



School of Graduate Studies

1280 Main Street West
Hamilton, Ontario, Canada
L8S 4L8

Phone 905.525.9140
Ext. 23679
<http://graduate.mcmaster.ca>

March 11, 2013

To : Members of the Faculty of Health Sciences Graduate Policy and Curriculum Council

From : Medy Espiritu *Medy Espiritu*
Assistant Secretary and SynApps System Administrator

The next meeting of the Faculty of Health Sciences Graduate Policy and Curriculum Council will be held on **Thursday, March 21, 2013 at 9:45 a.m. in MDCL-3015.**

Listed below are the agenda items for discussion.

A G E N D A

I. Graduate curriculum recommendations

M.Sc. Global Health

- Change in the "Introduction" calendar description
- Change in admission requirements
- *710 – Learning Symposium and Field Orientation - change in course description
- *711 – Scholarly Paper - change in course description
- *712 – Global Health Practicum – new course

M.Sc. Health Sciences Education

- Change in course requirements

II. New program

- M.Sc. Biomedical Discovery and Commercialization

III. Other business

GLOBAL HEALTH PROGRAM PROPOSED CHANGES TO GRADUATE CALENDAR FEB. 2013

Existing	Proposed
<p>McMaster University has established a collaborative international learning experience with Maastricht University, The Netherlands. McMaster and Maastricht will be offering two core courses—Global Health Foundations I and II online by faculty members at both universities. Students from both universities will also join together for the learning symposium/field orientation (service learning) in Term 3. (Calendar page 349)</p>	<p>McMaster University has established a collaborative international learning experience with Maastricht University, The Netherlands. McMaster and Maastricht will be offering two core courses—Global Health Foundations I and II online by faculty members at both universities. Students from both universities will also join together for the learning symposium/field orientation (service learning) in Term 3 at Manipal University in India. Alternatives will be found for students with disabilities or for whom travel to India might cause undue hardship.</p>
<p>Admission Admission to the M.Sc. Global Health program requires an honours bachelor’s degree with at least a B+ from an accredited university (equivalent to a McMaster 8.5 out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. All students entering the program must have completed a university level course in statistical analysis with a minimum grade of B-.</p>	<p>Admission Admission to the M.Sc. Global Health program requires an honours bachelor’s degree with at least a B+ from an accredited university (equivalent to a McMaster 8.5 out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. All students entering the program must have completed a university level course in statistical analysis with a minimum grade of B-.</p>
<p>M.Sc. by Course Work Requirements for the course-based M.Sc. degree include: 1. Completion of the program with at least a B- standing, a minimum of eight graduate half courses which must include the five required courses: GLOB HTH *701, GLOBALST *710, HRM *721, BUS C721, GLOB HTH *702; two courses from the selected field of interest and an additional course from the elective offerings. 2. Successful completion of the learning symposium/field orientation (GLOB HTH *710). 3. Completion of a 15-20 page written scholarly paper on a topic approved by the student’s supervisor (GLOB HTH 711). (Calendar page 353)</p>	<p>M.Sc. by Course Work Requirements for the course-based M.Sc. degree include: 1. Completion of the program with at least a B- standing, a minimum of eight graduate half courses which must include the five required courses: GLOB HTH *701, GLOBALST *710, HRM *721, BUS C721, GLOB HTH *702; two courses from the selected field of interest and an additional course from the elective offerings. 2. Successful completion of the learning symposium/field orientation (GLOB HTH *710). 3. Completion of a 15-20 single-spaced page written scholarly paper on a topic approved by the student’s supervisor (GLOB HTH 711) and a Global Health Practicum (GLOB HTH 712(?)).</p>
<p>*710 / Learning Symposium and Field Orientation All students in the Master of Science in Global Health program are required to complete a Global Health Learning Symposium/Field Orientation, working in an approved public or private organization engaged in the prevention of disease, health promotion, health service delivery, health policymaking, or research in a global context. The placement provides the opportunity to become familiar with the kinds of organizations that put into practice the theory, concepts, and methods taught in the Master’s program. This course will take place through field visits, small group discussions and the presentations of the conclusions from project work undertaken during the placement. After three weeks, students will also present their research findings, in order to receive feedback from peers. (Calendar page 357).</p>	<p>*710 / Learning Symposium and Field Orientation All students in the Master of Science in Global Health program are required to complete a Global Health Learning Symposium/Field Orientation in India. The objective of the course is to consolidate collaboration and decision-making in transcontinental teams. In the Symposium students are required to a present abstracts of their scholarly paper/thesis research project in a real life, peer reviewed environment. It is interactive in nature where the students are challenged to integrate critical feedback from interdisciplinary faculty members and other experts in the global health field.</p> <p>The field orientation is designed to deepen critical thinking and research methods in a real life setting. It provides the opportunity to enhance assessment skills and cross-cultural intuition in a diverse complex setting. The experience includes field visits, small group discussions and final group presentations based on the findings from the field visits.</p> <p>Students unable to participate in the India Global Health Symposium because of disabilities or travel causing them undue hardship will have to fulfill the course requirements locally.</p>

<p>711 / Scholarly Paper (For students in the M.Sc. by Course Work Option)</p> <p>This full course is designed as an opportunity for graduate course-based M.Sc. students to demonstrate in writing, their ability to integrate ideas that reflect current knowledge in Global Health. The scholarly paper is to determine integrative thinking at a general and abstract level. A student will identify a topic, and in consultation, with a faculty member with expertise in the area, develop a proposal that is individualized to the student's area of interest. The student will then develop the paper under the guidance of a faculty member. The paper must be 15 to 20 pages, excluding references and appendices. The paper does not involve the collection or analysis of primary data or the conduct of research with subjects. It is a scholarly essay, not a thesis. It is critical to the course-based M.Sc. students to demonstrate mastery of the theoretical and methodological understandings that have been acquired during the course work.</p>	<p>711 / Scholarly Paper (For students in the M.Sc. by Course Work Option)</p> <p>This half-course is designed as an opportunity for graduate course-based M.Sc. students to demonstrate in writing, their ability to integrate ideas that reflect current knowledge in Global Health. The scholarly paper is to determine integrative thinking at a general and abstract level. A student will identify a topic, and in consultation, with a faculty member with expertise in the area, develop a proposal that is individualized to the student's area of interest. The student will then develop the paper under the guidance of a faculty member. The paper must be 15 to 20 single-spaced pages excluding references and appendices. The paper does not necessarily involve the collection or analysis of primary data or the conduct of research with subjects. It is a scholarly essay, not a thesis. It is critical to the course-based M.Sc. students to demonstrate mastery of the theoretical and methodological understandings that have been acquired during the course work.</p>
	<p>New Course GLOB HT712/Global Health Practicum</p> <p>This half-course is designed to allow the student to tailor learning to a selected practicum in clinical, education, research or administration, which meets their specific educational needs. Students must work with an approved public or private organization working in the field of global health either locally or internationally. The placement links the theory, the concepts, and health research methods taught in the program to real life practices.</p>



SCHOOL OF GRADUATE STUDIES

**RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM
- FOR CHANGE(S) INVOLVING DEGREE PROGRAM REQUIREMENTS /
PROCEDURES**

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** changes involving degree program requirements/procedures. **All** sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT								
NAME OF PROGRAM		MSc Global Health						
PROGRAM DEGREE	Ph.D. ()	M.A. ()	M.A.Sc. ()	M.B.A. ()	M. Eng. ()	M.Sc. (x)	Diploma Program ()	Other (Specify)
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)								
CHANGE IN ADMISSION REQUIREMENTS			CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE			CHANGE IN COURSE REQUIREMENTS		
CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR			x	EXPLAIN: The Global Health Symposium/Field Orientation course takes place in partnership with Manipal University in India.				
OTHER CHANGES	EXPLAIN:							
DESCRIBE THE <u>EXISTING</u> REQUIREMENT/PROCEDURE:								
<p>McMaster University has established a collaborative international learning experience with Maastricht University, The Netherlands. McMaster and Maastricht will be offering two core courses—Global Health Foundations I and II online by faculty members at both universities. Students from both universities will also join together for the learning symposium/field orientation (service learning) in Term 3.</p>								
PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE (Attach additional pages if space is not sufficient.)								
<p>McMaster University has established a collaborative international learning experience with Maastricht University, The Netherlands. McMaster and Maastricht will be offering two core courses—Global Health Foundations I and II online by faculty members at both universities. Students from both universities will also join together for the learning symposium/field orientation (service learning) in Term 3 at Manipal University in India. Alternatives will be found for students with disabilities or for whom travel to India might cause undue hardship.</p>								

RATIONALE FOR THE RECOMMENDED CHANGE:

Manipal University provides an ideal setting for a Global Health Symposium and field orientation.

PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)

September 2013

ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.

No

PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR:

McMaster University has established a collaborative international learning experience with Maastricht University, The Netherlands. McMaster and Maastricht will be offering two core courses—Global Health Foundations I and II online by faculty members at both universities. Students from both universities will also join together for the learning symposium/field orientation (service learning) in Term 3 at Manipal University in India. Alternatives will be found for students with disabilities or for whom travel to India might cause undue hardship.

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Christy Gombay Email: gombayc@mcmaster.ca Extension: 22206 Date submitted: February 2013

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.



**RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM
- FOR CHANGE(S) INVOLVING DEGREE PROGRAM REQUIREMENTS /
PROCEDURES**

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** changes involving degree program requirements/procedures. **All** sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT								
NAME OF PROGRAM		MSc Global Health						
PROGRAM DEGREE	Ph.D. ()	M.A. ()	M.A.Sc. ()	M.B.A. ()	M. Eng. ()	M.Sc. (X)	Diploma Program ()	Other (Specify)
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)								
CHANGE IN ADMISSION REQUIREMENTS			X	CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE			CHANGE IN COURSE REQUIREMENTS	
CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR			EXPLAIN:					
OTHER CHANGES	EXPLAIN:							
DESCRIBE THE <u>EXISTING</u> REQUIREMENT/PROCEDURE:								
<p>Admission Admission to the M.Sc. Global Health program requires an honours bachelor's degree with at least a B+ from an accredited university (equivalent to a McMaster 8.5 out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. All students entering the program must have completed a university level course in statistical analysis with a minimum grade of B-. Students with no background in health may be required to complete a make-up course in health before entering the program. Finally, applicants must have a strong interest in one of the fields offered in the program.</p>								
PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE (Attach additional pages if space is not sufficient.)								
<p>Admission Admission to the M.Sc. Global Health program requires an honours bachelor's degree with at least a B+ from an accredited university (equivalent to a McMaster 8.5 out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. Students with no background in health may be required to complete a make-up course in health before entering the program. Finally, applicants must have a strong interest in one of the fields offered in the program.</p>								

RATIONALE FOR THE RECOMMENDED CHANGE:

To more adequately reflect the interdisciplinary nature of the program we need a more flexible approach to the statistics requirement. During the last two years of the program a number of otherwise ideal candidates have been rejected because they did not meet the current requirements of having completed a statistics course.

PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)

September 2013 (for applicants applying for 2014 entrance)

ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.

No

PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR:

Admission

Admission to the M.Sc. Global Health program requires an honours bachelor's degree with at least a B+ from an accredited university (equivalent to a McMaster 8.5 out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. Students with no background in health may be required to complete a make-up course in health before entering the program. Finally, applicants must have a strong interest in one of the fields offered in the program.

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Christy Gombay Email: gombayc@mcmaster.ca Extension: 22206 Date submitted: Feb 2013

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.



**SCHOOL OF GRADUATE STUDIES
RECOMMENDATION FOR CHANGE IN GRADUATE
CURRICULUM - FOR CHANGE(S) INVOLVING COURSES**

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: espirtu@mcmaster.ca).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM				
COURSE TITLE		Learning Symposium and Field Orientation		
COURSE NUMBER	GLOB HTH 710	COURSE CREDIT		
		FULL COURSE ()	HALF COURSE (X)	QUARTER (MODULE) ()
INSTRUCTOR(S)		Dr. Andrea Baumann and Dr. Christy Gombay		
PREREQUISITE(S)				
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)				
NEW COURSE	<input type="checkbox"/>	DATE TO BE OFFERED:	WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:	
WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES WRITTEN APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.				
CHANGE IN COURSE TITLE	<input type="checkbox"/>	PROVIDE THE NEW COURSE TITLE:		
CHANGE IN COURSE DESCRIPTION	<input checked="" type="checkbox"/>	600-LEVEL COURSE (Undergraduate course for graduate credit) Please see #4 on page 2 of this form		
CHANGE TO FULL COURSE	<input type="checkbox"/>	CHANGE TO HALF COURSE	<input type="checkbox"/>	CHANGE TO QUARTER COURSE
COURSE CANCELLATION	<input type="checkbox"/>	PROVIDE THE REASON FOR COURSE CANCELLATION:		
OTHER CHANGES	<input type="checkbox"/>	EXPLAIN:		
BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description (maximum 6 lines) to be included in the Graduate Calendar.				
<p>All students in the Master of Science in Global Health program are required to complete a Global Health Learning Symposium/Field Orientation in India. The objective of the course is to consolidate collaboration and decision-making in transcontinental teams. In the Symposium students are required to present abstracts of their scholarly paper/thesis research project in a real life, peer reviewed environment. It is interactive in nature where the students are challenged to integrate critical feedback from interdisciplinary faculty members and other experts in the global health field.</p> <p>The field orientation is designed to deepen critical thinking and research methods in a real life setting. It provides the opportunity to enhance assessment skills and cross-cultural intuition in a diverse complex setting. The experience includes field visits, small group discussions and final group presentations based on the findings from the field visits.</p> <p>Students unable to participate in the India Global Health Symposium because of disabilities or travel causing them undue hardship will have to fulfill the course requirements locally. The curriculum expectations including field orientation and grading will be the same.</p>				
CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.				
<p>The current description in the graduate catalogue does not adequately address the objectives of the course. Which have been narrowed to focus on learning in a cross-cultural complex setting of a lower or middle-income country. The alternative setting for the Global Health Learning Symposium and Field Orientation for those students unable to attend the planned one in India focuses on local settings working with marginalized communities in the Hamilton region.</p> <p>*710 / Learning Symposium and Field Orientation</p> <p>All students in the Master of Science in Global Health program are required to complete a Global Health Learning Symposium/Field Orientation, working in an approved public or private organization engaged in the prevention of disease, health promotion, health service delivery, health policymaking, or research in a global context. The placement provides the opportunity to become familiar with the kinds of organizations that put into practice the theory, concepts, and methods taught in the Master's program. This course will take place through field visits, small group discussions and the presentations of the conclusions from project work undertaken during the placement. After three weeks, students will also present their research findings, in order to receive feedback from peers.</p>				

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)

This course synthesizes knowledge gained by students in the three streams of global health and challenges students to present in a written and verbal form during the course. The introduction to field work is designed to test students' knowledge of health research methods. It is a precursor to their own individual research for their scholarly papers or their theses.

