UNIVERSITY OF TORONTO

University of Toronto
New Graduate Collaborative Program Proposal – expedited approval

Section 1

Program Proposed:	**Collaborative Program in Musculoskeletal Sciences (CPMS)**
Lead Faculty / Academic Division:	**Medicine**
Lead Faculty / Academic Division Contact:	**Avrum Gotlieb**
Anticipated start date of new program:	**September 2013**
Version Date:	**October, 15 2012**

Section 2

1. Program Rationale

There is an increasing burden of illness related to musculoskeletal disorders. The Collaborative Program in Musculoskeletal Sciences (CPMS) will focus on the education and the training of graduate students to develop and carry out musculoskeletal research, with an aim to educate students in how their work fits into the larger community of musculoskeletal research that stretches from bench to bedside to society. The program's goal is to create leaders in the field of musculoskeletal sciences who will possess the knowledge and capability to bring about transformational change in this health research area.

The University of Toronto has a cohort of high quality faculty with expertise in all related medical research disciplines, constituting one of the largest musculoskeletal research communities in the world. Research areas include immunology, cell biology, molecular medicine and genomics, muscle physiology, imaging, pathology, bioengineering and, related clinical areas such as orthopaedics, rheumatology, dentistry, kinesiology, rehabilitation, injury prevention, and pain management. Advances in these areas are converging to allow for major advances in translating research to musculoskeletal care and health, and this collaborative program will build on this community to provide a unique education and training program.

The program will foster graduate education, training and research in the field of musculoskeletal sciences by: (1) bringing numerous but dispersed graduate students together with musculoskeletal researchers within the University of Toronto in a focused and purposeful way and (2) encouraging collaboration across a wide spectrum of medical-related disciplines within the University through the core course and seminar series. This will be a unique graduate education program, as there is only one other similar program in North America at the University of Rochester. The collaborative program will act as an academic hub for graduate students in different disciplines and will be supported by the Institute of Medical Science, and the newly established Toronto Musculoskeletal Centre, a type "C" Extra Departmental Unit (EDU) focused on interdisciplinary musculoskeletal research.[1]

[1]Type "C" Extra Departmental Unit (EDU) is a multidisciplinary multidepartment research and/or academic unit with a defined research domain. The Toronto Musculoskeletal Centre was established on 1 January, 2011 in an agreement between the U of Toronto, Mount Sinai Hospital and Sunnybrook Health Sciences Centre.

2. Participating Programs, Degrees and Names of Graduate Units[2]:

- Biomedical Engineering, (MASc, PhD), Institute of Biomaterials and Biomedical Engineering
- Dentistry (MSc, PhD), Graduate Department of Dentistry
- Exercise Sciences (MSc, PhD), Graduate Department of Exercise Sciences
- Health Policy, Management and Evaluation (MSc, PhD), Institute of Health Policy, Management and Evaluation
- Laboratory Medicine and Pathobiology (MSc, PhD) Department of Laboratory Medicine and Pathobiology
- Medical Science (MSc, PhD) Institute of Medical Sciences
- Rehabilitation Science (MSc, PhD) Graduate Department of Rehabilitation Science

3. Objectives and Added Value for Students

Demand For The Program:

Anticipated demand for this program is high and consistent. Based on the current number of graduate students supervised by the core faculty, we anticipate that we will have a minimum of 15 students in the initial year of the program (chiefly from graduate students already enrolled in UofT graduate degree programs). The program is aiming for 24 new students per year at steady state. Demand has been assessed by reviewing applications for graduate studies at participating departments submitted by students with specific interest in musculoskeletal research. In the 2011-12 graduate admissions cycle, the participating graduate units currently have a total of 81 MSc and PhD students who are now completing degrees in related research field.

Department	***# of 2011-12 admissions in the field of Musculoskeletal Sciences***
Dentistry	20
Exercise Sciences	12
Institute of Biomaterials and Biomedical Engineering	10
Institute of Health Policy, Management and Evaluation	12
Institute of Medical Science	15
Laboratory Medicine and Pathobiology	8
Rehabilitation Science	16

Another indicator of demand is the experience of the University of Rochester Center for Musculoskeletal Research (the only equivalent program in North America.). Its graduate school and its assembly of related graduate programs is substantially smaller than that at the University of Toronto, and it has fewer supervisors in musculoskeletal-based research than we have in Toronto. Its collaborative program equivalent was established two years ago, and now has approximately 40 students enrolled. Based on its experience, we anticipate substantial demand in our program. As the CPMS gains visibility, we anticipate that additional graduate students will be attracted to the UofT.

Applications to the CP in Musculoskeletal Sciences will be evaluated based on the application's academic excellence and program fit. If there is a significant demand over the program's expected capacity, the Director will consider running additional sessions of the core course.

[2] Graduate unit is a generic reference for graduate departments, centres, institutes, or schools, all of which can be thought of as "departments".

Value Added

- Through the core course and seminar series, the CPMS will offer excellence exposure to musculoskeletal science research.
- It will enhance group identity, create a vibrant forum for collaborative work, and maximize resource utilization. All graduate students will obtain heightened insight into a wide array of disciplines and methodologies they would not normally receive from their home program and department alone.
- Professional contacts throughout the international musculoskeletal research community will be enhanced through participation in this program
- Graduate students will receive formal recognition of their training in musculoskeletal science on their graduate transcripts.

Common Learning Experience in the Program

The common learning experience will be the core course, Foundations in Musculoskeletal Science, and the seminar series. All students at both degree levels will complete these requirements. In both activities students from diverse academic backgrounds will participate and interact with faculty and experts in the topic area of musculoskeletal science.

In the rare instance that a student who has completed the Collaborative Program at the master's level wishes to also enroll in the Collaborative Program at the doctoral level, the student will not be required to repeat the core course, Foundations in Musculoskeletal Science, but will be required to attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series and complete the doctoral thesis in the area under the supervision of a core faculty member.

Overlap with Other University of Toronto Collaborative Programs:

There is no other Collaborative Program at the University of Toronto with a focus on musculoskeletal science.

4. Admission and Program Requirements

Admission Requirements

Applicants must meet the entry requirements of the home graduate program and graduate unit. Students may apply to the Collaborative Program prior to, or after registering in their degree program. In addition to the application requirements of the home degree program, the CPMS will require:

- A resume or curriculum vitae
- A one page letter explaining how the student's program of study and specific research interests relate to musculoskeletal science
- A letter of recommendation from a faculty member, if possible the thesis supervisor in a thesis-based graduate program, commenting on the applicant's academic abilities, and likelihood for research success.

The CPMS Program Committee will make decisions about admission to the Collaborative Program, based on the above information.

Program Requirements

Students must register in the degree program through one of the participating graduate units. They must meet all respective degree requirements of the School of Graduate Studies and their participating home

graduate unit as well as the requirements of the collaborative program.

Master's Level

In addition to meeting home graduate unit program requirements, students will be required to:

- Complete the required core course: MSC3001H Foundations In Musculoskeletal Science
- Attend and participate in 12 seminars of the SRM3335H, Master's Seminar Series(CR/NCR)
- Complete a thesis, major project or placement in the area of musculoskeletal sciences under supervision of a collaborative program core faculty member.

