MASTER OF APPLIED SCIENCE
BIOMEDICAL ENGINEERING
SPECIALIZATION IN
BIOINFORMATICS

Summary

• Degree offered: Master of Applied Science (MASc)
• Registration status options: Full-time; Part-time
• Language of instruction: English
• Primary program: MASc in Biomedical Engineering
• Collaborative specialization: Bioinformatics
• Program option (expected duration of the program):
  • within two years of full-time study
• Academic units: Faculty of Engineering (https://engineering.uottawa.ca/), School of Electrical Engineering and Computer Science (http://engineering.uottawa.ca/eecs/), Department of Mechanical Engineering (http://engineering.uottawa.ca/mechanical/), Department of Chemical Engineering (http://engineering.uottawa.ca/chemical/), Ottawa-Carleton Institute of Biomedical Engineering (http://www.ocibme.ca/)

Program Description

Ottawa-Carleton Joint Program

Established in 2006, the Ottawa-Carleton Institute of Biomedical Engineering (OCIBME) combines the teaching and research strengths of many academic units across the University of Ottawa and Carleton University.

Graduate education in biomedical engineering is multidisciplinary, and it combines the teaching and research input of seven primary participating academic units at:

University of Ottawa:
• Department of Mechanical Engineering (MCG)
• School of Electrical Engineering and Computer Science (EECS)
• Department of Chemical Engineering (CHG)

Carleton University:
• Department of Systems and Computer Science
• Department of Mechanical and Aerospace Engineering
• School of Computer Science
• Department of Physics

Research facilities are shared between the two campuses. Students have access to the professors, courses and facilities at both universities; however, they must enroll at the “home university” of their thesis supervisor if they are enrolled in the MASc option, or of their project supervisor if they are enrolled in the MEng with project/internship.

The Institute is a participating unit in the collaborative program in Bioinformatics (at the master’s level).

Collaborative Program Description

Bioinformatics is an emerging and increasingly important scientific discipline dedicated to the pursuit of fundamental questions about the structure, function and evolution of biological entities through the design and application of computational approaches. Fundamental research in these areas is expected to increase our understanding of human health and disease which translates into innovation in industry. Bioinformaticians today must be able to appreciate significant research in other fields and therefore require an understanding of the basic principles of other disciplines. To meet this challenge Carleton University and the University of Ottawa offer a collaborative program leading to a master of science degree in the primary program with specialization in Bioinformatics or, in the case of computer science, a master of computer science degree with specialization in Bioinformatics.

Main Areas of Research

The Institute benefits from the expertise of a number of prominent medical researchers and well established University of Ottawa medical research units including: the University of Ottawa Heart Institute and the University of Ottawa Eye Institute. In addition to the participating academic units listed above, a number of others are involved in the program through the research activities of some of their faculty members, or through graduate courses that may be taken as electives by students in the program.

Members of the Institute are engaged in four main research fields:

• Medical instrumention
• Biomedical image processing
• Biomechanics and biomaterials
• Medical informatics
• Telemedicine

Other Programs Offered Within the Same Discipline or in a Related Area

• Master of Applied Science Biomedical Engineering (MASc)
• Master of Engineering Biomedical Engineering Concentration in Clinical Engineering (MEng)
• Master of Engineering Biomedical Engineering (MEng)

Fees and Funding

• Program fees:

The estimated amount for university fees (https://www.uottawa.ca/university-fees/) associated with this program are available under the section Finance your studies (http://www.uottawa.ca/graduate-studies/programs-admission/finance-studies/).

International students enrolled in a French-language program of study may be eligible for a differential tuition fee exemption (https://www.uottawa.ca/university-fees/differential-tuition-fee-exemption/).

• To learn about possibilities for financing your graduate studies, consult the Awards and financial support (https://www.uottawa.ca/graduate-studies/students/awards/) section.

This is a copy of the 2022-2023 catalog.

https://www.uottawa.ca/en/graduate/master-applied-science-biomedical-engineering-specialization-bioinformatics/index.html
Notes
• The program is governed by the regulations and procedures for Joint Graduate Programs and the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations/) in effect for graduate studies at each of the two universities.
• In accordance with the University of Ottawa regulation, students have the right to complete their assignments, examinations, research papers, and theses in French or in English. Research activities can be conducted in either English or French or both depending on the language used by the professor and the members of the research group.

