482nd REPORT OF THE ACADEMIC POLICY COMMITTEE TO SENATE
Part B – items submitted for the October 12th, 2017 meeting of APC and electronically approved on October 18th, 2017

I.   **TO BE APPROVED BY SENATE**

(A) NEW TEACHING PROGRAMS REQUIRING SENATE APPROVAL

School of Continuing Studies

Professional Development Certificate in Data Analytics for Business (22 CEUs)
Appendix A
On October 18th, 2017, APC electronically approved a proposal to create a new Professional Development Certificate in Data Analytics for Business (22 CEUs). This intensive program caters to business leaders and managers who are interested in learning how to process and analyze data in the fastest and most efficient fashion in order to stay competitive. Graduates of this program will acquire essential data analytics skills to support and improve business decision making, lead data analytics teams and create data-driven organizational culture.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed Professional Development Certificate in Data Analytics for Business (22 CEUs).

Professional Development Certificate in Data Science and Machine Learning (26 CEUs)
Appendix B
On October 18th, 2017, APC electronically approved a proposal to create a new Professional Development Certificate in Data Science and Machine Learning (26 CEUs). Professionals with expertise in data science are in high demand on the job market and there is currently a gap between the needs of the industry and the number of skilled candidates. The School of Continuing Studies aims to fill this gap with the creation of this Professional Development Certificate, which will provide its graduates with essential data science and machine learning knowledge and skills.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed Professional Development Certificate in Data Science and Machine Learning (26 CEUs).

Faculty of Engineering
B.Eng.; Major in Materials Engineering (147-148 cr.)
Appendix C

On October 18th, 2017, APC electronically approved a proposal to create a new B.Eng.; Major in Materials Engineering (147-148 cr.). This new major will give more flexibility to the students of the Materials Engineering program by removing the co-op work term. The co-op courses have also been removed from the core curriculum and replaced by two required technical complementary courses. The current program is also being revised and turned into a co-op option of the Materials Engineering program. There is no direct admission to this program, as students will enroll in the Co-op in Materials Engineering and transfer to the proposed major if they are not completing the work terms.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed B.Eng.; Major in Materials Engineering (147-148 cr.)

Graduate and Postdoctoral Studies
<u>**Faculty of Engineering**</u>
Ph.D. in Urban Planning, Policy and Design (0 cr.)
Appendix D

On October 18th, 2017, APC electronically approved a proposal from the School of Urban Planning to create a Ph.D. in Urban Planning, Policy and Design. This new program will build on the success of the School's Ad hoc Ph.D. program, which has been attracting many applicants over the years, and respond to the demand for training at the doctoral level in the field, as there is currently no autonomous Ph.D. program in Urban Planning offered in English east of Toronto. The program will prepare its graduates for high quality, interdisciplinary research and teaching on the management of urban development and for leadership in the design and evaluation of plans and policies across North America and beyond. The Ph.D. in Urban Planning, Policy and Design will replace the Ad hoc Ph.D. that the School of Urban Planning was offering until December 2016. Approval from the Ministry will be required.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed Ph.D. in Urban Planning, Policy and Design (0 cr.).

<u>**Faculty of Medicine**</u>
M.Sc. in Pharmacology; Environmental Health Sciences (45 cr.)
Ph.D. in Pharmacology; Environmental Health Sciences (0 cr.)
Appendix E and F

On October 18th, 2017, APC electronically approved a proposal to create a new M.Sc. in Pharmacology; Environmental Health Sciences (45 cr.) and a Ph.D. in Pharmacology; Environmental Health Sciences (0 cr.). These two graduate options

will bring together graduate students from participating units, such as Epidemiology, Biostatistics and Occupational Health, Experimental Medicine, Pharmacology and Therapeutics and Natural Resource Sciences to expose them to diverse issues and methods and foster an interdisciplinary and collaborative approach to research.

APC therefore recommends that Senate approve the following resolution:
Be it resolved that Senate approve the proposed M.Sc. in Pharmacology; Environmental Health Sciences (45 cr.) and the proposed Ph.D. in Pharmacology; Environmental Health Sciences (0 cr.).

(B) ACADEMIC PERFORMANCE ISSUES / POLICIES / GOVERNANCE/AWARDS - *none*

(C) CREATION OF NEW UNITS / NAME CHANGES / REPORTING CHANGES - *none*

(D) CHANGES IN DEGREE DESIGNATION – *none*

(E) INTER-UNIVERSITY PARTNERSHIPS – *none*

(F) OTHER – *none*

II. TO BE ENDORSED BY SENATE / PRESENTED TO SENATE FOR DISCUSSION – *none*

III. APPROVED BY APC IN THE NAME OF SENATE

(A) DEFINITIONS – *none*

(B) STUDENT EXCHANGE PARTNERSHIPS / CONTRACTS / INTERUNIVERSITY PARTNERSHIPS - *none*

(C) OTHER - *none*

IV. FOR THE INFORMATION OF SENATE

A) ACADEMIC UNIT REVIEWS – *none*

B) APPROVAL OF COURSES AND TEACHING PROGRAMS

1. Programs

  a) APC Approvals (new options/concentrations and major revisions to existing programs)

    i. New Programs - *none*

    ii. Major Revisions of Existing Programs
      Faculty of Engineering

B.Eng.; Co-op in Software Engineering (141-147 cr.)
On October 18th, 2017, APC electronically approved a change of title from the Bachelor of Software Engineering to the B.Eng.; Co-op in Software Engineering (141-147 cr.), as the program is no longer jointly offered by the School of Computer Science and the Department of Electrical and Computer Engineering. Co-op courses have also been added to the core curriculum, turning the program into a Co-op program, which will ensure that students gain professional experience before completing their degree. These revisions will require Ministry approval.

b) APC Subcommittee on Courses and Teaching Programs (SCTP) Approvals
(Summary Reports: http://www.mcgill.ca/sctp/documents/)

i. Moderate and Minor Program Revisions
Approved by SCTP on September 28th, 2017 and reported to APC on October 12th, 2017
School of Continuing Studies
Diploma in Internet Business Technology (30 cr.)
Diploma in Management; Internet Business (30 cr.)
Graduate Certificate in Internet Business (15 cr.)

Faculty of Engineering
B.Eng.; Co-op in Materials Engineering (147-148 cr.)

ii. **Program Retirements**
Approved by SCTP on September 28th, 2017 and reported to APC on October 12th, 2017
Faculty of Engineering
Bachelor of Software Engineering (B.S.E.) (137-144 cr.)

2. **Courses**

a) New Courses
Reported as having been approved by SCTP on September 28th, 2017: 27
School of Continuing Studies: 23
Faculty of Engineering: 4

b) Course Revisions
Reported as having been approved by SCTP on September 28th, 2017: 3
Faculty of Agricultural and Environmental Sciences: 1
School of Continuing Studies:2

c) Course Retirements - *none*

3. **Other -** *none*

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APC APPENDIX A   17-APC-10-06

New Program/Major or Minor/Concentration Proposal Form

(2017)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

> Professional Development Certificate

1.1 Major (Legacy= Subject)(30-char. max.)

> Data Analytics for Business

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

>

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

>

2.0 Administering Faculty/Unit

> School of Continuing Studies

Offering Faculty/Department

> Continuing Studies/Career & Professional Development

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

> 201801

4.0 Rationale for new proposal

Data is critical for business decisions. Faster processing and analysis of data and information allows companies to make faster and better decisions in less time and gives them a competitive advantage. Business leaders across all industry sectors need to learn how to extract value from data in order to remain competitive. McGill SCS has the opportunity to offer an intensive professional development program for business leaders and managers to help them acquire essential data analytics skills to support and improve business decision-making. Admission Requirements: Bachelor's degree in Business Administration or Commerce. Applicants with a non-business Bachelor's degree should have a min. of 2 years of experience in managerial position or complete CGMG-282. Introduction to Business course. *The CPD reviews, revises or retires any existing programs that are obsolete or have low enrolment.*

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type
- ☐ Bachelor's Program
- ☐ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☐ Graduate Certificate
- ☐ Graduate Diploma
- ☐ Ph.D. Program
- ☐ Doctorate Program (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program (By Correspondence)
- ☒ Other (Please specify)
  Professional Development Certificate

5.2 Category
- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other
  Please specify

5.3 Level
- ☐ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☒ Continuing Ed (Non-Credit)
- ☐ Collegial
- ☐ Masters & Grad Dips & Certs
- ☐ Doctorate
- ☐ Post-Graduate Medicine/Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(for GPS) Yes ____ No ____

5.5 Requires Resources
Yes ____ No _X__

6.0 Total Credits/CEUs

> 22 CEUs

7.0 Consultation with

Related Units	Yes **X**	No
Financial Consult	Yes	No **X**

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

This program is designed to help business leaders and managers develop the analytical mindset required to turn insights obtained from data analysis into actionable business decisions and strategies. The program also addresses the leadership and management skills required to structure and lead data analytics teams and to create a data-driven organizational culture.

The program is offered in English and must be completed within 2 years.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

Professional Development Certificate in Data Analytics for Business (22 CEUs)

Required Courses (22 CEUs)
CBUS 256 Data Science for Business Decisions (4 CEUs)
CBUS 260 Statistics for Business Decision Making (4 CEUs)
CBUS 261 Data Analytics Fundamentals (4 CEUs)
CBUS 262 Leading Data Science Projects and Teams (4 CEUs)
CBUS 299 Data Science Capstone Project (6 CEUs)

Attach extra page(s) as needed

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Inna Popova, Director, Non-Credit Programs		06 September 2017
Curric/Acad Committee	Carmen Sicilia, Associate Dean		Sept. 11, 2017
Faculty 1	Judith Potter, Dean of Continuing Studies		11/09/2017
Faculty 2	Kamal Salmasi, Area Coord.Mgm. IB. Entrepr.		Sept. 11, 2017
Faculty 3			
SCTP			Sept. 28, 2017
GS			
APPC			
Senate			

SCTP APPROVED

Submitted by

Name	Lucia Brunetti
Phone	514-398-6152
Email	Lucia.brunetti@mcgill.ca
Submission Date	15 August 2017

To be completed by ARR:

CIP Code

FINAL
Proposal for Professional Development Certificate
IN DATA ANALYTICS FOR BUSINESS

Program Title

Professional Development Certificate in **Data Analytics for Business**

INDUSTRY ADVISORY GROUP (in alphabetical order by last name)

Name	Job Title	Company
Sonia Basili	Director, Talent Management	Stradigi
Nabil Beitinjaneh	Data Strategist	Taramaki
Stéphane Caron	Premier directeur, Intelligence d'affaires	Radio-Canada
Dr. Hoda Daou	Data Scientist	Kronos
Fouad Farès	Senior Partner	MINDMASTER Canada
Bertrand Helias	Executive Director Capacity and Casting	Ubisoft
Dennis Mahbeer	Director, Corporate IT, Application Development Business Intelligence and Supply Chain	Gildan
Christophe Masurel	Director of Innovation	Lynks
Shibl Mourad	Montreal Site Director	Google
Samuel Rispal	Managing Director	Lynks
Solmaz Shahalizadeh	Director of Merchant Services Algorithms	Shopify
Alex Smirnov	Director, Mergers, Acquisitions and Corporate Development	Couche-Tard
Khaled Tannir	Big Data Architect Lead	DataXper
Dr. Nathanael Weill	IoT Data Scientist	Mnubo

Program Rationale

Data is critical for business decisions. Yet, less than 0.5 per cent of all data is currently analyzed and used according to the International Data Corporation (IDC). Processing data and information faster allows companies to make faster and better decisions and gives them a competitive advantage. However, less than 25% of organizations feel that their data and analytics maturity has reached the level where it has actually optimized business outcomes. In the last four years, six in ten companies consistently report technology skills shortage. The skills that are deemed more scarce are in Big Data Analytics (42%) which are primarily in demand by large employers.