Doctoral Level

In addition to meeting home graduate unit program requirements, students will be required to:

- Complete the required CPMS Core Course: MSC3001H Foundations in Musculoskeletal Science. Students who have completed MSC3001H at the master's level and who transfer to a doctoral degree and the doctoral level of the collaborative program are not required to complete an additional core course at the doctoral level.
- Attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series. Students who transfer from a master's degree and master's collaborative program to a doctoral degree and the doctoral collaborative program will be required to attend 18 seminars in total, and the total will include the number of seminars attended at both the master's and doctoral levels..
- Complete a thesis in the area of musculoskeletal sciences under supervision of a collaborative program core faculty member.
- In the rare instance that a student who has completed the Collaborative Program at the master's level and wishes to also enroll in the Collaborative Program at the doctoral level, the student will not be required to repeat the core course, Foundations in Musculoskeletal Science, but will be required to attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series and to complete the doctoral thesis in the area under the supervision of a core faculty member. These requirements will ensure that as a doctoral student the candidate benefits from a significant common learning experience. The seminar and research requirement, in combination with the core course completed previously, will be sufficient to support the learning outcomes of the doctoral component of the Collaborative program.

Courses

MSC3001H – *Foundations in Musculoskeletal Science:*

This half-credit course will consist of a series of 12 two -hour lectures covering the spectrum of the topics and issues particularly relevant to designing and conducting research in musculoskeletal science. Students will achieve an enhanced appreciation of the breadth and complexities of research in the field, and will be better able to discuss disparate areas of research, thereby reinforcing a spirit of interdisciplinary research. In order to receive a grade, students will be required to complete an essay, assist in delivery of a specified lecture topic and ensuing discussion, and activity participate in discussions.

SRM3335H- Master's Seminar Series and SRD4445H – Doctoral Seminar Series:

This extended format type 1 (CR/NCR) graduate seminar series will expose students in the Collaborative Program in Musculoskeletal Sciences to current research and recent advances in this emerging field. The seminar series attendees will include students, faculty, clinicians, researchers and guests and students will acquire unique opportunities to network, exchanging novel ideas and enhancing opportunities for true interdisciplinary collaboration. Students enrolled in this credit/non-credit course will

be required to attend and participate in an ongoing monthly formal seminar series, featuring local and international investigators of key importance in the field. Topics will change annually to encompass the broad spectrum of musculoskeletal science and will cover a continuum from cell biology to kinematics, epidemiology, and knowledge translation. Students will also be required to present their research once at the annual Musculoskeletal Science Meeting – which is part of the Seminar Series. In this seminar, internationally recognized experts will speak and interact with students, Student are required to attend this meeting each year they are enrolled in the CPMS. Students at the master's level will be required to attend at least twelve sessions on different topics to obtain credit in this course while students in the doctoral level will be required to attend 18 sessions.

SGS CALENDAR ENTRY

Musculoskeletal Sciences

Lead Faculty
Medicine

Participating Degree Programs

- Biomedical Engineering, (MASc, PhD),
- Dentistry (MSc, PhD)
- Exercise Sciences (PhD, MSc)
- Health Policy, Management and Evaluation (MSc, PhD)
- Laboratory Medicine and Pathobiology (MSc, PhD)
- Medical Science (MSc, PhD)
- Rehabilitation Science (MSc, PhD)

Overview

There is an increasing burden of illness related to musculoskeletal disorders. The Collaborative Program in Musculoskeletal Sciences (CPMS) will focus on the education and the training of graduate students to develop and carry out musculoskeletal research, with an aim to educate students in how their work fits into the larger community of musculoskeletal research that stretches from bench to bedside to society. The program's goal is to create leaders in the field of musculoskeletal sciences who will possess the knowledge and capability to bring about transformational change.

The University of Toronto has a cohort of high quality faculty with expertise in all related medical research disciplines, constituting one of the largest musculoskeletal research communities in the world. Research areas include immunology, cell biology, molecular medicine and genomics, muscle physiology, imaging, pathology, bioengineering and, related clinical areas such as orthopaedics, rheumatology, dentistry, kinesiology, rehabilitation, injury prevention, and pain management. Advances in these areas are converging to allow for major advances in translating research to musculoskeletal care and health, and this collaborative program will build on this community to provide a unique education and training program.

This program is of particular interest to graduate students who wish to enhance their interdisciplinary knowledge and advance their careers. Professional contacts throughout the international musculoskeletal research community are enhanced through participation in this program. Graduate students will receive formal recognition of their training in musculoskeletal science on their graduate transcript.

Contact and Address

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Mount Sinai Hospital
Room 877
600 University Avenue
Toronto, Ontario M5G 1X5
Canada

Programs

Master's Level

Admission Requirements

Applicants who wish to enroll in the collaborative program must apply to and be admitted to both a graduate degree program in one of the participating units and to the collaborative program. In addition to the application requirements of the home degree program, the CPMS requires:

- A resume or curriculum vitae
- A one page letter explaining how the applicant's student's program of study and specific research interests relate to musculoskeletal science
- A letter of recommendation from a faculty member, if possible the thesis supervisor in a thesis-based graduate program, commenting on the applicant's academic abilities, and likelihood for research success.

Program Requirements

- Satisfy requirements of the home degree program and graduate unit
- Complete the required CPMS Core Course: MSC3001H, Foundations In Musculoskeletal Science
- Attend and participate in 12 seminars of the SRM3335H *Master's Seminar Series (CR/NCR)*.
- Complete a thesis or major project or placement in the area of musculoskeletal sciences under the supervision of collaborative program core faculty member

Doctoral Level

Students enrolled in the Collaborative Program at the master's level who transfer to the doctoral level will have the course MSC3001H *Foundations in Musculoskeletal Science* counted toward the completion of the doctoral collaborative program requirements.

Admission Requirements

Applicants who wish to enroll in the collaborative program must apply to and be admitted to both a graduate degree program in one of the collaborating units and to the collaborative program. In addition to the application requirements of the home degree program, the CPMS requires:

- A resume or curriculum vitae

- A one page letter explaining how the applicant's program of study and specific research interests relate to musculoskeletal science
- A letter of recommendation from a faculty member, usually the thesis supervisor in a thesis-based graduate program, commenting on the applicant's academic abilities, and likelihood for research success at the doctoral level.

Program Requirements

- Satisfy requirements of the home degree program and graduate unit
- Complete the required CPMS Core Course: MSC3001H Foundations in Musculoskeletal Science. Students who have completed MSC3001H at the master's level and who transfer to a doctoral degree and the doctoral level of the collaborative program are not required to complete an additional core course.
- Attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series. Students who transfer from a master's degree and master's collaborative program to a doctoral degree and the doctoral collaborative program will be required to attend 18 seminars in total, and the total will include the number of seminars attended at both the master's and doctoral levels.
- Complete a thesis in the area of musculoskeletal sciences under supervision of a collaborative program core faculty member.
- In the rare instance that a student who has completed the Collaborative Program at the master's level wishes to also enroll in the Collaborative Program at the doctoral level, the student will not be required to repeat the core course, Foundations in Musculoskeletal Science, but will be required to attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series and complete the doctoral thesis in the area under the supervision of a core faculty member.

Completion of program requirements:

All students enrolled in the Collaborative Program must complete the requirements of the Collaborative Program, in addition to those requirements for the degree program in their home graduate unit. The Collaborative Program Director is responsible for certifying the completion of the Collaborative Program requirements. The home graduate unit is solely responsible for the approval of the student's home degree requirements.

