

## CALL FOR STUDENT NOMINATIONS FALL 2022

### Research Internship Program in Engineering and Science at McGill University

Tec de Monterrey has the aim of offering to its high-performing students a multicultural environment that contributes to their global perspective, academic, research and personal development in institutions of recognized international prestige. The Vice-Rector's Office for Internationalization, in collaboration with the School of Engineering and Science of Tec de Monterrey as well as the research groups and centers at McGill University, invites pre-graduate students to carry out research internships in Fall 2022.

In order to participate in internships, students need to have specific requirements and skills. Detailed information about the project and the selection criteria can be found at "*Mi Espacio*" *MiTec>Estudia en el Extranjero> Estudiantes interesados > Oferta Disponible*.

All applicants must be enrolled in academic plans prior to Tec21 Model. Students must have and demonstrate:

- Completed at least 5 semesters at TEC by the time of the application.
- A minimum general average of 85.
- Proof of English language proficiency from the minimum TOEFL 550 or equivalent (current or expired).
- Participation and experience in research projects.
- Highly motivated, able to work independently, well organized and a good team player.
- Passionate about tackling challenges.

Participating academic programs:

- Projects 1 and 2 are open to IC, IDS
- Project 3 is open to IDM, IRS, ITC, IID, ITC
- Project 4 is open to IM, IMT, IQ
- Projects 5 and 6 are open to IM, IMT, IFI, IME, IID
- Project 7 is open to IBT, IE, IID, ITC
- Projects 8, 9 and 10 are open to IQ, IBT

\*Students interested in applying can do so even if their study program at Tec does not cover the programs listed above.

## PROFESSORS, RESEARCH GROUPS AND PROJECTS

### Faculty of Engineering

1. **Prof. Mary Kang, Department of Civil Engineering and Applied Mechanics.**

[Subsurface Hydrology and Geochemistry Research Group](#). Research areas are groundwater hydrology and environmental impacts of subsurface-based energy development. Application areas include groundwater impacts and greenhouse gas emissions related to oil and gas development and geologic storage of carbon dioxide. The current projects involve (1) the development of analytical, numerical, and combined analytical-numerical multi-scale models of multi-phase flow through porous media, (2) field measurements of gas fluxes, and (3) geospatial and statistical data analysis. Fluids of interest include carbon dioxide, methane and other hydrocarbons, and water.

Field of study: civil engineering, sustainable development.

No. spots: 1

2. **Prof. Luis Miranda Moreno, Department of Civil Engineering and Applied Mechanics.**

[Innovation in Mobility and Transportation Safety Lab-IMAts Lab](#) is an interdisciplinary, multi-cultural research hub with solid bonds with other universities, industry, and government agencies. The research team covers areas around sustainable urban mobility, road safety, and emerging technologies using innovative and state-of-the-art methodologies. The current research focuses on the impact of transportation systems and infrastructure on wellbeing.

Field of study: civil engineering, sustainable development.

No. spots: 1

3. **Prof. Jeremy Cooperstock, Department of Electrical and Computer Engineering.**

[Shared reality Lab](#). Current Research: multimodal immersive systems, augmented reality, telepresence, mobile computing, haptics. Shared reality lab is broadly concerned with human-computer interaction technologies, emphasizing multimodal sensory augmentation for communication in both co-present and distributed contexts. This research tackles the full pipeline of sensory input, analysis, encoding, data distribution, and rendering, as well as interaction capabilities and quality of user experience. Applications of these efforts include distributed training of medical and music students, augmented environmental awareness for the blind community, treatment of lazy eye syndrome, low-latency uncompressed HD videoconferencing and a variety of multimodal immersive simulation experiences. Most of Prof. Cooperstock research takes place within the Shared Reality Environment, a facility that includes two different configurations of multi-projector displays, camera and loudspeaker arrays, and a high-fidelity vibrotactile sensing and actuated floor.

Field of study: digital systems, robotics, IT

No. spots: 1

4. **Prof. Mihriban Pekguleryuz, Department of Materials Engineering.**

[Material Engineering Group](#)

**Aerospace materials**

-Aerospace materials are at the cutting edge of materials research since they are used at the extremes of temperature and endurance yet must be as light as possible. These exotic materials also benefit from novel manufacturing processes. In the department of materials engineering, professors Pekguleryuz are developing these materials and processes:

Ignition-Resistant Magnesium Alloys. Magnesium is successfully used in spacecraft structures and in the external components of aircrafts. However, the use of Mg has been restricted inside the aircraft cabin by the FAA due to potential ignition hazards. The ignition behaviour of Mg alloys is, however, quite different from pure Mg itself, where alloying can significantly slow down oxidation kinetics and increase the ignition temperature. The objective of this research is the use of rare earth and alkaline earth additions to Mg to develop ignition proof magnesium alloys for aircraft use.

