Master of Health Sciences Program

Proposal to Add New Field in Kinesiology

November 2010

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1. INTRODUCTION

In April 2008, UOIT submitted a proposal to Ontario Council on Graduate Studies (OCGS) for a Master of Health Sciences Degree. In the initial submission, there were two declared fields in the program; Community Health and Health Informatics. Community Health field focuses on the analysis of environmental and social conditions implicated in a community's health and wellness. Understanding these conditions provide a foundation for developing strategies that might be used to promote wellness in ailing communities. The field of Health Informatics focus on the development an understanding of latest computing and information technology competencies, methods and architectures as applied within the context of health care to support healthcare administration, management, policy, training, clinical management and clinical research. The MHSc program was approved by OCGS in December of 2008. We commenced the program in September 2009 with 22 students (17 studying full-time, 5 part-time); 17 of this initial cohort are now in their thesis year. The primary objective of the Masters of Health Sciences program is to provide students opportunities to conduct high-quality research within the areas of health informatics or community health in an interdisciplinary health sciences research environment. Students will graduate from the program with an understanding of the various approaches (and their limitations) available to answer the sorts of questions health scientists pose.

UOIT graduated its first undergraduate BHSC students with a kinesiology specialization in June 2010 and we now have a growing demand for opportunities for post-graduate study in kinesiology. UOIT's Faculty of Health Science is now seeking approval to add an additional field in Kinesiology within the MHSc program. This field will address an emerging and rapidly growing field within the area of health sciences, with a focus on understanding how exercise and physical activity can be used as an intervention to promote health and well being in a range of populations, including those with developmental delays, children and adolescents, adults with chronic pain, cardiovascular, respiratory, metabolic, psychiatric and neurological disease as well as recreational and high performance athletes. The proposed field also supports the University's Strategic Research Plan to support "Community and Social Wellness" and its broad mission to provide "career-oriented… graduate university programs with a primary focus on programs that are innovative and response to the needs of students and employers." This addition of this field will also benefit from the experiences and research interests of new faculty as well as the interdisciplinary research environment within the University.

2. OVERVIEW OF NEW FIELD

Kinesiology involves the application of various areas of science to the study of human movement for health and wellness as well as those with special needs. Currently, the Faculty of Health Sciences offers: (1) a Bachelor of Sciences in Nursing (Honours) – BScN (Hons) in collaboration with Durham College, (2) a Bachelor of Health Science (Honours) in Medical Laboratory Science (BHSc – Med Lab) -- the first of its kind in Ontario. (3) a Bachelor of Health Science (Honours) which includes a Comprehensive stream, a specialization in Health Information Management and a Kinesiology specialization with either a Health and Wellness or Exercise Science focus. Students across the 3 programs take several courses together, thereby enhancing their interdisciplinary education.

The proposed Kinesiology field will encompass research in human health and wellness, motor learning and development, human neuroscience and biomechanics, exercise physiology and rehabilitation, as well as health and exercise psychology. Therefore, the field of Kinesiology will provide students with

opportunities to identify, address, and overcome the increasingly complex health-related challenges that influence the health and wellness of individuals and their communities.

Definition and Rationale

Kinesiology refers to the study of human movement. Its goal is to enhance human performance in healthy and unhealthy states by better understanding the mechanisms which lead to optimal movement over the lifespan. Kinesiology is by nature a multi-disciplinary area which includes health and exercise physiology, exercise physiology and neuroscience, motor control and learning and biomechanics as well as health and exercise psychology and the sociology of health. Even within these sub-disciplines there is overlap. For example, Dr. Bernadette Murphy and Dr. Paul Yielder have a collaborative project integrating neuroscience and exercise psychology to better understand the mechanism by which exercise enhances memory and cognitive function in individuals suffering from depression. Dr. Kevin Power is translating his work on the role and importance of the spinal cord in human movement from work with animals to techniques in humans. This has important implications for rehabilitation following stroke and spinal cord injury. Dr. Meghann Lloyd has applied her understanding of the role of movement in human development to enhancing motor development in children with Down syndrome, cerebral palsy and autism. Dr. Lloyd and Professor Mary Bluechardt, the Dean of the Faculty, are collaborating on a funded research project investigating the role of fundamental motor skills in children with and without Down syndrome.