Approximately half of the world's population was connected to the internet for the first time in 2016. Gartner report states that 8.4 Billion Connected "Things" will be in use in 2017, up 31 percent from 2016 . Business leaders across all industry sectors - hospitality, retail, healthcare – need to learn how to extract value from data in order to remain competitive.

McGill SCS has the opportunity to offer an intensive professional development program for business leaders and managers to help them acquire essential data analytics skills to support and improve business decision-making.

Program Description

This program is designed to help business leaders and managers develop the analytical mindset required to turn insights obtained from data analysis into actionable business decisions and strategies. The program also addresses the leadership and management skills required to structure and lead data analytics teams and to create a data-driven organizational culture.

Learning Objectives

At the end of this program, participants should be able to:

- Develop essential data literacy and analytical mindset
- Appreciate the role data science and analytics play in various contexts and industries
- Ask the right questions and understand how data analysis is used to drive business decisions
- Describe the complete data analytics cycle
- Effectively communicate data insights by using data visualization and storytelling tools and techniques
- Understand data governance and compliance
- Structure and lead a data analytics team
- Implement data-driven approach to various areas of business activities
- Develop innovative business solutions using data insights

Program Toolkit & Languages:

- Microsoft Excel
- Tableau
- SQL
- IBM Watson
- SAP Lumira

Who Should Attend

Business leaders and managers who are seeking to acquire and apply practical data analytics knowledge and skills required to support data-driven business decision making.

Program Structure

The Program is offered in English and consists of **5 required courses,** which must be completed within 2 years:

CBUS 256   **Data Science for Business Decisions**
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 260   **Statistics for Business Decision Making**
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 261   **Data Analytics Fundamentals**
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 262   **Leading Data Science Projects and Teams**
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 299   **Data Science Capstone Project**
30 hours in class + at least 30 hours of assignments = 6 CEUs

TOTAL CEUs: **22**

Pre-requisites

Solid quantitative and business background
Proficiency in Microsoft Excel or other data analysis tools

Program Admission Requirements

Bachelor's degree in Business Administration or Commerce.

Applicants with a non-business Bachelor's degree should have:

Minimum of 2 years of experience in managerial position
Or
Introduction to Business course
http://www.mcgill.ca/study/2017-2018/courses/cgmg-282

COURSES

CBUS 256 Data Science for Business Decisions
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
Recent extraordinary improvements in data-collection technologies have changed the way companies make informed and effective business decisions. Whatever field you work in, you probably have access to much more data than what you can make sense of by simple manual inspection. Businesses across all industry sectors - hospitality, retail, healthcare – need to use the data they have access to more efficiently in order to improve or even just understand what is driving their business.

Course Description
This course aims to provide an overview of how data science can help drive business decisions and create new business models. The emphasis is placed on data strategy and how to move from data to insight. The course explores the data science process and how companies could surmount the different challenges they face when implementing a data driven business including ethics, data governance and privacy. The evolution of data technology and storage, as well as application of data science tools and techniques to different business areas such as customer and web analytics, operations analytics, human resources related analytics are explored through examples from various fields such as retail, healthcare and marketing.

CBUS 260 Statistics for Business Decision Making
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
The environment in which businesses operate is increasingly uncertain and unpredictable; hence, analysis of a lot of data and information is necessary to support decision-making process. Good understanding and application of statistical methods increases confidence in the interpretation of results from data analysis.

Course Description
This course provides an overview of fundamental statistical and mathematical concepts needed to perform statistical data analysis to support business decision-making and projections such as probability, random variables, descriptive statistics, regression modelling, common probability distributions, experimental design.

CBUS 261 Data Analytics Fundamentals
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
In order to lead a data team to successful outcomes, one has to understand the overall data process from start to end. Hands-on experience using different tools would allow managers to get a better appreciation of this process and the issues and challenges that data project teams might face.

Course Description
The objective of this course is to introduce fundamental analytical methods and tools used to collect, analyze and interpret business data. An overview of NoSQL databases, RDBMS databases

and data structures is provided. Participants will be exposed to a complete data cycle using powerful tools such as Microsoft Excel, SQL and Tableau to analyze data, create forecasts and models, design visualizations, and communicate insights.

CBUS 262 Leading Data Science Projects and Teams
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
There is much more to data science and analytics than just technology and programming techniques. In order to succeed with data projects, management has to set up the proper data organization along with the appropriate governance, privacy and project management processes. This course is one of the required courses in the non-credit Professional Development Certificate in Data Analytics for Business.

Course Description
This course focuses on the capabilities needed by organizations to successfully create a data driven culture and to properly lead data related projects all the way from idea to delivery. Topics covered include different roles and responsibilities within a data project, how to recruit, evaluate, and develop a team with diverse and complementary skill sets, define the goals of each stage of the data science pipeline. Challenges of data governance will also be addressed along with best practices in governance and compliance.

CBUS 299 Data Science Capstone Project
30 hours in class + at least 30 hours of assignments = 6 CEUs

Rationale
Data science is a truly interdisciplinary field that encompasses computational, business and communication skills required to translate business issues into technical requirements, perform data analysis and effectively communicate the insights derived from data to guide business decisions.

Course Description
This capstone course supported by our industry partners will provide the opportunity to apply all the knowledge gained during the program in order to build a full data science pipeline from preparing and visualizing data, building and testing models, analyzing results and deriving business insights from their analysis. The focus is placed on communicating the insights gleaned from the data analysis through visualizations and on presenting the recommendations reached.

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APC APPENDIX B   17-APC-10-06

New Program/Major or Minor/Concentration Proposal Form

(2017)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

Professional Development Certificate

1.1 Major (Legacy= Subject)(30-char. max.)

Data Science and Machine Learning

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

2.0 Administering Faculty/Unit

School of Continuing Studies

Offering Faculty/Department

Continuing Studies/Career & Professional Development

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

201801

4.0 Rationale for new proposal

As a consequence of rapid increases in connectivity bandwidth, digital storage, and processing power, businesses now have access to vast amounts of data that can provide important insights. Data science involves the process of analyzing data and translating it into useful knowledge that can guide business decisions. Demand for professionals with a data science skill set is constantly growing, and many companies are struggling to find the right talent. Indeed, there exists a significant gap between the current industry needs and the number of candidates available in the job market. McGill SCS has the opportunity to fill this gap by offering a program that will equip working professionals with essential data science and machine learning knowledge and skills.
Admission Requirements: Applicants must hold a minimum of one of the following degrees: Bachelor of Engineering, Science or Commerce, MIS. Applications from mature students* who do not meet the above criteria but have extensive experience in software programming or data analytics and have previously completed relevant coursework in calculus, statistics, or computer science will be evaluated on a case by case basis.
The CPD Department reviews, revises or retires any existing programs that are obsolete or have low enrolment.

Please check appropriate box(es)

5.1 Program Type
- ☐ Bachelor's Program
- ☐ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☐ Graduate Certificate
- ☐ Graduate Diploma
- ☐ Ph.D. Program
- ☐ Doctorate Program
  (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program
  (By Correspondence)
- ☒ Other (Please specify)
  Professional Development Certificate

5.2 Category
- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other
  Please specify

5.3 Level
- ☐ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☒ Continuing Ed (Non-Credit)
- ☐ Collegial
- ☐ Masters & Grad Dips & Certs
- ☐ Doctorate
- ☐ Post-Graduate Medicine/Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(for GPS) Yes _____ No _____

5.5 Requires Resources
Yes _____ No _X_

6.0 Total Credits/CEUs

26 CEUs

7.0 Consultation with

Related Units	Yes **X** No
Financial Consult	Yes No **X**

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

This program is designed to equip professionals with essential data science knowledge and skills required to manage, manipulate, analyze and extract value from data. The program links mathematical and computational concepts to practical real-world, data-driven examples. Focus is placed on the most frequently used data science tools and languages, including Apache Spark, Hadoop, Tableau, Python, Scala and SQL. The program aims to prepare professionals to work through a complete data science pipeline, whether for the simple purpose of data exploration and extracting knowledge, or to build machine learning models from the data for specific goals such as prediction or classification. Participants have the opportunity to work in cross-functional teams to translate their learnings into business insights to help guide business decisions.

This program is offered in English and must be completed within 2 years.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.
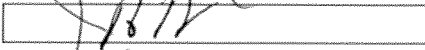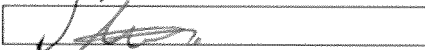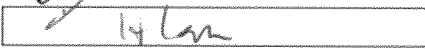
If new concentration (option) of existing Major/Minor (program), please attach
a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight
under the headings of: Required Courses, Complementary Courses, Elective Courses)

Professional Development Certificate in Data Science and Machine Learning (26 CEUs)

Required Courses (26 CEUs)
CBUS 255 Computational Applied Statistics (4 CEUs)
CBUS 256 Data Science for Business Decisions (4 CEUs)
CBUS 257 Data at Scale (6 CEUs)
CBUS 258 Practical Machine Learning (6 CEUs)
CBUS 299 Data Science Capstone Project (6 CEUs)

Attach extra page(s) as needed

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Inna Popova. Director. Non-Credit Programs		06 Sep 2017
Curric/Acad Committee	Carmen Sicilia. Associate Dean		Sept. 7, 2017
Faculty 1	Judith Potter. Dean of Continuing Studies		11/09/2017
Faculty 2	Fabrice Labeau. IT Program Committee Chair		11/09/2017
Faculty 3	Dr. Hang Lau. Area Coordinator. IT & Sup.Ch.		Sept 7, 2017
SCTP			Sept. 28, 2017
GS			
APPC			
Senate			

SCTP
APPROVED

Submitted by

		To be completed by ARR:
Name	Lucia Brunetti	
Phone	514-398-6152	CIP Code
Email	Lucia.Brunetti@mcgill.ca	
Submission Date	15 August 2017	

FINAL
Proposal for Non-Credit Professional Development Certificate
IN DATA SCIENCE AND MACHINE LEARNING

PROGRAM TITLE

Professional Development Certificate **in Data Science and Machine Learning**

INDUSTRY ADVISORY GROUP (in alphabetical order by last name)

Name	Job Title	Company
Sonia Basili	Director, Talent Management	Stradigi
Nabil Beitinjaneh	Data Strategist	Taramaki
Stéphane Caron	Premier directeur, Intelligence d'affaires	Radio-Canada
Dr. Hoda Daou	Data Scientist	Kronos
Fouad Farès	Senior Partner	Mindmaster Canada
Bertrand Helias	Executive Director Capacity and Casting	Ubisoft
Dennis Mahbeer	Director, Corporate IT, Application Development Business Intelligence and Supply Chain	Gildan
Christophe Masurel	Director of Innovation	Lynks
Shibl Mourad	Montreal Site Director	Google
Samuel Rispal	Managing Director	Lynks
Solmaz Shahalizadeh	Director of Merchant Services Algorithms	Shopify
Alex Smirnov	Director, Mergers, Acquisitions and Corporate Development	Couche-Tard
Khaled Tannir	Big Data Architect Lead	DataXper
Dr. Nathanael Weill	IoT Data Scientist	Mnubo

PROGRAM RATIONALE

As a consequence of rapid increases in connectivity bandwidth, digital storage, and processing power, businesses now have access to vast amounts of data that can provide important insights. Data science involves the process of analyzing data and translating it into useful knowledge that can guide business decisions. Demand for professionals with a data science skill set is constantly growing, and many companies are struggling to find the right talent.