Course List

MSC3001H Foundations in Musculoskeletal Science
SRM3335H Master's Seminar Series
SRD4445H Doctoral Seminar Series

Program Committee

Alman, Benjamin - BA, MD, FRCSC - Medical Science ***(Director)***
Bombardier, Claire - MD, FRCPC - Health Policy Management and Evaluation
Davis, Aileen M. - BScPT, MSc, PhD - Rehabilitation Science
Grynpas, Marc - PhD - Laboratory Medicine and Pathobiology
Hawker, Gillian A. - MD, MSc, FRCPC - Health Policy Management and Evaluation
Inman, Robart D. - MD
Kandel, Rita MD - FRCPC - Laboratory Medicine and Pathobiology
Mahomed, Nizar N - MD, FRCSC, MPH, ScD
Whyne, Cari - PhD - Biomaterial Engineering
White, Lawrence - M MD, FRCPC
Yeung, Rae S. - M. MD, PhD, FRCPC - Medical Science

5. Degree Level Expectations (DLEs), Program Learning Outcomes and Program Structure

A collaborative program is intended to provide an additional multidisciplinary experience for students enrolled in, and completing the requirements of a degree program. The requirements for the Collaborative Program in Musculoskeletal Sciences (CPMS) are **in addition to** the degree requirements and are not meant to extend the student's time to degree. The collaborative program focuses on establishing a depth of knowledge through key core elements within the framework of Musculoskeletal Sciences.

Master's DLE

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs]	**MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES**	**HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES**
EXPECTATIONS: *This Collaborative Program in Musculoskeletal Sciences extends the skills associated with the Master's degree and is awarded to students who have demonstrated:*		
1. Depth and Breadth of Knowledge A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the academic discipline, field of study, or area of professional practice.	Depth of knowledge is defined in CPMS as acquiring and understanding of current interdisciplinary research and recent advances in the emerging research area of musculoskeletal sciences. This includes obtaining heightened insight into a wide array of disciplines and methodologies. This is reflected in students who are able to: understand the interdisciplinary nature of Musculoskeletal Science and current research and methodologies in the area; identify cross-disciplinary research opportunities, investigate new areas of research based on clinical needs; develop an enhanced appreciation of the breadth and complexities of research in the area. Breadth of knowledge is addressed through the primary degree program of registration.	In the Foundations course students will receive a common foundation of the topics that will be updated annually to reflect the rapid evolution of ideas in the area. In the seminar series course, topics will also change annually and will include fundamental musculoskeletal research, to cover a continuum from cell biology to kinematics, epidemiology, and knowledge translation. In addition to their attendance of the seminars, students will also be required to present their research in the Annual Musculoskeletal Science meeting (part of the Seminar Series) in which they will be able to interact with internationally recognized experts in the field.
2. Research and Scholarship A conceptual understanding	The specific learning outcomes for students in this area will be in line with the expectations of the primary	Students will achieve this learning outcome through completing a thesis or major project or placement in the area of

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs]	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
and methodological competence that i) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline; ii) Enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence; and iii) Enables a treatment of complex issues and judgments based on established principles and techniques; **and,** on the basis of that competence, has shown at least one of the following: i) The development and support of a sustained argument in written form; or ii) Originality in the application of knowledge.	degree program of registration with a particular focus on Musculoskeletal Science	musculoskeletal sciences under of supervision of a faculty member affiliated with the program.
3. Level of Application of Knowledge Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.	Level of Application of Knowledge is defined in CPMS as being able to undertake analysis and evaluation of a range of research in Musculoskeletal Sciences. This is reflected in students who are able to: enhance their analytical and research abilities; evaluate the current state of knowledge in interdisciplinary musculoskeletal research within the University of Toronto and internationally.	The Foundations course will provide common foundation of topics and issues particularly relevant to designing and conducting research in musculoskeletal science. In the seminar series students will be exposed to current research and recent advances in the area. The seminars will provide students an opportunity to meet and network with expert researchers in the area; facilitate opportunities for collaboration among participants in the program. Students will present their research and interact with internationally recognized experts in the area during the Annual Musculoskeletal Science meeting.
4. Professional Capacity/Autonomy a. The qualities and transferable skills	Professional Capacity/Autonomy is defined in Collaborative Program in Musculoskeletal Silence as the ability to enhance the education in the emerging area of	The cross- disciplinary courses of home units and this collaborative program as well as the MSK- EDU will act as an academic hub for graduate students in different

MASTER'S DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs]	MASTER'S PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
necessary for employment requiring i) The exercise of initiative and of personal responsibility and accountability; and ii) Decision-making in complex situations; b. The intellectual independence required for continuing professional development; c. The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and d. The ability to appreciate the broader implications of applying knowledge to particular contexts.	musculoskeletal sciences and increase the visibility of musculoskeletal research for graduate students from multidisciplinary degree program This will be reflected in students who are able to: identify cross-disciplinary research opportunities, value knowledge of important musculoskeletal problems, and develop a strong network of peers and professional contacts	disciplines, This will create a vibrant forum for collaborative work, create maximize resources, enhance a group identity, and thus increase the visibility of musculoskeletal research. The Foundations course will cover topics updated annually to reflect the rapid evolution of ideas in the area. The seminar series will expose students to current research and recent advances in the area, and will facilitate opportunities for students to meet, network, and hear from local and international investigators in the area. .
5. Level of Communications Skills The ability to communicate ideas, issues and conclusions clearly.	Level of Communication skills is addressed through the primary degree program of registration.	

Doctoral DLE

DOCTORAL DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	DOCTORAL PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
EXPECTATIONS *This Collaborative Program in Musculoskeletal Sciences extends the skills associated with the Doctoral degree and is awarded to students who have demonstrated:*		
1. Depth and Breadth of Knowledge A thorough understanding of a substantial body of knowledge that is at the forefront of their academic discipline or area of professional practice.	Depth of knowledge is defined in CPMS as acquiring and understanding of current interdisciplinary research and recent advances in the emerging area of musculoskeletal sciences. This includes obtaining heightened insight into a wide array of disciplines and methodologies.	In the Foundations course students will receives a common foundation of the topics that will be updated annually to reflect the rapid evolution of ideas in the area. In the seminar series course topics will also change annually and will include

DOCTORAL DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	DOCTORAL PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
	This is reflected in students who are able to: understand the interdisciplinary nature of Musculoskeletal Science and current research and methodologies in the area; identify cross- disciplinary research opportunities, investigate new areas of research based on clinical needs; develop an enhanced appreciation of the breadth and complexities of research in the area. Breadth of knowledge is addressed through the primary degree program of registration.	fundamental musculoskeletal research, to cover a continuum from cell biology to kinematics, epidemiology, and knowledge translation. In addition to their attendance of the seminars, students will also be required to present their research in the Annual Musculoskeletal Science meeting (part of the Seminar Series) in which they will be able to interact with internationally recognized experts in the area.
2. Research and Scholarship a. The ability to conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems; b. The ability to make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and c. The ability to produce original research, or other advanced scholarship, of a quality to satisfy peer review, and to merit publication.	The specific learning outcomes for students in this area will be in line with the expectations of the primary degree program of registration with a particular focus on Musculoskeletal Science	Students will achieve this learning outcome through completing a substantial thesis or major project or placement in the area of musculoskeletal sciences under of supervision of a faculty member affiliated with the program.
3. Level of Application of Knowledge The capacity to i) Undertake pure and/or applied research at an advanced level; and ii) Contribute to the development of academic or professional skills, techniques, tools, practices,	Level of Application of Knowledge is defined in CPMS as being able to undertake analysis and evaluation of a range of research in Musculoskeletal Sciences. This is reflected in students who are able to: enhance their analytical and research abilities; evaluate the current state of knowledge in interdisciplinary	The Foundations course will provide common foundation of topics and issues particularly relevant to designing and conducting research in musculoskeletal science. Seminar Series students will be exposed to current research and recent advances in the area. The