2. EXPECTED ENROLMENT:

All students in the MSc of Global Health

3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):

Course materials will consist of lectures, seminars, field site visits, small group work & presentations.

4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION (percentage breakdown, if possible): (For 600-level course, indicate the Extra Work to be required of graduate students, i.e., exams, essays, etc.)

Students will be graded on a pass fail basis.

5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).

No

6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?

PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Christy Gombay Email: gombayc@mcmaster.ca Extension: 22206 Date submitted: February 2013

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/Medy/2012



**SCHOOL OF GRADUATE STUDIES
RECOMMENDATION FOR CHANGE IN GRADUATE
CURRICULUM - FOR CHANGE(S) INVOLVING COURSES**

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: espiritu@mcmaster.ca).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM		MSc Global Health Program		
COURSE TITLE		Scholarly Paper		
COURSE NUMBER	GLOB HTH 711	COURSE CREDIT		
		FULL COURSE ()	HALF COURSE (X)	QUARTER (MODULE) ()
INSTRUCTOR(S)		Dr. Andrea Baumann and Dr. Christy Gombay		
PREREQUISITE(S)				
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)				
NEW COURSE	<input type="checkbox"/>	DATE TO BE OFFERED:	WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:	
WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). NOTE: CROSS-LISTING OF COURSES REQUIRES WRITTEN APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.				
CHANGE IN COURSE TITLE	<input type="checkbox"/>	PROVIDE THE NEW COURSE TITLE:		
CHANGE IN COURSE DESCRIPTION	<input checked="" type="checkbox"/>	600-LEVEL COURSE (Undergraduate course for graduate credit) Please see #4 on page 2 of this form		
CHANGE TO FULL COURSE	<input type="checkbox"/>	CHANGE TO HALF COURSE	<input checked="" type="checkbox"/>	CHANGE TO QUARTER COURSE
COURSE CANCELLATION	<input type="checkbox"/>	PROVIDE THE REASON FOR COURSE CANCELLATION:		
OTHER CHANGES	<input type="checkbox"/>	EXPLAIN:		
BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description (maximum 6 lines) to be included in the Graduate Calendar.				
711 / Scholarly Paper (For students in the M.Sc. by Course Work Option) This half- course is designed as an opportunity for graduate course-based M.Sc. students to demonstrate in writing, their ability to integrate ideas that reflect current knowledge in Global Health. The scholarly paper is to determine integrative thinking at a general and abstract level. A student will identify a topic, and in consultation, with a faculty member with expertise in the area, develop a proposal that is individualized to the student's area of interest. The student will then develop the paper under the guidance of a faculty member. The paper must be 15 to 20 single-space pages excluding references and appendices. The paper does not necessarily involve the collection or analysis of primary data or the conduct of research with subjects. It is a scholarly essay, not a thesis. It is critical to the course-based M.Sc. students to demonstrate mastery of the theoretical and methodological understandings that have been acquired during the course work.				
CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.				
Existing Description: 711 / Scholarly Paper (For students in the M.Sc. by Course Work Option) This full course is designed as an opportunity for graduate course-based M.Sc. students to demonstrate in writing, their ability to integrate ideas that reflect current knowledge in Global Health. The scholarly paper is to determine integrative thinking at a general and abstract level. A student will identify a topic, and in consultation, with a faculty member with expertise in the area, develop a proposal that is individualized to the student's area of interest. The student will then develop the paper under the guidance of a faculty member. The paper must be 15 to 20 pages, excluding references and appendices. The paper does not involve the collection or analysis of primary data or the conduct of research with subjects. It is a scholarly essay, not a thesis. It is critical to the course-based M.Sc. students to demonstrate mastery of the theoretical and methodological understandings that have been acquired during the course work.				
Proposed course changes are: 1. Changed from full course to half course. 2. Clarifying page length 15-20 single-spaced pages..... 3. adding the word 'necessarily' to the sentence 'The paper does not involve....'				

<p>1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)</p> <p>The course provides an opportunity for students to demonstrate that they have understood the constituent elements of global health and are able to express them in a written academic format.</p>
<p>2. EXPECTED ENROLMENT:</p> <p>All those students in the Global Health program who are not doing theses - approximately 90% of those enrolled to date.</p>
<p>3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):</p> <p>Self-directed learning of students supervised by faculty of the Global Health program</p>
<p>4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION (percentage breakdown, if possible): (For 600-level course, indicate the <u>Extra Work</u> to be required of graduate students, i.e., exams, essays, etc.)</p> <p>Evaluation of scholarly papers is done on a pass/fail basis</p>
<p>5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).</p> <p>No</p>
<p>6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?</p>
<p>PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:</p> <p>Name: Christy Gombay Email: gombayc@mcmaster.ca Extension: 22206 Date submitted: February 2013</p>

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/Medy/2012



SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING COURSES

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** course changes. All sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: espiritu@mcmaster.ca).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT/PROGRAM				
COURSE TITLE		Global Health Practicum		
COURSE NUMBER	GLOB HTH 712	COURSE CREDIT		
		FULL COURSE ()	HALF COURSE (X)	QUARTER (MODULE) ()
INSTRUCTOR(S)		Dr. Andrea Baumann and Dr. Christy Gombay		
PREREQUISITE(S)				

NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)

NEW COURSE	<input checked="" type="checkbox"/>	DATE TO BE OFFERED: May 2014	WAS THE PROPOSED COURSE OFFERED ON DEAN'S APPROVAL? IF YES, PROVIDE THE DATE:
-------------------	-------------------------------------	--	---

WILL THE COURSE BE CROSS-LISTED WITH ANOTHER DEPARTMENT? NO IF YES, ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S). **NOTE:** CROSS-LISTING OF COURSES REQUIRES WRITTEN APPROVAL FROM EACH DEPARTMENT AND FACULTY CONCERNED.

CHANGE IN COURSE TITLE		PROVIDE THE NEW COURSE TITLE: Global Health Practicum
-------------------------------	--	---

CHANGE IN COURSE DESCRIPTION		600-LEVEL COURSE (Undergraduate course for graduate credit) Please see #4 on page 2 of this form	
CHANGE TO FULL COURSE		CHANGE TO HALF COURSE	CHANGE TO QUARTER COURSE

COURSE CANCELLATION		PROVIDE THE REASON FOR COURSE CANCELLATION:
----------------------------	--	--

OTHER CHANGES		EXPLAIN:
----------------------	--	-----------------

BRIEF DESCRIPTION FOR CALENDAR - Provide a brief description (maximum 6 lines) to be included in the Graduate Calendar.

This half-course is designed to allow the student to tailor learning to a selected practicum in clinical, education, research or administration, which meets their specific educational needs. Students must work with an approved public or private organization working in the field of global health either locally or internationally. The placement links the theory, the concepts, and health research methods taught in the program to real life practices.

CONTENT/RATIONALE - Provide a brief description, i.e., outline the topics or major sub-topics, and indicate the principal texts to be used.

For non-thesis students, the Global Health practicum provides an opportunity to consolidate the learning acquired during the program and apply this knowledge in real world contexts. While some students may elect to complete practicums in a lower to middle-income country, many more will elect to complete this course in a local/regional setting working with marginalized communities.

1. STATEMENT OF PURPOSE (How does the course fit into the department's program?)

This half-course promotes self-directed learning under the supervision of global health faculty at McMaster University. Students in the sub-fields of globalization and development, global diseases, and global health management will be encouraged to deepen their knowledge in their particular area of interest.

2. EXPECTED ENROLMENT:

All students in the course-based MSc of Global Health program

3. DESCRIBE IN DETAIL THE METHOD OF PRESENTATION OF COURSE MATERIAL (i.e., lectures, seminars):

Not applicable.

4. DESCRIBE IN DETAIL THE METHOD OF EVALUATION (percentage breakdown, if possible): (For 600-level course, indicate the Extra Work to be required of graduate students, i.e., exams, essays, etc.)

Students will submit a final report on their GH practicum and be graded on a pass/fail basis.

5. TO PREVENT OVERLAP, IS A COURSE IN THE SAME OR A RELATED AREA OFFERED IN ANOTHER DEPARTMENT? IF YES, PLEASE ATTACH TO THIS FORM ANY RELEVANT CORRESPONDENCE WITH THE OTHER DEPARTMENT(S).

No

6. IF THE COURSE IS INTENDED PRIMARILY FOR STUDENTS OUTSIDE YOUR DEPARTMENT, DO YOU HAVE THE SUPPORT OF THE DEPARTMENT/PROGRAM CONCERNED?

PLEASE PROVIDE THE CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Christy Gombay Email: gombayc@mcmaster.ca Extension: 22206 Date submitted: February 2013

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

SGS/Medy/2012



**RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM
- FOR CHANGE(S) INVOLVING DEGREE PROGRAM REQUIREMENTS /
PROCEDURES**

PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** changes involving degree program requirements/procedures. **All** sections of this form **must** be completed.
2. An electronic version of this form must be emailed to the Assistant Secretary and SynApps System Administrator (Email: *espiritu@mcmaster.ca*).
3. A representative from the department is required to attend the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT		Health Science						
NAME OF PROGRAM		Master of Science in Health Sciences Education						
PROGRAM DEGREE	Ph.D. ()	M.A. ()	M.A.Sc. ()	M.B.A. ()	M. Eng. ()	M.Sc. (X)	Diploma Program ()	Other (Specify)
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)								
CHANGE IN ADMISSION REQUIREMENTS			CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE			CHANGE IN COURSE REQUIREMENTS		x
CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR			EXPLAIN:					
OTHER CHANGES	x	EXPLAIN: Students must demonstrate basic competency in statistics before completing the program.						
DESCRIBE THE <u>EXISTING</u> REQUIREMENT/PROCEDURE:								
<p>Students enrolled in the Master of Science in Health Sciences Education Program are not required to demonstrate competency in statistics. As it was anticipated that only a small minority of students would choose a research (i.e. Thesis) stream, statistics was not a formal course requirement. However, our experience is that almost half of the students have indicated interest in pursuing primary research through the Thesis stream. Likewise, we feel that as the nature of Health Sciences Education requires active engagement with studies using quantitative methods via the literature. Therefore, all students could benefit from a demonstrated understanding of statistical methods.</p>								
PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE (Attach additional pages if space is not sufficient.)								
<p>Students will be required to pass a basic statistics competency examination prior to completing the program. In the the competency examination the student will be required to demonstrate basic interpretation of statistical tests, and basic knowledge of appropriate use of different statistical tests. Examinations will be offered during the residency periods. While no formal statistic course will be required, students will be given support for examination preparation through directed readings and online modules. Both the readings and the modules will be delivered through the Avenue website. Should students choose to take a formal statistics course this will be in addition to any program requirements. A faculty member within the program will support students' statistics learning through office hours, message boards on Avenue, and email.</p>								

RATIONALE FOR THE RECOMMENDED CHANGE:

Students can benefit from demonstrated knowledge of statistics in pursuing a career in health sciences education. This is especially true, as numerous students have indicated interest in pursuing primary research/thesis.

PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)

September 2013

ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.

Students have been made aware of this expectation and it has been passed through the HSED Curriculum Committee.

PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR:

Students will be required to pass a basic statistics competency examination prior to completion of the program. This examination will require students to demonstrate basic interpretation of common statistical tests, and basic knowledge of when to use different tests. Students will be given support in preparation for the examination through optional directed readings and web-based modules/presentations. The examination can be written during one of the residency periods.

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Kelly Dore

Email: dore@mcmaster.ca

Extension: 22956

Date submitted: March 1st, 2013

If you have any questions regarding this form, please contact Medy Espiritu, Assistant Secretary and SynApps System Administrator, School of Graduate Studies, extension 24204.

