CREATE-U

Combining Research Experience and Technical Electives for Undergraduates

WHY RESEARCH?

Because you like asking questions

Because you can learn how to find answers

Because you want to know more

Because you want to make a contribution to what we know

WHY CREATE-U?

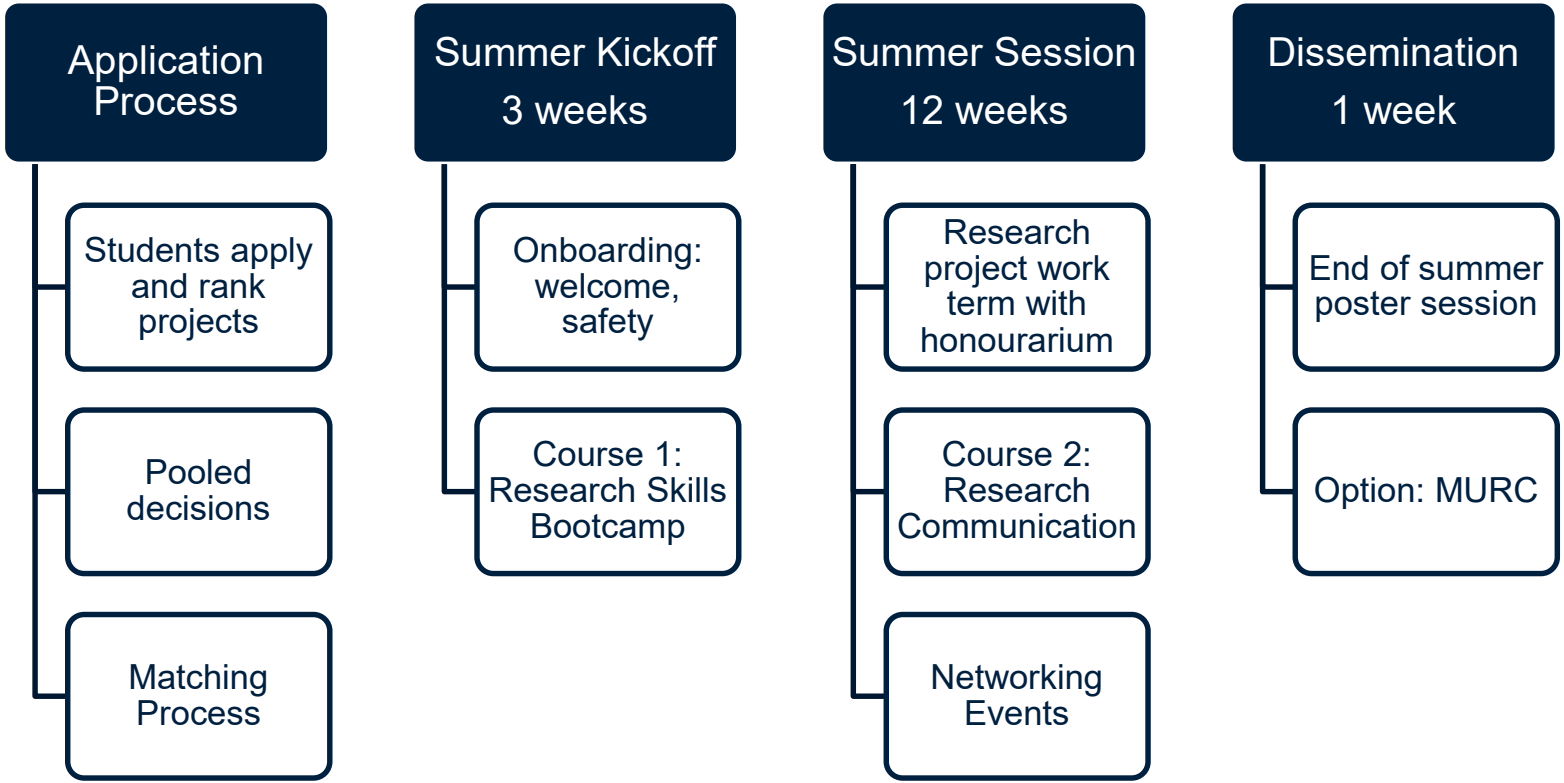
A supportive environment and cohort approach to research

Courses that complement and support your work

Counts as two* technical electives + Co-op!