Together these research areas provide unique options for students graduating with a bachelor's degree in kinesiology to pursue a Master's degree. The program will also be of considerable interest for students from other universities with interest in kinesiology and human physiology.

Description of Kinesiology as a New Field in the Masters of Health Science

The Kinesiology field will concentrate on the current research areas of faculty contributing to the field including: the role of exercise in promoting neural function; mechanisms to enhance appropriate motor learning for injury prevention and rehabilitation; asymmetry of hand preference as a model of chronic adaptive plasticity; the role of the spinal cord in the production of rhythmic and non-rhythmic movements; the reciprocal relationship between motor development and physical activity in both healthy and developmentally delayed children; and barriers to full participation in physical activity.

Improving human health is one of the eight goals set up by the United Nations to be achieved by the year of 2015 (WHO). The leading global risks for mortality in the world are high blood pressure (responsible for 13% of deaths globally), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%). These risks in turn raise the risk of chronic diseases such as heart disease, diabetes, stroke, cancer and musculoskeletal pain. They affect individuals across all income groups in most nations (WHO 2007). Exercise is one of the single most fundamental interventions which can help to decrease each one of these global risks. Understanding the mechanisms of these diseases and the optimal way to utilize exercise to prevent them and as a treatment intervention is a priority area for improving human health. Most importantly, a better understanding of the mechanisms of its efficacy and how to promote exercise will facilitate the development of **preventative measures,** improving health and wellness of individuals and communities across Canada, and thereby lowering overall health care costs.

3. THE FACULTY

Currently, there are 21 full-time core faculty member positions in the Faculty of Health Sciences, consisting of a mix of assistant, associate, and full professors. The full time faculty complement will both grow and maintain continuity. All of the faculty are tenured or tenure track-core faculty members and are part of three different foci within the Faculty of Health Sciences, Community Health, Health Informatics, and Human Health Biology. The latter field - Human Health Biology - is a field in the MSc/PhD in Applied Bioscience program offered by the Faculty of Science at UOIT. This is a unique interdisciplinary field which is taught jointly by members of the Faculties of Science and Health Sciences. While this field provides an appropriate PhD pathway for Kinesiology students, it lacks the focus on kinesiology based subjects that is required for a Master's program.

One of the strengths of the Faculty of Health Science is the quality of its members. By virtue of its subject matter, the health sciences are interdisciplinary, and the Health Sciences faculty at UOIT reflects this reality. Faculty training and research encompass a broad array of areas: microbiology, pathology, epidemiology, nursing, kinesiology, oncology, biochemistry, nutrition, business, information technology, mental illness, sociology, and health policy. The professors have an impressive publication record, and they have been highly successful in acquiring grant funding from provincial and federal governments as well as private industry sources. Many of the faculty members have won awards for their contributions to teaching, research, and community service. Research conducted by faculty members has contributed to the scientific community in a number of areas including an understanding of how changes in the way that the brain processes information in chronic musculoskeletal pain states may perpetuate the pain, the importance of spinal cord pathways in the control of movement, the role of physical activity in promoting development in children with Down's syndrome, the importance of functional specialization between the right and left sides of the brain and the importance of physical literacy in promoting physical activity in children.

The research interests of the faculty cover a range of topics within Kinesiology with a strong element of interaction between individual members as well as emerging collaborations with other faculty members within Health Sciences and in other faculties such as Business and Information Technology. For example, Dr. Murphy collaborates with Dr. Carolyn McGregor, our CRC in Health Informatics, investigating how changes in Heart Rate Variability might be used to study changes in alertness levels. Various kinesiology faculty will be involved in a project with Dr. Fletcher Lu and Dr. Manon Lemonde using technology to increase physical activity in adolescents. Dr. Lemonde and Dr. Yielder are supervising a student who is investigating the role of Tai Chi in decreasing falls risk in the elderly. Dr. Murphy has a collaboration with Dr. Andrew Hogue in the Game Development and Entrepreneurship program working to develop a serious game to train firefighters in safe lifting techniques to decrease back injury. Drs. Murphy and Yielder have also discussed collaboration with Dr. Bill Kapralos from the Game Development and Entrepreneurship program around developing a serious game to enhance motor skill acquisition in stressful clinical environments. Dr. Pierre Cote, an epidemiologist from the University of Toronto, is working with Dr. Murphy to develop a questionnaire to assess musculoskeletal injury risk in student laptop users. The following core members of Faculty of Health Sciences will be involved in teaching and supervision of graduate students in the proposed field of study. Dr. Ellen Vogel has research interests in nutritional genomics, chronic disease prevention and management, nutrition and health policy, community-based program evaluation, social determinants of health and improving prenatal and postpartum outcomes in at-risk individuals/families and she has expressed an interest in future collaborations within overlapping areas of the Kinesiology field.