McMASTER UNIVERSITY PROGRAM PROPOSAL BRIEF FOR THE
PROGRAMS

HONOURS BACHELOR OF HEALTH SCIENCES and
MASTER OF SCIENCE
IN BIOMEDICAL DISCOVERY AND COMMERCIALIZATION

March 7, 2013

CONTENTS

1.	PROGRAM	
1.1	Consistency of program with University's mission and academic plan	3
1.2	Clarity and appropriateness of program requirements and learning outcomes in meeting University's Degree Level Expectations	4
1.3	Appropriateness of degree nomenclature	7
2.	ADMISSION REQUIREMENTS	
2.1	Appropriateness of program's admission requirements for the learning outcomes established for completion of program	7
2.2	Alternative requirements for admission into the program	8
3.	STRUCTURE	
3.1	Administrative, governance and communication processes	8
3.2	Appropriateness of program's structure and regulations to meet specified program learning outcomes and Degree Level Expectations	9
3.3	Rationale for program length	10
4.	PROGRAM CONTENT	
4.1	How curriculum addresses the current state of the discipline or area of study	10
4.2	Unique curriculum or program innovations or creative components	10
4.3	Nature and suitability of major research requirements	11
4.4	Appropriateness of the courses for graduate level degrees	12
5.	MODE OF DELIVERY	
5.1	Appropriateness of proposed mode(s) of delivery to meet program learning outcomes and Degree Level Expectations and availability of necessary physical resources	12
6.	ASSESSMENT OF TEACHING AND LEARNING	
6.1	Appropriateness of proposed methods for instruction and assessment of student achievement for intended Program Learning Outcomes	12
6.2	Plans for documenting and demonstrating the level of performance of students	13
7.	RESOURCES FOR ALL PROGRAMS	
7.1	Administrative unit's planned utilization of existing human, physical and financial resources and any institutional commitment to supplement the resources	13
7.2	Participation of a sufficient number and quality of faculty who are competent to teach and/or supervise in the program	15
7.3	Evidence of adequate resources to sustain the quality of scholarship produced	16
8.	RESOURCES FOR UNDERGRADUATE AND GRADUATE PROGRAMS	
8.1	Plans for adequate numbers of faculty and staff to achieve program's goals	16
8.2	Plans to provide the necessary resources in step with the program's implementation	16
8.3	Planned/anticipated class size	17
8.4	Provision and supervision of experiential learning opportunities	17
8.5	Role of adjunct and sessional faculty	18
9.	QUALITY AND OTHER INDICATORS	
9.1	Definition and use of indicators that provide evidence of quality of the faculty	18
9.2	Evidence of a program structure and faculty research that will ensure the intellectual quality of the student experience	19
10.	CONSULTATION PROCESS	
10.1	Description of the consultation process undertaken during the development of the proposal	20

APPENDICES

Appendix A: Summary of the association of program learning outcomes with undergraduate degree level expectations

Appendix B: Summary of the association of program learning outcomes with graduate degree level expectations

Appendix C: Course descriptions for the BDC program

Appendix D: Summary of existing programs that combine business and biochemistry/biotechnology

Appendix E: List of attendees at the one-day stakeholders workshop on October 5, 2011

Appendix F: List of ad-hoc program development committee members

Appendix G: Letters of support

1. PROGRAM

The Biomedical Discovery and Commercialization (BDC) program will be a multidisciplinary training program, concentrated in the biomedical sciences that will produce graduates with the combined strengths of discovery research skills and business acumen. An important goal of the BDC program is the exposure of students to business curriculum in the DeGroote School of Business to complement a strong foundation in the biomedical sciences obtained in the Faculty of Health Sciences. Further, the program seeks to make strong connections with the health research business community in order to provide internships and community mentors for its trainees. With this unique combination of skills and knowledge, BDC graduates will be well positioned for employment in the biotechnology, pharmaceutical and other biomedical science sectors of the economy. Likewise they will be equipped to pursue further studies in, for example, graduate studies in research, Master of Business Administration, Law or Medicine.

The proposed format of the BDC program is a '4+1' Bachelor plus Master program. It will comprise a four-year undergraduate Bachelor's degree that begins in level III, followed by a fifth year Master's degree. Candidates who successfully graduate from the four-year undergraduate BDC program may then choose to apply for admission to the one-year non-thesis, course-based Master's program. Upon successful completion of each of the degree requirements, candidates will have graduated with a Bachelor of Health Sciences degree in BDC and subsequently a Master of Science degree in BDC. This document presents a combined proposal for the two degree programs and as such is being submitted to both Undergraduate Council and Graduate Council for approval.

1.1 Consistency of program with University's mission and academic plan

The Department of Biochemistry and Biomedical Sciences is an accomplished, nonclinical, research-intensive department in the Faculty of Health Sciences. The Department was founded in 1967 and since that time has offered undergraduate and graduate programs leading to Bachelor of Science (B.Sc.), Master of Science (M.Sc.) and Doctor of Philosophy (Ph.D.) degrees. Our faculty members are appointed to the Faculty of Health Sciences and our graduate degrees are awarded through the Faculty of Health Sciences, while our undergraduate degrees are awarded through the Faculty of Science. The Department has been running a sizeable undergraduate program for more than 45 years, and we currently have more than 120 graduate students enrolled in our graduate programs. We have a strong track record in discovery research and have established cutting-edge educational offerings at both the undergraduate and graduate levels that integrate research and education. Inquiry-based learning approaches emphasize transferable skills in the biomedical sciences, including oral and written communication, problem-solving, critical thinking, and the acquisition of important and practical laboratory and research skills. The undergraduate program is further underpinned by a cooperative education option with a high degree of success in work placements.

Likewise, the DeGroote School of Business is recognized as an international leader in innovative approaches to teaching, learning and service to the business community. The School provides a full range of business education opportunities. Through its mission of excellence in management research, education and professional service, structured within an experiential learning environment, it has achieved international stature. The DeGroote School of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB) International. AACSB International is arguably the most recognized business school accreditation body around the world. Less than 5% of Schools of Business worldwide have earned this accreditation of excellence in management education.

The new BDC program will offer an alternative and unique point of entry for students from level II Health Sciences and Life Sciences programs, attracting students with an aptitude for the basic sciences and strong interest in health, drug discovery and business. The BDC program will draw on the

existing strength, expertise and a culture of excellence in research and education in the Department of Biochemistry and Biomedical Sciences, emphasizing leading-edge pedagogy and integrating research and education. Further, the program will provide opportunities for students to learn from thought-leaders in commerce at McMaster and business leaders in the community. Indeed, the BDC program will take new and unprecedented steps to engage the commercial health research sector of southern Ontario to facilitate experiential learning in the community (e.g., pharmaceutical, biotechnology and investment companies). The attributes and goals of the BDC program are thus aligned with the University's mission, academic plan and President Deane's letter to the McMaster community, *Forward with Integrity*:

- to excel in teaching, research and scholarship, with a commitment to creativity, innovation and excellence in our undergraduate offerings (*University Mission Statement*, http://www.mcmaster.ca/univsec/reports_lists/mission.cfm)
- to link teaching and scholarship (*McMaster University Academic Plan*, <http://www.mcmaster.ca/newsevents/acadplan.htm>)
- to impart technical and professional skills that will permit our graduates a range of career choices (*McMaster University Academic Plan*, <http://www.mcmaster.ca/newsevents/acadplan.htm>)
- to improve the student experience through experiential and self-directed learning, and to serve the community (*Forward with Integrity*, <http://www.mcmaster.ca/presidentsoffice/fwi.html>)

1.2 Clarity and appropriateness of program requirements and learning outcomes in meeting University's Degree Level Expectations

Program learning outcomes

The program learning outcomes for the BDC program were developed in a highly consultative process that included substantive consultation and brainstorming sessions with stakeholders from both academia and the private sector (please refer to Section 10 for details). The following learning outcomes characterize the consensus that emerged from these discussions.

B.H.Sc. degree

Upon completion of the undergraduate program, graduates will be able to:

1. Apply their basic knowledge of the process of drug development, manufacturing and marketing to function effectively in the biotechnology, pharmaceutical and other biomedical science sectors of the economy.
2. Contribute to research and development of new commercial products and pharmaceutical therapies using their understanding of drug targets, diseases, protein/gene structure and function.
3. Undertake laboratory research using sound research practices and methodologies.
4. Critically analyse the primary literature, case studies, and theory to propose innovative solutions to scientific and business problems.
5. Communicate clearly, both verbally and in writing, utilising various formats to benefit both academia and industry.
6. Function as effective collaborative team members in a variety of roles in cross-disciplinary teams.
7. Apply knowledge of commercial development and biomedical research in experiential learning

- opportunities within industry and academia.
8. Pursue career and lifelong learning opportunities related to biomedical science.

M.Sc. degree

In addition to the above program learning outcomes, upon completion of the graduate program, graduates will be able to:

1. Integrate theoretical concepts and synthesize knowledge from various disciplines to develop an original commercial product for the market.
2. Manage a research project, set goals and priorities within a team.
3. Analyze data, make critical interpretations and place these findings into context with the published scientific literature in the development of a new product.
4. Communicate clearly and lead effectively to maximize potential opportunities within and outside of academia.
5. Undertake biomedical discovery while being mindful of its scientific, commercial, ethical, political and social contexts and implications.
6. Demonstrate evidence of entrepreneurial and leadership skills.

The learning outcomes identified for these programs resonate strongly with a commentary published in the journal *Biochemistry and Molecular Biology Education* that states "...our [Biochemistry] students need to appreciate the amount of capital needed to commercialize a scientific discovery. As informed, scientifically literate citizens, they should appreciate the cost of discovery and commercialization of new pharmaceuticals for both rare and common diseases."

(<http://www.kgi.edu/Documents/BusinessBio%20bambed.pdf>)

Overview of the program requirements

In level III, students will obtain inquiry style exposure to real world efforts in drug discovery and development through an introduction to the principles of discovery research in BDC 3A03 (Road to Biomedical Discovery) and the application of these principles to drug discovery in BDC 3B06 (Biotechnology and Drug Discovery). For example, in BDC 3B06, students will be required to gather and review current studies of drug therapies and use this information to develop creative and sound new treatments based on the scientific literature, and communicate their findings to their peers and experts. Students will concurrently acquire some of the technical skills discussed in these two theoretical courses in BDC 3C09 (Research Skills Laboratory and Inquiry). The latter course is experiential in nature, as the techniques will be applied in the context of mini-laboratory projects that mimic actual primary research, rather than being presented as a series of disconnected techniques. Students will also gain their first introduction to the business aspects of the industry through COMMERCE 2BA3 (Organizational Behaviour) and COMMERCE 3MD3 (Introduction to Contemporary Applied Marketing).

In level IV, the program draws additional courses from the DeGroote School of Business with COMMERCE 4AK3 (Accounting Information for Decision Making) and COMMERCE 4FW3 (Finance for Entrepreneurs) to round out student exposure to key areas of business. Students will also have access to four additional commerce courses as electives, COMMERCE 4KH3 (Management Issues in Electronic Business), COMMERCE 4MC3 (New Product Marketing), COMMERCE 4AP3 (Business Policy: Strategic Management), and COMMERCE 4QA3 (Operations Modelling and Analysis). This capstone year will culminate with a senior thesis in BDC 4A15 (Senior Research Thesis) in which students will have first-hand exposure to discovery research when they undertake their own original independent research project under the supervision of a faculty member in the Department of Biochemistry and Biomedical Sciences. Ultimately, the senior research thesis will foster creative and critical thinking in primary research through a close oversight of each student's

research path by the supervisor and the examining committee. Students will participate in the experimental design and goal setting throughout the thesis experience. Finally, level IV of the program will be especially flexible to facilitate student-centered exploration of additional elements of drug discovery, clinical biochemistry, immunology, pharmacology, epidemiology, clinical research, intellectual property, quality control and quality assurance, clinical trials, research ethics, regulatory affairs, public health, or commerce in BDC 403 (Current Topics in Biomedical Discovery and Commercialization) by subscribing to two modules (each module is 6 weeks in duration – equivalent to half of the term) that suit their interests. This degree requirement will contribute to the breadth of knowledge acquired through the program as students develop an understanding of the major fields in the discipline, as well as the ability to apply learning from areas outside of the discipline.

During the one-year Master’s program, students will build upon the skills and knowledge acquired in the undergraduate program. The first semester of the Master’s program includes BDC 701 (Team Project) which integrates the business and science of the development of a novel commercial product, and is complemented by two business courses that are offered through the MBA program in the DeGroote School of Business: BUSINESS B748 (Entrepreneurship from a Diverse University Base), and a choice of BUSINESS B730 (Strategic Management of Technology) or BUSINESS C727 (Pharma/Biotech Business Issues). During the second semester, students will complete an internship in a related field (BDC 702) (for example, a placement in clinical trials or pharmaceutical marketing) with co-supervision from a faculty member of the Department. The Master’s concludes with the culminating task of a scholarly paper (BDC 703) that demands a rigorous synthesis of the student’s experiential and in-course learning, under the guidance and supervision of a member of the Department. While it is not required, the scholarly paper may be submitted for publication to an appropriate journal.

An overview of the program is shown in Table 1 below. Descriptions of the courses are included in **Appendix C**.

Table 1: Biomedical Discovery and Commercialization Programs

Level	Courses	Units
III	BDC 3A03 (Road to Biomedical Discovery) BDC 3B06 (Drug Discovery and Development) BDC 3C09 (Research Skills Laboratory and Inquiry) COMMERCE 2BA3 (Organizational Behaviour) COMMERCE 3MD3 (Introduction to Contemporary Applied Marketing) *BIOCHEMISTRY 3G03 (Nucleic Acids and Proteins) if BIOCHEMISTRY 2B03 and 2BB3 not completed Elective(s)	3 units 6 units 9 units 3 units 3 units 0-3 units 3-6 units
IV	COMMERCE 4AK3 (Accounting Information for Decision Making) COMMERCE 4FW3 (Finance for Entrepreneurs) BDC 4A15 (Senior Research Thesis) BDC 4B03 (Current Topics in Biomedical Discovery and Commercialization) Elective(s)	3 units 3 units 15 units 3-6 units 3-6 units
Master’s	BDC 701 (Team Project) BDC 702 (Community Internship) BDC 703 (Scholarly Paper) BUSINESS B748 (Entrepreneurship from a Diverse University Base) BUSINESS B730 (Strategic Management of Technology) or BUSINESS C727 (Pharma/Biotech Business Issues)	1 course 1 course 1 course 1/2 course 1/2 course

* Candidates who have not completed BIOCHEMISTRY 2B03 (Nucleic Acid Structure and

Function) and BIOCHEMISTRY 2BB3 (Protein Structure and Enzyme Function) prior to entering the BDC Program, will be required take BIOCHEMISTRY 3G03 (Proteins and Nucleic Acids) in level III (in place of 3 units of electives).

The tables in **Appendix A** and **Appendix B** show the association of the program learning outcomes with the undergraduate degree level expectations (<http://cill.mcmaster.ca/COU/degree/undergraduate.html>) and graduate degree level expectations (<http://cill.mcmaster.ca/COU/degree/graduate.html>), respectively.

1.3 Appropriateness of degree nomenclature

The degree nomenclature was commensurate with the primary focus and content of each degree.

The primary interactions of students in the undergraduate BDC program will take place with faculty members in the Faculty of Health Sciences with a focus on biomedical research. The B.H.Sc. degree in Biomedical Discovery and Commercialization is a four year Honours Program grounded in Program Learning Outcomes that were designed to meet the Undergraduate Degree Level Expectations.

Most Master level programs in the Faculty of Health Sciences are designated as Master's of Science, and the focus and content of this degree is consistent with these. The M.Sc. degree in Biomedical Discovery and Commercialization is a one-year course-based Master's designed to meet the Graduate Degree Level Expectations through the Team Project and Scholarly Paper.

The program name *Biomedical Discovery and Commercialization* encompasses the two key components of the training program to prepare graduates for direct entry into the workforce: 1) to prepare students with the scientific and technical knowledge and understanding that underlies breakthrough discoveries in the biomedical sciences, and 2) to educate students with business fundamentals. Perhaps, foremost, the degree nomenclature implies one of the most important features of the program – that is, the integration of business and science.

