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## Faculty of Agriculture and Food Sciences

### ***PhD programs available***

- Agrifood Microbiology
- Animal Sciences
- Food Science and Technology
- Plant Biology
- Soils and Environment

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 2.67 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required.  
1) Some course exams are available in English and 2) Some PhD course(s) may be taken as a guided study reading class.
- **Other requirements:** Suggestion: Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (3 credits)**
  - Advanced statistical analysis for research
- **Complementary Courses (3 credits)**
  - According to the program
- **Doctoral Exam (3 credits)**
  - Oral exam or written proposal or both according to the program

**Thesis (80 credits), including research activities**

### **Research Areas**

- The conservation of resources: water, air, soil
- Agri-food management
- Human and animal reproduction
- The protection of horticultural species and physiology
- Agro-environmental technology
- The governance of animal and plant species
- Animal and plant genomics
- Agri-food engineering
- Nutraceuticals and functional foods
- Food safety and wholesomeness

### **Financial Support – Doctoral Funding**

Steps	Amount*
Activity successfully completed	3,000.00\$
Coursework completed	3,000.00\$
Publications	500.00\$ per publication
Thesis deposit before the end of the 11th semester of full-time registration	4,000.00\$ (minus publications)

\* All amounts are in Canadian dollars.

### **Professors**

- Consult the [Faculty directory of researchers](http://www.fsa.ulaval.ca/nc/en/research/expertises/research-directory/lister_chercheurs/) to find your supervisor.  
Website: [http://www.fsa.ulaval.ca/nc/en/research/expertises/research-directory/lister\\_chercheurs/](http://www.fsa.ulaval.ca/nc/en/research/expertises/research-directory/lister_chercheurs/)

## *Animal Sciences (PhD)*

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in biological sciences or agronomy
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.8 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required.  
2) course exams are available in English and 3) X PhD course(s) may be taken as a guided study reading class.
- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (3 credits)**
  - Statistics
- **Complementary Courses 3credits)**
  - Reproduction
  - Biotechnology
- **Doctoral Exam 1 credits**
  - Oral exam at the end of year 1
- **Thesis (2 credits)**

### ***Research Areas***

- Reproduction
- Genetic
- Farm animal models ( cows-pig)
- Ovarian physiology
- Oocyte (eggs) quality
- Genomic analysis
- Epigenetic analysis
- Metabolism and reproduction

**Financial Support – Doctoral Funding**

Steps	Amount*
Step 1 (semester 1)	\$3000

\* All amounts are in Canadian dollars.

**Professors**

Marc-André Sirard  
Chaire de Recherche du Canada en Génomique de la Reproduction  
Département des Sciences Animales Pavillon des services,  
INAF, bureau 2732 Université Laval, Québec,  
Canada, G1V 0A6 Tel : 418 656-7359  
Email: [Marc-Andre.Sirard@fsaa.ulaval.ca](mailto:Marc-Andre.Sirard@fsaa.ulaval.ca)  
<http://www.crbr.ulaval.ca/>  
<http://www.inaf.ulaval.ca/>  
<http://www.reprogenomique.fsa.ulaval.ca/>

## Faculty of Law

### *Doctoral Program (LL.D.)*

#### **Admission Requirements**

- **A Master's degree** (or equivalent as recognized by Université Laval) in law. However, if you have successfully completed your master's degree with non-thesis and are able to demonstrate your abilities, you may, under certain conditions, be admitted to doctoral program.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.00 out of a possible 4.33.
- **Proficiency in French/English:** Courses are offered in French. However, proficiency in English is required. Applicants must also demonstrate sufficient mastery of French language. Non-francophone applicants will be asked to take the Test de français international (TFI) before admission. The required level is 825/990.

#### **Program Requirements (90 credits)**

- **Compulsory Courses (7 credits)**
  - Legal Research Methodology
  - Legal Epistemology
  - Visiting professor Seminar
- **Complementary Courses (12 credits)**

#### **More than 80 courses and internship, including:**

- WTO, International Trade and FTA
- International Intellectual Property Law
- International Banking Law
- International (and Domestic) Environment and Sustainable Development, Biodiversity Law, Climatic changes, Natural Resources Law, Energy Law, Water Law
- International (and Domestic) Food Security law
- International Cultural Law
- International Law of the Sea
- International (domestic) Labour Law
- International (domestic) Economical and Social Rights
- International (domestic) Children Law
- International (domestic) Criminal Law



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- International Refugee Law
- Native Law
- European Law
- Etc.
- **Doctoral Exam (8 credits)**
  - Retrospective Exam (written exam)
  - Prospective Exam (public presentation of the thesis project)
- **Thesis (63 credits)**

***Research Areas***

**15 Research Centres & Chairs**

- Centre on International & Transnational Law
- Centre on Economic Law
- Legal Research Chair in Food Diversity and Security
- Goldcorp Research and Innovation Chair in Natural Resources and Energy Law
- Canada Research Chair in Environmental Law
- Financial Services Law Research Group
- Louis-Philippe-Pigeon Chair in Legal Drafting
- Canada Research Chair in International Criminal Justice and Human Rights
- UNESCO Chair on the diversity of cultural expressions
- Etc.

## Faculty of Pharmacy

### *Pharmaceutical Sciences (PhD)*

#### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in pharmaceutical sciences or in related fields of study. The graduate candidate in biology, biochemistry, chemistry, microbiology, epidemiology, kinesiology, medicine, experimental medicine, psychology, nursing, sociology, etc. may be eligible.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 2.67 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Note that Université Laval is a French-language institution. Instructions are provided in French, assignments and exams are written in French. However, courses may be taken in the 2<sup>nd</sup> year and some exams are available in English. Before giving its approval, the researcher will verify that the candidate has a good knowledge of French and/or English language by language tests (TEOFL / TOEIC or TFI) or by exchange via e-mail, phone or Internet (Skype).
- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

#### ***Program Requirements***

- **Compulsory Courses (5 credits)**
  - Doctoral exam (4 credits)
    - Oral and written evaluation by the second semester
  - Doctoral seminar (1 credit)
- **Complementary Courses (5 credits)**
  - To determine with the researcher
- **Thesis (80 credits)**

#### ***Research Areas***

- Drug biotransformation and pharmacokinetics; pharmacogenetics and pharmacogenomics; pharmacology (cardiology, neuropharmacology, metabolism pharmacology, cell pharmacology), epidemiology and pharmacoepidemiology (use and effects of drugs, psychosocial aspects of cancer, psychosocial issues of genomics and pharmacogenomics and drug neuroepidemiology), pharmaceutical technology and pharmaceutical chemistry.



