

SCHOOL OF SCIENCE, MATHEMATICS AND ENGINEERING

# Catalog of Research and Project-Based Learning

2020-2021





## Table of Contents

<b>Welcome</b>	3
<b>Biology</b>	4
<b>Biotechnology</b>	8
<b>Excercise Science</b>	
Fitness Technician	10
<b>Natural Science &amp; Engineering</b>	
Geoscience	
Geology	13
GIS	15
Atmospheric Science	17
Chemistry	18
Engineering	21
Physics – Astronomy	23
<b>Mathematics</b>	
Learn a New Language: Mathematics	24
Student Math League	25
<b>Other Resources</b>	
SME Symposium	26
STEM – Learning Support Services	27
Clubs & Organizations	28
School of Science, Mathematics and Engineering	29

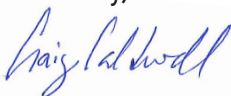




## Welcome!

Salt Lake Community College is a great place to start taking your science, math, and engineering coursework...but we have much more to offer than just the typical class experience. Take a moment to look through the opportunities described in our Project-Based Learning Catalog and you will find amazing ways to participate in research, projects, and other collaborative efforts that go far beyond the lecture hall. No matter your interest, we have something for you, including experiences in Biology, Biotechnology, Chemistry, Physics, and Engineering. I encourage you to use this guide to search for ways that you can take part in extraordinary learning opportunities that will boost your learning, confidence, and skills as you work toward your academic goals. Feel free to reach out to the faculty listed here and explore ways to enrich your educational experience at SLCC.

Sincerely,



Craig Caldwell

Dean, School of Science, Mathematics and Engineering

## Biology

### SLCC Genome Annotation Project

#### Contact:

Tim Beagley, PhD

[tim.beagley@slcc.edu](mailto:tim.beagley@slcc.edu)

Rebecca Sperry

[rebecca.sperry@slcc.edu](mailto:rebecca.sperry@slcc.edu)

[slccgap.org](http://slccgap.org)

#### Project Description:

The Salt Lake Community College (SLCC) Genome Annotation Project is a cooperative partnership with the Department of Energy's Joint Genome Institute and the Microbial Genome Annotation Network. The project has been designed to afford SLCC students an opportunity to learn the capabilities of computational biology while reinforcing basic biological principles surrounding the central dogma of molecular biology.

Each semester SLCC students take a 50,000 nucleotide segment of the *Halogeometricum borinquense* genome and examine its contents in terms of likely protein coding genes. The students in the laboratory portion of Cell Biology (BIOL 2025) start by generating an open reading frame (ORF) map of the segment that can be called a consensus map. This consensus map becomes a scientific hypothesis regarding the location of protein coding genes in the segment. Subsequently, each student is assigned several of the ORFs to annotate and to acquire multiple lines of evidence to support or reject the hypothesis that the ORF is a protein coding gene.

To date, SLCC students have mapped and annotated 700,000 nucleotides of the four million bases in the genome. Many students have mastered the basics of computational biology and the majority of students have gained a deeper understanding of the molecular mechanisms of the cell. Additionally, numerous individual research projects have spun off from the projects, and students are currently working on these projects as independent research.

**Related Course:** BIOL 2025

## SLCC Antibiotic Resistance Project

### Contact:

Tim Beagley, PhD

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Rebecca Sperry

[rebecca.sperry@slcc.edu](mailto:rebecca.sperry@slcc.edu)

[slccgap.org](http://slccgap.org)

### Project Description:

Beginning Spring Semester 2018, students in BIOL 2065 (Microbiology Lab) will be collecting soil samples along the Wasatch Front and using them to determine relative levels of bacterial resistance to certain antibiotics.

Sample locations and resistance levels will be displayed via GIS technology on a public and interactive map. Once the project gets up and running, SLCC students and others will be able to contribute to the project in a variety of ways.

## Ecology & Sustainability

### Contact:

Jessica Berryman

[jessica.berryman@slcc.edu](mailto:jessica.berryman@slcc.edu)

### Project Descriptions:

**Independent Ecological Research:** Students conduct an independent ecological research project and present it at a mock symposium in class, and are encouraged to participate in the SME symposium in the spring. This class is offered in the fall.