2. ADMISSION REQUIREMENTS

2.1 Appropriateness of program's admission requirements for the learning outcomes established for completion of program

Culture and philosophy

The aim of the BDC program is to offer rigorous leading-edge training designed for students who desire a rich, scholarly experience that an internationally competitive research-intensive institution can provide. McMaster is at the forefront of scientific discovery, yielding dramatic discoveries that uncover the inner workings of biological systems and that hold great promise for understanding the nature of human diseases. This program, in particular, seeks out exceptional individuals with a capacity for translating basic research into commercial enterprise. Students will receive a strong foundation in modern biomedical science and commercialization through an integrated program of laboratory research, group projects, business courses and an internship placement.

B.H.Sc. degree

Selection will be based on academic achievement, a written statement of interest and an interview but requires, as a minimum, submission of an on-line application by the stated deadline, completion of any Level II program with a Cumulative Average of at least B (equivalent to a McMaster 8.0 GPA out of 12) and completion of both CHEMISTRY 2OA3 and 2OB3 (or both CHEMICAL BIOLOGY 2OA3 and 2OB3).

The prerequisites imply that the vast majority of applicants will apply from the Faculty of Health Sciences or the Faculty of Science and have strong foundational knowledge in the basic sciences or health sciences that underpin drug discovery. Successful applicants will likewise be business-minded with an ability to work collaboratively in both small groups and large groups, and with individuals from diverse backgrounds in order to meet the Program Learning Outcomes.

M.Sc. degree

Admission to the M.Sc. program is not automatic. Applicants must submit an application to the School of Graduate Studies following the online application guidelines and submission deadlines. Admission to the M.Sc. program will require, at minimum, a cumulative average of B+ (equivalent to a McMaster 8.5 GPA out of 12) from the undergraduate BDC program and will be based on a written statement of interest and an interview. Successful applicants must also meet all School of Graduate Studies admission requirements as stated in the Graduate Calendar (http://digitalcommons.mcmaster.ca/sgs_cal/10/).

Students in the BDC Master's program are expected to show, over the course of study, evidence of scholarly accomplishments, excellent communication in writing and in oral presentation, and novel contributions to their research project. To the best of our ability, we will assess the candidate's application package to identify those candidates who we feel will meet and/or exceed these expectations. Admission will be offered to qualified B.H.Sc. graduates from the undergraduate BDC program. Any unused slots will be filled from outside applicants who qualify.

2.2 Alternative requirements for admission into the program

B.H.Sc. degree

In exceptional cases, there may be students from faculties outside of Health Sciences and Science with these prerequisites and aptitudes, and with a strong interest in the program. The BDC program will be an inclusive and open one that will evaluate such applications on a case-by-case basis. This approach will be facilitated by evaluation of statements of interest and interviews with short-listed applicants.

M.Sc. degree

Applicants who have not completed the undergraduate BDC program may apply and will be considered for admission if they have completed the equivalent of the required undergraduate courses for the BDC program in levels III and IV from another program/institution (please refer to the program requirements in Table 1). Again, these applications will be evaluated on a case-by-case basis.

3. STRUCTURE

3.1 Administrative, governance and communication processes

The BDC program will be administered by the Department of Biochemistry and Biomedical Sciences in the Faculty of Health Sciences. The curriculum and program will be overseen by the Associate Chair, Undergraduate Studies and the Associate Chair, Graduate Studies. A Program Director (contractually-limited faculty appointment) will be hired to teach and provide community outreach leadership in the program. In the latter function, this individual will liaise and coordinate with leaders in the health research business community who will teach and supervise interns in the Master's program. The Program Director will report to the Chair of the Department and work in collaboration with the respective Associate Chairs of Undergraduate Studies and Graduate Studies. Three new contractually-limited appointment faculty will be hired to teach and carry out research in discovery

science and supervise/train many of the new graduate students associated with this program. A Program Coordinator (staff member) will be hired to oversee the administration of the program and will function as the primary administrative contact for admissions, calendar changes, degree audits, in addition to the coordination and support of teaching by mentors from industry. Two administrative assistants will be hired to provide front-line assistance to students, faculty, the Coordinator and the Director for each portion of the program (undergraduate and graduate). Finally, a lab technician will be hired to oversee the teaching labs and provide support for the laboratory course (BDC 3C09). All communications related to the program will originate from the Program Coordinator, Program Director or the Associate Chairs.

Program and course changes are first approved by the Undergraduate and Graduate Curriculum Committees in the Department of Biochemistry and Biomedical Sciences, which are chaired by the respective Associate Chairs, and then presented to the Department for approval. Subsequent approvals are sought from the Health Sciences Education Committee, the Graduate Policy and Curriculum Council and the Faculty Executive, the governing committees that oversee all education programs in the Faculty of Health Sciences. Changes relating to the DeGroote School of Business will be presented for approval to the School's Undergraduate Curriculum and Policy Committee, the Graduate Curriculum and Policy Committee and the Faculty Executive of Business. Undergraduate Council approval will be sought for final approvals of the B.H.Sc. components, while Graduate Council approval will be sought for final approvals of the Master's components.

3.2 Appropriateness of program's structure and regulations to meet specified program learning outcomes and Degree Level Expectations

The Program Director will be primarily responsible for overseeing the BDC program. This person will work closely in collaboration with the Associate Chair of Undergraduate Studies and the Associate Chair of Graduate Studies who meet annually with their respective Curriculum Committees to assess the programs, courses and enrollments. Both Chairs have open door policies and are tuned in to the needs of the students, graduates, teaching assistants and faculty. Based on feedback, the curriculum and/or the level of support and guidance will be routinely adjusted to meet the needs of the students, teaching assistants, faculty and the learning objectives of the program. In conjunction with the Program Director, the Associate Chairs will be responsible for preparation of the documentation required for the cyclic IQAP reviews.

The Associate Dean (Academic) in the DeGroote School of Business will work closely with the Associate Chairs in the Department of Biochemistry and Biomedical Sciences in monitoring the progress of the BDC students as they proceed through the program and the Commerce courses. The curriculum will be overseen carefully and adjusted appropriately to ensure that the needs of the students are met. Representatives from the DeGroote School of Business will be invited to attend Curriculum Committee meetings when matters concerning the BDC program are discussed.

Student progress will be reviewed at the end of each term by the Program Coordinator and Director. Students in the B.H.Sc. program who fail to maintain a minimum grade of B in each of the required program courses will be invited to meet with the Program Director to discuss areas of weakness and suggest remedial strategies. Students must successfully complete all required BDC courses in level III in order to advance to level IV.

Students registered in the M.Sc. program will be required to meet with the Program Director at the end of each term to review the learning objectives and set new goals for the upcoming term that will align with the Program Learning Outcomes.

3.3 Rationale for program length

B.H.Sc. Degree

The duration of the undergraduate BDC program is in accordance with the traditional four-year Honours program.

M.Sc. Degree

The Master of Science in BDC program is a one-year non-thesis course of study where students complete the required course work during the Fall term, a community internship during the Winter term, and scholarly paper during the Spring/Summer term.

4. PROGRAM CONTENT

4.1 How curriculum addresses the current state of the discipline or area of study

The pharmaceutical and health biotechnology sectors are very significant contributors to the Canadian economy and are poised for considerable growth. Indeed, these areas represent a rapidly advancing industry worldwide and are targets of the innovation agendas of the federal, provincial and municipal governments in Canada. Related opportunities in associated health policy and regulatory elements of government are likewise predicted to grow.

In Ontario, there is a particular concentration of commercially-oriented pharmaceutical companies, including research-based and generic drug makers, with a focus on areas related to drug discovery, drug development, medical and regulatory affairs, intellectual property, technical sales and marketing. Furthermore, there is a growing cohort of early and mid-stage biotechnology companies with high prospects to emerge as flagships of a knowledge-based health technology economy. These sectors and the associated health policy and regulatory arms of government require employees with strong multi-disciplinary credentials in the biomedical sciences and commerce.

While strong training in either basic biomedical sciences or in business has been the traditional path for career success in these fields, there is an unmet need for graduates with cross-disciplinary training in these areas. Our survey of training programs in Ontario, Canada and North America reveals that there is a unique opportunity to provide such training in preparation for a career in the health sciences industry and health policy sectors of the economy. (See **Appendix D** for a list of existing related programs.)

4.2 Unique curriculum or program innovations or creative components

Unlike traditional basic science programs, adjunct faculty will figure prominently in the BDC program. Adjunct faculty will ostensibly participate in the fourth year topics course (BDC 4B03) and at the Master's level through a team project course (BDC 701) and a community internship (BDC 702). These thought-leaders will hail from diverse elements of the health business and government sectors including areas of biotechnology, pharmaceutical, venture capital, regulatory affairs, intellectual property and medicine, providing a rich environment for student-focused learning.

Unlike other combined business and science programs, where students are enrolled in existing business courses, the DeGroote School of Business will mount separate sections of the Commerce courses for BDC students in order to tailor the content, examples and cases in order to make the applications relevant to the field.

Furthermore, this unique program will benefit from strong existing links between the Department of Biochemistry and Biomedical Sciences and outstanding research institutes in the Faculty of Health Sciences as well as commercialization facilities located at McMaster. These include the Institute for Infectious Disease Research, McMaster Immunology Research Centre, Stem Cell and Cancer Research Institute, Farncombe Family Digestive Health Research Institute, McMaster Industry Liaison Office and the McMaster Innovation Park.

In the first semester of the Master's program, we envision a team project (BDC 701 Team Project) where students will work in small teams leveraging their training and developing career interests to develop new technology in a discovery research laboratory or to create business plans and an entrepreneurial pitch for a new venture in biomedicine. Indeed, we see students self-identifying for one of two kinds of experiences. This first will be fashioned after iGEM, a yearly world-wide competition known as International Genetically Engineered Machine, where teams of university students are charged with creating simple biological machines from iGEM's Registry of Standard Biological Parts. The second will be a team effort toward an entrepreneurial pitch for a new venture in biomedicine that encompasses cutting edge science and sound business strategy and will culminate in a presentation to members of the local venture community. The presentation will be akin to the popular television series 'Dragon's Den', and will include submission of a written business plan.

4.3 Nature and suitability of major research requirements

B.H.Sc. Degree

The undergraduate BDC program requires completion of a 15 unit laboratory research thesis under the supervision of a researcher affiliated with the Department of Biochemistry and Biomedical Sciences. This research thesis comprises a major component of the fourth year curriculum, and will be conducted over the course of the Fall and Winter semesters. Requirements for the thesis course include: 1) a research proposal for the work that they expect to conduct, 2) an extensive review of the relevant literature, 3) reviewing and setting goals in collaboration with the supervisor on a regular basis (at minimum on a monthly basis), 4) communication of the proposed project and progress-to-date in a formal presentation at the end of the first term to supervisor, examining committee and peers, 5) formative evaluation from the supervisor at the end of the first term with a formal response from the student, 6) thesis defense at the end of the second term, and 7) submission of a final written thesis report.

M.Sc. Degree

The Master of BDC program is a course-based Master's which culminates with the completion of a scholarly paper (BDC 703) which integrates the theoretical constructs from the coursework (BDC courses and BUSINESS courses) with experiential learning opportunities obtained through the community internship (BDC 702). Upon completion of the first two semesters of the Master's program, each student will have obtained an individual learning experience that is unique to them. The specific product conceived, produced and marketed through the Team Project in combination with the specific nature of their community internship placement (for example, marketing vs. clinical trials) will provide an opportunity for creative exploration of Biomedical Research and Commercialization. Students will formulate a thesis for their scholarly paper in consultation with their Scholarly Paper Supervisor.

Students may begin preparation of the scholarly paper during the course of their internship, gathering resources and primary research papers that integrate their specific Team Project outcomes with their work placement experience. Students will be expected to draw from the primary literature, and ground their thesis and experiences on established principles and theories from Biomedical Sciences and Business. The scholarly paper must also meet the minimum requirements set out in the Scholarly Paper Guidelines for the BDC program.

4.4 Appropriateness of the courses for graduate level degrees

M.Sc. degree

The Master's program requires completion of three full BDC courses at the Master's level, and two half courses in Business which stem from the MBA program from the DeGroot School of Business. The BDC program is a non-thesis course-based Master's in which the traditional thesis and collection of data is replaced with a graduate level team project course that integrates learning across the disciplines. At the conclusion of the internship, students will also be required to complete a scholarly paper as described above in section 4.3. Upon completion of these two courses, students will have amassed a broad and systematic understanding of discovery research and its novel application to formulating a creative solution for a current and relevant medical problem, and how to bring their treatment to market through the commercialization process. Grounded in fundamental principles in the basic biomedical sciences, students will be learning and working at the leading cusp of biotechnology and commercialization. A common thread that is woven through the Team Project and Community Internship is the collaboration within an interdisciplinary team where decision-making, communication and leadership are key factors.

5. MODE OF DELIVERY

5.1 Appropriateness of proposed mode(s) of delivery to meet program learning outcomes and Degree Level Expectations and availability of necessary physical resources

As mentioned in Section 1, the Department focuses its educational offerings on student-centered inquiry-based learning with an emphasis on communication and other transferable skills. The BDC program will be no exception, and in fact it will take student-centered learning to the next level with, for example, the Topics course modules offered in fourth year in BDC 4B03 with a student to faculty ratio of 5:1. The pedagogical style will be increasingly inquiry-based and team-based as students progress through to fourth year. The curriculum will hone their group skills over the course of the B.H.Sc. and Master's programs as discussed above in section 4.4.

This mode of delivery and requirement for small group team-based work requires small classrooms. These are available through Education Services in the Health Sciences Centre and the Michael DeGroot Centre for Learning.

6. ASSESSMENT OF TEACHING AND LEARNING

6.1 Appropriateness of proposed methods for instruction and assessment of student achievement for intended Program Learning Outcomes

In addition to traditional tests and exams that measure recall of content and application of knowledge, the BDC program will assess comprehensive knowledge through projects that require application, as well as creative problem-solving, deep learning and critical thought. The BDC, Business and Commerce courses will emphasize teamwork and collaborative skills. These skills will be evaluated through progress meetings with the instructor or teaching assistants and formative feedback through peer evaluation. BDC program students will also demonstrate their learning through written and oral presentations, which are key skills that need to be practiced and developed to prepare graduates for career success.