DOCTORAL DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	DOCTORAL PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
ideas, theories, approaches, and/or materials.	musculoskeletal research within the University of Toronto and internationally.	seminars will provide students an opportunity to meet and network with expert researchers in the area; facilitate opportunities for collaboration among participants in the program. Students will present their research and interact with internationally recognized experts in the area during the Annual Musculoskeletal Science meeting.
4. Professional Capacity/Autonomy a. The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations; b. The intellectual independence to be academically and professionally engaged and current; c. The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and d. The ability to evaluate the broader implications of applying knowledge to particular contexts.	Professional Capacity/Autonomy is defined in Collaborative Program in Musculoskeletal Silence as the ability to enhance the education in the emerging area of musculoskeletal sciences and increase the visibility of musculoskeletal research for graduate students from multidisciplinary degree program This will be reflected in students who are able to: identify cross-disciplinary research opportunities, value knowledge of important musculoskeletal problems, and develop a strong network of peers and professional contacts	The cross- disciplinary courses of home units and this collaborative program as well as the MSK- EDU will act as an academic hub for graduate students in different disciplines, This will create a vibrant forum for collaborative work, create maximize resources, enhance a group identity, and thus increase the visibility of musculoskeletal research. The Foundation course will cover topics updated annually to reflect the rapid evolution of ideas in the area. The Seminar Series will expose students to current research and recent advances in the area, and will facilitate opportunities for students to meet, network, and hear from local and international investigators in the area. .
5. Level of Communication Skills The ability to communicate complex and/or ambiguous ideas, issues and conclusions clearly and effectively.	Level of Communication skills is addressed through the primary degree program of registration.	

DOCTORAL DEGREE LEVEL EXPECTATIONS (based on the Ontario Council of Academic Vice Presidents (OCAV) DLEs)	DOCTORAL PROGRAM LEARNING OBJECTIVES AND OUTCOMES	HOW THE PROGRAM DESIGN AND REQUIREMENT ELEMENTS SUPPORT THE ATTAINMENT OF STUDENT LEARNING OUTCOMES
6. Awareness of Limits of Knowledge An appreciation of the limitations of one's own work and discipline, of the complexity of knowledge, and of the potential contributions of other interpretations, methods, and disciplines. Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.	Level of Awareness of is addressed in the primary degree program of registration	

6. Assessment of Student Learning

Assessment takes place through the formal program requirements for both degree levels. Graduate students in the master's or doctoral degree levels complete two courses in Musculoskeletal Sciences: the core course Foundations in the Musculoskeletal Science (MSC3001H) from which they receive evaluation of work and a graduate grade, and the Seminar Series course (SRM3335H/SRD4445H). The seminar series is a credit/no credit seminar series course, and credit is granted for attendance at a minimum of 12 sessions. The core course, Foundations in Musculoskeletal Science is the common learning element of the program, and consists of twelve sessions. The course will foster an enhanced appreciation of the breadth and complexities of research in the area, and students will be better able to discuss disparate areas of research, thereby reinforcing a spirit of interdisciplinary research. In order to receive a grade, students will be required to complete an essay (on an instructor-approved topic in musculoskeletal science research not related to the student's thesis topic) which is worth 30%; assist in delivery of a specified topic by completing a lecture presentations and discussion (in conjunction with, and assessed by, the lecturer) in two sessions with 30% percentage value per session for a total of 60% of the grade. Participation is worth 10%, the course instructor will be responsible for monitoring attendance records and assessing active participation. Students who are not performing to expectation in this course will be contacted and counselled as required by the instructor on a timely basis.

Depending on the requirements of their home program, students may also be required to complete a major paper, thesis or practicum placement (masters' level) with a musculoskeletal science focus under the supervision of one of the collaborative program's core faculty members. The evaluation of this capstone work provides the final assessment of how the student has integrated material from the field.

7. Resources

The Collaborative Program's 14 core faculty members are available to students in the home programs as advisors or supervisors. If a student's program includes a thesis, it is expected that a core faculty member in the student's home graduate unit will be involved in thesis supervision. Core faculty members contribute to the Collaborative Program through teaching of the core course and participating in the

delivery of seminar series. Not all faculty members are active in the Collaborative Program every year and, in many cases, simply may remain available to interested students. Each participating degree program contributes to the Collaborative Program through student enrolments, although not necessarily every year.

Each Collaborative Program has a Director and a Program Committee. Together they are responsible for admitting students to the Collaborative Program and ensuring that the faculty associated with the program have the capacity to supervise all program students. Consequently an assessment of supervisory capacity occurs twice: once when students are admitted to their home degree program and once on their applications to the Collaborative Program.

The University finds that the participation in a collaborative program does not normally add significantly to a faculty member's supervisory load. For the most part, students in the collaborative program will continue to have their thesis or major research paper supervised by a faculty member in their home program who also participates in the collaborative program.

The Collaborative Program will be supported through the Institute of Medicine Science (IMS) and the Toronto Musculoskeletal Centre (EDU C of the UofT Faculty of Medicine). The IMS will provide non-paid administrative support related to maintaining course and student records as well as booking class rooms for the core course and seminar series. The Toronto Musculoskeletal Centre will provide funds for a part time administrative support, a stipend for the director, and funds to support speakers and the events of the graduate seminar series. Funding for the Toronto Musculoskeletal Centre runs until December 30, 2014 and the Director of the Centre will apply for the funding to be renewed. In the event that the funding of the Centre is not renewed, the Department of Surgery, Faculty of Medicine, has committed to cover all costs related to program administration and communicated this to the Vice Dean, Graduate Affairs.

Please see Appendix B for a list by program of core graduate faculty.

8. Administration

Please see Appendix C: Memorandum of Agreement

9. Governance Process

	Levels of Approval Required
Consultation with Provost	
Decanal and Provostial Sign Off	
	Graduate unit approval
	Faculty/Divisional Governance
Submission to Provost's Office	AP&P
Program may begin advertising as "Pending Approval"	
	Ontario Quality Council

Developed by the Office of the Vice-Provost, Academic Programs: September 14, 2011

APPENDIX A

COLLABORATIVE PROGRAM REQUIREMENTS & DEGREE PROGRAM REQUIREMENTS

Participating Degree Programs

- Biomedical Engineering, (MASc, PhD), Institute of Biomaterials and Biomedical Engineering
- Dentistry (MSc, PhD), Graduate Department of Dentistry
- Exercise Sciences (MSc, PhD), Graduate Department of Exercise Sciences
- Health Policy, Management and Evaluation (MSc, PhD), Institute of Health Policy, Management and Evaluation
- Laboratory Medicine and Pathobiology (MSc, PhD) Department of Laboratory Medicine and Pathobiology
- Medical Science (MSc, PhD) Institute of Medical Sciences
- Rehabilitation Science (MSc, PhD), Graduate Department of Rehabilitation Science

All students enrolled in the collaborative program must complete MSC3001H, Foundations in Musculoskeletal Science, the seminar series course and the thesis or major research paper topic should be in the field of the Collaborative Program.

Biomaterial Engineering, Institute Biomaterial and Biomedical Engineering

- **MASc**

MASc Requirements	1.0 FCEs required courses 1.0 FCEs electives from within the degree program
The MSC3001H course is in addition to the home program requirements due to lack elective room.	

- **PhD**

PhD Requirements	0.5 FCEs required courses 0.5 FCEs electives from within the degree program
The MSC3001H course is in addition to the home program requirements due to lack of elective room.	