### ***Financial Support – Doctoral Funding***

Researchers will follow the financial plan proposed by the UL/CSC scholarship by supporting the equivalent of Quebec student tuition fees.

Furthermore, the Faculté de Pharmacie offer a financial support plan of 9 000 \$ for PhD students who successfully complete the five financial support plan steps. To have the money, the student has to complete each step in time. Please note that this faculty financial plan can be modified at any time.

\* All amounts are in Canadian dollars.

### ***Professors***

- **Éric Biron**

**Research areas:** Medicinal chemistry, antibiotics, anticancer agents, organic chemistry, peptide chemistry and biology, peptidomimetics

**Expertise:** Synthesis of macrocyclic molecules and screening of cyclic peptide libraries to discover protein-protein interaction inhibitors and develop new antimicrobial and anticancer agents

**Email:** [Eric.Biron@pha.ulaval.ca](mailto:Eric.Biron@pha.ulaval.ca)

**Website:** [https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Eric\\_Biron](https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Eric_Biron)

- **Frédéric Calon**

**Research areas:** Pharmaceutical sciences, nutrition, neurodegenerative disease or movement disorders.

**Email:** [Frederic.Calon@crchul.ulaval.ca](mailto:Frederic.Calon@crchul.ulaval.ca)

**Websites:** [https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Frederic\\_Calon](https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Frederic_Calon)

**Note:** Candidates must contact directly Dr Calon and send him a complete CV.

- **Frédéric Picard**

**Research areas:** There are two phenomena currently affecting our society - a rapidly aging population and a sharp increase in obesity. Our lab is interested in the molecular links that contribute to change in energy metabolism upon aging. We focus our research on transcriptional regulation of metabolism, as well as circulating factors that impact on age-related diseases such as diabetes, inflammation, cancer and aortic stenosis. We are hoping to determine if our findings could serve as potential new pharmacological targets. Used

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models are mice (transgenic and knockout), human tissues, culture mammalian cells, and *C. elegans* (nematode worm for longevity studies). We are combining molecular biology to physiology to unravel signaling pathways. Our lab is open to bright, hardworking and motivated students. The ability to meet deadlines and propose innovative ideas are considered strong requisites. The selected candidate must have excellent grades in undergraduate studies.

**Expertise of the lab:** Our lab is located at the Heart and Lung Research Institute in Quebec. Research is centered on three main categories: cardiology, respiratory diseases and obesity and energy metabolism. In very close relationship with the hospital overspecialization fields; these categories have an ongoing interaction, thus promoting a rich collaboration between clinical and fundamental researchers. The Center has all the necessary assets to carry out its innovative vision in cutting-edge technology in researching cardiology, respiratory diseases and obesity. The CRIUCPQ is the only center in Canada to house this type of research and its development is consistent with the vision of Canadian Institutes in Health Research (CIHR).

**Email :** [Frederic.Picard@pha.ulaval.ca](mailto:Frederic.Picard@pha.ulaval.ca)

**Website:** [https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Frederic\\_Picard](https://www.pha.ulaval.ca/cms/site/pha/pharmacie/faculte-pharmacie/personnel/professeurs/Frederic_Picard)

## Faculty of Forestry, Geography and Geomatics

### *Forest Sciences (PhD)*

#### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Forestry, Natural Resources, Biology or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.0 out of a possible 4.33. Applicants with lower CGPAs may be accepted with conditions.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French however 1) they may be taken in the 2<sup>nd</sup> year, 2) course exams are available in English and 3) Ph.D. course(s) may be taken as a guided study reading class.
- **Other requirements:** Please note that students cannot enter the Ph.D. program until the M.Sc. degree has been awarded, or all requirements completed.

#### ***Program Requirements***

- **Compulsory Courses (6 credits)**
  - Doctoral Research Proposal (written and oral) (3 credits) – in the first year
  - Doctoral Exam (oral) (3 credits)
- **Complementary Courses (6 credits)**
- **Thesis (78 credits)**
- 

For more details refer to program description at :

<https://www.sbf.ulaval.ca/doctorat-en-sciences-forestieres>

#### ***Research Areas***

- Forest resource management, Forest organismal biology, Plant Systematics, Soil and Nutrition, Forest Policy and Economics, Tropical Forestry, Wildlife management, Forest Landscape Ecology, Forestry Operations, Silviculture, Forest Hydrology.
- Refer to the section "Professors", where their individual research areas/expertise are listed.

### **Financial Support – Doctoral Funding**

<b>Steps</b>	<b>Amount*</b>
Step 1 (semester 4 or 5)	3 600 \$ or 2 400 \$
Step 2 (semester 7 or 8)	3 600 \$ or 2 400 \$
Step 3 (semester 9, 10, 11 or 12)	4 800 \$ to 2 400 \$

\* All amounts are in Canadian dollars.

Steps and amounts are presented in details in the financial support plan of the Faculty at:

<https://www.ffgg.ulaval.ca/fonds-de-soutien-la-maitrise-et-au-doctorat>

### **Professors**

- **Jean BOUSQUET**: Forest Genomics, Population Genetics, Phylogeography, Gene Conservation, Tree Improvement for Wood Traits.  
Email : [jean.bousquet@sbf.ulaval.ca](mailto:jean.bousquet@sbf.ulaval.ca)  
Website : <https://www.sbf.ulaval.ca/professeurs/jean-bousquet>
- **Damase P. KHASA** : Agroforestry, Molecular Ecology, Environmental Bioengineering  
Email : [damase.khasa@sbf.ulaval.ca](mailto:damase.khasa@sbf.ulaval.ca)  
Website : <https://www.sbf.ulaval.ca/professeurs/damase-p-khasa>
- **Luc LEBEL** : Supply Chain Management, Forest Operations, Fiber Procurement Systems Optimisation, Systems Engineering  
Email : [luc.lebel@sbf.ulaval.ca](mailto:luc.lebel@sbf.ulaval.ca)  
Website: <https://www.sbf.ulaval.ca/professeurs/luc-lebel>

### **Admission Requirements**

- **A Master's degree** (or equivalent as recognized by Université Laval) in Geomatics Sciences or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.0 out of a possible 4.33.
- **Proficiency in French/English:** Good proficiency in either French or English is required. Courses are offered in French. The candidate must be willing to learn French within the first year.
- **Other requirements:** Please note that students cannot enter the Ph.D. program until the M.Sc. degree has been awarded, or all requirements completed.