I. Core Health Sciences Faculty who will be primarily attached to the Kinesiology field in the MHSc Program

a. Dr. Bernadette Murphy

Dr. Murphy's primary interests are in the alterations in sensorimotor integration and motor control that occur following musculoskeletal injury and which may lead to chronic pain syndromes. The overall theme of her research is neural adaptation in humans and the role of physical interventions such as exercise and manipulation in aiding the re-establishment of meaningful neural connections. She will be involved in the teaching as well as supervision of graduate students in the proposed field.

b. Dr. Paul Yielder

Dr. Yielder's primary research interests are sourced from his background in Diagnostic Medical Imaging, Clinical Anatomy and Neuroscience. He is a clinical specialist in modality imaging including Computed Tomography/ Ultrasound Imaging and Magnetic Resonance Imaging. His primary interests are in the design application and contribution of MRI techniques to Neuroscience – Kinesiology and Neuro Psychiatry with a complimentary interest in Human Laterality and Asymmetry research. He has also a parallel interest in developmental neurobiology and neuropsychology applied to therapeutic relationships in clinical practice and clinical supervision. He will be involved in teaching as well as supervision of graduate students in the proposed field.

c. Dr. Meghann Lloyd

Dr. Lloyd's research takes a multidisciplinary approach to investigating physical activity and motor development of infants and young children with and without disabilities. A primary interest is in the reciprocal relationship between motor development and physical activity - how to use physical activity to promote motor development and how motor development promotes physical activity. A primary application of this research is to promote physical activity in children with developmental disorders e.g. Down syndrome, Autism Spectrum Disorders, Cerebral Palsy, and Developmental Coordination Disorder. She will be involved in the teaching and supervision of graduate students in the proposed field.

d. Dr. Mary Bluechardt

Dr. Mary Bluechardt's primary research interests are in long term athlete development and inclusion of athletes with intellectual disabilities. This work crosses various sectors including education, health, sport and recreation. A second area of research includes Aboriginal people with disabilities living in urban centers and the barriers to full participation. She will also be involved in the teaching and supervision of graduate students in the proposed field.

e. Dr. Kevin Power

Dr. Power's research program is aimed at understanding how spinal motoneurone excitability is altered when preparing for and executing rhythmic and non-rhythmic movements. The potential findings of this research program may have important ramifications both on our understanding of motor control and on rehabilitation strategies designed to maximize residual motor function

of individuals with motor impairments. He will be involved in teaching as well as supervision of graduate students in the proposed field.

II. Core Health Sciences Faculty whose research Interests may cross over into the kinesiology area and who may supervise or co-supervise kinesiology students

Manon Lemonde
Fletcher Lu
Carolyn McGregor
Ellen Vogel

III. Core Faculty from other faculties who will be contributing to the Kinesiology field as co-supervisors

Andrew Hogue
Bill Kapralos

IV. Adjunct Faculty from other Institutions who may be co-supervisors in the field

Tom McLellan - Ministry of Defense
Paul Marshall - University of Western Sydney
Heidi Taylor - New Zealand College of Chiropractic

List of core faculty who will contribute to the proposed new field

Faculty Name & Rank	M/F	Home Unit
Category 1		
*Lemonde, Manon - Associate Professor	F	Faculty of Health Sciences
Bluechardt, Mary – Professor and Dean	F	Faculty of Health Sciences
Lloyd, Meghann – Assistant Professor	F	Faculty of Health Sciences
Murphy, Bernadette – Professor	F	Faculty of Health Sciences
Power, Kevin – Assistant Professor	M	Faculty of Health Sciences
Yielder, Paul- Assistant Professor	M	Faculty of Health Sciences
Lu, Fletcher- Assistant Professor	M	Faculty of Health Sciences
*McGregor, Carolyn - Associate Professor and Canada Research Chair, Health Informatics	F	Faculty of Health Sciences/Faculty of Business and Information Technology
Category 3		
Hogue, Andrew-Assistant Professor	M	Faculty of Business and Information Technology
Kapralos, Bill-Assistant Professor	M	Faculty of Business and Information Technology
Category 5		
Tom McLellan - Ministry of Defense	M	Faculty of Health Sciences
Paul Marshall - Univ. of Western Sydney	M	Faculty of Health Sciences
Heidi Haavik - New Zealand College of Chiropractic	F	Faculty of Health Sciences