Dentistry, Graduate Department of Dentistry

- **MSc (Thesis option only)**

MSc Requirements	1.5 FCEs required courses 1.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **PhD (Thesis option only)**

PhD Requirements	1.5 FCEs required courses 2.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

Exercise Sciences, Graduate Department of Exercise Sciences

- **MSc**

MSc Requirements	1.0 FCEs required courses 2.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **PhD**

PhD Requirements	1.0 FCEs required courses 1.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

Health Policy Management and Evaluation, Institute of Health Policy, Management & Evaluation:

- **MSc**

MSc Requirements	1.0-1.5 FCEs required courses 1.5-2.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **PhD**

PhD Requirements	4.0 FCEs required courses 1.0FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **For the concentration Health Technology Assessment and Management see below:**

MSc Requirements	3.0 FCEs required courses
MSC3001H is in addition to the home program requirements due to lack of electives	

Laboratory Medicine and Pathobiology, Department of Laboratory Medicine and Pathobiology:

- **MSc**

MSc Requirements	1.5 FCEs required courses
The MSC3001H may be counted as a 0.5 elective	

- **PhD**

PhD Requirements	1.5 FCEs required courses 0.5-1.5 FCEs electives depending on whether the student has an MSc or not.
The MSC3001H course may be counted as a 0.5 FCE elective.	

Medical Science, Institute of Medical Science

- **MSc**

MSc Requirements	1.0 FCE required courses 1.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **PhD**

PhD Requirements	1.0 FCE required courses 1.0 – 2.0 FCEs electives depending on whether the student has an MSc or not.
The MSC3001H course may be counted as a 0.5 FCE elective.	

Rehabilitation Science, Graduate Department of Rehabilitation Science:

- **MSc**

MSc Requirements	1.0 FCEs required courses 1.0 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

- **PhD**

PhD Requirements	1.5 FCEs required courses 0.5 FCEs electives
The MSC3001H course may be counted as a 0.5 FCE elective.	

APPENDIX B

CORE FACULTY RESEARCH SYNOPSES

All teaching staff identified as members of the Collaborative Program are core faculty of the participating approved graduate programs and have been approved by the chair/director of their home unit for cross-appointment to the Collaborative Program. In bringing forward a proposal for a new Collaborative Program, the concern is that, in addition to being approved members of the graduate teaching staff, all proposed faculty be active in the field of the Collaborative Program. This list highlights peer review publications by the approved faculty members in the Collaborative Program field.

Institute of Medical Science

Benjamin Alman

Hsu SC, Zhang X, Yu C, Li ZJ, Wunder JS, Hui CC, Alman BA. Kif7 promotes Hedgehog signaling in growth plate chondrocytes by restricting the inhibitory function of Sufu. Development. 2011: 138(17): 3791-3801. Senior Responsible Investigator.

Wang CY, Wei Q, Han I, Sato S, Azarnier GR, Whetstone H, Poon R, Hu J, Zheng F, Zhang P, Wang W, Wunder JS, Alman BA. Hedgehog and notch signaling regulate self-renewal of undifferentiated pleomorphic sarcoma. Cancer Research. 2012: 72: 1013-1022. Senior Responsible Author.

Rae Yeung

Oen K, Duffy CM, Tse SM, Ramsey S, Ellsworth J, Chédeville G, Chetaille AL, Saint-Cyr C, Cabral DA, Spiegel LR, Schneider R, Lang B, Huber AM, Dancey P, Silverman E, Rosenberg AM, Cameron B, Johnson N, Dorval J, Scuccimarri R, Campillo S, Petty RE, Duffy KN, Boire G, Haddad E, Houghton K, Laxer R, Turvey SE, Miettunen P, Gross K, Guzman J, Benseler S, Feldman BM, Espinosa V, Yeung RS, Tucker L. Early outcomes and improvement of patients with juvenile idiopathic arthritis enrolled in a Canadian multicenter inception cohort. Arthritis Care Res (Hoboken). 2010 Apr; 62(4):527-36.

Shiff NJ, Tucker LB, Guzman J, Oen K, Yeung RS, Duffy CM. Factors associated with a longer time to access pediatric rheumatologists in Canadian children with juvenile idiopathic arthritis.JRheumatol. 2010 Nov;37(11):2415-21. Epub 2010 Aug 17.

Institute of Health Policy, Management and Evaluation

Claire Bombardier

Katchamart W, Bombardier C. Systematic monitoring of disease activity using an outcome measure improves outcomes in rheumatoid arthritis. J Rheumatol. 2010 Jul;37(7):1411-5.

Tang K, Escorpizo R, Beaton DE, Bombardier C, Lacaille D, Zhang W, Anis AH, Boonen A, Verstappen SM, Buchbinder R, Osborne RH, Fautrel B, Gignac MA, TugwellPS.Measuring the impact of arthritis on worker productivity: perspectives, methodologic issues, and contextual factors. J Rheumatol. 2011 Aug;38(8):1776-90.

Gillian Hawker

Borkhoff CM, Hawker GA, Wright JG. Patient gender affects the referral and recommendation for total joint arthroplasty.ClinOrthopRelat Res. 2011 Jul;469(7):1829-37.

Hawker, GA., Gignac, M.A.M., Badley, E., Davis, A.M., French, M.R., Li, Y. Perruccio, A.V., Power, J.D., Sale, J., Lou, W.A Longitudinal Study to Explain the Pain-Depression Link in Older Adults with Osteoarthritis. Arthritis Care & Research, 2011;63(10):1382-90. (Principal Author)

Institute of Biomaterials and Biomedical Engineering

John E. Davis

Ball TA, Davis JR, Lofthouse RA. A better way to deliver bone graft. Ann R CollSurg Engl. 2010 Apr;92(3):265.

Valarmathi MT, Fuseler JW, Goodwin RL, Davis JM, Potts JD. The mechanical coupling of adult marrow stromal stem cells during cardiac regeneration assessed in a 2-D co-culture model.Biomaterials. 2011 Apr;32(11):2834-50. Epub 2011 Feb 1.

Cari Whyne

Beyond bisphosphonates: photodynamic therapy structurally augments metastatically involved vertebrae and destroys tumor tissue. Won E, Wise-Milestone L, Akens MK, Burch S, Yee AJ, Wilson BC, Whyne CM. Breast Cancer Res Treat. 2010 Nov;124(1):111-9.

Hojjat SP, Won E, Hardisty MR, Akens MK, Wise-Milestone LM, Whyne CM. Non-destructive evaluation of the effects of combined bisphosphonate and photodynamic therapy on bone strain in metastatic vertebrae using image registration. Ann Biomed Eng. 2011 Nov;39(11):2816-22.

Department of Laboratory Medicine and Pathobiology

Marc Grynpas

Effect of rosiglitazone on bone quality in a rat model of insulin resistance and osteoporosis.Sardone LD, Renlund R, Willett TL, Fantus IG, Grynpas MD.Diabetes. 2011 Dec;60(12):3271-8. Epub 2011 Oct 12.

St-Pierre JP, Gan L, Wang J, Pilliar RM, Grynpas MD, Kandel RA. The incorporation of a zone of calcified cartilage improves the interfacial shear strength between in vitro-formed cartilage and the underlying substrate.ActaBiomater. 2012 Apr;8(4):1603-15..

Rita Kandel

Inorganic Polyphosphate Stimulates Cartilage Tissue Formation.St-Pierre JP, Wang Q, Li SQ, Pilliar RM, Kandel RA. Tissue Eng Part A. 2012 Apr 25. [Epub ahead of print]
PMID: 22429075.