### **Program Requirements**

- **Compulsory Courses (9 credits)**
  - Preliminary Research (3 credits)
  - Doctoral Exam (6 credits)
- **Complementary Courses (9 credits)**
- **Thesis (72 credits)**
- For more details refer to program description at :  
<https://www.scg.ulaval.ca/doctorat-en-sciences-geomatiques>

### **Research Areas**

- Refer to the section “Professors”, where their individual research areas/expertise are listed.

### **Financial Support – Doctoral Funding**

Steps	Amount*
Step 1 (semester 4 or 5)	3 600 \$ or 2 400 \$
Step 2 (semester 7 or 8)	3 600 \$ or 2 400 \$
Step 3 (semester 9, 10, 11 or 12)	4 800 \$ to 2 400 \$

\* All amounts are in Canadian dollars.

Steps and amounts are presented in details in the financial support plan of the Faculty at:

<https://www.ffgg.ulaval.ca/fonds-de-soutien-la-maitrise-et-au-doctorat>

## ***Professors***

- **Thierry BADARD:** <https://www.scg.ulaval.ca/thierry-badard>  
Geospatial Business Intelligence (GeoBI), Spatial OLAP, geo-analytical systems (geo-reporting, geo-dashboarding), mobile GeoBI and decision support systems, real time and in-memory analytics, spatial databases and datawarehouses, spatial data integration, Spatial ETL tools, geospatial web services, context-based reasoning and context-awareness, geoinformatics, standards and open source geospatial technologies.
- **Sylvie DANIEL :** <https://www.scg.ulaval.ca/sylvie-daniel>  
Terrestrial LiDAR automatic segmentation of LiDAR point clouds towards 3D modeling of building and urban items, processing of LiDAR and bathymetric point clouds towards port infrastructure monitoring and inspection; Image processing for terrestrial and underwater photogrammetric solutions dedicated to the 3D representation / modeling of real world scene ; Mobile Augmented Reality research and development for geo-engineering solutions.
- **Frédéric HUBERT :** <https://www.scg.ulaval.ca/frederic-hubert>  
Geospatial Business Intelligence, Spatial OLAP, mobile augmented reality, geospatial web services, geospatial multimodal interaction, spatial query language.
- **Stéphane ROCHE :** <https://www.scg.ulaval.ca/stephane-roche>  
Participatory/wiki planning and Geodesign, Geoweb 2.0 and Volunteered geographic information (VGI), Location-based social networks, smart city, SDI and spatially enabled society.
- **Mir MOSTAFAVI :** <https://www.scg.ulaval.ca/mir-abolfazl-mostafavi>  
3D modeling and simulation, 3D spatial analysis, Marine GIS, 3D point Cloud and LiDAR technology, Geospatial augmented reality, Semantic interoperability, Geosensor networks deployment and data integration
- **Jacynthe Pouliot:** <https://www.scg.ulaval.ca/jacynthe-pouliot>  
Geomatics, GIS, 3D modeling, Web development, Cartography

## ***Geographical Sciences (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Geography or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.0 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French.
- **Other requirements:** Please note that students cannot enter the Ph.D. program until the M.Sc. degree has been awarded, or all requirements completed. A written agreement (e-mail) from a professor confirming that he will act as a research director is also required.

### ***Program Requirements***

- **Compulsory Courses (6 credits)**
  - GGR-8001 Doctoral Research Proposal (written and oral) (3 credits)
  - GGR-8000 Doctoral Exam (written and oral) before the end of the 4<sup>th</sup> semester
- **Complementary Courses (6 credits) :**
  - a minimum of 3 credits in courses in the geography program and 3 credits in a large choice of courses
- **Thesis (78 credits)**

For more details refer to the program description at :

<https://www.ggr.ulaval.ca/doctorat-en-sciences-geographiques>

### ***Research Areas***

- Refer to the section "Professors", where their individual research areas/expertise are listed.

### **Financial Support – Doctoral Funding**

Steps	Amount*
Step 1 (semester 4 or 5)	3 600 \$ or 2 400 \$
Step 2 (semester 7 or 8)	3 600 \$ or 2 400 \$
Step 3 (semester 9, 10, 11 or 12)	4 800 \$ to 2 400 \$

\* All amounts are in Canadian dollars.

Steps and amounts are presented in details in the financial support plan of the Faculty at:

<https://www.ffgg.ulaval.ca/fonds-de-soutien-la-maitrise-et-au-doctorat>

### **Professors**

- **Frédéric LASSERRE:** Eastern Asia, Transportation and Logistics, Arctic, Trans-Asia transportation, One Belt/One Road.

Note: Supervision and funding are conditional on obtaining a research grant (decision in April 2016).

Email: [Frederic.Lasserre@ggr.ulaval.ca](mailto:Frederic.Lasserre@ggr.ulaval.ca)

Website : <https://www.ggr.ulaval.ca/frederic-lasserre>



## ***Wood Sciences (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Wood Sciences or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.0 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French. The candidate must be willing to learn French within the first year.
- **Other requirements:** Please note that students cannot enter the Ph.D. program until the M.Sc. degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (8 credits)**
  - Doctoral Exams (6 credits)
  - Seminar (2 credits.)
- **Complementary Courses (4 credits)**
- **Thesis (78 credits)**
- For more details refer to program description at :  
<https://www.sbf.ulaval.ca/doctorat-en-sciences-du-bois>

### ***Research Areas***

- Refer to the section "Professors", where their individual research areas/expertise are listed.

**Financial Support – Doctoral Funding**

Steps	Amount*
Step 1 (semester 4 or 5)	3 600 \$ or 2 400 \$
Step 2 (semester 7 or 8)	3 600 \$ or 2 400 \$
Step 3 (semester 9, 10, 11 or 12)	4 800 \$ to 2 400 \$

\* All amounts are in Canadian dollars.