**-Automotive materials**

Materials for automotive applications must be strong, light and formable. In our department, Professors Pegguleryuz, Jung, Jonas and Yue are developing different classes of these materials:

Magnesium sheet alloys for automotive body applications. The research of Professors Pegguleryuz, Jung, Jonas and Yue aims at developing new Mg alloys specifically tailored for twinroll casting and with weak crystallographic textures, both to reduce cost of sheet production and to improve the formability of Mg. The alloys target automotive body panels and closures. The research focuses on the addition of rare earth and alkaline earth elements to various binary magnesium alloy systems to create fine second phases, as well as solutes which change the axial ratio ( $c/a$ ) of hcp Mg

**-Metal processing**

The Light Metals Research Laboratory Professor Mihriban Pegguleryuz is equipped with state-of-the-art research capability and tools. The lab meets the needs of our research activities as well as offering light metals foundry services, and includes facilities which are able to synthesize, cast, and provide bench-scale rolling and extrusion of all light alloys.

Themes: Material Engineering (aerospace, automotive, metal processing).

Field of study: mechatronics, mechanics, physics, nanomaterials

No. spots: 1 per project

**5. Prof. Meyer Nahon. Department of Mechanical Engineering.**

[Research Group/Lab: Aerospace Mechatronics Lab](#)

The group's research goals are to increase the autonomy of these systems for a range of applications. In the context of UAVs, we are working towards increasing the autonomy of small multi-rotor vehicles for landing and take-off maneuvers, autonomous collision recovery control, and, of fixed-wing slow moving aircraft for acrobatic flying. Research with large indoor helium blimps related to control and docking of multiple blimps for artistic applications is also being pursued. A range of problems are being addressed including dynamics modeling and controller design, state estimation, localization and mapping, motion planning and parameter identification. In the context of Space Robotics, the current thrust of the research is related to Active Space Debris removal. The research group is investigating dynamics modelling and control algorithms for robotic debris removal as well as the use of tethered nets for debris capture. Work is also ongoing on space debris attitude and orbital propagation taking into account environmental uncertainties.

Field of study: mechanics, robotics, mechatronics, physics

No. spots: 1

**6. Prof. Jorge Angeles. Faculty of Engineering. Department of Mechanical Engineering.**

[Robotic Mechanical Systems Lab](#)

The focus of my research is design and control of robotic mechanical systems at large as well as their mechanical components, such as drives and sensors. A major activity here is the development of speed reducers meeting the strict requirements of robotic and mechatronic applications: low backlash; low friction; and high stiffness. While meeting these demands is quite challenging, we are trying hard to do much better than gears by means of cam-roller transmissions. On robot design, I stress robustness regarding their kinetostatic, elastostatic and elastodynamic performances. Research in robotic mechanical systems focuses

on lower-mobility parallel robots, with special attention to Schoenflies-motion generators, a.k.a. parallel SCARA systems. Research in the area of design theory and methodology is also underway.

Field of study: Mechanics, physics, robotics, mechatronics, manufacturing

No. spots: 1

**7. Prof. Georgios Mitsis. Department of Bioengineering.**

**Biosignals and Systems Analysis Lab**

The research group is interested in the application of signals and systems theory to the life sciences. In this context, the team is conducting research related both to algorithm development with a focus on nonlinear and time-varying systems modeling, and their applications to biological/physiological signals and systems, with a focus on cerebral hemodynamics and autoregulation. Specifically, the team is conducting research in the following areas: Modeling of nonlinear and time-varying dynamic systems; Cerebral hemodynamics and autoregulation; Time-varying functional brain connectivity; Computational oncology and optimal therapy design for cancer treatment.

Field of study: biomedical engineering, electrical, computer and software engineering, biotechnology.

No. spots: 1

**8. Prof. Noémie-Manuelle Dorval Courchesne. Department of Chemical Engineering.**

**Dorval Lab.** Research areas: Advanced Materials, Biotechnology, Energy, Nanotechnology. We work at the intersection of materials science, chemical engineering, synthetic biology, and nanotechnology. Biological materials have exquisite properties that enable them to naturally participate in various chemical and physical phenomena, assemble into complex shapes, and bind molecules or particles. Our research focuses on exploiting, enhancing and complementing these properties to fabricate next-generation multifunctional materials and devices. Specifically, we combine genetic engineering to program biomaterials with novel functions; bioconjugate, organic and inorganic chemical syntheses to form composites and to interface biological with inorganic materials; materials assembly and microfabrication techniques to construct useful devices.