6.2 Plans for documenting and demonstrating the level of performance of students

The BDC program will be externally reviewed during cyclical reviews, and assessed on an ongoing basis through indicators such as student grades and awards data. The BDC program will be closely monitored as it unfolds, and as we receive feedback from students, faculty, teaching assistants and placement supervisors. Ultimately, we will judge success by assessing the career success and satisfaction of our graduates and thus we will make every effort to maintain contact with our graduates to this end. Efforts to improve the program, whether in content or delivery, in response to the data/feedback will be routine and on-going.

7. RESOURCES FOR ALL PROGRAMS

7.1 Administrative unit's planned utilization of existing human, physical and financial resources and any institutional commitment to supplement the resources

i) **Human Resources** – The Department of Biochemistry & Biomedical Sciences is a research intensive department with a strong commitment to undergraduate and graduate education. Two faculty are currently dedicated to undergraduate education, Dr. Michelle MacDonald (Teaching Professor and Associate Chair, Undergraduate Studies) and Dr. Felicia Vulcu (contractually-limited appointment) both of whom teach, counsel students and engage in teaching research while the graduate portfolio is led by an Assistant Dean, Faculty of Health Sciences Graduate Program (Dr. Brian Coombes, PhD., Associate Professor and Canada Research Chair) who also serves in the capacity of Associate Chair, Graduate Education for the Department of Biochemistry and Biomedical Sciences. The Department currently consists of fifty-one faculty members that include a number of joint and associate members. Department operations, finance management of support staff are the domains of the Manager of Operations and Manager of Strategy & Planning. An administrative assistant/laboratory technician provides direct support to the Biochemistry undergraduate program and an administrative assistant supports the graduate program.

The research intensive nature of the department creates numerous opportunities for exposure to cutting edge research. Students who subscribe to research-based courses and seek summer research employment in faculty laboratories benefit enormously from a strong culture of integrating research and education. In this context, the BDC program will likewise benefit from significant capacity in the faculty complement of the Department of Biochemistry and Biomedical Sciences who routinely integrate research and education .

Plans for additional human resources: Three new contractually limited faculty appointments (one of whom will be the Program Director), one Program Coordinator, two Administrative Assistants and one part-time Laboratory Technician (described on page 15) will round out this complement, as will contributors from the Business School and Adjunct faculty from the health research and business community. Finally, the Department of Biochemistry and Biomedical Sciences has a large graduate student contingent (>120 students) available to participate as Teaching Assistants. This resource is currently only partially tapped with fifty-three existing 130-hr Teaching Assistantships. The BDC program will enlist additional TAs from this pool of graduate trainees and from the Business School.

ii) **Library Resources** – Our Department is located in the Health Sciences Centre, which is home to the University's major medical/life sciences library. The Health Science Library houses an extensive collection of books and journals that are relevant to the students in our program. The HSC Library also subscribes to an extensive collection of online journals, which are fully accessible from

campus and off-site using the E-Resources website. All students have access to the library's online collection using their MacID, a unique authenticator that grants access to all of the web resources of the University. This off-site access is especially important to the trainees located at the Hamilton General Hospital's Thrombosis and Atherosclerosis Research Institute (TaARI), as part of the David Braley Research Institute (Werstuck, Trigatti). The second major library that serves the needs of our students is the H.G. Thode Library of Science and Engineering. This library houses collections that are relevant to those working mainly in the areas of chemical biology, chemistry, and structural biology. Of special note is the access to the Innis Library for the commerce course work. It maintains an extensive collection of business books and periodicals in print and online formats. The Innis Library subscribes to a vast collection of online resources that provide quick access to full-text articles, journals, reports and statistics for business students. There are approximately 18,000 business titles held by Innis and an additional 15,000 online resources related to business.

iii) **Laboratory Facilities (Individual)** – Most of our faculty's individual laboratories are self-contained with equipment routinely used for their research needs. All of our faculty members hold at least one research grant (most hold several) and a portion of these funds are used on a discretionary basis for equipment renewal, etc., as needed. Infrastructure programs from the Canada Foundation for Innovation (CFI) and Ontario Research Fund (ORF) have supported equipment needs for our newer faculty. The Department occupies approximately 25,000 square feet of wet-lab research space in the Health Sciences Centre. Core faculty members (Wright, Brown, Magarvey) occupy an additional ~7,000 square feet of wet-lab space in the Michael DeGroote Centre for Learning and Discovery (MDCL) for operation of their individual research programs. The Stem Cell and Cancer Research Institute (Bhatia) is also in the MDCL and occupies more than 13,000 square feet on the fifth floor of this building.

iv) **Laboratory Facilities (Common)** – Several major infrastructure grants have been secured by Biochemistry faculty over the past 7 years that have been used to enhance the equipment available to trainees in our program. These grants have allowed the procurement of cutting-edge equipment and build-outs of major research centers. **The Centre for Microbial Chemical Biology (CMCB)** (<http://fhs.mcmaster.ca/cmcb/index.html>) is a \$20M facility built in 2009 that houses state-of-the-art infrastructure to support research at the interface of the disciplines of chemistry and biology. The CMCB is located in two 12,000 square foot multi-user labs on the 2nd floor of MDCL and is professionally managed by several full-time staff. Ensclosed in the CMCB operations is a high-throughput screening laboratory, celebrated as being among the first in Canadian Universities, a bioinformatics suite, natural products chemistry lab, and equipment for protein and biophysical experiments. The **MacBiophotonics** laboratory is an imaging facility that provides access to the latest and best in microscopy, fluorimetry and high content screening. This 3,000 square foot facility is located on the 4th floor of the Health Sciences Centre in Department-managed space. **The Canadian Centre for Electron Microscopy** is a major 8,000 square-foot research facility supporting world-class research from scientists across the country. One of our faculty members (Ortega, Co-Director of the EM Facility) and his trainees use the two field emission gun transmission electron microscopes in this facility for their work in cryo- electron microscopy. The Department also runs a common autoclave facility for all labs (400 square feet), a developer room (250 square feet), and a newly renovated space that houses the x- ray source that supports structural biologists in the Department (Guarne, Junop, Yang).

v) **Undergraduate Teaching Laboratories** – The undergraduate teaching laboratory in the Department of Biochemistry and Biomedical Sciences is comprised of two main rooms (6,000 square feet in total) which typically house a maximum of 24 students/room for a total of 48 students. The teaching labs are equipped with up-to-date equipment and supplies designed to allow students first-hand training in relevant biochemical techniques. Aside from an Olympus fluorescence microscope, four micro- centrifuges and a new Avanti JE high-speed centrifuge, the labs are also home to two Genesys10 UV/Vis Spectrophotometers, twelve new Spectronic20D+ Spectrophotometers, a plate

reader, two thermocyclers, six Bioreactors (1.5-2L) and five Napco Microbiological Safety Cabinets. The labs also contain ample pipettes (1 set/pair of students), automatic and multi-channel pipettors, six desktop computers for data collection and analysis and other supplies designed to enhance the student experience in techniques such as: PCR, SDS-PAGE, protein expression and purification, Western blotting, protein crystallization, enzyme kinetics and mammalian tissue culture (including mouse embryonic stem cells).

vi) **Gould Trading Floor** – Students will also benefit from experiential learning through real-life business learning opportunities in the Allen H. Gould Trading Floor housed in the DeGroote School of Business. The Gould Trading Floor is a unique interactive, experiential classroom, where students learn the fundamentals of the capital markets. It is a state-of-the-art facility delivering real-time data feeds from North American financial markets, allowing students to acquire necessary skills and competencies demanded by today's business environment.

vii) **Homebase** – In 2009 the Department secured a sizable meeting room adjacent to the Ewart Angus Centre in the Health Sciences Centre as a meeting place for our students. The space is used for specific events, general socialization or for group projects. It is equipped with a conference table and chairs, a sofa and maintains wireless access to the internet.

viii) **Financial Resources** – The Department is very research intensive and is able to integrate our research expertise successfully into our undergraduate and graduate programs. Eleven core members are current or past holders (last 5 years) of Canada Research Chairs (4 Tier I and 7 Tier II). In 2011, the faculty members in the Department of Biochemistry & Biomedical Sciences held 33 CIHR operating grants and 104 total operating grants for an average per investigator of \$288,032/yr from CIHR and \$728,378/yr from all sources totaling \$16.6 million. These faculty members have made a commitment to the mentoring of students, both graduate and undergraduate and they have the resources to do so.

7.2 Participation of a sufficient number and quality of faculty who are competent to teach and/or supervise in the program

One of the novel aspects of the program is the small class sizes that will be offered through the fourth year Topics Course modules. Each of the members of the Department of Biochemistry and Biomedical Sciences will offer a 6-week module that will be focused in their research area and provide a special opportunity for students to interact with faculty who are thought-leaders in a variety of research fields. These modules will provide ultimate flexibility for students to tailor their studies to suit their emerging interests. See **Appendix C** for some examples of modules that will be offered in the curriculum.

In addition, we have had strong interest from leaders in the local biotech, pharma and biomedical business community. Several individuals have expressed strong interest in teaching and mentoring in our proposed program and thus we anticipate that the modules offered in the fourth year Topics course will grow to include offerings by adjunct members of the department from the community.

The Department of Biochemistry and Biomedical Sciences is a research-intensive unit with a strong track-record of funding and includes senior faculty who are at the top of their fields as well as junior faculty who are emerging stars and with the addition of 3 new faculty, the Department will expand on its breadth of research strength that spans diverse aspects of biochemistry including infection, metabolism, stem cell biology and cancer. The BDC program will capitalize on this excellence in research to provide quality thesis topics and mentoring for independent study.

Faculty members at the DeGroote School of Business play a leadership role in solidifying McMaster's status as one of the country's "most innovative" research-intensive universities. The research conducted at DeGroote generates new business knowledge and has important practical implications for

both management and teaching. Presently, there are 69 full-time faculty in the School with 8 teaching-track faculty members. Teaching assistants will be provided for each course.

Faculty members in the Business School have built an international reputation on its research. Researchers publish regularly in the Financial Times Top 45 Business School Journals. The Financial Times (FT) compiles the Business School research rank, and is calculated according to the number of faculty publications published in 45 academic and practitioner journals.

7.3 Evidence of adequate resources to sustain the quality of scholarship produced

The resources outlined in section 7.1 will support and sustain the quality of scholarship produced.

8. RESOURCES FOR UNDERGRADUATE AND GRADUATE PROGRAMS

8.1 Plans for adequate numbers of faculty and staff to achieve program's goals

Please refer to item 8.2 below.

8.2 Plans to provide the necessary resources in step with the program's implementation

Since 2004, the Department of Biochemistry and Biomedical Sciences has recruited 13 new faculty members at all ranks (2 Professor; 5 Associate; 6 Assistant) in areas that enhance the quality of our research and teaching offerings. For example, four of these recruits were in the area of stem cell and cancer biology (Bhatia, Hope, Doble, Singh), adding significant new research capacity in this burgeoning area of biology. The Stem Cell and Cancer Research Institute at McMaster has become a leading centre in Canada for attracting the best graduate students and postdoctoral fellows into this area. Five new faculty recruits have added new capacity to an area of existing strength in microbiology and chemical biology (Bishop, Burrows, Coombes, Magarvey, Surette). The Centre for Microbial Chemical Biology and the Michael G. DeGroot Institute for Infectious Disease Research at McMaster has provided a central hub for these investigators and their trainees to interact and to enhance the quality of the student experience. Further, the Department of Biochemistry and Biomedical Sciences has added significant strength in the area of human metabolism (Schertzer, Sloboda, Stein, Szabo).

To support the new BDC program, seven new positions will be created. Three FTE contractually limited faculty, one of which will be the Program Director hired to oversee the program and liaise with industry (0.5 FTE is assigned to the undergraduate program, 0.5 FTE is assigned to the graduate program), the other two FTE faculty will have research specializations in discovery, one full-time Program Coordinator (one FTE staff member) will be hired to oversee the administration of the program (0.5 FTE is assigned to the undergraduate program, 0.5 FTE is assigned to support the graduate program), two FTE Administrative Assistants will be hired to provide front-line assistance for the undergraduate and graduate sections and finally, a part-time Laboratory Technician (0.5 FTE) will be hired support the laboratory course (BDC 3C09).

Additional space for the new undergraduate program office will be provided by the Faculty of Health Sciences. Classrooms will be available for formal lectures via the Registrar's office and small learning and teaching spaces for the Level IV groups will be available via the Faculty of Health Sciences Education Services Department. The current undergraduate teaching lab, located on the first floor of the Health Sciences Building, will be utilized to its maximum capacity and another lab (1074 square feet) on the 4th floor has been confirmed by Education Services for our use as an additional teaching lab space for the BDC program.

In keeping with the University's plan to secure adequate resources to invest in faculty, staff, student services and support, library resources, and space the department is committed to using those resources strategically. The current Student Experience Task Force position paper from the President's Forward with Integrity document (2011) recommends four key goals and recommendations to transform the student experience at McMaster. Goal 3 speaks directly to support: Improve institutional structures that support learning.

8.3 Planned/anticipated class size

While our existing Biochemistry programs currently have high rates of retention, and we anticipate a similarly high rate of retention in the BDC program, we plan to admit fifty-five students to level III of the BDC undergraduate program each year in order to achieve a steady-state enrolment of 100 students across levels III and IV of the undergraduate program (50 students in level III, plus 50 students in level IV) while allowing for some attrition at either level. Likewise, we will admit up to 55 graduate students at the Master's level to allow for some attrition.

Enrolment will be limited during the first few years of the program to ensure adequate placement opportunities in the private sector and government during the internship in the second semester of the Master's program. We will endeavor to build new relationships and develop new partnerships to potentially expand the program in future years, provided that student demand and institutional support grow in measure with the program.

8.4 Provision and supervision of experiential learning opportunities

B.H.Sc. Degree

Experiential learning is an integral component of the program. Several experiential components are described above, including the capstone undergraduate experiential element, the fourth year thesis. Here, the students will spend approximately half of their efforts in fourth year completing a thesis research project in the laboratory under the supervision of a faculty member.