Steps and amounts are presented in details in the financial support plan of the Faculty at:

<https://www.ffgg.ulaval.ca/fonds-de-soutien-la-maitrise-et-au-doctorat>

**Professors**

- **Pierre BLANCHET:** Ecoresponsible Wood Construction  
Email : [pierre.blanchet@sbf.ulaval.ca](mailto:pierre.blanchet@sbf.ulaval.ca)  
Websites : <https://www.sbf.ulaval.ca/professeurs/pierre-blanchet>  
<https://circular.chaire.ulaval.ca/>

## Faculty of Sciences and Engineering

### ***PhD programs available***

- Actuarial Sciences
- Biochemistry
- Biology
- Biophotonics
- Chemistry
- Computer Science
- Earth Sciences
- Mathematics
- Microbiology
- Oceanography
- Physics
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Materials and Metallurgical Engineering
- Mechanical Engineering
- Mining Engineering
- Water Engineering

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 2.67 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required.  
1) Some course exams are available in English and 2) Some PhD course(s) may be taken as a guided study reading class.
- **Other requirements:** Suggestion: Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- Requirements vary depending on the program.

### **Research Areas**

- Smart environments
- Nordic and Arctic environments
- Optics and photonics
- Natural resources and sustainable development
- Robotics and Computer Vision
- Materials Science
- Biological Systems

### **Financial Support – Doctoral Funding**

<b>Steps</b>	<b>Amount*</b>
Progression studentship	7 x \$500.00
Doctoral exam or seminar presentation	\$750.00
Doctoral exam, seminar or conference	\$1,000.00
Publication	\$750
Communication	\$1,000.00
Initial thesis submission	\$1,000.00**
<b>Total</b>	<b>8,500.00\$</b>

\* All amounts are in Canadian dollars.

\*\* A \$500 bonus will be added to the studentship for graduation if the initial deposit is made before the session that precedes the maximum qualifying session.

### **Professors**

- Consult the List of Research Centres and Chairs-UL-2015-2016 to find your supervisor.

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in domaine(s) or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 2.67 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French, however:
  - 1) they may be taken in the 2nd year,
  - 2) course exams are available in English and
  - 3) 2 PhD course(s) may be taken as a guided study reading class.
- **Other requirements:** Suggestion: Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (2 credits):**
  - Doctoral seminar
- **Complementary Courses (6 credits in total)** – to choose from the list:
  - Special subjects (Biochemistry)
  - Interactions RNA/proteins
  - Determination of protein structure
  - Introduction to membrane biophysics
  - Enzymology
  - Introduction to biophotonics
  - Neuroscience I
  - Neuroscience II
- **Doctoral Exam (2 credits)**
  - Written part and oral examination
  - Should be passed by session 2, with 1 additional attempt at session 3 if failed.
- **Thesis (86 credits)**

### Research Areas

- Biochemistry, enzymology, protein structure and function
- Biophysics, membrane structure and function, ion channels
- Neurobiology, neuroscience, neuronal signaling, synaptic transmission, Alzheimer's disease, epilepsy
- Biophotonics, optical sensing and manipulation, intravital imaging
- Structure and function of proteins
- Protein-Protein interaction
- Protein X-ray crystallography
- Structural bioinformatics

### Financial Support – Doctoral Funding

Steps	Amount*
Semester 1-8	Tuition fees and CSC scholarship

\* All amounts are in Canadian dollars.\* In case the student has succeeded in the application for the CSC scholarship, he or she will receive extra support (\$4500-\$7000 per year) from the supervisor and/or the department.

### Professors

- **Lisa Topolnik:** Biophysics, ion channels, signal transduction, neurobiology, neuroscience, neuronal signaling, synaptic transmission, Alzheimer's disease, epilepsy, biophotonics, optical sensing and manipulation, intravital imaging, optogenetics, pharmacogenetics

Email: [lisa.topolnik@bcm.ulaval.ca](mailto:lisa.topolnik@bcm.ulaval.ca)

Website: [www.neuronimaging.ca](http://www.neuronimaging.ca)

- **Rong Shi**

(1) Structure and function of proteins: Antibiotic tailoring enzymes;  
Phage proteins and bacteria-phage interactions;  
Novel virulence factors in *Pseudomonas Aeruginosa*.

(2) Protein-Protein complexes

(3) Protein X-ray crystallography

(4) Structural bioinformatics

Email: [rong.shi@bcm.ulaval.ca](mailto:rong.shi@bcm.ulaval.ca)

Website: <http://www.ibis.ulaval.ca/?pg=rongShi>

## ***Chemical Engineering (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Mechanical or Chemical Engineering or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.4 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. There are two obligatory courses. There are graduate courses offered in English. Course exams are available in English  
**Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (2 credits)**
  - Additional doctoral project 1 (credit)
  - Scientific oral and written communication II
- **Complementary Courses (8 credits)**
  - GCH-7000 Implementation of polymers 3
  - GCH-7001 Rheology of Polymers 3
  - GCH-7002 Numerical Methods in Chemical Engineering 3
  - GCH-7003 Biochemical Kinetics 3
  - GCH-7004 Mathematical Methods in Chemical Engineering 3
  - GCH-7005 reaction systems 3
  - GCH-7006 Research Methodology 3
  - GCH-7007 Environmental biotechnology 3
  - GCH-7008 Fluid mechanics biphasic 3
  - GCH-7009 Heterogeneous Catalysis 3
  - GCH-7010 Special Topics (Chemical Engineering) 3
  - GCH-7011 Planning and analysis of experiments 3
  - GCH-7012 Nanomaterials and their application in catalysis 3
  - GCH-7013 Exchange phenomena 3
  - GCH-7014 Separation technologies and capture greenhouse gas 3
  - GCH-7015 Biomolecular Engineering 3
- **Doctoral Exams**
  - EOP (probatory exam) (semester 3)
  - EGD (general doctoral exam) (semester 5)

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- Final defence (last semester)
- **Thesis (11 credits per semester)**

### **Research Areas**

Complex Fluid mechanics; Experimental, Computational & Analytical Fluid Dynamics; Hydrodynamic Instability; Non-Newtonian Fluid Flows; Multiphase Flows; Displacements Flows; Suspensions Flows; Buoyant Flows; Elastohydrodynamic; Magnetohydrodynamics; Microfluidics & Nanofluidics

### **Financial Support – Doctoral Funding**

Steps	Amount*
EOP (probatory exam) (semester 3)	\$750
EGD (general docotoral exam) (semester 5)	\$750
Publication as first author (semester 2-12)	\$750
Course GCH-8001 (semester 6-12)	\$750
Thesis submission before semester 13	\$1,500

\* All amounts are in Canadian dollars.

