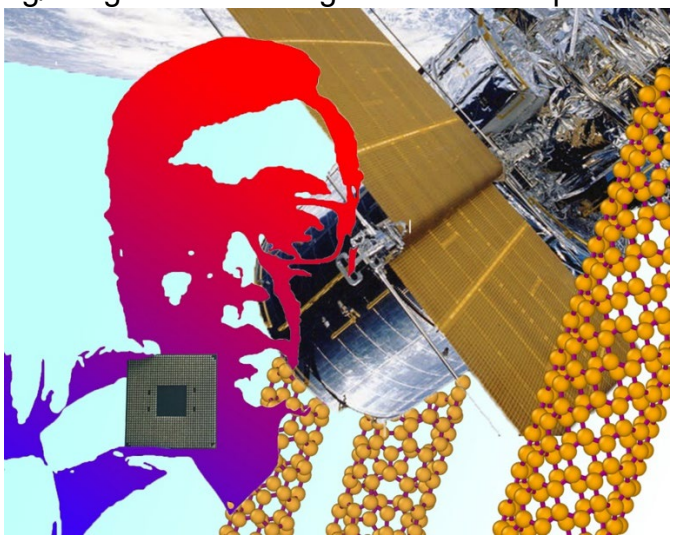
☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (2) Making Cooling/Refrigeration Without Refrigerator.

The traditional refrigerators are large, expansive, noisy, and low efficiency by some criticisms, largely due to the running fluid, the compressors and the evaporators. At some extreme cases like in the space, on computer chips, on satellites, or in the ocean, we want to make supercooling without using the refrigerator. The task can be performed by modern solid-state materials. When we add a voltage to the material, it will cool one side and heat another side. This is called the Peltier cooler. This project will try to find materials that can induce cooling/refrigeration with high coefficient of performance.



Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded

☐Yes ☒No Track 2: Faculty-Grant Funded SURP

If you have funding for Track 2 students, how many do you plan to support?

☒Yes ☐No Track 3: Volunteer

☒Yes ☐No Track 4: Research for Credit

Professor Shuang Tang
tangs1@sunypoly.edu
College of Engineering
Assistant Professor

Project Title: (3) How to Measure Strength/Hardness/Thermal Properties Like Playing Video Games.

As the development of modern computers, many engineering tasks like materials synthesis, testing and measurement can be carried out at a virtual lab environment, without going to the physical lab, which is cheap, safe, and fast, just like playing a video game.

The figure is illustrating how to do the compression test to measure the elastic and plastic strength of a foam material upon compression using a virtual reality technique. The virtual lab technique is now widely used in industry and more accepted after pandemic for safety and risk control, due to its flexibility in working locations.

This project will teach you virtual lab skills and supercomputer operations, to do materials related research for academic paper publications. (figure adapted from online)

Student Skills / Requirements: students willing to do materials science/engineering and solid state physics projects, and interested in paper publishing.

Location: ☐Albany Campus ☒Utica Campus ☒Remote

I am willing to accept students from the following tracks:

☒Yes ☐No Track 1: SURP-Funded
☐Yes ☒No Track 2: Faculty-Grant Funded SURP
If you have funding for Track 2 students, how many do you plan to support?
☒Yes ☐No Track 3: Volunteer
☒Yes ☐No Track 4: Research for Credit