**Related Course:** BIOL 2225

**Sustainable Food Systems:** As part of a service-learning course, students design and carry out a class term project that provides service to a local non-profit specifically oriented toward sustainable food systems.

**Related Course:** BIOL 1405

**Field Biology:** Students will camp with faculty in a field location in southern Utah and explore adjacent natural areas where they will learn the taxonomy, ecology and natural history of the local flora and fauna. The class will assess and compile an inventory of the communities and ecosystem structure of a local Wilderness Study Area for a presentation. This is part of a May term course.

**Related Course:** BIOL 2350

## Urban Ecology of Birds

### Contact:

Corey Riding

[corey.riding@slcc.edu](mailto:corey.riding@slcc.edu)

### Project Descriptions:

#### Urban Bird Mortality

Urban areas can be difficult for birds, especially during migration. Birds frequently collide with buildings, mostly at glass surfaces like windows. This issue, however, has been studied primarily in large cities of eastern North America. Our study will help us understand aspects of bird-window collision mortality right here in Utah. Students who attend a short training can participate in monitoring SLCC campus buildings for birds that have perished due to window collisions.

#### Winter Raptor Monitoring

Nearly 40 years ago, a study looked at the abundance and habitat associations of raptors around Utah Lake during winter. That area has changed dramatically in the last four decades. This study will help us understand how the abundance and habitat use of various raptor species may have changed with increasing urbanization. Students can participate as observers in driving surveys during winter months (November to March).

#### Other Research Opportunities

As time and funding permit, I will initiate other research projects in which students can participate. Generally, these projects will focus on the ecology of birds, particularly in urban settings, but they could cover a broader scope of ecological and biological topics. Students who may be interested are welcome to contact me at any time regarding current opportunities.



## Biodiversity, Ecology, Evolution Research Projects

### Contact:

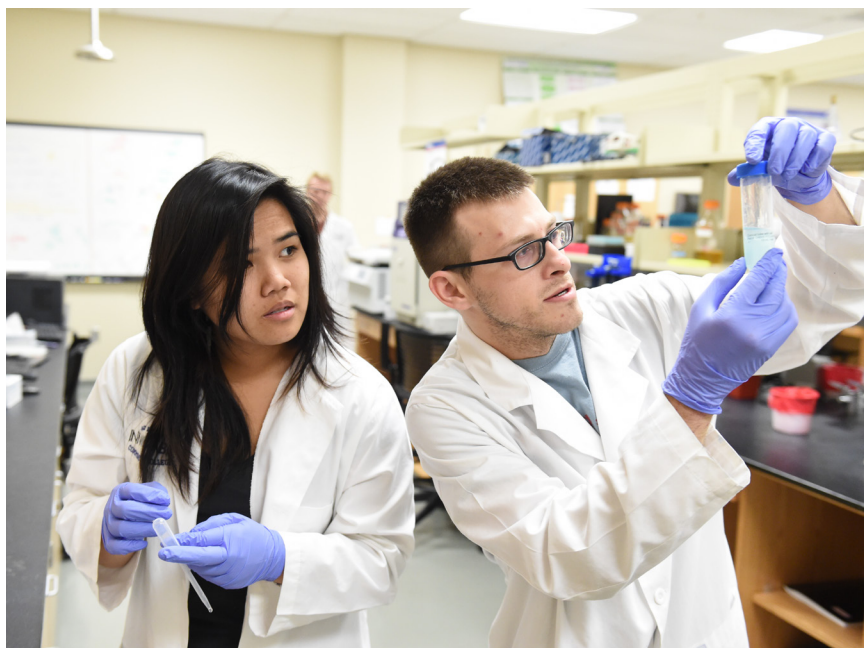
Emmanuel Santa-Martinez, PhD  
[emmanuel.santamartinez@slcc.edu](mailto:emmanuel.santamartinez@slcc.edu)

Melissa Hardy, PhD  
[melissa.hardy@slcc.edu](mailto:melissa.hardy@slcc.edu)

### Project Description:

**Independent Research Project:** Students design and conduct an independent research project during the semester and present it at a poster mini-symposium. This class is offered in the fall and spring.