Field of study: chemistry, nanotechnology, biotechnology, biomaterials.

No. spots: 1

**Faculty of Sciences**

**9. Prof. Christopher J. Thibodeaux. Department of Chemistry.**

**Thibodeaux Lab.** Research Themes: Chemical Biology and Synthesis/Catalysis. Prof. Thibodeaux research applies a diverse set of experimental tools spanning the realms of biochemistry, analytical chemistry, biophysics, molecular biology, and bioinformatics to study the biosynthesis of antimicrobial natural products and the biological processes that contribute to bacterial virulence and pathogenesis.

Field of study: chemistry, biochemistry, biophysics.

No. spots: 1

**10. Prof. Anthony Mittermaier- Department of Chemistry**

**Mittermaier Lab.** Research Themes: Chemical Biology and Chemical Physics

The focus of Mittermaier lab is biomolecular dynamics. The goal is to understand how proteins, DNA, RNA, and metabolites change shape, react, and assemble with one another. This knowledge aids the development of new types of drugs and bioinspired materials and sheds light on the physical chemical principles that underlie living systems. The Lab's approach is based on three complementary pillars: experiments –design new methods to measure WHAT biomolecules are doing, as they do it; theory –use Physical Chemistry to

better explain WHY they behave the way they do; and computation –write computer code that integrates experimental data and theoretical models to give detailed descriptions of biomolecular function that are thermodynamically and kinetically correct. Individual projects lean more heavily toward one pillar or another, or to practical applications.

Field of study: chemistry, biochemistry, biophysics.

No. spots: 1

## ADDITIONAL PROJECTS

Besides the projects included in this call, students are invited to research online to find out which faculty members at the Faculty of Engineering and at the Faculty of Science conduct research in the students' areas of interest. One way to do this is to navigate the websites of the Faculty of Engineering and the Faculty of Sciences' departments, schools, or other academic units, where the students will find listings of the professor in different areas.

### ***Academic Departments-Faculty of Engineering***

- [Bioengineering. Laboratory Code of Conduct | Department of Bioengineering - McGill University](#)
- [Chemical Engineering. Research | Chemical Engineering - McGill University](#)
- [Civil Engineering. Profiles List | Civil Engineering - McGill University](#)
- [Electrical and Computer Engineering. Research areas | Electrical and Computer Engineering - McGill University](#)
- [Mechanical Engineering. Research Areas in Mechanical Engineering | Mechanical Engineering - McGill University](#)
- [Mining and Materials Engineering](#)
- 

### ***Academic Departments-Faculty of Sciences***

- [Biochemistry. Research | Anatomy and Cell Biology - McGill University](#)
- [Biology. Research at McGill Biology | Department of Biology - McGill University](#)
- [Chemistry. Research themes | Department of Chemistry - McGill University](#)
- [Computer Science. McGill School Of Computer Science](#)
- [Environment. Bieler School of Environment Associates and Adjuncts | Bieler School of Environment - McGill University](#)
- [Physics. McGill Physics: Research](#)

### Note

When selecting a research project, it is highly recommended that students ensure that:

- The researcher is an active Faculty Professor or Associate Professor.
- The professor's profile and his/her research work is sufficiently descriptive on the faculty's website.
- The professor has more than one research project in force.
- The professor leads a research lab.

## DOCUMENTATION and GENERAL GUIDELINES

Documentation to submit:

- A motivation letter (maximum 1 page) in English.
- A copy of your CV (free format)
- Proof of English language proficiency from the minimum TOEFL 550 or equivalent (current or expired)
- Unofficial transcript (FAM in English)
- Copy of valid passport (more than a year for expiration)

Some recommendations when writing motivation letter and CV:

- Demonstrate interest and familiarity with the professor's research area and specify skills or background, and what could add to the research group or project.
- Mention interests, qualifications (relevant coursework, experience), and expectations.