Broad based entrance (minimum GPA 76% in 200-level +)

WHAT CREATE-U LOOKS LIKE



APPLY

December 1 – January 2

- 4 questions + unofficial transcript
- Project posting ranking

Minimum GPA - 76% average in 200-level and higher courses

Exception: GPA for students in Year 2 will include 100-level courses

What motivated you to apply for CREATE-U?

What is something you are (or have been) curious about? How have you explored this interest?

Describe a challenge you have faced - academically, professionally, or personally - and how you overcame it.

Describe a problem you had that did not have an obvious path to a solution. What did you do?

POOLED DECISIONS

10 spots available for summer 2022

Broad-based admission – GPA is 1/6 of score

Looking for indicators of research potential

- Direct experience not necessary
- How you solve problems, technical or otherwise

MATCHING PROCESS

Top applicant = 1st choice placement

2nd place applicant = 1st choice placement unless same as top applicant, then 2nd choice

etc.

Please read Skills for Success and ensure you meet minimum requirements

After placements – informational interview

- Applicant or supervisor can decline if the match is a poor fit

MECH 410G RESEARCH SKILLS

Bootcamp format at start of summer - 3 hours / day for 3 weeks

By the end of this course, students should be able to:

- Explain how research is funded and disseminated
- Conduct a literature review
- Critically evaluate papers from the literature, including statistics
- Create a clearly defined and measurable research question
- Describe the purpose and structure of research conferences
- Explain how research structures (eg. funding, hiring) influence equity, diversity and inclusion (EDI) in research, and how this impacts the public

MECH 410H/550U RESEARCH COMMUNICATION

By the end of this course, students will be able to communicate their research through a variety of genres, in a way that is understandable, relevant, and persuasive to audiences of varied backgrounds. Specifically, students will present their research in the following forms:

- Narrative literature review that builds on work done in MECH 410G
- NSERC Outline of proposed research
- Extended research abstract
- Poster presentation, which can then be presented at the Multi-disciplinary Undergraduate Research Conference (MURC)
- Academic journal article (for 500-level only*)

** Students who meet the Faculty of Graduate Studies requirements can take this course at the 500 level*

SUMMER MAIN SESSION – 13 WEEKS – RESEARCH WORK TERM

Research lab in UBC Mech

Minimum wage – number of hours varies by position

- 27 hours/week = $6000 salary
- 35 hours / week = $7660.80/salary

Some positions can be extended into fall

- Mech 493 (pre-reqs will be waived) (unpaid)
- USRA or WL International (separate competition)
- Co-op

NETWORKING EVENTS AND MENTORSHIP

Graduate student mentor assigned to each student (typically working on the same or similar project)

Networking events for all students and mentors, and select faculty members

- Topics will vary
  - What a career in academia looks like
  - What an industry research career looks like
  - Communicating with your supervisor
  - What you do when you hit a research roadblock

TIMELINE

- Apply! December 1 – January 2
- Results Announced: January 9-16
- Informational interviews: January 11-20
- CREATE-U Dates: May 1 – September 1, 2022
- + Poster Session (early September)
- MURC (optional): March 2023