Program Contact Information
Graduate Studies Office, Faculty of Engineering (https://engineering.uottawa.ca/graduate-studies-office/)
STE 1024
800 King Edward Ave.
Ottawa ON Canada
K1N 6N5
Tel.: 613-562-5347
Fax.: 613-562-5129
Email: engineering.grad@uottawa.ca

Twitter | Faculty of Engineering (https://twitter.com/uOttawaGenie/?lang=en)
Facebook | Faculty of Engineer (https://www.facebook.com/uottawa.engineering/)

Admission Requirements
For the most accurate and up to date information on application deadlines, language tests and other admission requirements, please visit the specific requirements (https://www.uottawa.ca/graduate-studies/programs-admission/apply/specific-requirements/) webpage.

To be eligible, candidates must:
• Have a bachelor’s degree with a specialization or a major (or equivalent) in engineering, science, computer science, or a related discipline, with a minimum admission average of 75% (B+).
  Note: International candidates must check the admission equivalencies (https://www.uottawa.ca/graduate-studies/international/study-uottawa/admission-equivalencies/) for the diploma they received in their country of origin.
• Demonstrate a good academic performance in previous studies as shown by official transcripts, research reports, abstracts or any other documents demonstrating research skills.
• Identify at least one professor who is willing to supervise your research and thesis. We recommend that you contact potential thesis supervisors as soon as possible.
• Be sponsored into the collaborative specialization by a faculty member of the collaborative program, normally the thesis supervisor, who must be appointed, cross-appointed or stand as an adjunct at the primary program.

Language Requirements
Applicants must be able to understand and fluently speak and write the language of instruction (English) in the program to which they are applying. Proof of linguistic proficiency may be required.

Applicants whose first language is neither French nor English must provide proof of proficiency in the language of instruction.

Note: Candidates are responsible for any fees associated with the language tests.

Notes
• The choice of research supervisor will determine the primary campus location of the student. It will also determine which university awards the degree
• The admission requirements listed above are minimum requirements and do not guarantee admission to the program.
• Admissions are governed by the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations/) in effect for graduate studies and by the general regulations of the Ottawa-Carleton Institute of Civil Engineering (OCICE).
• To be accepted into the collaborative program candidates must be admitted to the master’s program in Biomedical Engineering. Candidates must apply to the primary program and indicate in their application for admission to the master’s program in Biomedical Engineering that they wish to be accepted into the collaborative-specialization in Bioinformatics.

Program Requirements
Master’s with Collaborative Specialization
The Department may require students to take additional courses, depending on their backgrounds.

Students must meet the following requirements for the master’s with collaborative specialization:

Compulsory Courses (BMG):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BMG 5112</td>
<td>Introduction to Biomedical Engineering</td>
<td>3</td>
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<tr>
<td></td>
<td>6 course units from:</td>
<td>6</td>
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<tr>
<td>BMG 5103</td>
<td>Biomedical Instrumentation</td>
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<tr>
<td>BMG 5104</td>
<td>Biological Signals</td>
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<td>BMG 5105</td>
<td>Medical Image Processing</td>
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<tr>
<td>BMG 5106</td>
<td>Introduction to Medical Imaging Principles and Technology</td>
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<tr>
<td>BMG 5107</td>
<td>Wavelet Applications in Biomedical Image Processing</td>
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<tr>
<td>BMG 5108</td>
<td>Advanced Topics in Biomedical Image Processing</td>
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<td>BMG 5109</td>
<td>Advanced Topics in Medical Instrumentation</td>
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<tr>
<td>BMG 5110</td>
<td>Advanced Topics in Biomechanics and Biomaterials</td>
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<tr>
<td>BMG 5111</td>
<td>Advanced Topics II Medical Informatics and Telemedicine</td>
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<tr>
<td>BMG 5300</td>
<td>Biological and Engineering Materials</td>
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<tr>
<td>BMG 5301</td>
<td>Biomechanics of Skeletal System, Motion and Tissue</td>
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<tr>
<td>BMG 5302</td>
<td>Biofluid Mechanics</td>
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With cutting-edge research, our graduate students, researchers and educators strongly influence national and international priorities.