Demand for professionals with data science skill set is constantly growing and many companies are struggling to find the right talent. LinkedIn recently reported that data analysis is one of the most sought-after skill categories by recruiters. The IBM institute for Business Value indicated that a recent analysis of LinkedIn found more than 60,000 job openings for data scientists. However, another analysis found only 11,400 professionals worldwide with the required skills. Forbes' article "*Machine Learning Is Creating A Demand For New Skills*" highlights the growing demand for a new skill set in regard to data scientists, for whom the demand is projected to exceed supply by more than 50% by 2018. Companies need these specialists now in order to stay competitive.

1

Indeed, there exists a significant gap between the current industry needs and candidates available in the job market. McGill SCS has the opportunity to fill this gap by offering a program that would equip working professionals with essential data science and machine learning knowledge and skills.

DATA SCIENCE CAREER OUTLOOK

Jobs requiring machine learning skills are paying an average of $114,000. Advertised data scientist jobs pay an average of $105,000 and advertised data engineering jobs pay an average of $117,000.

59% of all Data Science and Analytics (DSA) job demand is in Finance and Insurance, Professional Services, and IT.

Annual demand for the fast-growing new roles of data scientist, data developers, and data engineers will reach nearly 700,000 openings by 2020.

By 2020, the number of jobs for all US data professionals will increase by 364,000 openings to 2,720,000 according to IBM. McKinsey & Company projects that the demand for deep analytics processionals could exceed the supply on a global basis.

Data Science and Analytics (DSA) jobs remain open an average of 45 days, five days longer than the market average.

Source:
https://www.forbes.com/sites/louiscolumbus/2017/05/13/ibm-predicts-demand-for-data-scientists-will-soar-28-by-2020/#29752c027e3b

International Data Corporation's FutureScape Worldwide Big Data and Analytics 2016 Predictions report highlights that the shortage of skilled staff will extend from data scientists to architects and experts in data management; big data—related professional services will have a Compound Average Growth Rate (CAGR) of 23% through 2020.

Source:
https://www.idc.com/getdoc.jsp?containerId=259835

Data Science Career / Roles / Paths

- Data Analyst
- Data Engineer
- Data Journalist
- Machine Learning Practitioner
- Data Scientist

PROGRAM DESCRIPTION

This program is designed to equip professionals with essential data science knowledge and skills required to manage, manipulate, analyze and extract value from data. The program links essential mathematical and computational concepts to practical real-world, data-driven examples. Focus is placed on the most frequently used data science tools and languages, including Apache Spark, Hadoop, Tableau, Python, Scala and SQL.

The program aims to prepare candidates who are able to work through a complete data science pipeline, whether for the simple purpose of data exploration and extracting knowledge, or to build ML models from the data for specific goals such as prediction or classification. Participants have the opportunity to work in cross-functional teams to translate their learnings into business insights to help guide business decisions.

Whether you are considering embarking on a career in data science or simply want to enhance your professional portfolio with new skills, this program will help you meet your goals.

The program is offered in English and must be completed within 2 years.

LEARNING OBJECTIVES:

At the end of this program, you should be able to:

- Demonstrate solid understanding of relevant statistical, mathematical concepts and computational tools

- Apply essential data science tools to ingest, clean, process and analyze various large data sets using batch and streaming modes.

- Work through all the phases of a complete data science pipeline with structured and unstructured data

- Test and evaluate different machine learning techniques, and learn how to select the proper one in order to solve a business problem

- Formulate a business need or problem into a data science project and select the proper tools and algorithms needed.

- Interpret and effectively communicate data insights by using data visualization and storytelling techniques and translate them into business-specific knowledge.

PROGRAM TOOLKIT & LANGUAGES:

- Apache Hadoop
- Apache Spark
- Tableau

3

- Github
- Python
- Scala
- SQL

WHO SHOULD ATTEND

Both established professionals and recent university graduates seeking to acquire essential technical data science and machine learning knowledge and skills or wishing to embark on a career in data science.
Those planning to pursue INFORMS Certified Analytics Professional (CAP®) certification or other similar designations.

PROGRAM STRUCTURE

The Program is offered in English and consists of **5 required courses, which** must be completed within 2 years:

CBUS 255   **Computational Applied Statistics**
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 256   **Data Science for Business Decisions**
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

CBUS 257   **Data at Scale**
35 hours in class + at least 25 hours of assignments/readings = 6 CEUs

CBUS 258   **Practical Machine Learning**
35 hours in class + at least 25 hours of assignments/readings = 6 CEUs

CBUS 299   **Data Science Capstone Project**
30 hours in class + at least 30 hours of assignments = 6 CEUs

TOTAL CEUs: **26**

PRE-REQUISITES

Strong quantitative background
Proficiency in Excel, Access or other data analysis tools
Essential programming skills, preferably in Python

Students may take the following self-assessment online tests to establish their level of proficiency in Python.
https://www.pluralsight.com/paths/python
https://www.testdome.com/tests/python-online-test/45
https://tests4geeks.com/python
https://www.techgig.com/skilltest/python

4

Students without prior knowledge of Python should complete the following Python courses online and provide proof of completion:

Introduction to Python for Data Science course
prior to taking CBUS 255 Computational Applied Statistics
https://www.datacamp.com/courses/intro-to-python-for-data-science

Intermediate Python for Data Science course
prior to taking CBUS 258 Machine Learning in Data Science Course:
https://www.datacamp.com/courses/intermediate-python-for-data-science

PROGRAM ADMISSION REQUIREMENTS

Applicants must hold a minimum of one of the following degrees:

- Bachelor of Engineering (B.Eng.)
- Bachelor of Science (B.Sc.)
- Bachelor of Commerce in MIS (B.Com MIS)

Note:
Applications from mature students* who do not meet the above criteria but have extensive and relevant experience in software programming or data analytics and have previously completed relevant coursework in calculus, statistics, or computer science will be evaluated on a case by case basis.

*Applicants who are 21 years of age or older

COURSES

CBUS 255 Computational Applied Statistics
30 hours class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
A solid grasp of statistical concepts and methods is critical for mastering data science and machine learning. This course will address statistical thinking essentials, as well as how to perform statistical analysis computationally.

Course Description
This course provides a comprehensive practical introduction to fundamental statistical concepts of common distributions, statistical methods, and data analysis using Python and other software packages. Develop the ability to apply appropriate statistical methods to summarize and analyze data; report and interpret results. Focus is placed on data description, descriptive statistics, probability, random variables, binomial, poisson, normal distributions, sampling distribution of the mean, estimation, hypothesis testing, analysis of variance, tests of goodness of fit, regression, non-parametric statistics.

CBUS 256 Data Science for Business Decisions
30 hours in class + at least 10 hours of assignments/readings = 4 CEUs

Course Rationale
Recent extraordinary improvements in data-collection technologies have changed the way companies make informed and effective business decisions. Whatever field you work in, you probably have access to much more data than what you can make sense of by simple manual inspection. Businesses across all industry sectors - hospitality, retail, healthcare – need to use the data they have access to more efficiently in order to improve or even just understand what is driving their business.

Course Description
This course aims to provide an overview of how data science can help drive business decisions and create new business models. The emphasis is placed on data strategy and how to move from data to insight. The course explores the data science process and how companies could surmount the different challenges they face when implementing a data driven business including ethics, data governance and privacy. The evolution of data technology and storage, as well as application of data science tools and techniques to different business areas such as customer and web analytics, operations analytics, human resources related analytics are explored through examples from various fields such as retail, healthcare and marketing.

CBUS 257 Data at Scale
35 hours in class + at least 25 hours of assignments/readings = 6 CEUs

Course Rationale
Extracting insights and value from very large-scale datasets requires powerful computing resources, as well as proficiency with a variety of computational methods, tools and languages.

Course Description
This course familiarizes participants with different aspects of large data sets and how they are managed both on site and in the Cloud. Emphasis is placed on providing participants with hands-on experience

from data ingestion to analysis of large data sets, both data-at-rest or data-in-motion (streaming data), including defining Big Data and its 5 V's: Volume, Velocity, Variety, Veracity, and Value. Architectures of distributed databases and storage, ecosystems such as Hadoop and Spark are covered followed by introduction to Scala, Spark-Shell and PySpark.

CBUS 258 Practical Machine Learning
35 hours in class + at least 25 hours of assignments/readings = 6 CEUs

Course Rationale
Using algorithms, machine learning methods enable computer programs and systems to learn from new data in order to self-adapt, change and improve. Machine learning is used across many industries to address business needs by determining various patterns, such as making customer churn predictions, performing sentiment analysis, detecting fraud, predicting equipment failures and detecting network intrusion among others.

Course Description
This course aims to introduce participants to essential machine learning methods and techniques through an end-to-end machine learning project. The emphasis is placed on practical experience with machine learning using Python programming language, *scikit-learn* and TensorFlow, as well as on understanding classification and training models. The course will provide an introduction to artificial Neural Networks, deep learning, convolutional and recurrent neural nets and reinforcement learning.

CBUS 299   Data Science Capstone Project
30 hours in class + at least 30 hours of assignments = 6 CEUs

Rationale
Data science is a truly interdisciplinary field that encompasses computational, business and communication skills. To be an effective data scientist one needs to be able to translate business issues into technical requirements, perform data analysis, effectively communicate the insights derived from data and "connect the dots" to guide business decisions.

Course Description
This capstone course supported by our industry partners will provide the opportunity to apply all the knowledge gained during the program in order to build a full data science pipeline from preparing and visualizing data, building and testing models, analyzing results and deriving business insights from their analysis. The focus is placed on communicating the insights gleaned from the data analysis through visualizations and on presenting the recommendations reached.

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APC APPENDIX C 17-APC-10-06

New Program/Major or Minor/Concentration Proposal Form

(2017)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

| Bachelor of Engineering (B.Eng.) |

1.1 Major (Legacy = Subject) (30-char. max.)

| Materials Engineering |

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max)

| |

1.3 Minor (with Concentration, if Applicable) (30char. max)

| |

2.0 Administering Faculty/Unit

| Engineering (EN) |

Offering Faculty/Department

| EN - Mining and Materials Engineering |

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

| 201805 |

4.0 Rationale and Admission Requirements for New Proposal

In order to allow greater flexibility in the Materials Engineering Program by allowing students to graduate with less than 3 work terms, it is proposed to create a program that does not include the co-op work terms. A program revision of the current program is being submitted concurrently to make it a co-op option of the Materials Engineering Program. Compared to the existing B.Eng.; Co-op in Materials Engineering, the co-op courses listed under Required Materials Engineering Courses (MIME 280 (2 credits), MIME 380 (2 credits), and MIME 480 (2 credits)) have been removed. These 6 credits have been replaced by two required technical complementary courses. Note that there will be no direct admission to this program; students will be admitted to the Co-op in Materials Engineering and will transfer to the Major if they are not completing the work terms. Therefore, there will be no difference in enrolment and no additional resources required. Enrolment into the Co-op program will subsequently be divided between the Co-op program and the Major program after the latter comes into effect.