### **Professor**

- **Seyed Mohammad Taghavi:** He is the manager and the principle investigator of the Laboratory of Complex Fluids Research (LCFR). His primary interest is complex fluid dynamics research to solve problems of industrial relevance, by adopting analytical, experimental and computational techniques, together providing a deeper understanding. Areas in which we will look for new research challenges include but are not limited to multiphase flows, non-Newtonian flows, suspension flows, polymer flows, micro, nano and bio-fluidics, and interdisciplinary fluid dynamics applications.
- Email: [Seyed-Mohammad.Taghavi@gch.ulaval.ca](mailto:Seyed-Mohammad.Taghavi@gch.ulaval.ca)
- Website: <http://www.gch.ulaval.ca/smtag/>



## ***Civil Engineering (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in finite element modeling, high-performance computing, or solution methods for large linear systems or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.33 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French; however the books are in English. All exams and homeworks are available in English. There are two required courses.
- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Complementary Courses (9 credits)**
  - Introduction to the finite element method
  - Advanced continuum mechanics
  - Finite element method for fluids
  - High-performance computing
  - Boundary finite element method
  - Etc.
- **Doctoral Exam (9 credits)**
  - Written exam before the end of the 2<sup>nd</sup> semester
  - Oral exam before the end of the 3<sup>rd</sup> semester

### ***Research Areas***

Please look at each professor below.

### ***Financial Support – Doctoral Funding***

The supervisor will give \$ 6,000 per year as a scholarship to the student. In addition, the department of Civil Engineering will give approximately \$ 1,500 per year, depending on the performance of the student.

\* All amounts are in Canadian dollars.

### ***Professors***

- **Prof. A. Baggag**

“High Performance Computing and Advanced Numerical Methods in Continuum Mechanics”

Email: [Abdelkader.Baggag@gci.ulaval.ca](mailto:Abdelkader.Baggag@gci.ulaval.ca)

Website : <http://www.gci.ulaval.ca/>

***Research areas :***

- Extended finite element method (XFEM)
- High performance computing, Parallelism with Message Passing Interface (MPI)
- Frictional and frictionless contact problems with XFEM
- Solidification, and Phase Changes: Two-phase Stefan problem is level-set formulation
- Fluidic interfaces, mass transport of species in two-phase flows
- Object-Oriented XFEM implementation for evolving discontinuities
- Crack propagation with XFEM
- Multiphysics problems in continuum mechanics with embedded interfaces
- Fluid-Structure Interaction (FSI) with the eXtended Finite Element Method (XFEM) Mortar Methods in Continuum Mechanics

Professeur Baggag is also affiliated with the prestigious « Groupe Interdisciplinaire de Recherche en Éléments Finis », i.e., Group on Multidisciplinary Research in Finite elements (GIREF), see

<http://www.giref.ulaval.ca/chercheurs.html>

- **Prof. Mario Fafard**

Email: [Mario.Fafard@gci.ulaval.ca](mailto:Mario.Fafard@gci.ulaval.ca)

Website : <http://www.gci.ulaval.ca/>

Work undertaken under the R&D projects “Advanced Modelling of Aluminium Electrolytic Cells” and «Improvement of the aluminium electrolysis energy efficiency by anodes making process optimization” will allow to further knowledge and techniques required to improve the energy performance of Hall-Heroult cells, in order to reduce energy consumption and CO<sub>2</sub> emissions.



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**Research areas :**

- Aluminium production, advanced numerical modelling;
- Multiphysics problem;
- Extended finite element method;
- Chemical species migration modelling;
- Fluid dynamics, solid mechanics, Hall-Héroult cells;
- Thermo-electro-mechanical modelling; C++ programming.

- **Prof. David Conciatori**

Email: [david.conciatori@gci.ulaval.ca](mailto:david.conciatori@gci.ulaval.ca)

Website : <http://www.gci.ulaval.ca/>

**Research areas :**

- Climate analysis, structure exposure,
- Material durability,
- Analysis of aging and innovative structures,
- Vulnerability analysis of the road network,
- Durability of UHPC.

- **Prof. Luca Sorelli**

Email: [Luca.Sorelli@gci.ulaval.ca](mailto:Luca.Sorelli@gci.ulaval.ca)

Website : <http://www.gci.ulaval.ca/lisorelli>

**Research areas :**

- Multi-scale characterization of composite by new nano-indentation techniques;
- Micromechanics modelling of cement composite;
- Diffusive-damage modeling for concrete durability
- Modeling and Design of Timber-Concrete structures;
- Finite Element modelling and design of Ultra High Performance Fibre Reinforced Concrete structures.

- **Prof. Peter Vanrolleghem**

Email: [Peter.Vanrolleghem@gci.ulaval.ca](mailto:Peter.Vanrolleghem@gci.ulaval.ca)

Website : <http://modeleau.fsg.ulaval.ca>

**Research areas :**

- modélisation
- surveillance et contrôle de la qualité de l'eau
- systèmes environnementaux

## Computer Science (PhD)

### Admission Requirements

- **A Master's degree** (or equivalent as recognized by Université Laval) in Computer Science or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.5 / 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required.  
All courses are offered in French, however 1) they may be taken in the 2<sup>nd</sup> year, 2) some pedagogical books and exams may be obtained in English 3) the thesis may be written in English
- **Other requirements:** Suggestion: Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### Program Requirements

- **Complementary Courses (9 credits chosen among the followings)**  
[GIF-7104](#), [GLO-7000 à GLO-7006](#), [GLO-7021](#), [GSO-6082](#), [IFT-7000 à IFT-7004](#), [IFT-7006 à IFT-7017](#),  
[IFT-7020](#), [IFT-7022](#), [IFT-7025](#), [IFT-7026](#)
- **Doctoral Exam (9 credits)**  
[IFT-8002](#) Written Exam on Fundamental Computer Sciences (3 credits)  
[IFT-8003](#) Subject Proposal (3 credits)  
[IFT-8004](#) Thesis Proposal (3 credits)
- **Thesis (78 credits)**