M.Sc. Degree

The graduate portion of this program incorporates one term of unpaid internship where students will receive on-the-job training and mentoring in the business community. Students will be placed in an internship position through a matching process. Our long term goal is to secure a large number of placements in the future such that employers can interview students as part of the matching process, and such that each party can find a suitable match based on more than one choice.

In advance of the placement, at the end of the Fall semester, all program students will take part in an internship orientation which will describe the professional and academic requirements for the internship. The academic requirements include completion of a learning portfolio and a weekly reflective journal. Students will record and collect evidence that demonstrates a fulfillment of their individual learning objectives and the Program Learning Outcomes and to form the connection in the manner that their learning experiences are grounded in the literature. Short term and long term goals will be set for the placement, in conjunction with the site supervisor, in the context of project management, report writing and synthesis of textbook knowledge that is put into practice. The contents of the learning portfolio and reflective journal will provide the background and basis for the student presentation at the 'Internship Day Symposium' which will take place on campus during the first month of the Spring term. All students will be required to participate and present on the skills and knowledge that were acquired through the internship, and any key works or projects that were accomplished during their placement. Students will present to an audience composed of partners from industry, University faculty, staff and students.

The student will have a primary site supervisor, but will also be co-supervised by a faculty member from the Department. The co-supervisor will be responsible for assessing and providing feedback on the learning portfolio and weekly reflective journal entries. Midway through the placement, the site supervisor and student will each receive formative feedback to ensure a positive, healthy and productive learning environment with ample opportunity for communication and feedback. Any issues or concerns from the supervisor or the student will be brought to the attention of the Program Coordinator and Director, and every attempt will be made to arrive to an earnest resolution. At the conclusion of the internship, the co-supervisor will assign a final grade for the course based on the portfolio, reflective journal and feedback from the site supervisor.

8.5 Role of adjunct and sessional faculty

In the Golden Horseshoe and Greater Toronto Area, there exists a tremendous resource of expertise in the pharmaceutical and health research sectors. These individuals represent an untapped group of thought-leaders for advanced training and mentoring. We aim to establish strong ties with this community through adjunct departmental appointments. Individuals who have strong interests in contributing to multidisciplinary education with avant-garde classroom and inquiry learning, as well as internships in the Master's program will be welcome contributors to the BDC program.

9. QUALITY AND OTHER INDICATORS

9.1 Definition and use of indicators that provide evidence of quality of the faculty

Faculty members are assessed based on their research performance through the quality of publications, research funding, supervision of graduate and undergraduate students, teaching evaluations and administrative service to the university or community.

- i) **Faculty Operating Grants** – In 2011, the faculty members in the Department of Biochemistry and Biomedical Sciences held 33 CIHR operating grants and 104 total operating grants for an average per investigator of \$288,032 from CIHR and \$728,378 from all sources. From 2004 to the present, CIHR funding awarded to department faculty has increased by 234%. Grants awarded in 2011/12 total \$16.6 million.
- ii) **Faculty Awards and Honours** – Eleven core members of the Department of Biochemistry and Biomedical Sciences are current or past holders (last 5 years) of Canada Research Chairs (Tier 1: Andrews, Bhatia, Surette, Wright; Tier 2: Brown, Coombes, Doble, Draper, Fradin, Li, Steinberg), and two Associate Members are CRC holders (Brennan, Singh). Together, our CRC holders supervise 48 graduate students in our program, representing 40% of our total student body (average 4.5 students per CRC holder). These numbers reflect a strong commitment to the health and vitality of the training environment. Several prestigious personal honours have been bestowed on our faculty over the past 6 years that recognize the prominence and influence of our program mentors in their areas of science. These include 5 CIHR New Investigators Awards (Burrows, Coombes, Guarné, Magarvey, Ortega); the Killam Prize (Wright); the Canadian Society of Molecular Biosciences New Investigator Award (Brown, Bhatia); the W.A.E. McBryde Medal (Li); the CSM Murray Award for Career Achievement in Microbiology (Brown); Canada Top 40 Under 40 (Bhatia, Coombes); the Fisher Scientific Award for outstanding career achievement by a junior investigator (Coombes); and Fellow of the Royal Society of Canada (Wright). In addition, two of our newest faculty members received a Tier II CRC (Sloboda) and a Canadian Diabetes Career Award (Schertzer).

The DeGroot School of Business is fortunate to have recently recruited two world-renowned Research Chairs in the Finance and Business Economics Area: Dr. John Maheu, Professor and BMO Financial

Group Chair in Capital Markets – Financial Literacy and the Individual Investor, and Dr. Ronald Balvers, Professor and Michael Lee-Chin & Family Chair in Investment and Portfolio Management. In addition, Dr. Jiaping Qiu was appointed the CIBC Chair in Financial Markets.

Dr. Manish Kacker, a key instructor in the program, holds the Michael Lee-Chin & Family Professor in Strategic Business Studies. His research interests, especially of significance to the BDC students, address managerial problems in the domains of marketing channels, marketing strategy and entrepreneurship.

9.2 Evidence of a program structure and faculty research that will ensure the intellectual quality of the student experience

Faculty enhancement and renewal

Since 2004, the Department of Biochemistry and Biomedical Sciences recruited 13 new faculty members at all ranks (2 Professor; 5 Associate; 6 Assistant) in areas that enhance the quality of our research offerings. For example, four of these recruits were in the area of stem cell and cancer biology (Bhatia, Hope, Doble, Singh), adding significant new research capacity in this burgeoning area of biology. The Stem Cell and Cancer Research Institute at McMaster has become a leading centre in Canada for attracting the best graduate students and postdoctoral fellows into this area. Five new faculty recruits have added new capacity to an area of existing strength in microbiology and chemical biology (Bishop, Burrows, Coombes, Magarvey, Surette). The Centre for Microbial Chemical Biology and the Michael G. DeGroot Institute for Infectious Disease Research at McMaster has provided a central hub for these investigators and their trainees to interact and to enhance the quality of the student experience. The IIDR holds an annual Trainee Day where the research accomplishments of graduate students and postdoctoral fellows working in IIDR laboratories are showcased. The appeal of these new faculty recruits and their research foci is evidenced by the 33 new graduate students they currently supervise in the Biochemistry graduate program.

Graduate research and supervision

The tremendous record of success by our graduate students in funding competitions and their research output suggest that we enjoy a healthy culture of student mentorship in our graduate programs as well. In addition, members of our faculty are heavily engaged in the quality of graduate training through active participation on graduate supervisory committees for other students. Most of our faculty serve on 2-3 supervisory committees for every one of their own students. This is an ongoing and active commitment, since these committees meet every 6 months (for M.Sc.) or annually (for Ph.D.) for a 2-hour face-to-face meeting where feedback on the student's research progress and their written report is discussed. In exit surveys for doctoral students from 2008-2011, students graded the overall accessibility of their committee members and the guidance they provided as 8 of out 10 (exceeded expectations).

Undergraduate research and supervision

Here the record of the existing Biochemistry undergraduate program is instructive. In the past five years, there has been a movement by students toward integrating research experience into the curriculum. We have added three more research courses to our existing Biochemistry programs, and they have been subscribed to increasingly over the last two years. With the growth in our department faculty complement, we have been able to accommodate every student in our program who sought out a third year 6-unit research project or a fourth year 12-unit thesis. Indeed, there is an excess of capacity in these research laboratories and a strong appetite to mentor young scientists.

Each year, nearly 50% of the incoming class of Master's level students originated from our undergraduate Biochemistry program. This is a testament to the quality of leadership and mentorship that students experience in our undergraduate program.

Facilities and services

Furthermore, the research infrastructure within the department allows for student access and exposure to high-end, state-of-the-art research facilities such as the Biophotonics facility, High Throughput Screening facility, and state-of-the-art NMR, Mass Spectrometry and DNA sequencing services, successfully merging our research and teaching activities.

10. CONSULTATION PROCESS

10.1 Description of the consultation process undertaken during the development of the proposal

Discussions have been on-going for the past three years among the leadership of Biochemistry and Biomedical Sciences and of the DeGroot School of Business on the possibilities of a new multidisciplinary program that would integrate commerce and biomedical sciences. We have consulted informally with students and graduates during the same time period.

The program was formally proposed at a Departmental meeting in March of 2011, and in October of 2011, the Department organized a one-day workshop inviting participants from the community, industry and academe. Also in attendance were alumni from our Biochemistry programs. This workshop was put on with the help of a professional facilitator with strong credentials in education with the expressed purpose of establishing well-informed goals for the BDC program. The list of attendees is provided in **Appendix E**. The results of the workshop were presented to the faculty at a Departmental meeting later in October. The Department members unanimously approved to pursue the development of this program.

Following the workshop, an ad-hoc Program Development Committee was struck and met bi-weekly from January through May 2012 to assemble a potential framework for the new program. Members of the ad-hoc committee are provided in **Appendix F**.

On June 5, 2012, the Department held a departmental retreat to discuss the framework. The members were extremely enthusiastic about this initiative and unanimously (informally) approved of the framework.

On September 5, 2012 the Department unanimously approved the new program proposal.

This program proposal was prepared in consultation and in collaboration with the DeGroot School of Business. As is required in the approvals process, it is necessary that the program proposal be approved by the DeGroot School of Business. The proposal will be presented for approval to the School's Undergraduate Curriculum and Policy Committee, Graduate Curriculum and Policy Committee, and the Faculty of Business before its eventual presentation to Undergraduate Council and Graduate Council.

Appendix A

Summary of the association of program learning outcomes with undergraduate degree level expectations

Program Learning Outcomes*	Degree Level Expectations	Teaching and Learning Activities	Evidence/Assessments
1	1a,1b, 3b	<ul style="list-style-type: none"> BDC 3A03 (ROAD TO BIOMEDICAL DISCOVERY) BDC 3B06 (DRUG DISCOVERY AND DEVELOPMENT) BDC 3C09 (RESEARCH SKILLS LABORATORY AND INQUIRY) BDC 4A15 (SENIOR RESEARCH THESIS) COMMERCE 3MD3 (INTRODUCTION TO CONTEMPORARY APPLIED MARKETING) 	<ul style="list-style-type: none"> Assignments Projects Laboratory experiments Symposium Portfolios (across the program) Tests/exams
2	1, 2, 3, 4, 5, 6	<ul style="list-style-type: none"> BDC 3A03 (ROAD TO BIOMEDICAL DISCOVERY) BDC 3B06 (DRUG DISCOVERY AND DEVELOPMENT) 	<ul style="list-style-type: none"> Assignments Projects Laboratory experiments Symposium Portfolios (across the program)
3	2a, 5	<ul style="list-style-type: none"> BDC 3C09 (RESEARCH SKILLS LABORATORY AND INQUIRY) BDC 4A15 (SENIOR RESEARCH THESIS) COMMERCE 3MD3 (INTRODUCTION TO CONTEMPORARY APPLIED MARKETING) 	<ul style="list-style-type: none"> Assignments Laboratory experiments Thesis Symposium Portfolios (across the program)
4	1, 2a, 2b, 3, 4, 5	<ul style="list-style-type: none"> BDC 3A03 (ROAD TO BIOMEDICAL DISCOVERY) BDC 3B06 (DRUG DISCOVERY AND DEVELOPMENT) BDC 4A15 (SENIOR RESEARCH THESIS) 	<ul style="list-style-type: none"> Projects Laboratory experiments Symposium Portfolios (across the program)
5	4	<ul style="list-style-type: none"> BDC 3B06 (DRUG DISCOVERY AND DEVELOPMENT) BDC 3C09 (RESEARCH SKILLS LABORATORY AND INQUIRY) BDC 4A15 (SENIOR RESEARCH THESIS) 	<ul style="list-style-type: none"> Projects Laboratory experiments Thesis Symposium Portfolios (across the program)
6	6a, 6b, 6c	<ul style="list-style-type: none"> BDC 3B06 (DRUG DISCOVERY AND DEVELOPMENT) 	<ul style="list-style-type: none"> Assignments Projects

		<ul style="list-style-type: none"> • COMMERCE 2BA3 (ORGANIZATIONAL BEHAVIOUR) 	<ul style="list-style-type: none"> • Symposium • Portfolios (across the program)
7	1, 2, 3, 6	<ul style="list-style-type: none"> • BDC 4A15 (SENIOR RESEARCH THESIS) 	<ul style="list-style-type: none"> • Laboratory experiments • Thesis • Symposium • Portfolios (across the
8	6	<ul style="list-style-type: none"> • BDC 4A15 (SENIOR RESEARCH THESIS) 	<ul style="list-style-type: none"> • Laboratory experiments • Thesis • Symposium • Portfolios (across the

*Program Learning Outcomes for B.H.Sc. Degree:

1. Apply their basic knowledge of the process of drug development, manufacturing and marketing to function effectively in the biotechnology, pharmaceutical and other biomedical science sectors of the economy.
2. Contribute to research and development of new commercial products and pharmaceutical therapies using their understanding of drug targets, diseases, protein/gene structure and function.
3. Undertake laboratory research using sound research practices and methodologies.
4. Critically analyse the primary literature, case studies, and theory to propose innovative solutions to scientific and business problems.
5. Communicate clearly, both verbally and in writing, utilising various formats to benefit both academia and industry.
6. Function as effective collaborative team members in a variety of roles in cross-disciplinary teams.
7. Apply knowledge of commercial development and biomedical research in experiential learning opportunities within industry and academia.
8. Pursue career and lifelong learning opportunities in biomedical discovery.