Please refer to the revision submitted simultaneously for the B.Eng.; Co-op in Mining Engineering to compare the program listings.

5.0 Program Information

Please check appropriate box(es)

5.1 Program Type

- ☒ Bachelor's Program
- ☐ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☐ Graduate Certificate
- ☐ Graduate Diploma
- ☐ Ph.D. Program
- ☐ Doctorate Program
  (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program
  (By Correspondence)
- ☐ Other:

Please specify

| |

5.2 Category

- ☐ Faculty Program (FP)
- ☒ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other:

Please specify

| |

5.3 Level

- ☒ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☐ Continuing Studies
  (Non-Credits)
- ☐ Masters & Grad Dip & Certs
- ☐ Doctorate
- ☐ Post-Graduate Medicine/
  Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(For GPS)

☐ Yes ☒ No

5.5 Requires Resources
(financial, personnel, space)

☐ Yes ☒ No

6.0 Total Credits

| 147-148 |

7.0 Consultation with

	Yes	No
Related Units	☐ Yes	☐ No
Financial Consult	☐ Yes	☐ No

Attach list of consultations.

New Program/Major or Minor/Concentration Proposal Form P1-1

8.0 Program Description (Maximum 150 words)

The Department offers a Major in Materials Engineering leading to an accredited B.Eng. degree in Materials Engineering. Materials are used to enact every human technology and have shaped key eras in history. In the Major in Materials Engineering, students will have the opportunity to learn the fundamental science and engineering of materials. The program spans the materials processing pipeline, teaching students how to enrich mineral-poor ore, then to process the materials into the desired microstructures and compositions and finally how to use these materials in various applications (aerospace, electronics and biological systems). With the choice of technical complementary courses, students have an opportunity to specialize and strengthen key materials technologies or broaden their horizons and take courses from several interdisciplinary areas.

Students entering this program must plan their schedule of studies in consultation with a departmental adviser.

9.0 List of proposed program for the New Program/Major or Minor/Concentration

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of courses) of existing Major/Minor.

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

B.Eng.; Major in Materials Engineering (148 credits)
Program credit weight: 147-148 credits
Program credit weight for CEGEP students: 119 credits

Entry into the Major in Materials Engineering
Students in Materials can be admitted only into the B.Eng.; Co-op in Materials Engineering. There is no direct entry to the Major in Materials Engineering (which does not include the work terms required for the Co-op program).
Students may enter the Major in Materials Engineering if they wish at any point in time during their study.
To transfer into the Major program, students must obtain approval from the department adviser and submit a Request for Course Authorization form to the McGill Engineering Student Centre (Frank Dawson Adams, Room 22).

Required Year 0 (Freshman) Courses
29 credits
Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents and select your term of admission.
CHEM 110 General Chemistry 1 (4)
CHEM 120 General Chemistry 2 (4)
MATH 133 Linear Algebra and Geometry (3)
MATH 140 Calculus 1 (3)
MATH 141 Calculus 2 (4)
PHYS 131 Mechanics and Waves (4)
PHYS 142 Electromagnetism and Optics (4)
AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies and Law, listed below under Complementary Studies (Group B).
Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses
36 credits
CCOM 206 Communication in Engineering (3)
CHEM 233 Topics in Physical Chemistry (3)
CIVE 205 Statics (3)
CIVE 207 Solid Mechanics (4)
COMP 208 Computers in Engineering (3)
ECSE 461 Electric Machinery (3)
FACC 100 Introduction to the Engineering Profession* (1)
FACC 250 Responsibilities of the Professional Engineer (0)
FACC 300 Engineering Economy (3)
MECH 289 Design Graphics (3)
FACC 400 Engineering Professional Practice (1)
MATH 262 Intermediate Calculus (3)
MATH 263 Ordinary Differential Equations for Engineers (3)
MATH 264 Advanced Calculus for Engineers (3)

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

9.0 List of proposed program for the New Program/Major or Minor/Concentration (cont.)

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of courses) of existing Major/Minor.

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Required Materials Engineering Courses
62 credits
MIME 209 Mathematical Applications (3)
MIME 212 Engineering Thermodynamics (3)
MIME 250 Introduction to Extractive Metallurgy (3)
MIME 261 Structure of Materials (3)
MIME 311 Modelling and Automatic Control (3)
MIME 317 Analytical and Characterization Techniques (3)
MIME 341 Introduction to Mineral Processing (3)
MIME 345 Applications of Polymers (3)
MIME 350 Extractive Metallurgical Engineering (3)
MIME 352 Hydrochemical Processing (3)
MIME 356 Heat, Mass and Fluid Flow (4)
MIME 360 Phase Transformations: Solids (3)
MIME 362 Mechanical Properties (3)
MIME 452 Process and Materials Design (4)
MIME 455 Advanced Process Engineering (3)
MIME 456 Steelmaking and Steel Processing (3)
MIME 465 Metallic and Ceramic Powders Processing (3)
MIME 467 Electronic Properties of Materials (3)
MIME 470 Engineering Biomaterials (3)
MIME 473 Introduction to Computational Materials Design (3)

Complementary Courses (21 credits)
Technical Complementaries
15 credits

9-15 credits from the following:
CHEE 515 Material Surfaces: A Biomimetic Approach* (3)
CIVE 512 Advanced Civil Engineering Materials (3)
MECH 530 Mechanics of Composite Materials (3)
MIME 410 Research Project (3)
MIME 442 Analysis, Modelling and Optimization in Mineral Processing (3)
MIME 512 Corrosion and Degradation of Materials (3)
MIME 515 Material Surfaces: A Biomimetic Approach* (3)
MIME 526 Mineral Economics (3)
MIME 542 Transmission Electron Microscopy (3)
MIME 544 Analysis: Mineral Processing Systems 1 (3)
MIME 545 Analysis: Mineral Processing Systems 2 (3)
MIME 551 Electrochemical Processing (3)
MIME 556 Sustainable Materials Processing (3)
MIME 558 Engineering Nanomaterials (3)
MIME 559 Aluminum Physical Metallurgy (3)
MIME 560 Joining Processes (3)
MIME 561 Advanced Materials Design (3)
MIME 563 Hot Deformation of Materials (3)
MIME 565 Aerospace Metallic-Materials and Manufacturing Processes (3)
MIME 568 Topics in Advanced Materials (3)
MIME 569 Electron Beam Analysis of Materials (3)
MIME 570 Micro- and Nano-Fabrication Fundamentals (3)
MIME 571 Surface Engineering (3)
MIME 572 Computational Thermodynamics (3)
MIME 580 Additive Manufacturing Using Metallic and Ceramic Materials (3)

* Students choose either CHEE 515 or MIME 515 (offered in alternate years).

6 credits may be taken from courses outside of the Department of Mining and Materials Engineering, with departmental approval.

9.0 List of proposed program for the New Program/Major or Minor/Concentration (cont.)

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of courses) of existing Major/Minor.

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Complementary Studies
6 credits

Group A – Impact of Technology on Society
3 credits from the following:
ANTH 212 Anthropology of Development (3)
BTEC 502 Biotechnology Ethics and Society (3)
CIVE 469 Infrastructure and Society (3)
ECON 225 Economics of the Environment (3)
ECON 347 Economics of Climate Change (3)
ENVR 201 Society, Environment and Sustainability (3)
GEOG 200 Geographical Perspectives: World Environmental Problems (3)
GEOG 203 Environmental Systems (3)
GEOG 205 Global Change: Past, Present and Future (3)
GEOG 302 Environmental Management 1 (3)
MGPO 440 Strategies for Sustainability* (3)
PHIL 343 Biomedical Ethics (3)
RELG 270 Religious Ethics and the Environment (3)
SOCI 235 Technology and Society (3)
SOCI 312 Sociology of Work and Industry (3)
URBP 201 Planning the 21st Century City (3)

* Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B – Humanities and Social Sciences, Management Studies and Law
3 credits at the 200-level or higher from the following departments:
Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528 History of Housing (3)
BUSA 465 Technological Entrepreneurship* (3)
CLAS 203 Greek Mythology (3)
ENVR 203 Knowledge, Ethics and Environment (3)
ENVR 400 Environmental Thought (3)
FACC 220 Law for Architects and Engineers (3)
FACC 500 Technology Business Plan Design (3)
FACC 501 Technology Business Plan Project (3)
HISP 225 Hispanic Civilization 1 (3)
HISP 226 Hispanic Civilization 2 (3)
INDR 294 Introduction to Labour-Management Relations* (3)
INTG 201 Integrated Management Essentials 1**
INTG 202 Integrated Management Essentials 2**
MATH 338 History and Philosophy of Mathematics (3)
MGCR 222 Introduction to Organizational Behaviour* (3)
MGCR 352 Marketing Management 1* (3)
ORGB 321 Leadership* (3)
ORGB 423 Human Resources Management* (3)

* Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.
**Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the INTG 201 and INTG 202 course information for a list of these courses.

Recently revised existing program – approved Sept. 28, 2017

B.Eng.; Co-op in Materials Engineering (148 credits)
Program credit weight: 148 credits
Program credit weight for CEGEP students: 119 credits

Required Year 0 (Freshman) Courses (29 credits)
Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents and select your term of admission.

CHEM 110 General Chemistry 1 (4)
CHEM 120 General Chemistry 2 (4)
MATH 133 Linear Algebra and Geometry (3)
MATH 140 Calculus 1 (3)
MATH 141 Calculus 2 (4)
PHYS 131 Mechanics and Waves (4)
PHYS 142 Electromagnetism and Optics (4)

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies and Law, listed below under Complementary Studies (Group B).