The response of annulus fibrosus cell to fibronectin-coated nanofibrous polyurethane-anionic dihydroxyoligomerscaffolds.Attia M, Santerre JP, KandelRA.Biomaterials. 2011 Jan;32(2):450-60. Epub 2010 Sep 28.PMID: 20880584.

Graduate Department of Dentistry

Bernhard Ganss

Lacruz RS, Nakayama Y, Holcroft J, Nguyen V, Somogyi-Ganss E, Snead ML, White

SN, Paine ML, Ganss B. Targeted overexpression of amelotin disrupts the microstructure of dental enamel. PLoS One. 2012;7(4):e35200. Epub 2012 Apr 23. PubMed PMID: 22539960; PubMed Central PMCID: PMC3335167.

Somogyi-Ganss E, Nakayama Y, Iwasaki K, Nakano Y, Stolf D, McKee MD, Ganss B. Comparative Temporospatial Expression Profiling of Murine Amelotin Protein during Amelogenesis.Cells Tissues Organs. 2012;195(6):535-49. Epub 2011 Sep 9. PubMed PMID: 21912076.

Morris Manolson

Gramoun, A., Azizi, N., Sodek, J., Heersche, J.N.M., Nakchbandi, I., and Manolson, M.F. Fibronectin inhibits osteoclastogenesis while enhancing osteoclast activity via nitric oxide and interleukin-1β-mediated signaling pathways. J Cell Biochem. 2010 Nov 1;111(4):1020-34

Gramoun, A., Goto, T., Nosrdstrom, T., Rotstein, O., Grinstein, S., Heersche, J.N., M.F. Manolson.Bone Matrix Proteins and Extracellular Acidification; Potential Co-regulators of Osteoclast Morphology.J Cell Biochem. 2010 Oct 1;111(2):350-61.

Graduate Department of Exercise Sciences

Marius Locke

Locke M. Heat shock protein accumulation and heat shock transcription factor activation in rat skeletal muscle during compensatory hypertrophy ActaPhysiol 2008, 192, 403–411

Balan M. & Locke M. Acute exercise activates myocardial nuclear factor kappa B. Cell Stress and Chaperones 2010 16:105-111

Graduate Department of Rehabilitation Science

Aileen Davis

Davis AM, Palaganas MP, Badley EM, Gladman DD, Inman RD, Gignac MA. Measuring Participation in People with Spondyloarthritis Using the Social Role Participation Questionnaire. Annals of the Rheumatic Diseases, July 2011;70(10):1765-9. doi:10.1136/ard.2010.149211.

Davis AM, Perruccio AV, Ibrahim S, Hogg-Johnson S, Wong R, Streiner DL, Beaton DE, Cote P, Gignac MA, Flannery J, Schemitsch E, Mahomed NN, Badley EM. The Trajectory of Recovery and the Inter-Relationships of Symptoms, Activity and Participation in the First Year Following Total Hip and Knee Replacement. Osteoarthritis & Cartilage, 2011 Dec;19:1413-1421.

Susan Jaglal

Jaglal SB, Donescu OS, Bansod V, Laprade J, Thorpe K, Hawker G, Majumdar SR, Meadows L, Cadarette SM, Papaioannou A, Kloseck M, Beaton D, Bogoch E, Zwarenstein M. Impact of a centralized osteoporosis coordinator on post-fracture osteoporosis management: a cluster randomized trial. Osteoporos Int. 2012 Jan;23(1):87-95.

Jaglal SB, Hawker GA, Cameron C, Canavan J, Beaton DE, Bogoch E, Jain , Papaioannou A, ORMEW working group. The Ontario Osteoporosis Strategy: Implementation of a Population-based Osteoporosis Action Plan in Canada. Osteoporos Int. 2010 Jun;21(6):903-8.

Sunita Mathur

Robles PG, Mathur S, Janaudis-Fereira T, Dolmage TE, Goldstein RS, Brooks D. Measurement of peripheral muscle strength in individuals with chronic obstructive pulmonary disease: a systematic review. J CardiopulmRehabil Prev. 2011 Jan-Feb;31(1):11-24. Review.

Mathur, S., Lott, D.J., Senesac, C., Vohra, R., Germain, S.A., Sweeney, H.L., Walter, G.A., Vandenborne K. Age-related differences in lower limb muscle cross sectional area and torque production in boys with Duchenne muscular dystrophy. Archives of Physical Medicine and Rehabilitation. July 2010; 91(7): 1051-1058.

APPENDIX C

University of Toronto

MEMORANDUM OF AGREEMENT

COLLABORATIVE MASTER'S AND DOCTORAL PROGRAM IN

MUSCULOSKELETAL SCIENCE

[MONTH,YEAR]

Memorandum of Agreement concerning a Collaborative Graduate Program in ***Musculoskeletal Sciences***

1. Brief Description

In order to develop cooperative and multidisciplinary graduate education and research in Musculoskeletal Sciencethe following graduate units agree to the participation of graduate programs and associated degrees in the collaborative program:

- Biomedical Engineering, (MASc, PhD), Institute of Biomaterials and Biomedical Engineering
- Dentistry (MSc, PhD), Graduate Department of Dentistry
- Exercise Sciences (MSc, PhD), Graduate Department of Exercise Sciences
- Health Policy Management and Evaluation (MSc, PhD),, Institute of Health Policy, Management & Evaluation
- Laboratory Medicine and Pathobiology (MSc, PhD) Department of Laboratory Medicine and Pathobiology
- Medical Science (MSc, PhD) Institute of Medical Sciences
- Rehabilitation Science (MSc, PhD), Graduate Department of Rehabilitation Science

2. Admission and Program Requirements and Completion

2.1 Admission Requirements

Applicants must meet the entry requirements of the home graduate program and graduate unit. Students may apply prior to or after their registration in their degree program. In addition to the application requirements of the home degree program, the CPMS will require:

- A resume or curriculum vitae
- A one page letter explaining how the applicant's student's program of study and specific research interests relate to musculoskeletal science
- A letter of recommendation from a faculty member, if possible the thesis supervisor in a thesis-based graduate program, commenting on the applicant's academic abilities, and likelihood for research success.

The CPMS Program Committee will make decisions about admission to the Collaborative Program, based on the above information.

2.2 Program Requirements

Students must register in the degree program through one of the participating graduate units. They must meet all respective degree requirements of the School of Graduate Studies and their participating home graduate unit as well as the requirements of the collaborative program.

Master's Level

In addition to meeting home graduate unit program requirements, students will be required to:

- Complete the required core course: MSC3001H Foundations In Musculoskeletal Science
- Attend and participate in 12 seminars of the SRM3335H, Master's Seminar Series(CR/NCR)
- Complete a thesis or major project or placement in the field of musculoskeletal sciences under supervision of a collaborative program core faculty member.

Doctoral Level

In addition to meeting home graduate unit program requirements, students will be required to:

- Complete the required CPMS Core Course: MSC3001H Foundations in Musculoskeletal Science. Students who have completed MSC3001H at the master's level and who transfer to the doctoral level of the collaborative program are not required to complete an additional core course.
- Attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series. Students who transfer from a master's degree and master's level Collaborative Program to a doctoral degree and doctoral level Collaborative Program will be required to attend 18 seminars in total, and the total will include the number of seminars attended at both the master's and doctoral levels.
- Complete a thesis in the area of musculoskeletal sciences under the supervision of a collaborative program core faculty member
- In the rare instance that a student who has completed the Collaborative Program at the master's level and wishes to also enroll in the Collaborative Program at the doctoral level, the student will not be required to repeat the core course, Foundations in Musculoskeletal Science, but will be required to attend and participate in 18 seminars of the SRD4445H Doctoral Seminar Series and complete the doctoral thesis in the area under the supervision of a core faculty member.