Research at the Faculty of Engineering

Areas of research:

- Chemical and Biological Engineering
- Civil Engineering
- Electrical Engineering and Computer Science
- Mechanical Engineering

For more information, refer to the list of faculty members and their research fields on Uniweb.

IMPORTANT: Candidates and students looking for professors to supervise their thesis or research project can also consult the website of the faculty or department (https://www.uottawa.ca/graduate-studies/students/academic-unit-contact-information/) of their program of choice. Uniweb does not list all professors authorized to supervise research projects at the University of Ottawa.

Courses

Not all of the listed courses are given each year. The course is offered in the language in which it is described.

A 3-unit course at the University of Ottawa is equivalent to a 0.5-unit course at Carleton University.

**BMG 5001 Stage en génie clinique / Clinical Engineering Internship (6 crédits / 6 units)**

Stage en génie clinique dans un établissement extérieur à l'université. Rédaction d'un rapport ayant trait aux activités menées durant l'internat. Noté S (satisfaisant) ou NS (non satisfaisant) par le superviseur et un professeur nommé par le directeur du programme. / Internship in an institutional setting outside the university. Requires a formal written paper relating to the internship activities. Graded S (Satisfactory) / NS (Not satisfactory) by the supervisor and a professor appointed by the program director. Préalable : approbation du directeur du programme. / Prerequisite: approval of the program director. Ce cours est équivalent à BIOM 5801 à la Carleton University. / This course is equivalent to BIOM 5801 at Carleton University.

**Volet / Course Component:** Stage / Work Term

Préalable : approbation du directeur du programme. / Prerequisite: approval of the program director.

**BMG 5103 Biomedical Instrumentation (3 units)**

Instrumentation designed to measure physiological variables related to the function of the heart, lungs, kidney, nervous and musculo-skeletal systems; emergency, critical care, surgery and anesthesia equipment. This course is equivalent to BIOM 5100 at Carleton University.

**Course Component:** Lecture

Courses BMG 5103, ELG 6320 cannot be combined for units.

**BMG 5104 Biological Signals (3 units)**

Modeling of neuromuscular biological signals, including subthreshold phenomena, active behaviour of cell membranes, and innervation processes. Measurement of biological signals, including electrode effects. Time domain, frequency domain, and adaptive filtering techniques for noise reduction. This course is equivalent to BIOM 5101 at Carleton University.

**Course Component:** Lecture

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**BMG 5306 Special Topics in Mechanical and Aerospace Engineering: Biomechanics**

**BMG 5311 Design of Medical Devices and Implants**

**BMG 5312 Design of Orthopaedic Implants and Prostheses**

**BMG 5314 Biocontrols**

**BMG 5315 Biorobotics**

**BMG 5316 Biotransport Processes**

**BMG 5317 Medical Computing**

**BMG 5318 Advanced Health Care Engineering**

**BMG 5319 Introduction to Microfluidics**

**BMG 5323 Rehabilitation Engineering**

**BMG 5330 Electromagnetic Fields and Biological Systems**

**BMG 7199 Directed Studies in Biomedical Engineering**

**Compulsory Course (BNF):**

**BNF 5106 Bioinformatics** 3 Units

**Seminars:**

**BMG 6996 Biomedical Engineering Seminar**

**BNF 6100 MSc Seminar 1** 3 Units

**Thesis:**

**THM 7999 Master’s Thesis 2, 3**

**Note(s):**

1. The seminar involves a written report, the presentation of a seminar, and regular attendance at departmental seminars.
2. Presentation and defence of a research thesis on a topic in bioinformatics based on original research carried out under the supervision of a faculty member participating in the bioinformatics collaborative program.
3. Students are responsible for ensuring they have met all of the thesis requirements (http://www.uottawa.ca/graduate-studies/students/theses/).

**Minimum Requirements**

The passing grade in all courses is B.

Students who fail six units, or the thesis proposal, or whose research progress report is deemed unsatisfactory will be withdrawn from the program.