**Related Course:** BIOL 1625



## Biotechnology: InnovaBio®

### General Molecular Biology & Microbiology

#### Contact:

Lane Law, PhD

[lane.law@slcc.edu](mailto:lane.law@slcc.edu)

#### Project Description:

InnovaBio® is a laboratory space with specialized equipment and personnel dedicated to the education and mentorship of Science, Mathematics and Engineering students. Faculty and students are encouraged to contact us if they need support with current or potential research projects. Our staff scientists also collaborate with industry scientists to develop low priority projects. Once a project has been approved, students conduct experimental work and can present their work at the annual SME Symposium. Student-directed projects may also be approved, so contact us with your project ideas. Below are some examples of the work that can be accomplished in this space.

**General molecular biology:** Students learn DNA manipulation techniques for working with bacterial plasmids, including transformation, DNA mini-prep, restriction digest and PCR. These techniques can be used for cloning, gene expression analysis and species identification by DNA sequencing analysis.

**Protein work:** Detection of proteins from mammalian and bacterial systems using western blotting. Several projects have studied purification of proteins from *E. coli* using various methods, including solubility in various salt buffers and Fast Protein Liquid Chromatography (FPLC).

**Cell Culture:** Emphasizes skills used in the biotechnology industry for culturing cells. Projects will underscore the principles and practices of initiation, cultivation, maintenance, and the preservation of cell lines. Students will also be responsible for media preparation, cryopreservation, and troubleshooting common culture problems.

## Biotechnology: STUDENTfacturED®

### Microbiological Media, DNA Extraction Kits, and Plasmid DNA

#### Contact:

Thayne Dickey

[thayne.dickey@slcc.edu](mailto:thayne.dickey@slcc.edu)

#### Project Description:

STUDENTfacturED® offers a mentored, supportive, real-world working and learning business enterprise environment. It allows students to practice concepts and skills acquired through accompanying coursework and take advantage of educational benefits gained through project-based learning. The lab operates according to the STUDENTfacturED® quality manual. The goal is to be compliant with FDA regulations governing the manufacture of medical devices. Good documentation practices are key to every aspect of STUDENTfacturED® work.

This training strategy is especially important to the successful and effective comprehension of quality systems and FDA regulations as they relate to the biotech manufacturing industry. The goal of the STUDENTfacturED® enterprise is to prepare students, using contextual and practical training, for jobs in biotech manufacturing companies. STUDENTfacturED® is sustained through profits generated by the sale of STUDENTfacturED® products to high school teachers and other SLCC departments.

#### Products Made:

Cheek cell DNA extraction kits  
Bacterial transformation kits  
Unknown plasmid identification kits  
Polymerase chain reaction kits  
Microbiological media products such as

- Petri dishes
- Tubes
- Flasks

# Exercise Science: Fitness Technician

## Senior Fitness Testing

### Contact:

Chad Harbaugh

[chad.harbaugh@slcc.edu](mailto:chad.harbaugh@slcc.edu)

### Senior Fitness Testing

The Senior Fitness Test assesses mobility-related fitness parameters in older adults from ages 60-90 plus. The test measures physical attributes of strength, endurance, flexibility, agility and balance needed to perform everyday activities later in life. The students will learn correct testing parameters to ensure validity and reliability and interpret results to provide feedback to the participants. Participants will be older family members who volunteer to join us in the exercise physiology laboratory. In addition, the information will be utilized in the Fitness Technician Internship with the Exercise is Medicine initiative through the LiveWell clinic at Intermountain Health Care.

**Related Courses:** EXSC 2400 & EXSC 2450

## Y-Balance Test & Selective Functional Movement Screening Top Tier

### Contact:

Chad Harbaugh

[chad.harbaugh@slcc.edu](mailto:chad.harbaugh@slcc.edu)

### Y-Balance Test (upper and lower quarter)

**Lower Quarter:** A dynamic single-leg test that requires adequate strength, flexibility, core control and proprioception at stability and motor control limits.

**Upper Quarter:** A dynamic test in a single arm push-up position that puts an individual at their stability limits. This test requires core and shoulder girdle stability. Thoracic and shoulder mobility are also taken into consideration when performing this closed kinetic chain test. All quantitative data from upper and lower Y-balance testing is entered into statistical software called Move to Perform that categorizes them into categories based on limitations. Pre and post testing are performed and corrective strategies are implemented.