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses (36 credits)
CCOM 206 Communication in Engineering (3)
CHEM 233 Topics in Physical Chemistry (3)
CIVE 205 Statics (3)
CIVE 207 Solid Mechanics (4)
COMP 208 Computers in Engineering (3)
ECSE 461 Electric Machinery (3)
FACC 100 Introduction to the Engineering Profession* (1)
FACC 250 Responsibilities of the Professional Engineer (0)
FACC 300 Engineering Economy (3)
FACC 400 Engineering Professional Practice (1)
MATH 262 Intermediate Calculus (3)
MATH 263 Ordinary Differential Equations for Engineers (3)
MATH 264 Advanced Calculus for Engineers (3)
MECH 289 Design Graphics (3)

* Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Materials Engineering Courses (68 credits)
MIME 209 Mathematical Applications (3)
MIME 212 Engineering Thermodynamics (3)
MIME 250 Introduction to Extractive Metallurgy(3)
MIME 261 Structure of Materials (3)
MIME 280 Industrial Training 1 (2)
MIME 311 Modelling and Automatic Control (3)
MIME 317 Analytical and Characterization Techniques (3)
MIME 341 Introduction to Mineral Processing (3)
MIME 345 Applications of Polymers (3)
MIME 350 Extractive Metallurgical Engineering (3)

MIME 352 Hydrochemical Processing (3)
MIME 356 Heat, Mass and Fluid Flow (4)
MIME 360 Phase Transformations: Solids (3)
MIME 362 Mechanical Properties (3)
MIME 380 Industrial Training 2 (2)
MIME 452 Process and Materials Design (4)
MIME 455 Advanced Process Engineering (3)
MIME 456 Steelmaking and Steel Processing (3)
MIME 465 Metallic and Ceramic Powders Processing (3)
MIME 467 Electronic Properties of Materials (3)
MIME 470 Engineering Biomaterials (3)
MIME 473 Introduction to Computational Materials Design (3)
MIME 480 Industrial Training 3 (2)

Complementary Courses (15 credits)
Technical Complementaries
9 credits

6-9 credits from the following:
CHEE 515 Material Surfaces: A Biomimetic Approach* (3)
CIVE 512 Advanced Civil Engineering Materials (3)
MECH 530 Mechanics of Composite Materials (3)
MIME 410 Research Project (3)
MIME 442 Analysis, Modelling and Optimization in Mineral Processing (3)
MIME 512 Corrosion and Degradation of Materials (3)
MIME 515 Material Surfaces: A Biomimetic Approach* (3)
MIME 526 Mineral Economics (3)
MIME 542 Transmission Electron Microscopy (3)
MIME 544 Analysis: Mineral Processing Systems 1 (3)
MIME 545 Analysis: Mineral Processing Systems 2 (3)
MIME 551 Electrochemical Processing (3)
MIME 556 Sustainable Materials Processing (3)
MIME 558 Engineering Nanomaterials (3)
MIME 559 Aluminum Physical Metallurgy (3)
MIME 560 Joining Processes (3)
MIME 561 Advanced Materials Design (3)
MIME 563 Hot Deformation of Materials (3)
MIME 565 Aerospace Metallic-Materials and Manufacturing Processes (3)
MIME 568 Topics in Advanced Materials (3)
MIME 569 Electron Beam Analysis of Materials (3)
MIME 570 Micro- and Nano-Fabrication Fundamentals (3)
MIME 571 Surface Engineering (3)
MIME 572 Computational Thermodynamics (3)
MIME 580 Additive Manufacturing Using Metallic and Ceramic Materials (3)
* Students choose either CHEE 515 or MIME 515 (offered in alternate years).

3 credits may be taken from courses outside of the Department of Mining and Materials Engineering, with departmental approval.

Complementary Studies
6 credits

Group A – Impact of Technology on Society
3 credits from the following:
ANTH 212 Anthropology of Development (3)
BTEC 502 Biotechnology Ethics and Society (3)

CIVE 469 Infrastructure and Society (3)
ECON 225 Economics of the Environment (3)
ECON 347 Economics of Climate Change (3)
ENVR 201 Society, Environment and Sustainability (3)
GEOG 200 Geographical Perspectives: World Environmental Problems (3)
GEOG 203 Environmental Systems (3)
GEOG 205 Global Change: Past, Present and Future (3)
GEOG 302 Environmental Management 1 (3)
MGPO 440 Strategies for Sustainability* (3)
PHIL 343 Biomedical Ethics (3)
RELG 270 Religious Ethics and the Environment (3)
SOCI 235 Technology and Society (3)
SOCI 312 Sociology of Work and Industry (3)
URBP 201 Planning the 21st Century City (3)

* Management courses have limited enrolment and registration dates. See Important Dates at
http://www.mcgill.ca/importantdates.

Group B – Humanities and Social Sciences, Management Studies and Law
3 credits at the 200-level or higher from the following departments:
Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227 and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:
ARCH 528 History of Housing (3)
BUSA 465 Technological Entrepreneurship* (3)
CLAS 203 Greek Mythology (3)
ENVR 203 Knowledge, Ethics and Environment (3)
ENVR 400 Environmental Thought (3)
FACC 220 Law for Architects and Engineers (3)
FACC 500 Technology Business Plan Design (3)
FACC 501 Technology Business Plan Project (3)
HISP 225 Hispanic Civilization 1 (3)
HISP 226 Hispanic Civilization 2 (3)
INDR 294 Introduction to Labour-Management Relations* (3)
INTG 201 Integrated Management Essentials 1**
INTG 202 Integrated Management Essentials 2**
MATH 338 History and Philosophy of Mathematics (3)
MGCR 222 Introduction to Organizational Behaviour* (3)
MGCR 352 Marketing Management 1* (3)
ORGB 321 Leadership* (3)
ORGB 423 Human Resources Management* (3)

* Management courses have limited enrolment and registration dates. See Important Dates at
http://www.mcgill.ca/importantdates.
**Note: INTG 201 and INTG 202 are not open to students who have taken certain Management courses. Please see the
INTG 201 and INTG 202 course information for a list of these courses.

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	George Demopoulos		Sept 13 / 2017
Curric/Acad Committee	Laurent Mydlarski		March 29, 2017
Faculty 1	Laurent Mydlarski		April 11, 2017
Faculty 2			
Faculty 3			
CGPS			
SCTP			Sept. 28, 2017
APC			
Senate			

SCTP APPROVED

Submitted By

Name	Richard Chromik
Phone	514-398-5686
Email	richard.chromik@mcgill.ca
Submission Date	March 29, 2017

To be completed by ARR:

CIP Code

McGill

New Program/Major or Minor/Concentration
Proposal Form

(2017)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

> Doctor of Philosophy (Ph.D.)

1.1 Major (Legacy = Subject) (30-char. max.)

> Urban Planning, Policy and Design

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max)

>

1.3 Minor (with Concentration, if Applicable) (30char. max)

>

2.0 Administering Faculty/Unit

> Graduate and Postdoctoral Studies (GPS)

Offering Faculty/Department

> EN - School of Urban Planning

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

> 201809

4.0 Rationale and Admission Requirements for New Proposal

The goal of the program is to prepare students for high-quality, interdisciplinary research and teaching on the management of urban development and for leadership in the design and evaluation of urban policies and plans for cities in North America and the world. In Canada, there is currently no autonomous doctoral program in urban planning in English east of Toronto. The proposed program fills a need that is expressed in the large number of applications that the School's ad-hoc program receives every year (2-4 students are selected from an international pool of 40-60 applicants with backgrounds in planning and related disciplines). The application must contain a statement of research objectives, a CV, two samples of writing and two letters of recommendation from academic supervisors. To qualify for admission, candidates must have a Master's degree in urban planning or related field (Architecture, Civil Engineering, Environmental Studies, Geography, Urban Studies), with a GPA of 3.0 or more. Students whose Master's degree was only one year in length and students whose Master's degree was not in urban planning will be asked to take additional courses to make up for their lack of preparation. Expected enrolment is approximately three students per year. Additional resources are not required for this new program.

5.0 Program Information

Please check appropriate box(es)

5.1 Program Type

- ☐ Bachelor's Program
- ☐ Master's
- ☐ M.Sc. (Applied) Program
- ☐ Dual Degree/Concurrent Program
- ☐ Certificate
- ☐ Diploma
- ☐ Graduate Certificate
- ☐ Graduate Diploma
- ☒ Ph.D. Program
- ☐ Doctorate Program
  (Other than Ph.D.)
- ☐ Private Program
- ☐ Off-Campus Program
- ☐ Distance Education Program
  (By Correspondence)
- ☐ Other:

Please specify

>

5.2 Category

- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☒ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other:

Please specify

>

5.3 Level

- ☐ Undergraduate
- ☐ Dentistry/Law/Medicine
- ☐ Continuing Studies
  (Non-Credits)
- ☐ Masters & Grad Dip & Certs
- ☒ Doctorate
- ☐ Post-Graduate Medicine/
  Dentistry
- ☐ Graduate Qualifying
- ☐ Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(For GPS)

☒ Yes ☐ No

5.5 Requires Resources
(financial, personnel, space)

☐ Yes ☒ No

6.0 Total Credits

> 0 credits

7.0 Consultation with

Related Units	☒ Yes	☐ No
Financial Consult	☒ Yes	☐ No

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

The Doctor of Philosophy in Urban Planning, Policy and Design aims to prepare students for interdisciplinary research and teaching on the management of urban development as well as for leadership in the design and evaluation of urban policies and plans for cities in North America and the world. The program will focus on five identified areas of urban planning (land use planning and urban design; environmental planning; transportation planning; international development planning; real estate and economic development). Students are expected to spend the first two years of study taking courses, preparing for their comprehensive examination and writing their dissertation proposal. The remaining two (or more) years are spent conducting research and writing a thesis.

9.0 List of proposed program for the New Program/Major or Minor/Concentration

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of courses) of existing Major/Minor.

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Ph.D. in Urban Planning, Policy and Design (0 credits)

Every student must take courses worth at least 18 credits. Only one reading course can be included in this minimum requirement. The Advisory Committee may raise the requirement up to 24 credits (up to 36 credits for students entering as PhD 1) in order to meet the specific needs of the student. With approval of their committee, students may elect to take a larger number of courses than is required, but in no case will the number of credits exceed thirty unless the student enters the program in PhD 1.

Required Courses (9 credits)
URBP 612 History and Theory of Planning (3 credits)
URBP 701 Doctoral Comprehensive Examination (0 credits)
URBP 703 Doctoral Research Seminar 1 (3 credits)
URBP 704 Doctoral Research Seminar 2 (3 credits)
URBP 709 Doctoral Research Proposal (0 credits)

Complementary Courses (6 credits)
3 credits in advanced research methods at the 600 level or higher. It may be taken in any academic unit at McGill or another university, subject to the approval of the Graduate Program or School Director.

3 credits in advanced theory at the 600 level of higher. It may be taken at McGill or at another university and must be approved by the Graduate Program or School Director.

Elective Courses (3 credits)
Minimum 3 credits at the 500 level or higher, or more if the Advisory Committee so decides.

These credits may be taken in any academic unit at McGill or at another university, subject to the approval of the Advisory Committee.

The Advisory Committee may require that the number of electives be increased to improve the student's preparation in certain areas. Other courses, at the 500 level or higher, may be added with the approval of the Advisory Committee. In general, students will be asked to limit their elective coursework to 9 credits. In no case will they be allowed to take more than 15 credits in elective courses.

Up to two reading courses may be taken and only one may be included in the minimum 18 credits of course work. A reading course is taken when no appropriate course is available and is (at least) equivalent to a 3-credit course in terms of work load. Procedures for reading courses are outlined in the Reading Course guidelines.