**Research**

**Research Fields & Facilities**

Located in the heart of Canada's capital, a few steps away from Parliament Hill, the University of Ottawa is among Canada's top 10 research universities.

uOttawa focuses research strengths and efforts in four Strategic Areas of Development in Research (SADRs):

- Canada and the World
- Health
- e-Society
- Molecular and Environmental Sciences
Course Component: Lecture
Courses BMG 5105, ELG 5376 cannot be combined for units.

BMG 5105 Medical Image Processing (3 units)
Mathematical models of image formation based on the image modality and tissue properties. Linear models of image degradation and reconstruction. Inverse problems, regularization for image reconstruction. Image formation in radiology, computed tomography, MRI, nuclear medicine, ultrasound, positron emission tomography, electrical impedance tomography. This course is equivalent to BIOM 5200 at Carleton University.

Course Component: Lecture

BMG 5106 Introduction to Medical Imaging Principles and Technology (3 units)
Basic principles and technological implementation of x-ray, nuclear medicine, magnetic resonance imaging (MRI), and other imaging modalities used in medicine; contrast, resolution, storage requirements for digital images; applications outside medicine, future trends. This course is equivalent to BIOM 5201 at Carleton University.

Course Component: Lecture
Permission of the Department is required.

BMG 5107 Wavelet Applications in Biomedical Image Processing (3 units)
Introduction to wavelet analysis and processing techniques for the quantification of biomedical images and signals. Topics include: multiresolution algorithms for denoising and image restoration, multiscale segmentation and classification for computer aided diagnosis and compression. This course is equivalent to BIOM 5202 at Carleton University.

Course Component: Lecture
Prerequisites: ELG 5376 and BMG 5105

BMG 5108 Advanced Topics in Biomedical Image Processing (3 units)
Recent and advanced topics in the field of biomedical image processing and its related areas. Prerequisite: permission of the program director. This course is equivalent to BIOM 5203 at Carleton University.

Course Component: Lecture
Permission of the Department is required.

BMG 5109 Advanced Topics in Medical Instrumentation (3 units)
Recent and advanced topics in the field of medical instrumentation and its related areas. This course is equivalent to BIOM 5106 at Carleton University.

Course Component: Lecture

BMG 5110 Advanced Topics in Biomechanics and Biomaterials (3 units)
Recent and advanced topics in the field of biomechanics and biomaterials and its related areas. This course is equivalent to BIOM 5304 at Carleton University.

Course Component: Lecture

BMG 5111 Advanced Topics II in Medical Informatics and Telemedicine (3 units)
Recent and advanced topics in the field of medical informatics and telemedicine and its related areas. This course is equivalent to BIOM 5403 at Carleton University.

Course Component: Lecture

BMG 5112 Introduction to Biomedical Engineering (3 units)
Research ethics and methods. Engineering systems approach to analysis and modelling of human anatomy and physiology. Introduction to topics including biomechanics, electrophysiology, and computational biology. Biomedical technologies. Impact of technology on society. This course is equivalent to BIOM 5010 at Carleton University.

Course Component: Lecture

BMG 5113 Clinical Engineering (3 units)
Overview of the Canadian health care system; brief examples from other countries; clinical engineering and the management of technologies in industrialized and in developing countries; safety, reliability, quality assurance; introduction to biomedical sensor technologies; applications of telemedicine; impact of technology on health care. This course is equivalent to BIOM 5406 at Carleton University.

Course Component: Lecture

BMG 5130 Fundamentals of Policy I: Policy Analysis (3 units)
Policy analysis and policy processes with an emphasis on the stages of the policy process, as well as the influences of institutions, ideas and interests. This course is equivalent to HLTH 5201 at Carleton University.

Course Component: Lecture

BMG 5300 Biological and Engineering Materials (3 units)
Properties of structural biological materials (bone, tendon, ligament, skin, cartilage, muscle, and blood vessels) from an engineering materials viewpoint. Selection of engineering materials as biomaterials. Introduction to biocompatibility. Histology of soft tissues. Viscoelasticity, mechanical properties and models of muscles, ligaments and tendons. This course is equivalent to BIOM 5300 at Carleton University.

Course Component: Lecture
Permission of the Department is required.

BMG 5301 Biomechanics of Skeletal System, Motion and Tissue (3 units)
Analysis of human motion. Kinematics and kinetics of various activities. Engineering analysis and modeling techniques applied to human motion. Injury mechanics, treatment, prosthetic replacements. Fracture behaviour and healing processes. This course is equivalent to BIOM 5301 at Carleton University.