**Related Course:** EXSC 2415

### Selective Functional Movement Screening Top Tier

**Contact:**

Chad Harbaugh

[chad.harbaugh@slcc.edu](mailto:chad.harbaugh@slcc.edu)

Students analyze and perform a 12-movement pattern assessment used to gauge the status of movement, pattern-related pain and dysfunction. These movements are used to provoke symptoms and demonstrate limitations and dysfunctions. This is a pre and post assessment that is performed to allow students to see changes that may occur when awareness to spinal alignment and muscular compensation has occurred due to altered motor control or previous injury.

**Related Course:** EXSC 2200





### Functional Movement Screening & Athletic Internship Collaboration

**Contact:**

Chad Harbaugh

[chad.harbaugh@slcc.edu](mailto:chad.harbaugh@slcc.edu)

#### Functional Movement Screening

The functional movement system is comprised of seven movement tests that require a balance of mobility and stability. The movement patterns place the clients in positions where the Fitness Technician students observe weaknesses, imbalances, asymmetries and limitations. All quantitative data from the Functional Movement screening is entered into statistical software called Move to Perform that puts them into categories based on limitations. Pre and post testing are performed and corrective strategies are implemented.

**Related Course:** EXSC 2415

#### Athletic Internship Collaboration

Collaboration between the Fitness Technician Internship and the Athletic Department has been established to assess movement dysfunction utilizing the Functional Movement system and the Y-balance test on all of the athletes at Salt Lake Community College. All quantitative data from upper and lower Y-balance test is entered into statistical software called Move to Perform that categorizes them into categories based on limitations. Pre and post tests are performed and corrective strategies are implemented. Pain is also recorded to provide early detection to the Athletic Training Department.

**Related Course:** EXSC 2450

#### Odyssey House

New in the Fall 2017 internship program, the Odyssey House and the fitness technician internship class have collaborated to provide exercise prescription to individuals enrolled in the substance abuse treatment program. The students will gain hands-on experience designing and implementing exercise programs utilizing the curriculum from HLTH 2400 Special Populations.

**Related Course:** EXSC 2450

# Natural Sciences & Engineering: Geoscience – Geology

## Water Quality and GIS Analysis

### Contact:

Chris Johnson

[chris.johnson@slcc.edu](mailto:chris.johnson@slcc.edu)

### Water Quality

Students use water quality meters to analyze the Jordan River and East Canyon Creek at the Swaner Eco Preserve in Park City for dissolved oxygen (DO), total dissolved solids (TDS), pH, conductivity, and temperature. Jordan River is impaired under the Clean Water Act and Swaner Eco Preserve has installed beaver dam analogs (human-made beaver dams) to help improve water quality. Students learn how to use and calibrate water quality meters and map locations using the ESRI Survey 123 app for smartphones. This loads data into a cloud-based GIS in realtime. Students collect water quality data in segments of the Rivers to create a snapshot of the water conditions.

### GIS Analysis of Existing Data

Students graph and map existing water quality data or results for heavy metals in soil and interpret results. Students focus on Jordan River, tributaries like Little Cottonwood Creek, and historic mining areas in the Central Wasatch.

### Heavy Metals in Soil and Streams

#### Contact:

Chris Johnson

[chris.johnson@slcc.edu](mailto:chris.johnson@slcc.edu)

#### Heavy Metals in Soil near Historic Mine Sites in Central Wasatch

Students collect soil samples from various historic mining areas in the Central Wasatch and analyze samples for heavy metals such as lead, arsenic, cadmium, chromium, copper, and zinc. Field sampling uses ESRI Survey 123 smart phone apps to assist with GPS locating and GIS mapping. Samples are prepped and analyzed in the geology lab using the x-ray fluorescence (XRF) device. Results are mapped, graphed, and interpreted.

#### Heavy Metals in Streams

Students collect water and stream sediment samples from creeks in the Central Wasatch that are impaired for heavy metals per the Clean Water Act, such as Little Cottonwood Creek. Little Cottonwood Creek has high levels of some heavy metals but the origin is unknown. Water samples are sent to the inductively-coupled plasma-mass spectrometer (ICP-MS) lab the University of Utah Geology Dept. Sediment samples are analyzed in the geology lab using the XRF device. Results are mapped, graphed, and interpreted.

#### Heavy Metals in Your Community

Students would collect soil samples from areas of interest in their community such as their own garden beds, their own yards, or other public land areas in their community to determine if high levels of toxic heavy metals such as lead and arsenic are present. This is especially important for residential communities located near existing or former industrial areas. Results are mapped, graphed, and interpreted.