General guidelines:

- It is the candidate's responsibility to carefully read the information on possible research projects as well as additional information on the center or laboratory and scientist associated with the research project of interest.
- Students must have sufficient funds to support themselves in Canada as well as an appropriate Medical Insurance. Please, consider the living cost for a semester in Montreal [Cost of Living in Montreal. Feb 2022. Prices in Montreal \(numbeo.com\)](#)
- |Students work under the supervision of a McGill academic staff member and do not register courses at McGill. Therefore, students do not obtain official McGill transcripts.
- Students may be paid or unpaid depending on the departmental agreement. Students are encouraged to apply to national and international scholarships.
- Students are not eligible for free access to the McGill athletics facilities or other student services. Note: McGill students pay a fee which funds these services; undergraduate research trainees do not pay this fee.

## HOW AND WHERE TO SUBMIT THE DOCUMENTS

Students are allowed to apply up to 2 different internships/projects in the same call. Remember to modify your motivation letter and CV (if needed).

Documents must be digitized in **two PDF files**.

1. The first PDF file must be named with the prospective student ID # and complete name and must include:
  - Proof of English language proficiency from the minimum TOEFL 550 or equivalent (current or expired).
  - Copy of valid passport (more than a year from expiration).

2. The second PDF file must be named with the prospective student ID # and the last name of McGill's Research Professor in charge of the project. It must include

- Motivation letter.
- CV.
- Unofficial Transcript (FAM in English).

***Applications will not be considered if the documents come in multiple files.***

Enter info and requested documentation in the following link and remember to choose the Semester and project/researcher:

[McGill - Estancias de investigación Otoño 2022 \(jotform.com\)](https://jotform.com)

Note: If students select a project not included in this call, they must select Other in the list of projects included in the jotform.

Without exception, applications will not be accepted after the deadline. Candidates with incomplete documentation will not be considered to participate in the program. Please enclose all documents before submitting.

Starting dates and deadlines for receipt of applications for Fall 2022:

**Opening date:** February.

**Closing date:** April 8th (last day to submit documents).

We thank all students for their participation. We will only communicate with those who are preselected.

## SELECTION PROCESS

The selection process is divided into three parts under this calendar:

	Responsible	
1. Preselection: review all the candidates' documentation	International Programs Office of Tec de Monterrey	February to April 8 <sup>th</sup>
2. Selection: McGill's professor analyses preselected students' files	McGill Professor	February to April 30 <sup>th</sup>
3. Email confirming final candidates selected	International Liaison Office, Tec de Monterrey-Montreal	May

We will announce the final decision and students will have two days to accept or reject the offer. If the students accept the offer, they will receive further instructions on how to move forward with registration with both McGill and Tec de Monterrey.

The committee's decision is final.

## SOME CONSIDERATIONS TO KEEP IN MIND FOR SELECTED STUDENTS

- The first and last of the research internship day will be agreed separately in each case by the student and the McGill researcher. **Official Fall term is September-December.** Students need to complete at least 16 weeks of research internship.
- In order to qualify for a work permit exemption for researchers, students cannot stay more than 120 days in Canada. Consider this point when you agree on the first and last day of your research internship.
- Be aware that, as a selected student, you are part of the image of the institution, so in addition to complying with the norms and standards of McGill University you remain under the code, rules, values and the General Regulation of Students at Tec de Monterrey when being abroad.
- The selected students are encouraged to be proactive and committed with their learning process, dedication and contribution during their research internship. Occasionally, students might be asked to read some bibliography and dedicate some hours to the project before arrival, so they are better prepared.
- The work schedule will be defined for both the student and McGill researcher before the student arrives in Montreal. Depending on the internship, there is a Tec Researcher closely involved in the project or internship.
- Students may sign a confidentiality agreement at McGill, depending on the nature of the project and agreed terms by the professors.
- This is a full-time internship, from Monday to Friday.
- This call does not include funding for accommodation, food or any personal expenditure. Students are encouraged to look for additional funds either in Mexico or in Canada.

## REGISTRATION AND ACCREDITATION OF COURSES

Students can register from 0 to 32 credits at TEC. The tuition to be paid will be directly at the corresponding Tec de Monterrey campus. Payment will be made according to the number of credits/units registered.

Students will discuss with the head of study program and the advisor at the International Office in the campus based on the project assigned for the internship. There will be no transfer credits or transcript from McGill University

## ADDITIONAL INFORMATION

Any point not covered in this call will be resolved by the selection committee in conjunction with the competent authority of Tec de Monterrey as the case may be.

### **Coordinators of the Research Internship Program:**

Academics: Claudia Chávez [claudia.chavez@itesm.mx](mailto:claudia.chavez@itesm.mx) Director of the International Liaison Office-Montreal

Application process: contact the student advisor at the International Program Office at campus.