Course Component: Lecture
Permission of the Department is required.

BMG 5302 Biofluid Mechanics (3 units)

Course Component: Lecture
Permission of the Department is required.

BMG 5303 Ergonomics and Design (3 units)
Review of ergonomic issues encountered in engineering design, including biomechanical, physical and physiological issues. Course will present strategies for human interaction with complex systems, such as aircraft cockpits, equipment control consoles, human-robotic interactions, and tele-operated equipment. This course is equivalent to BIOM 5303 at Carleton University.

Course Component: Lecture
Permission of the Department is required.

BMG 5304 Interactive Networked Systems and Telemedicine (3 units)
Telemanipulator; human motoring and sensory capabilities; typical interface devices; mathematical model of haptic interfaces; haptic rendering; stability and transparency; remote control schemes; time delay compensation; networking and real-time protocols, history and challenges of telemedicine; telemedicine applications: telesurgery, tele-monitoring, tele-diagnosis and tele-homecare. This course is equivalent to BIOM 5402 at Carleton University.

Course Component: Lecture
Courses BMG 5304 ad ELG 6133 cannot be combined for units.
BMG 5305 Pattern Classification and Experiment Design (3 units)
Introduction to a variety of supervised and unsupervised pattern classification techniques with emphasis on correct application. Statistically rigorous experimental design and reporting of performance results. Case studies will be drawn from various fields including biomedical informatics. This course is equivalent to BIOM 5405 at Carleton University.
Course Component: Lecture
Courses BMG 5305 and ELG 6102 cannot be combined for units.

BMG 5306 Special Topics in Mechanical and Aerospace Engineering: Biomechanics (3 units)
Overview of human anatomy and physiology with emphasis on artificial organ and prosthetic device design requirements. Application of engineering principles to cells and tissues, biofluid mechanics, human body energetics, measurement techniques, mechanics of human body systems, with emphasis on the artificial heart. This course is equivalent to BIOM 5306 at Carleton University.
Course Component: Lecture

BMG 5310 Introductory Biomechanics (3 units)
Application of traditional control system principles to the human body. Functionality of sample actuators and sensors. Characterization of human body control loops with emphasis on system stability, robustness, and effect of adverse external disturbance. Course project. This course is equivalent to BIOM 5310 at Carleton University.
Course Component: Lecture
Prerequisite: knowledge of basic control system analyses and design concepts using root locus and frequency response methods.

BMG 5318 Advanced Health Care Engineering (3 units)
Health care and technology; overview of medical devices and sensors; safe and effective use and management of technology; telemedicine; medical databases, data collection, storage, retrieval and computers in medicine; electronic patient records, PACS (picture archiving and communication systems); clinical decision-support systems. This course is equivalent to BIOM 5401 at Carleton University.
Course Component: Lecture
Courses BMG 5318, ELG 5123 and ELG 6130 cannot be combined for units.

BMG 5319 Introduction to Microfluidics (3 units)
Physics of liquid transport in micro-fabricated systems including physics at the microscale, hydrodynamics of microfluidic systems, diffusion mixing, introduction to microfabrication, examples of microfluidics devices and Micro PIV techniques, project.
Course Component: Lecture

BMG 5323 Rehabilitation Engineering (3 units)
Multidisciplinary approach to assistive-device design. Biomechanics applied to rehabilitation. Gait, neurological disorders, pathological gait, prosthetics, orthotics, seating, and mobility. Transducers, bio-instrumentation, EMG, FES. Augmentive communication and sensory aids. Human-assistive device interfaces, human-robot interfaces, computer-vision-guided rehabilitation aids, telerehabilitation. Current practice and research on new technologies. This course is equivalent to BIOM 5323 at Carleton University.
Course Component: Lecture

BMG 5330 Electromagnetic Fields and Biological Systems (3 units)
Review of electromagnetic waves at radio and microwave frequencies. Electrical and magnetic properties of tissue. Impact of electromagnetic waves on tissue. Cellular effects. This course is equivalent to BIOM 5330 at Carleton University.
Course Component: Lecture