# Natural Sciences & Engineering: Geoscience – GIS

## SLCC Crime Mapping, Land-Use Patterns, Building Geo Apps & Designing Story Maps

### Contact:

Adam Dastrup

[adam.dastrup@slcc.edu](mailto:adam.dastrup@slcc.edu)

### SLCC Crime Mapping Project

In partnership with the Utah Highway Patrol, learn how to use drone imagery, mapping-grade GPS and geographic information systems (GIS) to create a multi-campus map that focuses on potential crime areas or safety concerns around the various campuses. These maps will be shared for use by students, faculty or staff in the form of a story map or geo app.

### Analyzing Land Use Patterns Along the Wasatch Front

The Wasatch Front has grown incredibly in the last 20 years. There are several positive and negative consequences of growth. Where is the growth occurring and at the expense of what? What impacts could this growth have on environmental pollution, transportation, disaster response, social-economic segregation or unsustainable growth? Using local data from a variety of organizations within Utah, students can analyze potential problems and solutions.

### Designing Story Maps

Story Maps let you combine authoritative maps with narrative text, images and multimedia content. They make it easy to harness the power of maps and geography to tell your story.

### Building Geo Apps

Learn how to combine location and narrative in one application to better communicate and broadcast your story, create custom web applications that solve problems in your community and build powerful native applications for iOS and Android devices without touching a piece of code.

## United Nations Sustainable Development Goals, Mapping Natural Disasters & SLCC Campus Map

### Contact:

Adam Dastrup

[adam.dastrup@slcc.edu](mailto:adam.dastrup@slcc.edu)

### United Nations Sustainable Development Goals Project

The Sustainable Development Goals (SDGs) contains 17 goals with 169 targets covering a broad range of sustainable development issues. Using data and information from the United Nations and other international organizations, students will create a research poster to analyze potential socioeconomic and environmental causes of poverty and inequity and potential solutions.

### Mapping Natural Disasters

Students can focus on using geospatial technology such as satellite imagery and geographic information systems (GIS) to study any number of natural disasters. Students will focus on earthquake risk potential along the Wasatch Front or recent impacts from disasters such as tsunamis, hurricanes, flooding, climate change or disease.

### SLCC Campus Map Project

Learn how to use drone imagery, mapping-grade GPS and geographic information systems (GIS) to create a multi-campus map that could be used by the institution. These maps will be made available for use by students, faculty or staff in the form of a story map or geo app.





# Natural Sciences & Engineering: Atmospheric Sciences

## Mountain Weather/Air Pollution Research & WaterGirls | WaterKids Outreach Program

### Contact:

Maura Hahnenberger

[maura.hahnenberger@slcc.edu](mailto:maura.hahnenberger@slcc.edu)

### Mountain Weather & Climate Research

Conduct research on topics related to mountain weather & climate, such as snow & water supply, avalanches, lake effect snow, climate impacts on snowfall, and more.

**Related course:** ATMO 2200 Mountain Weather & Climate (Fall Semesters)

### Air Pollution & Atmospheric Chemistry Research

Conduct research on topics related to air pollution & atmospheric chemistry, such as emissions sources, weather & air quality, particulate matter, ozone, wildfire, dust storms, and more.

**Related course:** ATMO 2100 Air Pollution & Atmospheric Chemistry (Spring Semesters)

### WaterGirls | WaterKids Outreach Program Mentors

Students may act as a mentor and role model for the WaterGirls | WaterKids outreach program. WaterGirls | WaterKids is a field experience program dealing with water science for K-12 girls and/or boys.

More details regarding the WaterGirls | WaterKids program can be found at [slccwaterkids.weebly.com/](http://slccwaterkids.weebly.com/)

# Natural Sciences & Engineering: Chemistry

## Measuring Learning Outcomes in Chemistry Outreach in K-6 Elementary School Students

### Contact:

Ron Valcarce

[ron.valcarce@slcc.edu](mailto:ron.valcarce@slcc.edu)

Elemental Expeditions is a chemistry outreach program that was created at Salt Lake Community College to provide hands-on chemistry learning to underserved schools in the Salt Lake City area. Through the use of written and pictorial assessment, we measured the change in science-based informational knowledge and perception in K-6 students. Our assessment tool was administered pre and post classroom presentation, and the change in responses was measured.