Appendix B

Summary of the association of program learning outcomes with graduate degree level expectations

Program Learning Outcomes*	Degree Level Expectations	Teaching and Learning Activities	Evidence/Assessments
1	1, 2	<ul style="list-style-type: none"> BDC 701 (TEAM PROJECT) BUSINESS B730 (STRATEGIC MANAGEMENT OF TECHNOLOGY) BUSINESS C727 (PHARMA/BIOTECH BUSINESS 	<ul style="list-style-type: none"> Assignments Projects Symposium Portfolios (across the program)
2	4	<ul style="list-style-type: none"> BDC 701 (TEAM PROJECT) BUSINESS B730 (STRATEGIC MANAGEMENT OF TECHNOLOGY) 	<ul style="list-style-type: none"> Assignments Projects Symposium Portfolios (across the program)
3	2, 3, 6	<ul style="list-style-type: none"> BDC 702 (COMMUNITY INTERNSHIP) BDC 701 (TEAM PROJECT) BUSINESS C727 (PHARMA/BIOTECH BUSINESS 	<ul style="list-style-type: none"> Assignments Project Symposium Portfolios (across the
4	5	<ul style="list-style-type: none"> BDC 702 (COMMUNITY INTERNSHIP) BDC 701 (TEAM PROJECT) BUSINESS B748 (ENTREPRENEURSHIP FROM A DIVERSE UNIVERSITY BASE) 	<ul style="list-style-type: none"> Projects Symposium Portfolios (across the program)
5	1, 2, 4, 6	<ul style="list-style-type: none"> BDC 702 (COMMUNITY INTERNSHIP) BDC 701 (TEAM PROJECT) BUSINESS B748 (ENTREPRENEURSHIP FROM A DIVERSE UNIVERSITY BASE) BUSINESS B730 (STRATEGIC MANAGEMENT OF TECHNOLOGY) BUSINESS C727 	<ul style="list-style-type: none"> Projects Thesis Symposium Portfolios (across the program) Tests
6	4	<ul style="list-style-type: none"> BDC 702 (COMMUNITY INTERNSHIP) BDC 701 (TEAM PROJECT) BUSINESS B748 (ENTREPRENEURSHIP FROM A DIVERSE UNIVERSITY BASE) 	<ul style="list-style-type: none"> Assignments Projects

*Program Learning Outcomes for M.Sc. Degree:

1. Integrate theoretical concepts and synthesize knowledge from various disciplines to develop an original commercial product for the market.
2. Manage a research project, set goals and priorities within a team.
3. Analyze data, make critical interpretations and place these findings into context with the published scientific literature in the development of a new product.
4. Communicate clearly and lead effectively to maximize potential opportunities within and outside of academia.
5. Undertake biomedical discovery while being mindful of its scientific, commercial, ethical, political and social contexts and implications.
6. Demonstrate evidence of entrepreneurial and leadership skills.

Appendix C

Course descriptions for the BDC program

I. BDC courses

BDC 3A03 ROAD TO BIOMEDICAL DISCOVERY

The course will review examples of work in basic biochemistry that have paved the way to breakthroughs in drug discovery. Starting from a seminal paper, we will review the biophysical and physical chemistry concepts underlying the research and discuss how the initial scientific hypothesis evolved and

how the process of discovery research eventually led to the discovery of a new drug. Through the structures and mechanistic studies of essential biomolecules, such as the ribosome or ion channels, we will study the fundamental principles that govern protein and nucleic acid folding, drive enzyme catalysis or enhance biomolecular interactions. Basic principles will be taught from current literature.

Three lectures; one term

Prerequisite(s): Registration in level III of the Biomedical Discovery and Commercialization program

Course capacity: 55 Categories: NIL

BDC 3B06 DRUG DISCOVERY AND DEVELOPMENT

Selected topics on genomics, proteomics and bioinformatics illustrating the modern application of molecular biology and biochemistry to pharmaceutical and other research.

Three lectures; two terms

Prerequisite(s): Registration in level III of the Biomedical Discovery and Commercialization program

Course capacity: 55 Categories: NIL

BDC 3C09 RESEARCH SKILLS LABORATORY AND INQUIRY

A laboratory-based inquiry course where students learn and apply current techniques used in drug discovery. The course will integrate the scientific principles and methods being taught concurrently in BDC 3A03 and BDC 3B06.

One lecture or workshop (three hours), one lab (four hours); two terms

Prerequisite(s): Registration in level III of the Biomedical Discovery and Commercialization program

Course capacity: 55 Categories: NIL

BDC 4A15 SENIOR RESEARCH THESIS

A thesis based on a major research project supervised by a member or associate member of the Department of Biochemistry and Biomedical Sciences. The results will also be presented to the department in a seminar or as part of a poster session.

Six workshops (three hours); two terms

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Course capacity: 55 Categories: NIL

BDC 4B03 CURRENT TOPICS IN BIOMEDICAL DISCOVERY AND COMMERCIALIZATION

Students will examine two current topics in biomedical discovery and commercialization. Students must sign up for two topics from a list of available modules on a first-come, first-served basis. This course may be repeated with different topics.

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Course capacity: 55 Categories: NIL

Module A: BACTERIAL MACHINES

Bacteria are incredibly complex organisms that occupy every niche on our planet and perhaps even beyond. They interact with their environment and each other using sophisticated molecular machines to communicate, to move around, to wage war against competitors and to obtain the nutrients they need to replicate and survive. This module will discuss the mechanisms that bacteria have developed to interact with their world and what we can learn from studying them. Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module B: EARLY LIFE ORIGINS OF DISEASE RISK

The increase in the prevalence of obesity in recent decades has been more rapid than can be explained purely by genetic susceptibility or diet, which suggests that other factors are contributing to the current epidemic. There is now a large body of evidence demonstrating that adverse events that occur during early development, such as poor maternal nutrition or stress, can have long-term effects on the offspring and increase their risk of disease in adulthood. The developmental origins of health and disease paradigm proposes that early-life environmental conditions mitigate fetal adaptations and influence long-term individual disease risk. Herein, the organism capitalizes on a critical, but temporary, period of plasticity early in life during which it makes developmental adaptations; changes that have long-term sustained effects on physiological processes that lead to increased disease risk later in life. Despite the evidence from human and animal studies, the underlying mechanisms by which early life adversity influences the long-term disease risk in offspring are poorly defined.

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module C: ADVANCED MOLECULAR DIAGNOSTIC TECHNOLOGIES

This module will discuss biochemical basis of prevailing molecular diagnostic practices that explore either proteins or nucleic acids as molecular recognition elements. Several emerging diagnostic technologies that take advantage of advances made in the field, such as nanotechnology or molecular evolution, will also be reviewed.

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module D: IMMUNOMETABOLISM

The field of immunometabolism has emerged in order to integrate and understand the intricate links between immune and metabolic systems. This is particularly relevant to nutrition and metabolic disease since inflammation has emerged as a critical link between obesity and chronic diseases, such as diabetes. Understanding mutual pathogen and nutrient sensing systems and the relationship between the food we eat and the bacteria that surround us are key issues that can help to unravel immunometabolism problems. In particular, this research is interested in how obesity causes inflammation and how inflammation causes insulin resistance leading to diabetes?

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module E: FROM LAPTOP TO BENCHTOP I

The search for new drugs to combat the war against drug-resistance has reached an all-time high. With the development of high-throughput screening technologies and multiple compound and drug libraries at our fingertips we must now turn to novel methods for identifying the “diamond in the rough”: the perfect inhibitor/drug for our specific purpose. Students will utilize a virtual drug screening procedure for different target proteins with the use of online virtual screening labs like Dock Blaster to test a virtual library of compounds/drugs against the active site of the target protein structure. Students will analyze the “hits” using targeting criteria discussed in the course. Seminar, discussions, virtual lab (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module F: FROM LAPTOP TO BENCHTOP II

Students will test the findings from the virtual screening experiment in the previous course using biochemical assays. Students will publish their results in their own Undergraduate Scientific Journal which would be coordinated by the students themselves with guidance from graduate student mentors. Seminar, discussions, lab (three hours); one term

Prerequisite(s): Module F

Module capacity: 5 Categories: NIL

Module G: BIOMEDICAL SCIENCES AND SOCIETY

This course will investigate the social, political, cultural, environmental and ethical impacts of biomedical research.

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module H: ENERGY METABOLISM AND LINKS TO DIABETES

This course will examine energy metabolism in humans and how diet can affect the regulation of glucose metabolism, leading to type II diabetes.

Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Module I: NEURODEGENERATION AND PROTEIN FOLDING

Over half of people over 65 will be at risk for some form of neurodegenerative disease. The future challenge to human medicine will likely be as great as cancer. Most neurodegenerative diseases like Alzheimer's disease and Parkinson's disease have no known causes, but for a small group of individuals, there are defined genetic components. Rarer neurodegenerative diseases like Huntington's disease have one well defined genetic cause, giving researchers a huge advantage to try and uncover the precise mechanism of disease. In all neurodegeneration, one commonality that has been defined is at the level of protein misfolding, and recently, this misfolding has been

seen to impact the cell cytoskeleton, which increases as a function of age. The role of stress in the ageing brain, the cell cytoskeleton and the misfolding of proteins in diseases will be reviewed. Seminar and discussions (three hours); one term

Prerequisite(s): Registration in level IV of the Biomedical Discovery and Commercialization program

Module capacity: 5 Categories: NIL

Additional 6-week modules will be offered each year by contributing adjunct faculty from industry. Topics could include intellectual property, quality control and assurance, clinical trials, research ethics, regulatory affairs, public health, careers in the biomedical industry, etc...

BDC 701 TEAM PROJECT

Students will work as part of a team to manage a project from conception to completion, including design, manufacturing, quality control, marketing, etc., in the delivery and sale of the final manufactured commercial product. Students will generate a business plan and set short term and long term goals in order to meet all of the course requirements.

Seminars and discussions (9 hours); term 1 (full course)

Prerequisite(s): Registration in the Biomedical Discovery and Commercialization Master's program

Course capacity: 55 Categories: NIL

BDC 702 COMMUNITY INTERNSHIP

This internship provides students with the opportunity to explore career options and integrate academics through an experiential placement in industry, with the government or in the community. Students will record a weekly reflective journal and communicate their experience to their colleagues and the department during an "Internship Day" symposium to be held on campus at the beginning of the following term. Students will complete 13-15 weeks of placement work through the duration of the experience.

Term 2 (full course)

Prerequisite(s): Registration in the Biomedical Discovery and Commercialization Master's program

Course capacity: 55 Categories: NIL

BDC 703 SCHOLARLY PAPER

The culminating task of the scholarly paper will synthesize the knowledge, skills and attitudes acquired throughout the course of study and community internship. To be completed in the final semester of study (Spring/Summer).

One term (full course)

Prerequisite(s): Registration in the Biomedical Discovery and Commercialization Master's program

Course capacity: 55 Categories: NIL

II. Commerce/business courses

COMMERCE 2BA3 ORGANIZATIONAL BEHAVIOUR

The central objective of this course is to develop an understanding of human behaviour in organizations with a view toward effective management of such behaviour.

Prerequisite(s): Registration in any Commerce, Engineering and Management, Honours Business Informatics, Labour Studies or four or five-level non-Commerce program. Antirequisite(s):

KINESIOL 3L03

COMMERCE 3MD3 INTRODUCTION TO CONTEMPORARY APPLIED MARKETING

The course is oriented for advanced undergraduate (3rd or 4th year) or graduate students (e.g. M.Sc.) in programs which require training in Marketing but who have no previous background in Commerce. The students of such programs are expected to be joining the workforce as technical managers and/or entrepreneurs in the general domain of their core disciplines. The purpose of the course is to provide the students a high level overview of contemporary Marketing concepts and a hands-on experiential component leading up to a

Marketing Plan.

Prerequisite(s): Registration in level III or IV of an Honours program

COMMERCE 4AK3 ACCOUNTING INFORMATION FOR DECISION MAKING This course covers the basic principles in financial and managerial accounting as well as the use of accounting information in decision making. In the financial accounting part of the course, the course covers the conceptual framework of accounting, Generally Accepted Accounting Principles, financial statements, and financial statement analysis. In the managerial accounting part of the course, the course covers cost behaviour, cost-volume-profit relationships, budgeting, and the use of cost information in decision making. Prerequisite(s): Registration in Level III or above of a non-Commerce program. Not open to students registered in any Commerce, Honours Business Informatics, or Engineering and Management program.

COMMERCE 4FW3 FINANCE FOR ENTREPRENEURS

This course is intended for students who wish to enhance their skills and knowledge in those areas of business that lead to successful entrepreneurship and/or small business management. The focus will be on those financial issues and decisions of particular concern to sole proprietors, partnerships, family-owned businesses and small non-public corporations. This will include the financial aspects of the relationship between the firm and its owners.

Prerequisite(s): Students in a 3rd or 4th year non-Commerce program. Not open to students registered in any Commerce, or Honours Business Informatics, or Engineering & Management program; or the Minor in Finance.

BUSINESS B748 ENTREPRENEURSHIP FROM A DIVERSE UNIVERSITY BASE

This course examines issues associated with mounting entrepreneurial ventures from a heterogeneous university base and addresses such concerns as intellectual property, marketing, strategic human resources, raising capital, and starting and growing a business in that context. The course is open to students from all faculties at McMaster and provides an opportunity to develop networks for accessing varied resources for entrepreneurial ventures. (This is a special topics course.)

BUSINESS B730 STRATEGIC MANAGEMENT OF TECHNOLOGY

In today's competitive environment technology has become a central component of the strategic process of many innovative organizations. This course surveys the issues involved in this new role for technology including competitive advantage, analytical tools, technology-based strategies, partnerships and alliances, and the process for managing technology so that it is closely integrated with the activities of the firm.

BUSINESS C727 PHARMA/BIOTECH BUSINESS ISSUES

This course will allow students to familiarize themselves with the strategic and management issues currently facing the Pharma/Biotech industries through a consideration of the structure and challenges of the industry at the global, national and provincial levels.