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Richard Shearmur		22/8/2017
Curric/Acad Committee	Laurent Mydlarski		May 3, 2017
Faculty 1	Laurent Mydlarski		May 18, 2017
Faculty 2			
Faculty 3			
CGPS	SCTP APPROVED	CGPS APPROVED	September 11, 2017
SCTP			Sept. 28, 2017
APC			
Senate			

Submitted By

Name	David Wachsmuth	To be completed by ARR:
Phone	514-398-4078	CIP Code
Email	david.wachsmuth@mcgill.ca	
Submission Date	May 03, 2017	

SUMMARY: Doctor of Philosophy in Urban Planning, Policy & Design

Building on the success of its ad-hoc PhD program, the School of Urban Planning wishes to give its doctoral program ministerial recognition and academic autonomy as the **PhD in Urban Planning, Policy and Design**. The goal of the program is to prepare students for high-quality, interdisciplinary research and teaching on the management of urban development and for leadership in the design and evaluation of policies and plans for cities in North America and the world.

In Canada, there is currently no autonomous doctoral program in urban planning in English east of Toronto. Indeed, **the proposed program fills a need** that is expressed in the large number of applications that the ad-hoc program receives every year. The school selects the best two to four students out of an international pool of forty to sixty applicants. The need for our PhD program is confirmed by the high quality of academic and professional positions that graduates of the program secure after earning their degree. Of the twelve students who obtained a PhD degree in urban planning from McGill University, four are university professors, two hold postdoctoral or lecturer's positions, two are expert consultants in private practice, and the others hold senior positions in multilateral organisations, government agencies or foundations.

In **comparison with other doctoral programs in North America**, the proposed PhD in Urban Planning, Policy and Design is a little more demanding than its Canadian counterparts but less onerous than its American counterparts in terms of course requirements (6 to 10 courses vs. 4 to 6 in Canada and 9 to 20 in the US), but it is similar to doctoral programs in both countries in its general structure: students are expected to spend the first two years of study taking courses, preparing for their comprehensive examination and writing their dissertation proposal; they spend the next two years (or more) doing research and writing their thesis. Compared to other programs, the proposed program is rather small in scale, with an enrolment of three students per year, on average. This annual intake will increase if the faculty complement of the School of Urban Planning is allowed to grow.

Students in the program will be supervised by professors, Associate Members, Adjunct Professors (and colleagues from other units) who possess **expertise in five areas of urban planning**: land-use planning and urban design, environmental planning, transportation planning, international development planning, and real-estate and economic development. In addition, students will benefit from the **strong links between Urban Planning and other units in research and supervision**. At McGill, Urban Planning professors share research grants and supervisory tasks with colleagues in numerous units and programs, including Architecture, Civil Engineering, Environment, Geography, International Development, Law, Management, Political Science and Social Work. Outside McGill, they work closely with colleagues at the Université de Montréal (including Polytechnique), UQÀM, INRS-UCS and Concordia, as well as with colleagues at leading universities in Canada, the US and other countries. The proposed program has received the support of six heads of departments or schools, four at McGill, one at the Université de Montréal and one at INRS-UCS.

The **formal requirements of the proposed program** (i.e., coursework, comprehensive examination, research proposal and thesis) aim to turn graduate students into high-level researchers whose expertise will improve public policy, planning and design in Canadian cities and in cities the world over. The **informal requirements of the program** (in terms of classroom teaching, writing practice, participation in seminars and contribution to institutional governance) aim to integrate students fully in the life of the university as a place of teaching and learning, a space of intellectual exchange and a node in wider academic and research networks.

APC APPENDIX E   17-APC-10-06

McGill
New Program/Major or Minor/Concentration Proposal Form

(2013)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

> Master of Science

1.1 Major (Legacy= Subject)(30-char. max.)

> Pharmacology

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

> Environmental Health Sciences

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

>

2.0 Administering Faculty/Unit

> Graduate and Postdoctoral Studies

Offering Faculty/Department

> Medicine / Pharmacology and Therapeutics

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

> 201809

4.0 Rationale and Admission Requirements for New Proposal

The investigation of key questions in Environmental Health Sciences requires an interdisciplinary, collaborative approach. This new graduate option will use core courses to bring together graduate students from participating units (i.e., Epidemiology, Biostatistics and Occupational Health; Pharmacology and Therapeutics; Natural Resource Sciences; Experimental Medicine), exposing them to diverse approaches and research issues. Please see Admission Requirements on page 3.

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type
- Bachelor's Program
- ☑ Master's
- M.Sc. (Applied) Program
- Dual Degree/Concurrent Program
- Certificate
- Diploma
- Graduate Certificate
- Graduate Diploma
- Ph.D. Program
- Doctorate Program
- (Other than Ph.D.)
- Private Program
- Off-Campus Program
- Distance Education Program
- (By Correspondence)
- Other (Please specify)

5.2 Category
- Faculty Program (FP)
- Major
- Joint Major
- Major Concentration (CON)
- Minor
- Minor Concentration (CON)
- Honours (HON)
- Joint Honours Component (HC)
- Internship/Co-op
- xThesis (T)
- Non-Thesis (N)
- Other
- Please specify

5.3 Level
- Undergraduate
- Dentistry/Law/Medicine
- Continuing Studies (Non-Credit)
- Collegial
- xMasters & Grad Dips & Certs
- Doctorate
- Post-Graduate Medicine/Dentistry
- Graduate Qualifying
- Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(for GPS) Yes   No

5.5 Requires Resources
Yes ____ No x

6.0 Total Credits

> 45 credits

7.0 Consultation with

Related Units   Yes ☑   No

Financial Consult   Yes   No X

Attach list of consultations.

8.0 Program Description (Maximum 150 words)

The M.Sc. in Pharmacology; Environmental Health Sciences will focus on the interplay between the environment and health. Environmental health research is highly interdisciplinary. Students will be given the opportunity to acquire a broad environmental perspective on exposure sciences, hazard screening methodologies, epidemiological approaches, health implications of environmental quality, and policy approaches.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

Existing Program:	Proposed New Option:
M.Sc. in Pharmacology; Thesis (45 credits)	M.Sc. in Pharmacology Thesis (Environmental Health Science Option) (45 credits)
Thesis Courses (24 credits) PHAR 696 Thesis Preparation (3 credits) PHAR 698 Thesis Preparation 2 (9 credits) PHAR 699 Thesis Preparation 3 (12 credits)	Thesis Courses (24 credits) PHAR 696 Thesis Preparation (3 credits) PHAR 698 Thesis Preparation 2 (9 credits) PHAR 699 Thesis Preparation 3 (12 credits)
Required Courses (12 credits) PHAR 601D1/D2 Research Seminar (6 credits) PHAR 609 Research Professionalism for Pharmacologists (1 credit) PHAR 610 Scientific Communication for Pharmacologists (2 credits) PHAR 712 Statistics for Pharmacologists (3 credits)	Required Courses (18 credits) PHAR 601D1/D2 Research Seminar (6 credits) PHAR 609 Research Professionalism for Pharmacologists (1 credit) PHAR 610 Scientific Communication for Pharmacologists (2 credits) PHAR 670 Principles of Environmental Health Sciences 1 (3 credits) PHAR 671 Principles of Environmental Health Sciences 2 (3 credits) PHAR 712 Statistics for Pharmacologists (3 credits)
Complementary Courses (9 credits) 6 credits, from the following courses: PHAR 503 Drug Discovery & Development 1 (3 credits)* PHAR 505 Structural Pharmacology (3 credits)* PHAR 562 Neuropharmacology (3 credits) PHAR 563 Endocrine Pharmacology (3 credits)	Complementary Courses (3 credits) 3 credits, from the following courses: PHAR 503 Drug Discovery & Development 1 (3 credits) PHAR 505 Structural Pharmacology (3 credits) PHAR 562 Neuropharmacology (3 credits) PHAR 563 Endocrine Pharmacology (3 credits)
OR completion of an equivalency exam OR an exemption granted by the Graduate Training Committee (GTC) on the basis of previous courses. *Students may take PHAR 503 or PHAR 505 but not both.	OR completion of an equivalency exam OR an exemption granted by the Graduate Training Committee (GTC) on the basis of previous courses.
Students who have taken these courses as part of their undergraduate degree, passed the equivalency exam, or been exempted, will register for the following courses: PHAR 697 Thesis Preparation 1 (6 credits) 3 credits, at the 700-level PHAR course(s), or the equivalent, upon approval by the (GTC))	Students who have taken these courses as part of their undergraduate degree, passed the equivalency exam, or been exempted, will register for: A 3 credit 700-level PHAR course, or the equivalent, upon approval by the GTC

Attach extra page(s) as needed

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Gerhard Multhaup, Dr. rer. nat. Professor and Chair		MAR 27 2017
Curric/Acad Committee	DAVID RAGSDALE		April 12/17
Faculty 1	ELAINE DAVIS	Elaine C. Davis	April 13, 2017
Faculty 2			
Faculty 3			
CGPS	SCTP APPROVED	CGPS APPROVED	September 11, 2017
SCTP			Sept. 28, 2017
APC			
Senate			

Submitted by

		To be completed by ARR:
Name		
Phone		CIP Code
Email		
Submission Date		

Admission Requirements:

Candidates are required to hold a B.Sc. degree in a discipline relevant to the proposed field of study; those with the M.D., D.D.S., or D.V.M. degrees are also eligible to apply. A background in the health sciences is recommended, but programs in biology, chemistry, mathematics, and physical sciences may be acceptable. Admission is based on a student's academic record, letters of assessment, and, whenever possible, interviews with staff members. Students are required to take the Graduate Record Examination Aptitude Test (xref: GRE) and the Test of English as a Foreign Language (xref: TOEFL) or the equivalent, except as follows: in accordance with McGill policy, only those whose mother tongue is English, who graduated from a recognized Canadian institution (anglophone or francophone), or who completed an undergraduate or graduate degree at a recognized foreign institution where English is the language of instruction are exempt from providing proof of competency in English.

McGill

APC APPENDIX F   17-APC-10-06

New Program/Major or Minor/Concentration Proposal Form

(2013)

1.0 Degree Title
Please specify the two degrees for concurrent degree programs

| Ph.D. |

2.0 Administering Faculty/Unit

| Graduate and Postdoctoral Studies |

1.1 Major (Legacy= Subject)(30-char. max.)

| Pharmacology |

Offering Faculty/Department

| Medicine/Pharmacology and Therapeutics |

1.2 Concentration (Legacy = Concentration/Option)
If applicable to Majors only (30 char. max.)

| Environmental Health Sciences |

3.0 Effective Term of Implementation
(Ex. Sept. 2004 = 200409)
Term

| 201809 |

1.3 Minor (with Concentration, if Applicable) (30 char. max.)

| |

4.0 Rationale and Admission Requirements for New Proposal

The investigation of key questions in Environmental Health Sciences requires an interdisciplinary, collaborative approach. This new graduate option will use foundations courses to bring together graduate students from participating units (i.e., Epidemiology, Biostatistics and Occupational Health; Pharmacology and Therapeutics; Natural Resource Sciences; Experimental Medicine), exposing them to diverse approaches and research issues.