### **Synthesis and spectroscopic/spectrometric analysis of the pharmaceutical phenytoin demonstrating the pinacol rearrangement**

#### **Contact:**

Ron Valcarce

[ron.valcarce@slcc.edu](mailto:ron.valcarce@slcc.edu)

The purpose of this research project was to develop an undergraduate organic laboratory procedure to provide a demonstrable example of the Pinacol rearrangement. The chemical synthesized in this experiment is Phenytoin, an anticonvulsant drug that was first synthesized in 1908 by the Biltz synthesis<sup>1</sup>. This synthesis involves base catalyzed addition of urea to benzil followed by Pinacol rearrangement to form Phenytoin. This is an ideal synthesis for demonstrating the Pinacol rearrangement at the undergraduate level, since the starting materials are readily accessible, the synthesis can be achieved and product isolated within a three to four hour time frame, and the product is easily characterized using Fourier transform infrared spectroscopy (FTIR).

### **A Green Chemistry Lip Balm Demonstration using Renewable, Biodegradable Materials**

#### **Contact:**

Ron Valcarce

[ron.valcarce@slcc.edu](mailto:ron.valcarce@slcc.edu)

The goal of this project is to develop a demonstration to introduce students to green chemistry by creating a lip balm using renewable, biodegradable materials which do not persist in the environment. This green chemistry demonstration is relatively fast, creates a product that most students use or are familiar with and demonstrates two of the 12 principles of green chemistry, #1. Prevent Waste and #10. Design for Degradation.

### Nitrate in Aquarium Waters & Fluoride in Water, Drinks and Commercial Products

#### Contact:

Peter Iles, PhD  
[peter.iles@slcc.edu](mailto:peter.iles@slcc.edu)

Rajan Kochambili  
[rajan.kochambili@slcc.edu](mailto:rajan.kochambili@slcc.edu)

#### Overall project has two approaches:

1. Chemical reduction of nitrate to nitrite for colorimetric measurement with online SIA instrument: Supervisors Dr. Peter Iles and Dr. Rajan Kochambilli.
2. Biotechnological reduction via nitrate-reducing enzymes. Collaborative supervision between biotech and chemistry. This work will involve a number of specific projects studying the choice of enzyme, speed of reactions and parameters such as temperature, ionic strength and others.

### Pharmaceuticals in the Jordan River

#### Contact:

Luther Giddings, PhD  
[lu.giddings@slcc.edu](mailto:lu.giddings@slcc.edu)

#### Project Description:

Contact Luther Giddings for additional details regarding this project.



# Natural Sciences & Engineering: Engineering

## Professional Conferences & Societies, Internships & Research Projects

### Contact:

Nick Safai

[nick.safai@slcc.edu](mailto:nick.safai@slcc.edu)

### International Research Project

In collaboration with a student from China, we study the amount of phosphates in the Zheijang River (China, Shanghai Region) and its environmental or other impacts on rural and urban areas. In collaboration with international faculty and students' work is being conducted titled: "Should 'Python for Engineers' be a Course Taught to Freshmen Engineering Majors in USA and Abroad?" This study has been accepted for publication in the American Society for Engineering Education (ASEE) 2019 Annual Conference proceeding, and to be presented at the ASEE Annual Conference in June 2019 in Tampa, Florida.

### Rocky Mountain Regional Conference (RMRC)

Students and Nick Safai are participating at the RMRC hosted by University of Colorado Boulder from April 4th to April 7th, where they experience and observe Concrete Canoe races at Boulder Reservoir, and other civil engineering and related projects at the University of Colorado recreation center lower gym, large ice overlook, upper court conference room, etc. Preparing students for entering projects in 2018 Rocky Mountain Regional Conference (RMRC). This is a four-day (Thursday-Sunday) event usually held the last week in March each year. Categories include steel bridge competition, concrete canoe races, mystery design, technical papers, etc. Students and Nick Safai participate and submit any paper or other related work.

### American Society of Civil Engineers Wasatch Branch Speaker Luncheon

The ASCE organizes and brings speakers under Nick Safai's direction. This is usually held in the Oak Room in the Student Center (STC) in Oct. or Nov. (if in fall) or March (if in spring). This event has been organized annually at SLCC for the past several years.