### Research Areas (general)

Machine Learning;  
Data Mining and Big Data;  
Robotic Systems;  
Pattern Recognition;  
Software Engineering;;  
Artificial Intelligence ;  
Constraint Solving Problems;  
Natural Language Processing;  
Cryptography and Security;  
Signal Processing;  
Software for Vision;

### **Financial Support – Doctoral Funding**

<b>Steps</b>	<b>Amount*</b>
Session 1 and 2 (BBAF grant)	1000 \$ per session
Sessions 3 to 9, if progression is conform	500 \$ per session
Success to written exam before the end of the 2 <sup>nd</sup> session	500 \$
Conference with proceeding as first author and presentation	500 \$ once
Journal publication as first author	500\$ once
Thesis draft sent for evaluation before the end of the 13 <sup>th</sup> session	1000 \$
Potential grant for excellence	1000 \$

\* All amounts are in Canadian dollars.

### **Professors**

#### **Professor Brahim Chaib-draa**

*Research interests:* Machine Learning; Data Mining, Bioinformatics, Pattern Recognition; Signal Processing; Estimation and Prediction; Vision; Robotic Systems; Control Systems.

*E-mail:* [chaib@ift.ulaval.ca](mailto:chaib@ift.ulaval.ca)

*Web site:* <http://damas.ift.ulaval.ca>

#### **Professor Nadia Tawbi**

*Research interests:* Computer security; Security policy enforcement; Information flow enforcement; Language-based security; Formal Verification; Static analysis; dynamic analysis

*E-mail:* [tawbi@ift.ulaval.ca](mailto:tawbi@ift.ulaval.ca)

*Web site:* [www.ift.ulaval.ca/Nadia\\_Tawbi](http://www.ift.ulaval.ca/Nadia_Tawbi)

## ***Electrical & Computer engineering (Ph.D)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in electrical or computer engineering or a subject closely related to selected graduate work.
- **High Academic Achievement:** Evaluated case by case.
- **Proficiency in French/English:** Proficiency in either French or English is required.

Courses are offered in French, however 1) they may be taken in the 2<sup>nd</sup> year, 2) course exams are available in English and 3) 1 of the 3 required PhD courses may be taken as independent study class.

- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (9 credits)**
  - Three graduate courses offered in the electrical and computer engineering department, or other departments if required for the thesis topic and upon approval.
- **Doctoral Exam (6 credits)**
  - A written exam covering thesis topics; a thesis proposal – a document describing the proposed research with literature review, proposed methodology and any preliminary results; and an oral presentation followed by questions related to the first two stages of the exam.
  - This exam takes place during the 4<sup>th</sup> semester of study: the thesis proposal has to be completed by the end of the 15<sup>th</sup> month of study, followed by the written exam and the oral presentation.
- **Thesis (75 credits)**

### ***Research Areas***

- Optical engineering and optical communications including instrumentation for metrology and spectroscopy, advanced modulation formats for coherent detection, all optical networks, radio over fiber for wideband access, optical design and thin films, imaging and remote sensing.
- Computer engineering including computer vision, sensors and 3D modeling, virtual reality and simulation, IR vision, image and video processing, cognitive vision. Machine learning and pattern recognition. Infrared thermography for materials inspection.
- RF communications and digital signal processing, data fusion, radar, wireless communications and MIMO systems, antennas and propagation, VLSI and microfluidics for bioengineering.
- Electrical power engineering including power electronics (generation, transmission, distribution and

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end use), industrial command, and renewable energy.

- Process observation and optimization including process control, observation and optimization, unmanned aerial vehicles, data reconciliation.

**Financial Support – Doctoral Funding**

Steps	Amount*
Laval University welcome award (first semester)	1000 \$
Laval University welcome award (second semester)	1000 \$
Successful doctoral exam (before the end of the fourth semester)	1750 \$
Satisfying research progress:	
- progress report submission (12 months after the PhD studies beginning)	500 \$
- progress report submission (16 months after the PhD studies beginning)	500 \$
- progress report submission (20 months after the PhD studies beginning)	500 \$
- progress report submission (24 months after the PhD studies beginning)	500 \$
- progress report submission (28 months after the PhD studies beginning)	500 \$
- progress report submission (32 months after the PhD studies beginning)	500 \$
- progress report submission (36 months after the PhD studies beginning)	500 \$
Paper presented at a scientific conference with a review committee before end of the 40 <sup>th</sup> month.	1000 \$
Paper accepted in a scientific journal with a review committee before end of the 36 <sup>th</sup> month.	750 \$
Thesis submitted before end of the 14 <sup>th</sup> semester of study	1000 \$
<i>Maximum doctoral funding from Laval University</i>	<i>12 000 \$</i>

\* All amounts are in Canadian dollars.

**Professors**

Email addresses and individual websites at

<http://www.gelgif.ulaval.ca/departement-et-professeurs/personnel-et-professeurs/professeurs/>

**Computer Vision and Systems Laboratory**, <http://vision.gel.ulaval.ca>

- Prof. Abdelhakim Bendada
- Prof. Robert Bergevin
- Prof. Christian Gagné
- Prof. Jean-François Lalonde
- Prof. Denis Laurendeau
- Prof. Xavier Maldague
- Prof. Marc Parizeau

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- Prof. André Zaccarin

**Radiocommunications and Signal Processing Laboratory, <http://lrts.gel.ulaval.ca>**

- Prof. Jean-Yves Chouinard,
- Prof. Paul Fortier,
- Prof. Benoit Gosselin,
- Prof. Dominic Grenier,
- Prof. Amine Miled,

**Electrical Power Engineering Laboratory, <http://leepci.gel.ulaval.ca>**

- Prof. Morad Abdelaziz
- Prof. Jérôme Cros
- Prof. Hoang Le-Huy
- Prof. Philippe Viarouge