2.3 Program Completion

Upon certification by the Collaborative Program Director that all requirements of the Collaborative Program have been fulfilled, the designation "Completed [session date] – Collaborative Graduate Program in Musculoskeletal Science" is shown on the graduate transcript. The home graduate unit recommends the granting of the degree.

3. Role of Participating Graduate Units

Each participating graduate unit shall retain its constitutional control over admissions and home program requirements, and is responsible to provide adequate research supervision by a member of the graduate faculty in the unit. Students in the collaborative program normally are supervised by a member of the collaborative program's core faculty, or have a core faculty member as a member of the supervisory committee (where supervision and a supervisory committee are required). Participating graduate units include reference to the collaborative program in the SGS Calendar entry, on the graduate unit website, and in other advertising material related to the home program. Core faculty members are identified with the collaborative program via the director's office. Core faculty members remain available to contribute to the collaborative program through teaching, supervision and participation in the delivery of seminar series and other collaborative program learning elements, and may serve on the collaborative program committee. Not all faculty members necessarily participate each year and, in many cases, may simply remain available to interested students. Some faculty may teach courses in the subject area of the collaborative program in the home program.

4. Administration of the Program

4.1 Program Director

The Program Committee initiates and recommends the appointment of a new director to the Dean of SGS, after consultation with chairs/directors of participating graduate units and with the Collaborative Program Director. The Dean of the School of Graduate Studies approves appointments of Directors of Collaborative Programs for terms normally up to five years (renewable).

4.2 Program Committee

The Collaborative Program is administered by a Program Committee consisting of at least one core graduate faculty member from each participating home program. The Program Committee shall be chaired by the Program Director. The Committee shall meet at least once annually. The Committee shall be responsible for the following activities:

- Review of all applications and admissions to the Collaborative Program
- Nomination of a Director from among its membership, as required
- Other issues (i.e. student counseling, curriculum review, approving advertising, adjudication of student funding and awards)

4.3 Administration: General

The Program Director will be assisted by the Collaborative Program Committee and a part-time staff administrative assistant paid through the Toronto Musculoskeletal Centre (EDU C of the UofT Faculty of Medicine)

5. Supporting Units

The Institute of Medical Science is the supporting graduate unit in the University of Toronto. It will provide administrative support, including entering grades and course enrolment on ROSI, booking rooms for courses, and assistance with editing the collaborative program entry in the annual School of Graduate Studies Calendar. The Toronto Musculoskeletal Centre will provide a stipend for the director and administrative support for the course and seminar series coordination.

6. Resource Issues

The Collaborative Program will be supported through the Institute of Medicine Science (IMS) and the Toronto Musculoskeletal Centre (EDU C of the UofT Faculty of Medicine). The IMS will provide non-paid administrative support related to maintaining course and student records as well as booking class rooms for the core course and seminar series. The Toronto Musculoskeletal Centre will provide funds for part time administrative support, a stipend for the director, and funds to support speakers and the events of the graduate seminar series. The Director and the administrative assistant will be responsible for organizing and administering the core course and graduate seminar series, apart from the support IMS will provide. Funding for the Toronto Musculoskeletal Centre runs until December 30, 2014 and the Director of the Centre will apply for the funding to be renewed. In the event that the funding of the Centre is not renewed, the Department of Surgery, Faculty of Medicine, has committed to cover all costs related to program administration and communicated this to the Vice Dean, Graduate Affairs.

School of Graduate Studies

University of Toronto

MEMORANDUM OF AGREEMENT (cont'd):

SIGNATURE PAGE

COLLABORATIVE MASTER'S AND DOCTORAL PROGRAM IN

MUSCULOSKELETAL SCIENCE

[MONTH, YEAR]

UNIT AGREES TO PARTICIPATE IN ACCORDANCE WITH ALL TERMS OUTLINED IN THIS MEMORANDUM OF AGREEMENT

Collaborative Program Director:

_____ Date: _____

Benjamin Alman, Institute of Medical Science

Graduate Units Participating in Collaborative Program:

_____ Date: _____

Scott G. Thomas, Chair, Graduate Department of Exercise Sciences
[Exercise Sciences, PhD, MSc]

_____ Date: _____

Richard Hegele, Chair, Department of Laboratory Medicine and Pathobiology
[Laboratory Medicine and Pathobiology, MSc, PhD]

_____ Date: _____

Susan Rappolt, Chair, Graduate Department of Rehabilitation Science
[Rehabilitation Science, MSc, PhD]

_____ Date: _____

Paul Santerre, Director, Institute of Biomaterials and Biomedical Engineering
[Biomedical Engineering, MASc, PhD]

_____ Date: _____

Adalsteinn Brown, Director, Institute of Health Policy, Management and Evaluation
[Health Policy, Management and Evaluation, MSc, PhD]

_____ Date: _____

Allan S. Kaplan, Director, Institute of Medical Science
[Medical Science, MSc, PhD]

_____ Date: _____

Morris Manolson, Associate Dean of Graduate and Postgraduate Studies, Faculty of Dentistry
[Dentistry, MSc, PhD]

Supporting Unit

_____ Date: _____

Allan S. Kaplan, Director, Institute of Medical Science

School of Graduate Studies& Vice-Provost, Graduate Education:

_____ Date: _____

Professor Brian Corman

Dean, School of Graduate Studies and Vice-Provost, Graduate Education

Lead Faculty:

_____ Date: _____

Avrum Gotlieb

Acting Vice-Dean, Graduate Affairs Faculty of Medicine

Governance Form C

Proposal Type:

√	New Course (ROSI Form also required)

Faculty Affiliation: Medicine

Name of Graduate Unit: Institute of Medical Sciences

Course Title: Foundations in Musculoskeletal Science

Rationale:

This is a required core course for the proposed Collaborative Program in Musculoskeletal Science. Successful completion will ensure that each student, regardless of home graduate unit and prior learning, receives a common foundation of the topics and issues particularly relevant to designing and conducting research in the highly interdisciplinary realm of musculoskeletal science. Students will achieve an enhanced appreciation of the breadth and complexities of research in the field, and will be better able to discuss disparate topic areas of research, thereby reinforcing a spirit of interdisciplinary research.

Course Description: This half-credit course, offered over one term (Fall or Winter), will consist of a series of twelve two-hour lectures. Lecturers will be experts in their respective topics drawn from graduate units and clinical departments associated with the Collaborative Program in Musculoskeletal Science.

For each class, lecturers will be assigned two students to help deliver the lecture content and manage the interactive discussion component of each class. Lecturer and students will meet and agree upon a lesson plan. Student assistance will include the following duties as required and agreed upon with the Lecturer:

- preparation of a reading list to be disseminated to students prior to the lecture
- assistance with the formal lecture presentation (i.e. Power point presentation, compilation of lecture notes, oral presentation)
- presentation of case reports pertinent to the lecture topic
- presentation of a critical review of pertinent journal articles
- preparation and positing of key questions for group discussion

At the end of the lecture, the Lecturer will meet with the student assistants, provide constructive feedback, review and analyze their performance and grade the students on their participation in the lecture presentation. The Course Instructor will review and approve these individual lecture grades, which will constitute 60% of the final course grade.