### **American Society for Engineering Education**

The ASEE club has sponsored a guest speaker from NASA. The speaker is an electronics engineer there, which provided the students a great opportunity to ask questions, learn and connect. The ASEE Club organizes various tours, the last of which consists of a tour of secured areas of Hill Air Force Base. Participants are guided through HAFB secured areas under the supervision of their chief engineers.

### **Society of Women Engineers**

Some of the recent events for the SWE club include: a recent visit to IM Flash, the largest exporter of domestic product “besides metals” in Utah, Egg Drop contest, and firing the test rocket at ATK. The SWE organizes various tours, the last of which are trips to observe the firing of a test rocket at the ATK Orbital test site and a tour of the Rocket Garden in Tremonton, Utah.

### **Special-Topic Projects**

Students’ recent topics of research and study have been accepted for presentation at the engineering annual conference in Tampa, Florida in June. The topics include: Project Based Learning for a Mechanical Engineering Major Student, Sustainability of Internal Combustion Engines, and A Sophomore’s Interdisciplinary Engineering Project Enhancing Learning and Engineering Education with International Applications and Markets Abroad.

Civil and mechanical engineering students may engage in special-topic projects, which are determined at the beginning of each semester and focus on a student’s areas of interest.

### **Internships and Industry Projects**

Students currently working or seeking internships in an industry may contact Nick Safai. This is a continuing project and includes research activities each semester.

### Natural Sciences & Engineering: Physics – Astronomy

#### Planetarium programming, instructional design and astronomy outreach

**Contact:**

Janalee Harrison

[janalee.harrison@slcc.edu](mailto:janalee.harrison@slcc.edu)

Students will participate in the development of planetarium shows designed to teach specific topics in astronomy, astrophysics, cosmology, planetary and earth sciences. Shows are designed for a specific audience that can be based on an age range from kindergarten to adult and/or accessibility by disability. Students may participate by developing educational content, designing/presenting a show, programming the planetarium computer, automation script programming and/or multimedia development. Students will work with our Digitalis portable planetarium system.

#### Undergraduate Research in Astronomy

**Contact:**

Jonathan Barnes

[jonathan.barnes@slcc.edu](mailto:jonathan.barnes@slcc.edu)

Students can use real astronomy data to explore the nature of stars and other astronomical phenomenon. Areas of interest include variable stars, star clusters, big data, and stellar spectroscopy.

## Mathematics

### Learn a new language: Mathematics

#### Contacts:

Shayne Vargo  
(General mathematics)  
[shayne.vargo@slcc.edu](mailto:shayne.vargo@slcc.edu)

Elizabeth Jones  
(Statistics)  
[elizabeth.jones@slcc.edu](mailto:elizabeth.jones@slcc.edu)

The Math Department strives to expose students to the plethora of applications of mathematics in other fields, such as physics, chemistry, engineering, geology, astronomy, economics, etc. But the list of areas to explore directly within mathematics itself is countably infinite, with many potential research ideas. Here is a tiny sample of possible topics of interest.

**Proofs:** Have you ever wondered where some of the theorems in your math classes come from? How do we know they are true? Explore the history, assumptions, lemmas, and mathematics that are involved with their proofs.

**Non-Euclidean Geometries:** Are there really  $180^\circ$  in a triangle? Could parallel lines meet? Does the fate of the universe depend on such ideas? Explore how geometry would work if Euclid's fifth postulate was false.

**Coding Theory and Cryptography:** Discover how to become a spy and create/crack secret messages or how binary codes transfer information over channels. See how matrices can be used to encode and encrypt.

**Chaos Theory:** Is the universe chaotic? Explore the mathematical meaning behind the "butterfly effect." Investigate the simultaneously fractal and chaotic behavior of the Mandelbrot and other famous sets.

**Prime Number Theory:** For thousands of years, mathematicians have sought a pattern to the prime numbers. Explore the Riemann Hypothesis, the Twin Prime Conjecture, the Goldbach Conjecture, and other mysteries behind these notorious numbers.

**Statistical Research:** Do you have your own theories about human behavior or want to explore a social phenomenon that can be measured quantitatively? Collect and analyze your own data to support your hypothesis.

Do you have any ideas of your own you would like to investigate? Come discuss them with us!