Category 1: tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review. For this purpose the master's and doctoral streams of a program are considered as a single program. Membership in the graduate program, not the home unit, is the defining issue.

Category 3: tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

Category 5: other core faculty: this category may include emeritus professors with supervisory privileges and persons appointed from government laboratories or industry as adjunct professors.

*Faculty members included in the original MHSc submission

See Appendix A for curricula vitae of professors who were not included in the original MHSc submission.

4. DEGREE REQUIREMENTS AND PROGRAM SEQUENCE

Program Learning Outcomes

The following program learning outcomes were included in the original Appraisal Brief for the MHSC and deemed by external consultants and the OCGS internal committee to have met provincial degree level expectations. These outcomes are equally relevant for the proposed new field. Outcome #5 has been adjusted to identify Kinesiology as a third field in the program.

Graduates of the MHSc program will be able to:

1. *critically describe the fundamental phases of the scientific research process, the various research methods health scientists use, and the limitations of these methods*
2. *critically analyze the environmental and social conditions that affect individuals' health and well-being*
3. *critically analyze, model, and assess the processes surrounding the "patient journey" through the health care system*
4. *independently design and conduct a research thesis or project using one or more research methods, and analyze the results*
5. *synthesize fundamental concepts from* health informatics *or* community health or kinesiology *fields and articulate them in the form of a written research thesis or project*

The learning outcomes for all fields in the MHSC, including the proposed Kinesiology field will be derived through a combination of coursework, supervised research, and a research thesis.

The student's research will be designed together by the supervisor and the student, with support from a- supervisory committee. Each student will have the opportunity to develop the prerequisites for specialized practice or advanced study in their chosen field . Learning activities and materials in the graduate courses have been carefully designed to ensure that learners are exposed to study which is at the forefront of scientific theory and practice. The courses provide students with in- depth learning in specialized areas of health sciences, and also allow participation in the scholarly activities of research, seminars, and presentations.

Research is complemented by graduate courses designed to ensure a comprehensive study of important topics in students' chosen fields, with emphasis on the translational bridge between current scientific knowledge and applications into clinical and community settings. Course formats are varied and include student presentations, lectures, journal clubs and discussions of current research as seminars.

General Degree Requirements for the MHSc

All students in the MHSc program must complete the following 30 credits:

- 1 required core course - Research in Health Sciences (3 cr.)
- 1 course in their chosen field (3 cr.)
- 3 elective courses (9 cr.)
- Prepare and orally defend a thesis - MHSc Thesis in Health Sciences (15 cr.)

Degree Requirements for MHSc Students Selecting a Field in Kinesiology

HLSC 5010G	Research in the Health Sciences	3 cr.
HLSC 5XXXG	Studies in Kinesiology	3 cr.
*3 elective courses		9 cr.
HLSC 5096G	MHSc Thesis in the Health Sciences	15 cr.

*At least one elective must be chosen from the list of Kinesiology electives below.

List of Courses

Core Courses (required for all MHSc students)

HLSC 5010G Research in the Health Sciences (3 cr.)
HLSC 5096G MHSc Thesis in the Health Sciences (15 cr.)

Required course for students selecting field of Kinesiology

HLSC 5XXXG Studies in Kinesiology (3 cr.)

Kinesiology Electives (at least one and up to three courses)

Note: Each course listed below is worth 3 cr.