5.0 Program Information
Please check appropriate box(es)

5.1 Program Type
- Bachelor's Program
- Master's
- M.Sc. (Applied) Program
- Dual Degree/Concurrent Program
- Certificate
- Diploma
- Graduate Certificate
- Graduate Diploma
- [x] Ph.D. Program
- Doctorate Program
- (Other than Ph.D.)
- Private Program
- Off-Campus Program
- Distance Education Program
- (By Correspondence)
- Other (Please specify)

5.2 Category
- Faculty Program (FP)
- Major
- Joint Major
- Major Concentration (CON)
- Minor
- Minor Concentration (CON)
- Honours (HON)
- Joint Honours Component (HC)
- Internship/Co-op
- x Thesis (T)
- Non-Thesis (N)
- Other
- Please specify

| |

5.3 Level
- Undergraduate
- Dentistry/Law/Medicine
- Continuing Studies (Non-Credit)
- Collegial
- Masters & Grad Dips & Certs
- x Doctorate
- Post-Graduate Medicine/Dentistry
- Graduate Qualifying
- Postdoctoral Fellows

5.4 FQRSC (Research) Indicator
(for GPS) Yes   No

6.0 Total Credits

| 0 |

7.0 Consultation with

| Related Units | Yes [x] | No |
| Financial Consult | Yes | No X |

Attach list of consultations.

P1-1

8.0 Program Description (Maximum 150 words)

The Ph.D. in Pharmacology; Environmental Health Sciences program is designed to train professionals for advanced basic research, teaching, and leadership positions in environmental health sciences. The Option will add a distinct focus on the interplay between the environment and health research. Students will acquire a broad environmental perspective, including exposure sciences, hazard screening methodologies, epidemiological approaches, health implications of environmental quality, and policy approaches.

9.0 List of proposed program for the New Program/Major or Minor/Concentration.

If new concentration (option) of existing Major/Minor (program), please attach a program layout (list of all courses) of existing Major/Minor.

Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit weight under the headings of: Required Courses, Complementary Courses, Elective Courses)

Existing Program:	Proposed new Option:
Ph.D. in Pharmacology (0 cr.)	**Ph.D. in Pharmacology; Environmental Health Sciences (0 cr.)**
Thesis	**Thesis**
• A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.	• A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.
Required Courses (12 credits)	Required Courses (15 credits)
• PHAR 609 Research Professionalism for Pharmacologists (1 credit)	• PHAR 609 Research Professionalism for Pharmacologists (1 credit)
• PHAR 610 Scientific Communication for Pharmacologists (2 credits)	• PHAR 610 Scientific Communication for Pharmacologists (2 credits)
• PHAR 701D1 Comprehensive Exam (0 credit)	• PHAR 670 Principles of Environmental Health Sciences 1
• PHAR 701D2 Comprehensive Exam (0 credit)	• (3 credits)
• PHAR 712 Statistics for Pharmacologists (3 credits)	• PHAR 671 Principles of Environmental Health Sciences 2
	• (3 credits)
Two additional 700-level PHAR courses (3 credits each), or the equivalent, upon approval by the Graduate Training Committee (GTC).	• PHAR 701D1 Comprehensive Exam (0 credit)
	• PHAR 701D2 Comprehensive Exam (0 credit)
	• PHAR 712 Statistics for Pharmacologists (3 credits)
Complementary Courses (6 credits)	
6 credits, chosen from the following courses.	One additional 700-level PHAR course (3 credits), or the equivalent, upon approval by the Graduate Training Committee (GTC).
*Students take PHAR 503 OR PHAR 505.	
• PHAR 503 Drug Design & Development 1 (3 credits)*	Complementary Courses (3 credits)
• PHAR 505 Structural Pharmacology (3 credits)*	3 credits, chosen from the following courses:
• PHAR 562 Neuropharmacology (3 credits)	• PHAR 503 Drug Design & Development 1 (3 credits)
• PHAR 563 Endocrine Pharmacology (3 credits)	• PHAR 505 Structural Pharmacology (3 credits)
	• PHAR 562 Neuropharmacology (3 credits)
	• PHAR 563 Endocrine Pharmacology (3 credits)
OR completion of an equivalency exam	OR completion of an equivalency exam
OR an exemption granted by the GTC on the basis of previous courses	OR an exemption granted by the GTC on the basis of previous courses

Attach extra page(s) as needed

10.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Gerhard Multhaup, Dr. rer. nat.		FEB 13 2017
Curric/Acad Committee	DAVID RAGSDALE (CHAIR)		Feb. 20, 2017
Faculty 1	ELAINE DAVIS (Asst Dean)		Feb 24, 2017
Faculty 2			
Faculty 3	SCTP APPROVED		
CGPS		CGPS Approval	Mar. 13, 2017
SCTP			April 6, 2017 *
APC			
Senate			

Submitted by

Name	
Phone	
Email	
Submission Date	

To be completed by ARR:

CIP Code

Admission Requirements:
Candidates are required to hold a M.Sc. degree in a discipline relevant to the proposed field of study; those with the M.D., D.D.S., or D.V.M. degrees are also eligible to apply. A background in the health sciences is recommended, but programs in biology, chemistry, mathematics, and physical sciences may be acceptable. Admission is based on a student's academic record, letters of assessment, and, whenever possible, interviews with staff members. Students are required to take the Graduate Record Examination Aptitude Test (xref: GRE) and the Test of English as a Foreign Language (xref: TOEFL) or the equivalent, except as follows: in accordance with McGill policy, only those whose mother tongue is English, who graduated from a recognized Canadian institution (anglophone or francophone), or who completed an undergraduate or graduate degree at a recognized foreign institution where English is the language of instruction are exempt from providing proof of competency in English.

* = AWAITING CONSULTATION.

APC APPENDIX G 17-APC-10-06.

McGill

Program/Major or Minor/Concentration Revision Form

(2017)

1.0 Degree Title
Specify the two degrees for concurrent degree programs

Bachelor of Engineering (B.Eng.)

1.1 Major (Legacy = Subject) (30-char. max.)

Software Engineering

1.2 Concentration (Legacy = Concentration/Option)
If applicable (30 char. max)

1.3 Minor (with Concentration, if applicable)
(30 char. max)

1.4 Category

☐ Faculty Program (FP)   ☐ Honours (HON)

☐ Major   ☐ Joint Honours

☐ Joint Major   Component (HC)

☐ Major Concentration (CON)   ☒ Internship/Co-op

☐ Minor   ☐ Thesis (T)

☐ Minor Concentration (CON)   ☐ Non-Thesis (N)

                                 ☐ Other

                                 Please specify

1.5 Complete Program Title

B.Eng.; Co-op in Software Engineering

2.0 Administering Faculty/Unit

Engineering (EN)

Offering Faculty/Department

EN - Electrical and Computer Engineering

3.0 Effective Term of revision or retirement
Please give reasons in 5.0 "Rationale" in the case of retirement

(Ex. Sept. 2004 = 200409)   ☐ Retirement

Term: | 201809 |

4.0 Existing Credit Weight   Proposed Credit Weight

137-144		141-147

5.0 Rationale for revised program

The program name is being changed and co-op courses are added to the core in order to make this program into a co-op program. The additional of the co-op courses will ensure that students gain practical experience.

The degree title is being changed from "B.S.E." (Bachelor of Software Engineering)) to "B.Eng." because the "B.S.E." title reflected that the program was jointly offered by the Department of Electrical and Computer Engineering and the School of Computer Science. The program is no longer jointly offered by the two units so we are taking the opportunity to change the degree title along with the program name, so that the degree designation is consistent with other B.Eng. programs.

Addition of an elective course allows our students to expand their knowledge in other disciplines. The credit weight of the technical complementary courses is being lowered to accommodate the elective course.

Old degree and program title: Bachelor of Software Engineering (B.S.E.). The old program is to be retired via this proposal.

6.0 Revised Program Description (Maximum 150 words)

This program offers students the opportunity to focus their studies on the skills needed to design and develop complex software systems. This emerging field of engineering is a major component of the growing Information Technology (IT) sector of the economy. Graduates of this program will have a solid foundation for careers in the software industry.

This is a co-op program with four paid industrial work terms, leading to an accredited B.Eng. degree in Software Engineering. Students must register for each work term (ECSE 201, ECSE 301, ECSE 401, ECSE 402) and pay associated fees by the Course Change (add/drop) registration deadline.

In addition to technical complementary courses, students take general complementary courses in social sciences, management studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

SEE NEXT PAGE FOR EXISTING DESCRIPTION.

This program offers students the opportunity to focus their studies on the skills needed to design and develop complex software systems. This emerging field of engineering is a major component of the growing Information Technology (IT) sector of the economy, in which the demand for qualified personnel continues to outstrip supply. Graduates of this program will have a solid foundation for careers in the software industry.

In addition to technical complementary courses, students take general complementary courses in social sciences, management studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

7.0 List of existing program and proposed program

Existing program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Bachelor of Software Engineering (B.S.E.) (137 credits)
Program credit weight: ~~137-144~~ credits
Program credit weight for Quebec CEGEP students: ~~115-119~~ credits
Program credit weight for out-of-province students: ~~137-141~~ credits

Required Year 0 (Freshman) Courses
25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a ~~115- to 119~~-credit program. For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents/ and select your term of admission.

CHEM 120 General Chemistry 2 (4)
MATH 133 Linear Algebra and Geometry (3)
MATH 140 Calculus 1(3)
MATH 141 Calculus 2 (4)
PHYS 131 Mechanics and Waves (4)
PHYS 142 Electromagnetism and Optics (4)
AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies and Law, listed below under Complementary Studies (Group B)

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses
35 credits

CCOM 206 Communication in Engineering (3)
COMP 206 Introduction to Software Systems (3)
COMP 250 Intro to Computer Science (3)
COMP 251 Algorithms and Data Structures (3)
COMP 302 Programming Languages and Paradigms (3)
COMP 360 Algorithm Design Techniques (3)
COMP 421 Database Systems (3)
FACC 100 Introduction to the Engineering Profession* (1)
FACC 250 Responsibilities of the Professional Engineer (0)
FACC 300 Engineering Economy (3)
FACC 400 Engineering Professional Practice (1)
MATH 240 Discrete Structures (3)
MATH 262 Intermediate Calculus (3)
MATH 263 Ordinary Differential Equations (3)

*FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Software Engineering Courses
~~52~~ credits

ECSE 200 Electric Circuits 1 (3)
ECSE 202 Introduction to Software Development (3)
ECSE 205 Probability and Statistics for Engineers (3)
ECSE 211 Design Principles and Methods (3)
ECSE 222 Digital Logic (3)
ECSE 223 Model-Based Programming (3)
ECSE 310 Thermodynamics of Computing (3)
ECSE 316 Signals and Networks (3)

B.Eng.; Co-op in Software Engineering (141 credits)
Program credit weight: 141-147 credits
Program credit weight for Quebec CEGEP students: 119-122 credits
Program credit weight for out-of-province students: 141-144 credits

Required Year 0 (Freshman) Courses
25 credits

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 119-122-credit program. For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see http://www.mcgill.ca/engineering/student/sao/newstudents/ and select your term of admission.