Join the SLCC

# Student Math League

for review and **competition!**

## The Competition

Each semester dozens of students compete in a one-hour AMATYC Student Math League competition for monetary prizes and scholarships to four-year schools. The format is an hour-long session of solving non-traditional math problems. Problems range from intermediate algebra through trigonometry with some probability. There is no cost to students!

## Preparation

Gather friends to work on your problem solving and algebra skills. You will be coached in a very relaxed environment by SLCC math faculty.

For more information contact:

**Spencer Bartholomew**

[spencer.bartholomew@slcc.edu](mailto:spencer.bartholomew@slcc.edu)

For rules and eligibility:

[amatyc.site-ym.com/page/SMLRules](http://amatyc.site-ym.com/page/SMLRules)



Come challenge yourself, add extra-curricular activity to your resume and meet other students who also have a passion for math.

The competitions are based on pre-calculus level mathematics and there are individual and team prizes, and the first place individual in the nation wins a scholarship to be used at a four-year college!

Salt Lake  
Community  
College



SLCC Student Math League is sponsored by the American Mathematical Association of Two Year Colleges.

### Other Resources: SME Symposium

#### SME Symposium

**Contact:**

801-957-6800

[stemlearning@slcc.edu](mailto:stemlearning@slcc.edu)

The SME Symposium provides an immersive experience for students pursuing science and technology related disciplines by providing the opportunity to refine presentation skills, receive valuable feedback, and connect with SLCC faculty, staff and peers in a conference environment.

This annual day-long event hosts industry guests, department tables and guest speakers from STEM-related fields, providing participants the opportunity to learn about pursuing a career in science, engineering or mathematics. The event is open to all SLCC students, staff, faculty and the public.

Visit [slcc.edu/STEM/symposium](http://slcc.edu/STEM/symposium) for more information.



GENDER & SEXUALITY  
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**WOMXN & QUEER**

*students at Salt Lake Community College.*

📍 *South City Campus 1-140*



*slcc.edu/gssrc*



*801.957.3143*



*gssrc@slcc.edu*



*SLCCGSSRC*



*SLCCGSSRC*



## Other Resources: Learning Support Services

### TRIO STEM

The purpose of the SLCC TRIO STEM Program is to support low-income and first-generation college students pursuing degrees in science, technology, engineering and mathematics by addressing individualized educational and career interests while providing the opportunities, tools and resources for self-efficacy.



#### TRIO STEM Locations

Rooms SI 358B and CT 242

801-957-4467

maricela.hernandez@slcc.edu

[slcc.edu/trio/stem](http://slcc.edu/trio/stem)

**SLCC offers free STEM-focused support services to those who want to improve and better their grades.**

**STEM Learning Resources offers:**

- **Workshops**
- **Free Walk-In Tutoring**
- **Project-Based Learning**
- **Computer Stations**
- **Study Space**

*Resources available at all campuses.  
Call or email us for additional  
information:*



[www.slcc.edu/STEM](http://www.slcc.edu/STEM)  
[STEMLearning@slcc.edu](mailto:STEMLearning@slcc.edu)  
 801-957-6800



**STEM LEARNING RESOURCES**

### Other Resources: Clubs & Organizations

[slcc.edu/sll/clubs-and-orgs](http://slcc.edu/sll/clubs-and-orgs)

#### American Chemical Society

**President:** Glen Johnson

**Faculty Contact:**

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#### American Society of Civil Engineers

**President:** Ezat Arif

**Faculty Contact:**

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#### American Society of Engineering Education

**Presidents:** Cyrus Safai  
and Shaun Mckellar

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#### Astronomy Club

**Faculty Contact:**

Janalee Harrison

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#### Bruin Robotics Club

**President:** Lucas Salas

**Faculty Contact:**

Quentin McRae

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#### SLCC Drone Club

**President:** Changes yearly

**Faculty Contact:**

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#### Environmental Club

**President:** Belinda  
Madsen

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#### Pre Medical Professionals

**President:** Sahra Grosser

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#### Pre Pharmacy Info Learning Society

**President:** Loan Chuynh

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#### Nano Club

**President:** Aubrey Lines

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#### SLCC Anatomy & Physiology

**Advisor:**

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#### Society of Women Engineers

**President:** Terra Ramey

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#### Students for the Exploration & Development of Space

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