Appendix D

Summary of existing programs that combine business and biochemistry/biotechnology

Undergraduate programs:

1. Simon Fraser University (Molecular Biology and Biochemistry and Business Joint Major)
2. University of Waterloo (Biotechnology & Chartered Accountancy Co-op)
3. University of Waterloo (Biotechnology & Economics Co-op)
4. Western University (Business Administration/Bachelor of Science)
5. Georgia Tech (Biochemistry - Business Option)
6. Imperial College (Biochemistry with Management)
7. Imperial College (Biochemistry with Management and Year in Industry/Research)
8. McMaster University (Bachelor of Technology Certificate/Diploma)

Graduate/post-graduate programs:

9. University of Toronto (Master of Biotechnology)
10. University of Calgary (Master of Biomedical Technology)
11. University of Auckland (Postgraduate Diploma in Bioscience Enterprise)
12. University of Auckland (Master of Bioscience Enterprise)
13. University of Cambridge (Master of Bioscience Enterprise)
14. Harvard University (Master of Biotechnology: Management Principles)
15. Rutgers (Master of Business and Science: Biotechnology and Genomics)
16. Johns Hopkins University (Master of Biotechnology Enterprise and Entrepreneurship)

Appendix E

List of attendees at the one-day stakeholder's workshop on October 5, 2011

Internal to the University

1. Michelle Benjamin, Manager, Science Career & Cooperative Education
2. Dr. Nick Bontis, Associate Professor and Director UG Programs, DeGroote School of Business
3. Dr. Eric Brown, Professor and Chair, Department of Biochemistry & Biomedical Sciences
4. Dr. Lori Burrows, Professor and Associate Chair, Research, Biochemistry & Biomedical Sciences
5. Dr. Brian Coombes, Associate Professor and Associate Chair, Graduate Education, Biochemistry & Biomedical Sciences
6. Dr. Lisa Dolovich, Research Director, Family Medicine
7. Dr. Carolyn Eyles, Professor, School of Geography & Earth Sciences
8. Dr. Gerhard Gerber, Professor Emeritus, BBS – former Chair and VP Research & International Affairs
9. Lori Goff, Educational Consultant, Centre for Leadership & Learning
10. Dr. Del Harnish, Professor, Pathology & Molecular Medicine and Assistant Dean, BHSc Program
11. Dr. Benson Honig, Professor, DeGroote School of Business
12. Dr. Michelle MacDonald, Associate Professor and Associate Chair, Undergraduate Program, Biochemistry & Biomedical Sciences
13. Ms. Bonnie Murphy, Manager, Strategy & Planning, Biochemistry & Biomedical Sciences
14. Dr. Nathan Magarvey, Assistant Professor, Biochemistry & Biomedical Sciences
15. Dr. Beth Marquis, Educational Consultant, Centre for Leadership & Learning
16. Dr. Alan Neville, Professor of Oncology and Associate Dean, Education, Faculty of Health Sciences
17. Dr. Glen Randall, Associate Professor, DeGroote School of Business
18. Dr. Patangi Rangachari, Professor Emeritus, Medicine
19. Elsie Quait-Randall, Executive Director, McMaster Industry Liaison Office (MILO)
20. Dr. Ian Rodger, Professor Emeritus, Medicine
21. Joanne Smith, Assistant Dean, Faculty of Science
22. Jon Stokes, PhD student, Biochemistry & Biomedical Sciences
23. Dr. Felicia Vulcu, Assistant Professor, Biochemistry & Biomedical Sciences
24. Dr. John Wallace, Farncombe Institute

External to the University

1. Dr. Luis Barreto, Consultant, formerly at Sanofi-Pasteur Limited
2. Brian Bloom, President & Head of Institutional Sales, Bloom Burton & Co., Toronto
3. Rebecca Bourque, MITACS, Director of Strategic Accounts & Business Development, Toronto
4. Carrie Brooks-Joiner, Management Consultant, Carrie Brooks-Joiner & Associates, Toronto
5. Mark Chamberlain, President & Senior Partner, Trivaris Ltd., Member, McMaster Board of Governors
6. Dr. Kevin Canning, Director, R&D Alliances at GlaxoSmithKline
7. Jay Lefton, LLP, Borden Ladner Gervais Law Firm, Toronto
8. Tony Legault, Program Director, Bioscience Education Canada
9. Dr. Daniel Mamelak, Director, Custom Biologics
10. Dr. Tushar Shakya, Postdoctoral Fellow, MITACS (former BBS PhD graduate)
11. Dr. Roderick Slavcev, Professor, Pharmaceutical Sciences, U. Waterloo
12. Dr. Brian Underdown, Managing Director, Lumira Capital Corp

Appendix F

List of ad-hoc program development committee members

1. Dr. Eric Brown, Professor and Chair, Department of Biochemistry & Biomedical Sciences
2. Dr. Brian Coombes, Associate Professor and Associate Chair, Graduate Education, Biochemistry & Biomedical Sciences
3. Dr. Del Harnish, Professor, Pathology & Molecular Medicine and Assistant Dean, BHSc Program
4. Dr. Benson Honig, Professor, DeGroot School of Business
5. Dr. Michelle MacDonald, Associate Professor and Associate Chair, Undergraduate Program, Biochemistry & Biomedical Sciences
6. Dr. Nathan Magarvey, Assistant Professor, Biochemistry & Biomedical Sciences
7. Dr. Felicia Vulcu, Assistant Professor, Biochemistry & Biomedical Sciences

Appendix G

Letters of support



Health 12800 Main Street West Phone 905.525.9140 Ext. 22545
Sciences Hamilton, Ontario Fax 905.528.3733
Library Canada L8S 4K1 Email baylel@mcmaster.ca
Website hsl.mcmaster.ca

LIBRARY REPORT ON RESOURCES AND SERVICES

TO SUPPORT AN UNDERGRADUATE PROGRAM IN

Biomedical Discovery and Commercialization

September 2012

This summary of the Health Sciences Library's information resources and services in support of the proposed undergraduate program in Biomedical Discovery and Commercialization has been prepared by the Health Sciences Library.

A. LIBRARY RESOURCES

COLLECTION DEVELOPMENT

Books, print journals and other research resources for students in Biomedical Discovery and Commercialization are held in or licensed by the Health Sciences Library, with the exception of business resources which are held in Innis Library (Business). The acquisition of health sciences material in support of the Biomedical Discovery and Commercialization will be coordinated through the Health Sciences Library.

McMaster University Libraries' holdings currently total 2 million volumes. To expand access to journals and books, the Libraries participate in national and regional consortium licenses for online full-text books and journals, and register for campus-wide electronic access instead of print subscriptions or purchase whenever possible.

The acquisition of material in the Health Sciences Library is governed by a Collection Policy that assigns a collection level based on the research intensity and degree level offered for a program. Much of the collection required to support Biomedical Discovery and Commercialization falls within the subject classification for Pharmacology (QV), and specialized areas within this classification are collected at various intensities. Publications in pharmacology, which includes experimental pharmacology, drug research, pharmacokinetics, and toxicology are purchased frequently and the collection is current. Please note that due to budget restrictions we have only actively purchased materials in support of specific needs within the Faculty of Health Science's clinical and non-clinical programs. These often come in the form of book recommendations from faculty and students. Publications in the category of Pharmacy and Pharmaceuticals are collected on a much less frequent basis, and not comprehensively. This category includes: pharmacy, drug industry, pharmacopoeias, formularies, medicinal chemistry, drug discovery, dosage calculation and prescription writing, pharmacognosy, materia medica, medicinal plants, herbs, drug standards and evaluation, regulation, drug catalogues of commercial medications and patent medicines, and types of pharmaceutical preparations and dosage forms. The Library does not collect in the area of compounding and dispensing of drugs.

Resources in the area of drug discovery and commercialization are very expensive, and funding is required to help to build and maintain the collection.

BOOKS

McMaster University currently holds approximately 2,400 titles in the QV classification, Pharmacology, although many of these items are drug guides. The Health Sciences Library holds approximately 120 current print titles related to Pharmacology, 7 of which are printed books and 5 of which are e-books which deal with drug discovery. The Health Sciences Library has not collected specifically in this area.

JOURNALS

Currently the McMaster community has access to over 21,000 full-text electronic journals. Full-text journals are accessible through the e-Journal Portal <http://library.mcmaster.ca/ejournals>.

The journal collection in this area is strong due to titles being included in large consortially licensed packages. A review of McMaster holdings identified 3 academic, peer-reviewed journals related to Biomedical Discovery and Commercialization. Articles from any additional titles missing from the Library's subscriptions could be supplied through Interlibrary Loans, which is a fee-based service.

DATABASES IN SUPPORT OF HEALTH SCIENCES EDUCATION

Databases licensed by McMaster include direct links to McMaster library holdings. Of particular usefulness for this program are:

- Embase (1980-)
- MEDLINE and PreMEDLINE (1950-)
- Proquest Dissertations and Theses
- PubMed
- Web of Science (includes citation mapping)

B. LIBRARY FACILITIES AND SERVICES

PHYSICAL SPACE, EQUIPMENT, SUPPORT, AND HOURS

The Health Sciences Library is open 97 hours per week during the term. The library offers 725 public seats, 15 group study rooms and 82 public computer stations. Students in Faculty of Health Sciences educational programs can pre-book group study rooms up to a week in advance. The Health Sciences Library eClassroom accommodates 36 people with 24 participant workstations.

There are 10 laptops and 3 projectors available for loan for in-library use and wireless service is available throughout the library. A Learning Commons provides a variety of software. Users have access to printing and photocopying facilities.

Information technology assistance is available in person at the Health Sciences Library Information Desk. The service is designed to assist patrons with library computer technology, including setting up their laptops and handheld devices to access the wireless network.

LIBRARY SERVICES

Research/Reference assistance at McMaster University is provided in person, by telephone, and by e-mail. The library offers regularly scheduled orientation and library instruction sessions (library basics, database and web

searching). This service is coordinated by the Head of Public Services. Online tutorials are also available for selected resources.

Because many of the courses will be senior-level inquiry-based research courses, experience has shown that specialized literature search training and support will be required for this program. Other Faculty of Health Sciences educational programs have liaison librarians who work closely with curriculum planners to provide timely and appropriate support to students in those programs. Due to the nature of the proposed Biomedical Discovery and Commercialization program, we recommend that .25 of a librarian be funded for the first year, expanding to .4 on an on-going basis.

For items not available in McMaster's Libraries, students can use Interlibrary Loan Services through RACER (<http://library.mcmaster.ca/racer.htm>). The cost of the service is paid by the student or faculty member.

Reciprocal agreements with various library consortia allow McMaster faculty, staff, and students to borrow in person from other university libraries in Canada.

ACCESS TO THE COLLECTION, CIRCULATION, AND RESERVE

The Health Sciences Library website (<http://hsl.mcmaster.ca>) provides access to the online catalogue and Web-based electronic resources, including full-text electronic journals, reference tools, databases, and e-books. All full-text electronic journals are also accessible from the e-journal portal at: <http://library.mcmaster.ca/ejournals>. The online library catalogue provides information on the material held or licensed by all McMaster Libraries. Most items circulate, with the exception of print journals and reference materials.

Students may borrow books that circulate from the McMaster collections for either two weeks or for shortened loan periods for popular items. Depending on the item books may be renewed online or from any campus library.

Submitted by:

Liz Bayley, Director

Health Sciences Library

McMaster University

Jennifer McKinnell, Head of Public Services

Health Sciences Library

McMaster University

Andrea McLellan, Head of Collections

Health Sciences Library

McMaster University

Health Sciences Library Acquisition Budget 5 Year Summary					
The Health Sciences Library collection is utilized in varying degrees by all programs within the Faculty. As a result, the library does not allocate this expenditure by educational or research programs					
	2007/2008	2008/2009	2009/2010	2010-2011	2011-2012
Books	\$266,037	\$187,038	\$387,000	\$236,645	\$235,322
Journals	\$999,985	\$1,236,899	\$1,234,644	\$1,148,270	\$1,293,473
Databases	\$249,904	\$270,763	\$277,039	\$305,233	\$294,711
Total Budget	\$1,557,400	\$1,709,746	\$1,945,894	\$1,774,344	\$1,903,181



OFFICE OF THE DEAN
DEGROOTE SCHOOL OF BUSINESS

1280 Main Street West
DSB 244
Hamilton, ON
L8S 4M4

T (905) 525-9140 Ext. 24431
F (905) 526-0852

October 3, 2012

Dr. Eric Brown
Chair
Biochemistry and Biomedical Science
HSC 4N59
Faculty of Health Sciences
McMaster University

Dear Dr. Brown:

Eric

On behalf of the DeGroote School of Business, I am providing details regarding the resources that will be required from the School for the proposed Honours Bachelor of Health Sciences Program in Biomedical Discovery and Commercialization (BDC). Of course, the below figures will be superseded by the new budget model when it is implemented fully for the University.

It has been agreed that the recovery cost for the School of Business of a full-time faculty member for a phased-in approach will commence at \$12,000 annually per course offered on load basis, and increasing in increments of \$2,000 annually to a maximum of \$20,000 annually per course per faculty member. These figures will change accordingly when the new budget model is implemented at which time the concept of a maximum figure will be irrelevant. This is based on two courses in Year III and two courses in Year IV.

Additional costs consist of teaching assistants (TA):

Graduate teaching assistants at \$5,500 per course

Undergraduate teaching assistants at \$2,750 per course

Year III – two graduate TAs for two courses x \$5,500 \$11,000

Year IV – one senior undergraduate TA for one course x \$2,750 \$ 2,750

one graduate TA for one course x \$5,500 \$ 5,500

For the eventual addition of Year V, the costs will continue in the phased-in model for full-time faculty involvement at the rate that year until the new budget model is implemented, and the teaching assistant costs for two graduate-level TAs will be \$11,000.

The BDC multi-disciplinary program will be an innovative addition to the curriculum offerings in the DeGroot School of Business. The partnering of DeGroot and the Faculty of Health Sciences provides important collaborative and creative opportunities for students and faculty. In addition, the program will be an important contribution in supporting the academic direction of the University and the emphasis on interdisciplinarity in its offerings.

Sincerely,



Dr. Bob McNutt
Acting Dean

cc: S. Denburg
G. Kanagaretnam
S. Mitchell

Eric - any concerns with these
numbers, please talk to
Gini + me



Faculty of Health Sciences
1200 Main Street West
Hamilton, Ontario, Canada L8N 3Z5
Phone 905.525.9140

To: Whom it may concern

From: Susan Birnie
Director, Education Services
Faculty of Health Sciences,
McMaster University

Date: September 19, 2012

Re: Availability of Teaching Rooms for Biomedical Discovery and Commercialization BHSc Program

Please be advised that I have reviewed the classroom requirements for the proposed BHSc program in Biomedical Discovery and Commercialization. The program will be primarily taught in classrooms that seat 25 to 30 students, in a set-up that facilitates discussion. The Faculty of Health Sciences has 20 such rooms, and capacity to meet the needs of the program is available. In addition, a biochemistry laboratory currently utilized by Midwifery and graduate students is utilized at less than 50% of the time, so we can meet the laboratory teaching needs of the new program.

I trust this information meets your needs.

A handwritten signature in cursive script that reads "S. Birnie".