CHEM 120 General Chemistry 2 (4)
MATH 133 Linear Algebra and Geometry (3)
MATH 140 Calculus 1(3)
MATH 141 Calculus 2 (4)
PHYS 131 Mechanics and Waves (4)
PHYS 142 Electromagnetism and Optics (4)
AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies and Law, listed below under Complementary Studies (Group B)

Note: FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Non-Departmental Courses
35 credits

CCOM 206 Communication in Engineering (3)
COMP 206 Introduction to Software Systems (3)
COMP 250 Intro to Computer Science (3)
COMP 251 Algorithms and Data Structures (3)
COMP 302 Programming Languages and Paradigms (3)
COMP 360 Algorithm Design Techniques (3)
COMP 421 Database Systems (3)
FACC 100 Introduction to the Engineering Profession* (1)
FACC 250 Responsibilities of the Professional Engineer (0)
FACC 300 Engineering Economy (3)
FACC 400 Engineering Professional Practice (1)
MATH 240 Discrete Structures (3)
MATH 262 Intermediate Calculus (3)
MATH 263 Ordinary Differential Equations (3)

*FACC 100 (Introduction to the Engineering Profession) must be taken during the first year of study.

Required Software Engineering Courses
60 credits

ECSE 200 Electric Circuits 1 (3)
ECSE 201 Co-operative Work Term 1 (2)
ECSE 202 Introduction to Software Development (3)
ECSE 205 Probability and Statistics for Engineers (3)
ECSE 211 Design Principles and Methods (3)
ECSE 222 Digital Logic (3)
ECSE 223 Model-Based Programming (3)
ECSE 301 Co-operative Work Term 2 (2)
ECSE 310 Thermodynamics of Computing (3
ECSE 316 Signals and Network (3)

7.0 List of existing program and proposed program (cont.)

Existing program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Existing program

ECSE 321 Introduction to Software Engineering (3)
ECSE 324 Computer Organization (4)
ECSE 326 Software Requirements Engineering (3)
ECSE 420 Parallel Computing (3)
ECSE 427 Operating Systems (3)
ECSE 428 Software Engineering Practice (3)
ECSE 429 Software Validation (3)
ECSE 456 ECSE Design Project 1 (3)
ECSE 457 ECSE Design Project 2 (3)

Complementary Courses
21-28 credits

Technical Complementaries
15-20 credits (5 courses) from the following

COMP 330 Theory of Computation (3)
COMP 350 Numerical Computing (3)
COMP 409 Concurrent Programming (3)
COMP 417 Introduction Robotics and Intelligent Systems (3)
COMP 424 Artificial Intelligence (3)
COMP 512 Distributed Systems (4)
COMP 520 Compiler Design (4)
COMP 521 Modern Computer Games (4)
COMP 525 Formal Verification (3)
COMP 529 Software Architecture (4)
COMP 533 Model-Driven Software Development (3)
COMP 551 Applied Machine Learning (4)
COMP 557 Fundamentals of Computer Graphics (3)
COMP 575 Fundamentals of Distributed Algorithms (3)
ECSE 325 Digital Systems (3)
ECSE 415 Introduction to Computer Vision (3)
ECSE 416 Telecommunication Networks (4)
ECSE 421 Embedded Systems (3)
ECSE 422 Fault Tolerant Computing (3)
ECSE 424 Human-Computer Interaction (3)
ECSE 425 Computer Organization and Architecture (3)
ECSE 439 Software Language Engineering (3)
ECSE 444 Microprocessors (4)

Natural Science Complementary Courses
3-6 credits

Students from CEGEP must complete 6 credits of Natural Science complementary courses; all other students must complete 3 credits of courses.

Natural Science complementary courses must be chosen from courses at the 200-level or higher from the following science departments, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering.
Atmospheric and Oceanic Sciences (ATOC)
Biology (BIOL)
Chemistry (CHEM)
Earth and Planetary Sciences (EPSC)
Earth System Science (ESYS)
Physics (PHYS)

Complementary Studies
6 credits

Group A – Impact of Technology on Society
3 credits from the following:

ANTH 212 Anthropology of Development (3)

Proposed program

ECSE 321 Introduction to Software Engineering (3)
ECSE 324 Computer Organization (4)
ECSE 326 Software Requirements Engineering (3)
ECSE 401 Co-operative Work Term 3 (2)
ECSE 402 Co-operative Work Term 4 (2)
ECSE 420 Parallel Computing (3)
ECSE 427 Operating Systems (3)
ECSE 428 Software Engineering Practice (3)
ECSE 429 Software Validation (3)
ECSE 456 ECSE Design Project 1 (3)
ECSE 457 ECSE Design Project 2 (3)

Complementary Courses
15-24 credits

Technical Complementaries
9-12 credits (3 courses) from the following:

COMP 330 Theory of Computation (3)
COMP 350 Numerical Computing (3)
COMP 409 Concurrent Programming (3)
COMP 417 Introduction Robotics and Intelligent Systems (3)
COMP 424 Artificial Intelligence (3)
COMP 512 Distributed Systems (4)
COMP 520 Compiler Design (4)
COMP 521 Modern Computer Games (4)
COMP 525 Formal Verification (3)
COMP 529 Software Architecture (4)
COMP 533 Model-Driven Software Development (3)
COMP 551 Applied Machine Learning (4)
COMP 557 Fundamentals of Computer Graphics (3)
COMP 575 Fundamentals of Distributed Algorithms (3)
ECSE 325 Digital Systems (3)
ECSE 415 Introduction to Computer Vision (3)
ECSE 416 Telecommunication Networks (4)
ECSE 421 Embedded Systems (3)
ECSE 422 Fault Tolerant Computing (3)
ECSE 424 Human-Computer Interaction (3)
ECSE 425 Computer Organization and Architecture (3)
ECSE 439 Software Language Engineering (3)
ECSE 444 Microprocessors (4)

Natural Science Complementary Courses
3-6 credits

Students from CEGEP must complete 6 credits of Natural Science complementary courses; all other students must complete 3 credits of courses.

Natural Science complementary courses must be chosen from courses at the 200-level or higher from the following science departments, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering.
Atmospheric and Oceanic Sciences (ATOC)
Biology (BIOL)
Chemistry (CHEM)
Earth and Planetary Sciences (EPSC)
Earth System Science (ESYS)
Physics (PHYS)

Complementary Studies
6 credits

Group A – Impact of Technology on Society
3 credits from the following:

7.0 List of existing program and proposed program (cont.)

Existing program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Proposed program (list course as follow: Subj Code/Crse Num, Title, Credit weight, under the heading of: Required Courses, Complementary Courses, and Elective Courses).

Existing program

BTEC 502 Biotechnology Ethics and Society (3)
CIVE 469 Infrastructure and Society (3)
ECON 347 Economics of Climate Change (3)
ENVR 201 Society, Environment and Sustainability (3)
ECON 225 Economics of the Environment (3)
GEOG 200 Geographical Perspectives: World Environmental
　　　　　Problems (3)
GEOG 203 Environmental Systems (3)
GEOG 205 Global Change: Past, Present and Future (3)
GEOG 302 Environmental Management 1 (3)
MGPO 440 Strategies for Sustainability* (3)
PHIL 343 Biomedical Ethics (3)
RELG 270 Religious Ethics and the Environment (3)
SOCI 235 Technology and Society (3)
SOCI 312 Sociology of Work and Industry (3)
URBP 201 Planning the 21st Century City (3)

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B – Humanities and Social Sciences, Management Studies and Law
3 credits at the 200-level or higher from the following departments:

Anthropology (ANTH)
Economics (any 200- or 300-level course excluding ECON 227
　　　　　and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
Political Science (POLI)
Psychology (excluding PSYC 204 and PSYC 305, but including
　　　　　PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)

OR one of the following:

ARCH 528 History of Housing (3)
BUSA 465 Technological Entrepreneurship* (3)
ENVR 203 Knowledge, Ethics and Environment (3)
ENVR 400 Environmental Thought (3)
FACC 220 Law for Architects and Engineers (3)
FACC 500 Technology Business Plan Design (3)
FACC 501 Technology Business Plan Project (3)
INDR 294 Introduction to Labour-Management Relations* (3)
MATH 338 History and Philosophy of Mathematics (3)
MGCR 222 Introduction to Organizational Behaviour* (3)
MGCR 352 Marketing Management 1* (3)
ORGB 321 Leadership* (3)
ORGB 423 Human Resources Management* (3)

*Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Proposed program

ANTH 212 Anthropology of Development (3)
BTEC 502 Biotechnology Ethics and Society (3)
CIVE 469 Infrastructure and Society (3)
ECON 347 Economics of Climate Change (3)
ENVR 201 Society, Environment and Sustainability (3)
ECON 225 Economics of the Environment (3)
GEOG 200 Geographical Perspectives: World Environmental
　　　　　Problems (3)
GEOG 203 Environmental Systems (3)
GEOG 205 Global Change: Past, Present and Future (3)
GEOG 302 Environmental Management 1 (3)
MGPO 440 Strategies for Sustainability* (3)
PHIL 343 Biomedical Ethics (3)
RELG 270 Religious Ethics and the Environment (3)
SOCI 235 Technology and Society (3)
SOCI 312 Sociology of Work and Industry (3)
URBP 201 Planning the 21st Century City (3)

* Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Group B – Humanities and Social Sciences, Management Studies and Law
3 credits at the 200-level or higher from the following departments:

Anthropology (ANTH)
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　　　　　and ECON 337)
History (HIST)
Philosophy (excluding PHIL 210 and PHIL 310)
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Psychology (excluding PSYC 204 and PSYC 305, but including
　　　　　PSYC 100)
Religious Studies (RELG)
School of Social Work (SWRK)
Sociology (excluding SOCI 350)
OR one of the following:

ARCH 528 History of Housing (3)
BUSA 465 Technological Entrepreneurship* (3)
ENVR 203 Knowledge, Ethics and Environment (3)
ENVR 400 Environmental Thought (3)
FACC 220 Law for Architects and Engineers (3)
FACC 500 Technology Business Plan Design (3)
FACC 501 Technology Business Plan Project (3)
INDR 294 Introduction to Labour-Management Relations* (3)
MATH 338 History and Philosophy of Mathematics (3)
MGCR 222 Introduction to Organizational Behaviour* (3)
MGCR 352 Marketing Management 1* (3)
ORGB 321 Leadership* (3)
ORGB 423 Human Resources Management* (3)

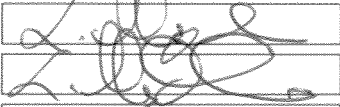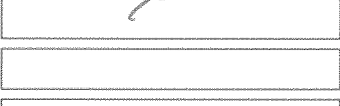*Note: Management courses have limited enrolment and registration dates. See Important Dates at http://www.mcgill.ca/importantdates.

Elective Course (3 credits)
One 3-credit course at the 200-level or higher from any department at McGill, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering.

8.0	Consultation with					
	Related Units	☒ Yes	☐ No	Financial Consult	☒ Yes	☐ No

Attach list of consultation: Memos from ECSESS, EUS and the Fee Advisory Committee attached

9.0 Approvals

Routing Sequence	Name	Signature	Date
Department	Andrew Kirk		2/12/2017
Curric/Acad Committee	Laurent Mydlarski		March 29, 2017
Faculty 1	Laurent Mydlarski		April 11, 2017
Faculty 2			
Faculty 3			
CGPS			
SCTP			Sept. 28, 2017
APC			
Senate			

SCTP APPROVED

Submitted By

Name	Roni Khazaka	To be completed by ARR:	
Phone	514-398-7123	CIP Code	
Email	roni.khazaka@mcgill.ca		
Submission Date	March 29, 2017		

10. FQRSC (Research) Indicator (for GPS): ☐ Yes ☐ No

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