BMG 5501 Étude technique et modélisation de la kinésithérapie (3 crédits)
Méthodes de systèmes d’ingénierie pour analyser et modéliser les systèmes anatomiques et physiologiques du corps humain. Propriétés mécaniques et électriques des tissus. Systèmes musculosquelettiques, cardiovasculaires et pulmonaires. Ce cours est équivalent à BIOM 5001 à la Carleton University.
Volet : Cours magistral
BMG 5502 Éthiques, normes et méthodes de recherche (3 crédits)  
Théories éthiques, prise de décision, codes de déontologie;  
expérimentation sur des animaux et des êtres humains, consentement,  
comités de déontologie; méthodes de recherche et règlements  
contenant la conception, la fabrication et la certification d’appareils  
médicaux; collecte, contrôle et analyse des données, y compris la  
protection de la confidentialité, dilemmes bioéthiques, effets (sociaux,  
politiques, financiers) de la technologie et de la recherche. Les cours ELG  
7514/EACJ 5300, BMG 5502 ne peuvent être combinés pour l’obtention  
de crédits. Ce cours est équivalent à BIOM 5002 à la Carleton University.  
Volet : Cours magistral

BMG 6000 Projet en génie biomédical / Biomedical Engineering Project (6  
crédits / 6 units)  
Projet en génie biomédical supervisé par un professeur approuvé par le  
directeur du programme. Rédaction d’un rapport approfondi, qui doit être  
presenté oralement. Noté S (satisfaisant) ou NS (non satisfaisant) par le  
 superviseur du projet et un autre professeur nommé par le directeur du  
 programme. Le projet peut normalement être complété en une session  
d’études à temps complet. Ce cours est équivalent à BIOM 5900 à la  
Carleton University. / Project in biomedical engineering supervised by  
a professor approved by the program director. Requires an in-depth  
report that must be presented orally. Graded S (Satisfactory) or NS (Not  
satisfactory) by the supervisor and by another professor appointed by the  
program director. The project can normally be completed in one session  
of full-time study. This course is equivalent to BIOM 5900 at Carleton  
University.  
Volet / Course Component: Recherche / Research  
Permission of the Department is required.

BMG 6001 Projet en génie clinique / Clinical Engineering Project (6  
crédits / 6 units)  
Projet en génie clinique supervisé par un professeur du programme  
and an engineer clinician. Rédaction et présentation orale d’un rapport  
approfondi. Noté S (satisfaisant) ou NS (non satisfaisant) par les  
 superviseurs du projet et un autre professeur nommé par le directeur du  
 programme. Le projet peut normalement être complété en une session  
d’études à temps complet. Ce cours est équivalent à BIOM 5901 à la  
Carleton University. / Project in clinical engineering supervised by a  
 professor in the program and a clinical engineer. Requires an in-depth  
report that must be presented orally. Graded S (Satisfactory) or NS (Not  
satisfactory) by the co-supervisors and by another professor appointed by the  
program director. The project can normally be completed in one session  
of full-time study. This course is equivalent to BIOM 5901 at Carleton  
University.  
Volet / Course Component: Recherche / Research  
Permission of the Department is required.

BMG 6996 Séminaire en génie biomédical / Biomedical Engineering  
Seminars  
Cours composé d’une série de séminaires présentés par des étudiants de  
deuxième cycle et des chercheurs en génie biomédical. En plus d’avoir à  
animer un séminaire, tous les étudiants doivent assister à au moins dix  
séances. Ce cours est équivalent à BIOM 5800 à Carleton University. /  
This course is in the form of seminars presented by graduate students  
and other researchers in the area of Biomedical Engineering. To complete  
this course, a student must attend at least ten seminars and make  
one presentation in the context of this seminar series. This course is  
equivalent to BIOM 5800 at Carleton University.  
Volet / Course Component: Séminaire / Seminar

BMG 7199 Directed Studies in Biomedical Engineering (3 units)  
Various possibilities exist for pursuing directed studies on topics  
approved by a course supervisor, including the above-listed course topics  
where they are not offered on a formal basis. This course is equivalent  
to BIOM 5906 at Carleton University.  
Course Component: Research