HLSC 5320G Neuroscience in Rehabilitation Kinesiology
HLSC 5060G Special Topics in Health Sciences Research
HLSC 5322G Theory and Application of Biomedical Signals and Images
HLSC 4412 G* Exercise Rehabilitation I
HLSC 4413G* Exercise Rehabilitation II
HLSC 4472G* Clinical Biomechanics and Ergonomics
HLSC 4414G* Advanced Topics in Neuromuscular Physiology and Pathophysiology
HLSC 4482G* Advanced Exercise Prescription
HLSC 4460G* Selected Topics in Physical Activity and Health

*Students may take ONE of the starred courses which are 4th year kinesiology courses cross listed in graduate studies as long as they have not previously taken its undergraduate equivalent. (For example, students who have taken 4412U Exercise Rehabilitation may not take the graduate counterpart, 4412G.)

Any courses cross-listed with 4th year undergraduate courses will have the same course content and learning outcomes, but they will have different assignments, exams and/or projects that will require the students to demonstrate graduate level learning and application.

Additional Electives

Any remaining electives can be selected from the following list of 3 credit courses:

HLSC 5050G Patient Journey Modelling
HLSC 5060G Special Topics in Health Sciences Research
HLSC 5070G Research–in-Progress Colloquium I*
HLSC 5071G Research-in-Progress Colloquium II*
HLSC 5111G Public Policy and Health Promotion
HLSC 5113G Strategies in Health Promotion Practice
HLSC 5115G Community Health of Vulnerable Populations
HLSC 5117G Epidemiology
HLSC 5119G Program Evaluation
HLSC 5121G Living with Persistent Conditions
HLSC 5020G Studies in Community Health
HLSC 5310G Biology of Infectious Disease
HLSC 5312G Research Topics on Human Pathophysiology
HLSC 5314G Environmental Determinants of Health (cross listed with APBS 5200G)
HLSC 5316G Cancer Biology

*Students must be registered in both HLSC 5070G and HLSC 5071G to receive elective credit for these courses.

Note: These remaining elective courses were approved in the OCGS review of the original MHSc program in April 2008.

Faculty Qualifications

Qualifications for faculty teaching and supervising in the proposed field are the same as those for faculty teaching and supervising other approved fields in the MHSc program. Faculty must hold PhD degrees and be approved as graduate faculty members. They should have relevant experience in teaching and research.

In summary, the proposed Kinesiology field will complement existing fields in MHSC program by adding a research emphasis that focuses on the role of human movement in health and disease. Thus, this new Kinesiology field will provide the opportunity to graduates from UOIT's BHSc degree with the kinesiology specialization to pursue laboratory and field based graduate research focused in Kinesiology.

Program Map and Sequence of Study

Below is the recommended program map for students selecting the field of Kinesiology in the Master of Health Science:

Year 1, Semester 1:	5010G	Research in Health Sciences
	5xxxG	Studies in Kinesiology
		Initiation of research program

Year 1, Semester 2:	Two electives Continuation of research program Approval of the research proposal by Supervisory Committee
Year 2, Semester 1:	Continuation of research program 5070G** Research in Progress Colloquium
Year 2, Semester 2:	Annual progress meeting 5071G** Research in Progress Colloquium Research seminar (upon approval by the Supervisory Committee) Completion of Thesis (upon approval by the Supervisory Committee)

**This is the recommended 5th elective for kinesiology students but they make take an alternative with approval of their research supervisor.

5. NEW COURSES

Program Content

The current selection of elective courses provides a solid foundation in kinesiology and health sciences and a new course is proposed to accommodate the inclusion of the proposed new field.

One new course will be added:

HLSC 5xxxG Studies in Kinesiology (required by all students in Kinesiology field)

Three courses have been approved internally and added to the MHSc program since its original approval by OCGS. These include:

HLSC 5320G Neuroscience in Rehabilitation Kinesiology
HLSC 5060 G: Special Topics in Health Sciences Research
HLSC 5322G: Theory and Application of Biomedical Signals and Images

Course Outlines for New Courses

Faculty: Faculty of Health Sciences		
Course title: HLSC 5xxxG Studies in Kinesiology		
Course number: 5---U	**Cross-listings:**	__X__ **Core** ___ **Elective**
Credit weight: 3	**Contact hours:** ___X__ Lecture _____ Lab _____ Tutorial _____ Other	

CALENDAR DESCRIPTION

This course will require students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to Kinesiology. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit science and society. The presentation will be expected to be appropriate for an interdisciplinary audience in Kinesiology.