**Process Observation and Optimization Laboratory, <http://loop.gel.ulaval.ca>**

- Prof. André Desbiens
- Prof. Éric Poulin

**Center for Optics, Photonics and Lasers, <http://www.copl.ulaval.ca/>**

- Prof. Jean-Daniel Deschênes
- Prof. Jérôme Genest
- Prof. Sophie La Rochelle
- Prof. Leslie Rusch
- Prof. Wei Shi



## ***Mathematics (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Mathematics or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 2.67 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Taught courses are offered in French, however:
  - 1) They may be taken in the second year;
  - 2) Course exams are available in English;
  - 3) Up to two courses may be taken as reading courses;
  - 4) PhD thesis may be written in English;
  - 5) The university offers French immersion courses.
- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Compulsory Courses (0 credits)**
- **Complementary Courses (16 credits)**
  - Algebraic Number Theory, Algebra, Commutative Algebra and Galois Theory, Lie Theory, Analytic Number Theory, Riemann Surfaces, Varieties and Differential Forms, and more.
  - Functionnal Analysis, Partial Differential Equations, Spectral Geometry, Spectral Theory, Riemannian Geometry, Operator theory, Riemann Surfaces, Quantum Mecanics, etc.
- **Doctoral Exam (6 credits)**
  - Two written exams on general and specialized topics and one oral exam.
  - All exams have to be passed by the end of the first year of registration at the PhD level.
- **Thesis (68 credits)**

## **Research Areas**

### **Factorization of p-adic L-functions**

An elliptic curve is a cubic curve that is equipped with a group structure. They are used heavily in modern-day cryptography. In this project you will study the p-adic L-function of an elliptic curve, which is a power series defined over p-adic numbers. It tells us about arithmetic properties of the curve over extensions of the rational numbers that are given by p-power roots of unity. You will investigate how the coefficients of these functions behave. By analysing values of these functions evaluated at a set of special points, you will study whether they factor into functions that are easier to understand. This will result in new arithmetic information on the elliptic curve.

### **Iwasawa theory of modular forms**

A modular form is an analytic function that satisfies invariant properties under certain Möbius transforms. In order to prove Fermat's Last Theorem, Andrew Wiles showed that an elliptic curve is in fact a special case of modular forms. The analytic structure of modular forms allow us to obtain new information about elliptic curves. In this project, you will study certain representations of the Galois group of the rational numbers that are described by the Fourier coefficients of a modular form. More precisely, you will look at the behaviour of these representations as you restrict them to a tower of extensions and understand their cohomology groups.

### **Construction of Euler systems**

An Euler system is a family of cohomology classes of a representation that satisfy certain compatibility condition. It is a very powerful tool in Iwasawa Theory because they give us a link between algebraic objects and to analytic objects. In this project, you will study the construction of Euler systems for a certain family of representations and apply them to study asymptotic behaviour of these representations. The construction will rely on understanding the geometry of modular curves and modular surfaces.

### **Spectral Geometry of the Dirichlet-to-Neumann operator**

Spectral geometry is the study of the interplay between the geometry of a space and the eigenvalues of naturally occurring operators on this space. The eigenvalues often correspond to natural frequencies of vibration, or to the energy levels of a quantum system. The golden age of spectral geometry started with the famous question proposed by M.Kac: "Can one hear the shape of a drum?" In 1992, C.Gordon, D.Webb and S.Wolpert gave a negative answer to this question by exhibiting two non-isometric planar domains with exactly the same natural frequencies. This means that the geometry of a space is not completely determined by its spectrum. Deciding which geometric quantities are spectrally determined is one of the main goal of spectral geometry. For instance, it is known since the beginning of the XXth century that the volume of a bounded domain is spectrally determined (Weyl's law).

The spectral geometry of elliptic differential operators has been extensively investigated over the last century. The action of a differential operator on a function depends only on its infinitesimal behavior. In contrast, pseudodifferential operators act globally. They often arise as solution operators to partial differential equations, which makes them of a fundamental importance in the field of inverse problems.

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Imagine for instance that an electrical potential is applied at the surface of a solid body. This produces a current flux across its surface which depends on the interior conductivity of the body. Recovering the conductivity inside the body from current and voltage measurements at the surface is known as the Calderón inverse problem. Mathematically, the conductivity can be represented by a Riemannian metric and the voltage-to-current operator is known to mathematicians as the Dirichlet-to-Neumann (DtN) map. A deep understanding of this operator is essential in applications to electrical impedance tomography, which is used in medical imaging and in geophysical prospecting.

The spectral geometry of the Dirichlet-to-Neumann operator is developing rapidly, as the subject has attracted plenty of attention in the last few years. While our understanding improves rapidly, several new challenging problems also emerged. My research program is focused on three axes of investigation: geometric bounds for eigenvalues, spectral asymptotics, geometric spectral invariants, discretization and coarse geometry. Projects for ambitious students are available in each of these directions.

**Bibliography** : A. Girouard and I. Polterovich, *Spectral geometry of the Steklov problem*, to appear in Journal of Spectral Theory. Preprint : arXiv:1411.6567.

### Financial Support – Doctoral Funding

Steps	Amount*
Semester 1 to 8 at 12 credits/semester	1200\$/semester
Semester 1 to 8 at 15 credits/semester	1500\$/semester

\* All amounts are in Canadian dollars.

### Professor

- Antonio Lei** is an assistant professor at Université Laval. His research interests are in Algebraic Number Theory, using techniques from Commutative Algebra, Cohomology Theory, p-adic Analysis and Arithmetic Geometry to study problems in Number Theory. In particular, he works on Iwasawa Theory, arithmetic properties of elliptic curves, modular forms, p-adic representations and so on. He is originally from Macao. He speaks Cantonese Chinese fluently and he has basic knowledge of Mandarin Chinese.  
 Email: [antonio.lei@mat.ulaval.ca](mailto:antonio.lei@mat.ulaval.ca)  
 Website: <http://www.antoniolei.com>
- Alexandre Girouard** is an assistant professor at Université Laval. His research is in spectral geometry. He works on isoperimetric problems (and other geometric bounds) for eigenvalues of natural geometric operators such as the Laplacian and the Dirichlet-to-Neumann map. This is at the crossroad of PDEs, functional analysis and Riemannian geometry.  
 Email: [alexandre.girouard@mat.ulaval.ca](mailto:alexandre.girouard@mat.ulaval.ca)  
 Website: <http://archimede.mat.ulaval.ca/agirouard/Prospective/>