BMG 9901 Séminaire de doctorat en génie biomédical / Biomedical  
Engineering PhD Seminar  
Une série de séminaires présentés par des étudiants aux cycles  
supérieurs et des chercheurs invités. En plus d’avoir à présenter deux  
 séminaires, les étudiants doivent assister et participer à au moins 20  
 séminaires. Noté S (satisfaisant) ou NS (non satisfaisant). Ce cours est  
equivalent à BIOM 6800 à Carleton University. / This course is in the form  
of seminars presented by graduate students and other researchers in the  
area of Biomedical Engineering. To complete this course, a student must  
attend at least 20 seminars and make two presentations in the context of  
this seminar series. This course is equivalent to BIOM 6800 at Carleton  
University.  
Volet / Course Component: Séminaire / Seminar

BMG 9997 Rapport et soutenance du projet de thèse / Report and  
Defence of Thesis Proposal  
Inscription requise de tous les candidats au doctorat jusqu’à la réussite  
al’examen de synthèse. / Following completion of the comprehensive  
examination, registration required for all PhD candidates until the thesis  
proposal is accepted by the Advisory Committee  
Volet / Course Component: Recherche / Research

BMG 9998 Examen de synthèse / PhD Comprehensive Exam  
À la suite de la réussite à l’examen de synthèse, inscription requise de  
tous les candidats au doctorat jusqu’à ce que le projet de thèse soit  
accepté par le Comité consultatif. / Registration required for all PhD  
candidates until the comprehensive examination is passed.  
Volet / Course Component: Recherche / Research

BNF 5106 Bioinformatics (3 units)  
Major concepts and methods of bioinformatics. Topics may include, but  
are not limited to: genetics, statistics & probability theory, alignments,  
phylogenetics, genomics, data mining, protein structure, cell simulation  
and computing.  
Course Component: Lecture

BNF 5107 Applied Bioinformatics (3 units)  
Computational knowledge discovery in and the dynamic nature of cellular  
networks. Includes, but is not limited to, knowledge representation, large  
 scale data integration, data mining and computational systems biology.  
This course is equivalent to BIOL 5516 at Carleton University.  
Course Component: Lecture

BNF 5504 Laboratoire de bioinformatique (3 crédits)  
Principes d’organisation, de récupération, de manipulation et  
d’analyse de données moléculaires en génomique, protéomique et  
transcriptomique. Analyses pratiques de ces données pour résoudre  
des questions biologiques en utilisant des méthodes quantitatives et  
computationnelles.  
Volet : Théorie et laboratoire  
Les cours BPS 4504 et BNF 5504 ne peuvent être combinés pour  
 l’obtention de crédits.
BNF 5506 Bioinformatique (3 crédits)
Concepts et méthodes en bioinformatique. Les sujets abordés peuvent inclure, entre autres, la génétique, les statistiques et les théories des probabilités, les alignements, la phylogénétique, la génomique et la structure de protéines.
Volet : Cours magistral

BNF 6100 MSc Seminar (3 units)
Current topics in bioinformatics presented by program professors and invited speakers. Oral presentation and written report required. Graded S (Satisfactory) / NS (Not satisfactory).
Course Component: Lecture

BNF 6500 Séminaire de maîtrise (3 crédits)
Sujets courants en bioinformatique présentés par des professeurs membres du programme et des conférenciers invités. Présentation orale et rapport écrit requis. Noté S (satisfaisant) ou NS (non satisfaisant).
Volet : Cours magistral

BNF 8166 Seminar in Bioinformatics (3 units)
Current research topics in bioinformatics presented by PhD students and invited speakers. Oral presentation required. Graded S (Satisfactory) / NS (Not satisfactory).
Course Component: Seminar

BNF 8301 Evolutionary Bioinformatics (3 units)
Fundamental concepts in molecular evolution and hands-on experience with computer analysis of DNA sequences. Topics may include molecular sequence databases, multiple alignments and phylogenetic trees. This course is equivalent to BIOL 5201 at Carleton University.
Course Component: Lecture
Prerequisite: Graduate standing plus basic courses in genetics and evolution.

BNF 8766 Séminaire en bioinformatique (3 crédits)
Sujets courants en bioinformatique présentés par des étudiants en PhD et des conférenciers invités. Présentation orale requise. Noté S (satisfaisant) ou NS (non satisfaisant).
Volet : Séminaire