2022 POSITIONS

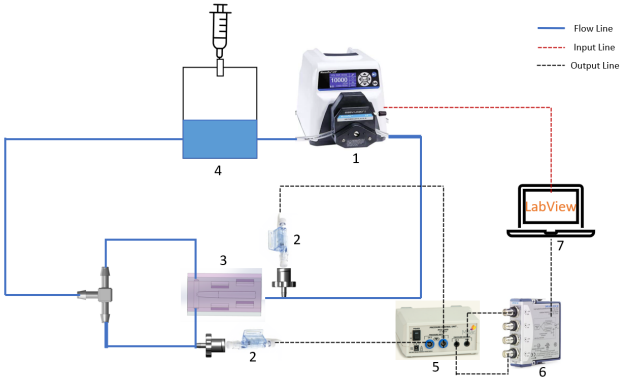
CEREBRAL ANEURYSM HEMODYNAMIC FACTORS

Laboratory Name: Industrial and Biological Multiphysics Laboratory

Faculty Supervisor: Prof. Dana Grecov

Graduate Student Mentor: Dr. Mehdi Jahandardoost

- Design and 3D print the aneurysm phantoms.
- Test Newtonian and non-Newtonian working fluids using different hemodynamic factors.
- Analyze and process the data and interpret results



CHARACTERIZATION OF PIEZOELECTRIC PAPER COMPOSITE FOR SENSING APPLICATIONS

Laboratory Name: Stoeber Lab

Faculty Supervisor: Prof. Boris Stoeber

Postdoctoral Mentor: Kanagasubbulakshmi Sankaralingam

- To characterize the electro-mechanical properties of piezoelectric composites via an impedance analyzer
- To relate the electro-mechanical properties to the composition and fabrication method of the piezoelectric composites

CLASSIFICATION OF BLOOD FILMS USING MACHINE LEARNING FOR DETECTING SICKLE CELL DISEASE

Laboratory Name: Stoeber Lab

Faculty Supervisor: Prof. Boris Stoeber

Graduate Student Mentor: Pranav Shrestha

- Test the performance of multiple machine learning algorithms to classify SCD participants from normal participants
- Characterize accuracy of different classification algorithms
- Use existing image datasets, and datasets generated in Vancouver to train/test classification algorithms
- Test other image processing methods to detect sickle cell disease from blood film images

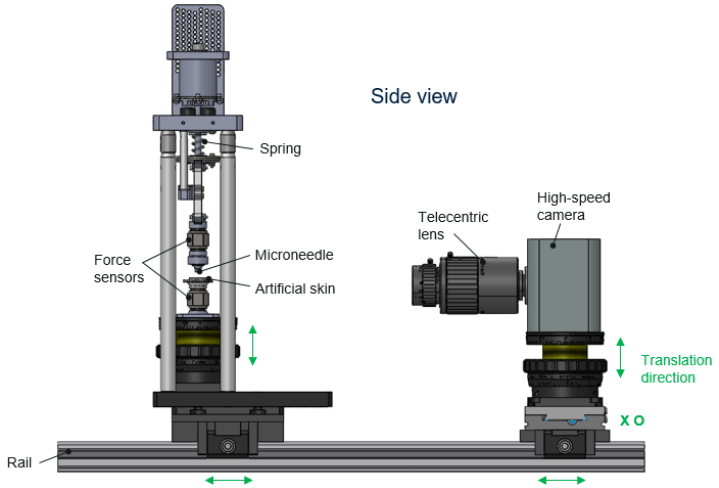
EXPERIMENTS WITH HOLLOW MICRONEEDLES – INSERTION OR FLUID EXTRACTION

Laboratory Name: Stoeber Lab

Faculty Supervisor: Prof. Boris Stoeber

Graduate Student Mentor: Pranav Shrestha

- Conduct experiments with hollow microneedles using existing experimental setup (Fig. 2) for insertion/ /extraction
- Analyze and process sensor/actuator data
- Design and 3D print (or machine) any required modifications to the experimental setup for testing new samples
- Conduct literature review to relate experimental findings to theoretical models



UNDERSTANDING THE FLUID DYNAMICS IN WELLBORE CEMENTING TO PREVENT MIGRATION OF METHANE

Laboratory Name: Complex Fluids

Faculty Supervisor: Ian Frigaard

Graduate Student Mentor: Ruizi Zhang/ Alondra Renteria

- Combination of mainly experimental work and associated computations
- Fluid preparation (Newtonian and non-Newtonian)
- Running experiments
- Image processing of the data
- Rheometry measurements of the fluids and data analysis
- May help to design new components, undertake bits of machining/manufacturing, and implement changes to the current apparatus
- Run 2D and 3D simulations