Topics to be covered will include the following:

Background:

- Biology of Connective Tissue
- Normal Structure and Skeletal Growth
- Pathology of Bone, Cartilage and Muscle I (Developmental Disturbances)
- Pathology of Bone, Cartilage and Muscle II (Adaptational Deformities)
- Current Approaches to Musculoskeletal Regeneration and Repair

- Healing Mechanisms
- Tumours of the Skeleton
- Bone Biomechanics
- Skeletal Stem Cell Biology
- Introduction to Histology
- Introduction to biostatistics
- Muscle response to exercise

Musculoskeletal Science and Innovative Technologies

- Biomedical materials
- Implants and bone interfacing
- Stem cells and regenerative medicine
- Cell and tissue engineering
- Diagnostic Imaging (MRI, CT, PET, US)
- Electron microscopy (SEM, TEM)
- Molecular Imaging
- Gene therapy
- Animal Models

Clinical Applications and Knowledge Translation

- Translation of New Therapies from Bench to Bedside
- Fundamentals of Clinical Trials Design
- Evaluation of Health-Related Quality of Life
- Patient Issues and Concerns
- Cost-Effectiveness & Global Health Economics
- Adoption of New Therapies
- Team management of musculoskeletal rehabilitation

Ethics and Commercialization: Issues and Concerns

- Research Ethics
- Clinical Ethics
- Biomedical Research Commercialization

Topics will be updated annually to reflect the rapid evolution of ideas in the field and to ensure optimal and novel annual student presentations.

Course Designator, Number and Weight:

M	S	C

3	0	0	1	H

Abbreviated Course Title:

F	N	D	N	S		I	N		M	U	S	C	U	L	O	S	K	E	L	E	T	A	L		S	C	I		

Name of Graduate Faculty Member Responsible for Course:

Benjamin Alman

Full Member, Institute of Medical Science

A.J. Latner Professor and Chair of Orthopaedics

Vice Chair Research, Department of Surgery, University of Toronto

Hospital for Sick Children

555 University Avenue

Toronto, ONM5G 1X8

Benjamin.alman@sickkids.ca Phone: 46-813-7980 FX: 416-813-6414

X	The person who has responsibility for the course is a Graduate Faculty Member.

Course Format: seminar

Regular/Modular/Continuous/Extended Course:[Mark one; see Governance Form C: Guidelines.]

X	Regular		Modular		Continuous		Extended

Does this change involve a course that is required to complete a graduate program?

	NO	X	YES (This is the core course of the Collaborative Program in Musculoskeletal Sciences)

Contact Hours: 24

Grading Scale:

X	Letter Grades		CR/NCR

Evaluation Components, Percentage Value and Timing:

Component	*Percentage Value*	*Timing*
Essay on an instructor-approved topic in musculoskeletal science research not related to the student's thesis topic	30%	submitted, marked and returned to student prior to final drop date of course
Student lecture presentations and discussion (in conjunction with, and assessed by, the Lecturer) in two sessions (30% percentage value per session)	2+30%	Throughout course
Participation (The course instructor will be responsible for monitoring attendance	10%	End of course

records and assessing active participation. Students who are not performing to expectation in this course will be contacted and counselled as required by the instructor on a timely basis.)		

Enrolment Projection: 12

Prerequisite: none

Co-requisites/exclusions/enrolment restrictions: Maximum of 12 graduate students enrolled in this course, to allow each student to participate in a lecture presentation.

Similarity/Overlap: N/A

Resources Required:

x	All elements of the course will be met with existing resources
	Additional resources will be required (contact your Faculty Graduate Office)

Effective Session Date: September, 2013

Chair/Director Name(s): Allan S. Kaplan, MD, FRCP(C)

Institute of Medical Science

Governance Form C

Proposal Type:

x	New Course (ROSI Add/Modify Form also required)

Faculty Affiliation: Medicine

Name of Graduate Unit: Institute of Medical Science

Course Title: Master's and Doctoral Seminar Series (Musculoskeletal Sciences) SRM3335H/SRD4445H

Rationale: This is a seminar series requirement for master's and doctoral students enrolled in the Collaborative Program in Musculoskeletal Sciences.

Course Description: This extended format type 1 (CR/NCR) graduate seminar series will expose students in the Collaborative Program in Musculoskeletal Sciences to current research and recent advances in this emerging field. Students will have the opportunity to network, exchange novel ideas and enhance interdisciplinary collaboration with faculty, clinicians, researchers and guests.

Students enrolled in this credit/non-credit course will be required to attend at least 12 seminars at the master's level and 18 seminars at the doctoral level, and they are expected to participate in this ongoing monthly formal seminar series, featuring local and international investigators of key importance in the field. Attendees at each session will be expected to familiarize themselves with the speaker's key papers in advance, and to actively participate in formal group discussions after each presentation. Students will also be required to present their research once at the annual Musculoskeletal Science Meeting – which is part of the seminar series. Students are required to attend this meeting each year they are enrolled in the CPMS.

The master's and doctoral students attend the same seminar series. Students registered in the collaborative program who transfer from the master's to the doctoral program are expected to attend at least 18 seminars in total within the SRM3335H and SRD4445H course codes..

Topics will change annually and will cover a continuum from bench to bedside to community. Topics will include fundamental musculoskeletal research, research in related dentistry, mesenchymal cell biology; genetics; animal models; biomechanics; kinetics; health services research; public health, outcomes research; knowledge translation; and commercialization.

Course Designator, Number and Weight:

S	R	M	3	3	3	5	H	(or SRD4445H)	

Abbreviated Course Title:

M	A	S	T	E	R	S		S	E	M	I	N	A	R		S	E	R	I	E	S					

Instructor/Course Coordinator:

Benjamin Alman

Full Member, Institute of Medical Science

A.J. Latner Professor and Chair of Orthopaedics

Vice Chair Research, Department of Surgery, University of Toronto

Hospital for Sick Children

555 University Avenue

Toronto, ONM5G 1X8

Benjamin.alman@sickkids.ca Phone: 46-813-7980 FX: 416-813-6414

X	The person who has responsibility for the course is a Graduate Faculty Member.

Course Format: Type 1 Graduate Seminar Series

Regular/Modular/Continuous/Extended Course:

	Regular		Modular	x	Continuous		Extended

Does this change involve a course that is required to complete a graduate program?

	NO	X	YES (This is a core course for a Collaborative Program in Musculoskeletal Sciences.)

Contact Hours per Week/Contact Hours for Modular Course: 2 hours per month on this ongoing basis. Master's students are required to attend and participate in at least 12 seminars for course credit, while PhD students are required to attend18 seminars.

Grading Scheme:

	Letter Grades	x	CR/NCR

Evaluation Components, Percentage Value and Timing:

- Attendance - master's students are required to attend and participate in at least 12 seminars for course credit, while PhD students are required to attend 18 seminars. The course instructor will be responsible for monitoring attendance records and ensuring active participation. Students who are not performing to expectation in this course will be individually contacted and counselled as required by the instructor.

- Students will also be required to present their research once at the annual Musculoskeletal Science Meeting – which is part of the seminar series. Student are required to attend this meeting each year they are enrolled in the CPMS.

Enrolment Projection: 15 (No Limitation)

Prerequisite: None

Co-requisites/exclusions/enrolment restrictions: Students must be enrolled in the Collaborative Program in Musculoskeletal Sciences

Similarity/Overlap: None

Resources Required:

x	All elements of the course will be met with existing resources
	Additional resources will be required (contact your Faculty Graduate Office)

Effective Session Date: September, 2013

Chair/Director Name(s): **Allan S. Kaplan**, MD, FRCP(C), Institute of Medical Science

Date of Graduate Unit Approval