## **Mathematics (Statistics Track) (PhD)**

### **Admission Requirements**

- **A Master's degree** (or equivalent as recognized by Université Laval) in statistics, biostatistics or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.33 out of a possible 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required. Courses are offered in French; however course exams are available in English.
- **Other requirements:** Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### **Program Requirements**

- **Compulsory Courses : none**
- **Complementary Courses (16 credits)**
  - STT-7120 Théorie et applications des méthodes de régression
  - STT-7130 Analyse de durées de vie
  - STT-7140 Statistique bayésienne
  - STT-7230 Planification des expériences
  - STT-7320 Statistique computationnelle
  - STT-7330 Méthodes d'analyse des données
  - STT-7340 Sondages : modèles et techniques
  - STT-7610 Introduction à la génétique statistique
  - STT-7620 Modèles d'équations structurelles 3
  - STT-7740 Sujets spéciaux
- **Doctoral Exam (6 credits)**
  - Written exam
  - Held at the 3rd semester. A second attempt within a year is allowed in case of failure.
- **Thesis (68 credits)**

### **Research Areas**

- Family-based genetic association methods for rare variants, coalescence theory, genealogical data modeling

**Financial Support – Doctoral Funding**

Steps	Amount*
Semester 1 to 8 at 12 credits/semester	1200\$/semester
Semester 1 to 8 at 15 credits/semester	1500\$/semester

\* All amounts are in Canadian dollars.

**Professors**

- **Alexandre Bureau:** statistical aspects of genetic linkage analysis and linkage disequilibrium gene mapping  
Email: [alexandre.bureau@fmed.ulaval.ca](mailto:alexandre.bureau@fmed.ulaval.ca)  
Website: [http://www.crulrg.ulaval.ca/pages\\_perso\\_chercheurs/bureau\\_a/english.html](http://www.crulrg.ulaval.ca/pages_perso_chercheurs/bureau_a/english.html)

## ***Mechanical Engineering (PhD)***

### ***Admission Requirements***

- **A Master's degree** (or equivalent as recognized by Université Laval) in Mechanical Engineering or a subject closely related to selected graduate work.
- **High Academic Achievement:** The minimum Cumulative Grade Point Average (CGPA) is 3.00 / 4.33.
- **Proficiency in French/English:** Proficiency in either French or English is required.  
All courses are offered in French, however 1) they may be taken in the 2<sup>nd</sup> year, 2) some pedagogical books and exams may be obtained in English 3) the thesis may be written in English.
- **Other requirements:** Suggestion: Please note that students cannot enter the PhD program until the MSc degree has been awarded, or all requirements completed.

### ***Program Requirements***

- **Complementary Courses (9 credits chosen among the followings)**
  - For Mechanical Engineering without specific concentration:  
GCI-7030, GMC-7000 to GMC-7025, GMC-7028 to GMC-7031, GMC-7042, GMC-7044
  - For Mechanical Engineering with Industrial Engineering concentration:  
GIF-7005, GIF-7006, GIN-7000 à GIN-7002, GIN-7010 à GIN-7017, GIN-7900, GMC-7009, GMC-7017, GMC-7021, GMC-7023, GMC-7025, GMC-7026, GMN-7003, GSO-6080 à GSO-6083, GSO-6087, GSO-7005, IFT-7011, MNG-7000, MQT-6003, MQT-6006 à MQT-6009, MQT-6011, MQT-6013, MQT-6014, RLT-7014, SIO-6021
- **Doctoral Exam (5 credits)**
  - GMC-8000 Examen de doctorat oral
  - GMC-8001 Communication orale de doctorat
  - GMC-8002 Examen de doctorat écrit
- **Thesis (82 credits)**

### ***Research Areas (general)***

**Aero-hydro-dynamics:** Aerodynamics; Fluid-structure Interaction; Transition; Turbulence; Boundary Layer; Instrumentation; Turbomachinery; Hydraulic turbines; Internal flows; CFD; experimental analysis, Instrument development, Renewable energy, CFD. **Energetic:** Combustion; Heat transfer, Renewable energy

**Mechanical systems:** Power gear transmissions; Aerial electrical conductors; Complex mechanisms; Mechatronics; Articulated systems; Vibrations; Acoustic radiation and noise control; CAD; Hydraulic and

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Pneumatic Systems; Composite materials.

**Production/Industrial:** Design; Development of systems and products; Robotics; Manipulators optimization; Optimal control, Manufacturing; FAO; Rapid prototyping; Assessment and quality control; Systems reliability; Maintenance; Availability of systems subject to random failures; Expert systems in maintenance; Production management; Automation and Mechatronics; Logistics networks; Neural control and Neural architectures; Powder metallurgy; Metrology; Equipment for industrial inspection.

### **Financial Support – Doctoral Funding**

<b>Steps</b>	<b>Amount*</b>
Session 1 and 2 (BBAF grant)	1000 \$ per session
Sessions 3 to 9, if progression is conform	500 \$ per session
Success to written exam GMC-8002 before the end of the 2 <sup>nd</sup> session	500 \$
Success to oral exam GMC-8000 before the end of the 3 <sup>rd</sup> session	500 \$
Conference with proceeding as first author and presentation	500 \$ once
Journal publication as first author	500\$ once
Thesis draft sent for evaluation before the end of the 13 <sup>th</sup> session	1000 \$
Potential grant for excellence	1000 \$

\* All amounts are in Canadian dollars.

### **Professors**

- Professor Louis Gosselin**  
Research interests: Heat transfer in buildings and industrial processes, energy efficiency, waste heat recovery, modeling and optimization techniques, power generation, advanced control of buildings, geothermal energy, district heating and cooling  
 Email : [louis.gosselin@gmc.ulaval.ca](mailto:louis.gosselin@gmc.ulaval.ca)  
 Web site: <http://www.gmc.ulaval.ca/lte>
- Professor Yvan Maciel**  
Research interests: turbulence, boundary layers, flow through heart valves  
 E-mail: [yvan.maciel@gmc.ulaval.ca](mailto:yvan.maciel@gmc.ulaval.ca)  
 Web site: <http://yvanmaciel.gmc.ulaval.ca/>