MECHANICS OF BUBBLES IN YIELD STRESS FLUIDS

Laboratory Name: Complex Fluids Lab

Faculty Supervisor: Ian Frigaard

Graduate Student Mentor: Dr Masoud Daneshi

- Fluid preparation
- Rheometry measurements of the fluid
- Running experiments
- Image processing
- May help in design of new components and implement changes to the current apparatus.

NEW SOFT ROBOTICS ACTUATORS FOR SURGICAL APPLICATIONS

Microelectromechanical Systems Laboratory

Faculty Supervisor: Dr. Mu Chiao

Graduate Student Mentor: Hiroshan Gunawardane

- Fabricating new SPAs (3D printing, molding, and casing) and characterizing them in our test rigs
- Helping develop new robotics gripper and testing it in a robotics manipulator (using Kinova robotics platform)

SEAWATER ATOMIZATION FOR MARINE CLOUD BRIGHTENING

Laboratory Name: Aerosols and Energy

Faculty Supervisor: Steven Rogak

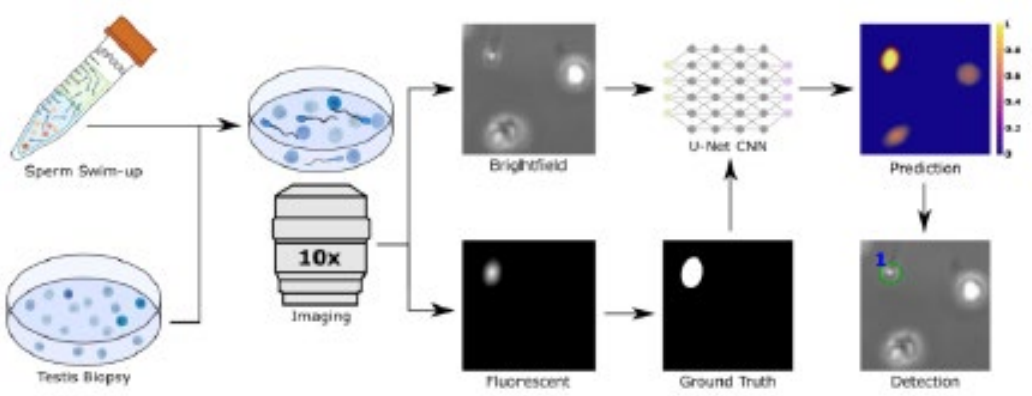
Graduate Student Mentor: Hamed Nikookar

- Design and fabricate atomization nozzles and determine the aerosol size distribution that results / energy consumption required
- Use the nanoparticle measurement systems in the UBC Aerosol Lab

SINGLE CELL IMAGE ANALYSIS USING MACHINE LEARNING

Laboratory Name: Multi-scale Design Laboratory Faculty Supervisor: Hong Ma Graduate Student Mentor: Erik Lamoureux

- Assist with and conduct biological experiments
- Data analysis
- Software use and programming
- Research presentations



UNDERSTANDING AIR QUALITY IN RURAL INDIA

Laboratory Name: iREACH (Integrated Research in Energy, Air, Climate and Health)
Faculty Supervisor: Naomi Zimmerman
Graduate Student Mentor: Sakshi Jain

- Literature review
- Apply statistical data analysis techniques to clean/prepare datasets
- Participate in calibrating air quality data collected in rural India by modifying existing calibration models and assessing the suitability of existing calibration models in an India context
- Create databases (timeseries) using calibrated air quality data and household characteristics.
- Develop and run logistic regression models and/or advanced machine learning statistical models to link relationships between observed indoor and outdoor air pollutant concentrations and parameters measured and collected in surveys.

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