Prerequisites	Acceptance to the Kinesiology Master's stream
Co-requisites	
Credit restrictions	
Credit exemptions	

LEARNING OUTCOMES

Students who complete this course will have demonstrated the ability to:

1. present the current state of knowledge on a particular topic in kinesiology in a clear and comprehensive seminar
2. identify the current gaps in knowledge in that area
3. suggest further avenues for the advancement of knowledge
4. relate how scientific advances in this area will benefit society

DELIVERY MODE

The course will run in a seminar/journal club format. Students will discuss proper presentation skills, and schedule presentation practice sessions to provide feedback. Kinesiology faculty and current graduate students will present on their research at some sessions and students enrolled in the course will be required to present an in depth critique of seminal research articles throughout the term. A final in depth literature review debating a key topic in their area of kinesiology will be required at the end of the semester.

TEACHING AND ASSESSMENT METHODS

Students will be evaluated based on the following:

1) How well the student organized the current state of knowledge into each presentation
2) Discussion of current gaps in knowledge
3) Demonstrate a deep knowledge on the subject matter
4) Discuss how research in the area will impact society
5) Overall quality of the seminar presentations
6) Quality of the final literature review

Feedback will be provided to the students by peers and faculty through a standardized evaluation form.
Grade: Class participation during outside presentations: 20%,
4 article presentations throughout the semester 40%,
Final literature synthesizing article critiques and new articles on a relevant topic 40%

CONSULTATION AND FINANCIAL IMPLICATIONS, WHERE APPROPRIATE

A Kinesiology faculty member will be required to co-ordinate this course as part of their overall course load. It is imagined that all kinesiology faculty will contribute presentation material.

APPROVAL DATES

Date of submission	*Submitted to Faculty of Heath Sciences Post-graduate committee on 29/09/10*
Curriculum Committee approval	
Faculty Council approval	

Course Outlines for Existing Courses: HLSC 5320G, HLSC 5060G, and HLSC 5322G

HLSC 5320G Neuroscience in Rehabilitation Kinesiology

COURSE DESCRIPTION:

Chronic neuromuscular disorders are an important community health issues. Altered patterns of sensorimotor integration are a common feature of many chronic neural and neuromuscular disorders, ranging from chronic low back pain to Parkinson's disease. Addressing this disordered integration is the focus of many modern rehabilitative approaches. This course will review the evidence for altered sensorimotor integration, discuss the techniques used to measure it and review some of the current literature on how it may be altered by different rehabilitation strategies.

PREREQUISITES: Permission of Instructor

REQUIRED READINGS: Selected Journal articles

LEARNING OUTCOMES

On completion of this course a student should:

1) have a sound understanding of human somatosensory and motor systems and sensorimotor integration.
2) be able to contrast how sensorimotor integration is altered in some chronic neural and neuromuscular conditions
3) be able to critiques the strengths and limitations of the techniques used to measure altered sensorimotor integration including electroencephalography (EEG), transcranial magnetic stimulation (TMS), electromyography (EMG) and functional magnetic resonance imaging (fMRI).

4) be able to synthesize some of the current literature on altered sensorimotor integration and how it might be addressed in a rehabilitation context.

COURSE OUTLINE

***Dates, topics and readings are approximate and are subject to change.

Week	Topic	Date
1	Review of Sensory Systems	January
2	Review of Motor Systems	January
3	Sensorimotor Integration	January
4	Measurement I-TMS and EMG	January
5	Measurement II-EEG	February
6	Measurement III-fMRI	February
7	**Midterm**	**February**
8	Journal club-SMI and chronic pain	March
9	Journal club-SMI and stroke rehabilitation	March
10	Journal club-student driven topics	March
11	Journal club-student driven topics	March
12	Project Presentations	April
13	Project Presentations	April

Evaluation Methods and Due Dates

Components	Mark
Presentation 1-Review of neuroanatomy and neurophysiology	20%
Presentation 2-Article presentation featuring a technique	20%
Presentation 2-Article presentation relevant to thesis topic	20%
Critical evaluation essay relating to topics in sensorimotor integration	35%
Questions asked in presentation of others	5%

HLSC 5060G Special Topics in Health Sciences Research

This course is designed to enable students to focus their research in a particular area of community health under the supervision of the thesis supervisor or other qualified faculty. Students investigate specific areas of interest to further their theoretical and research foundation in the health sciences. 3 cr
Prerequisite: HLSC 5010G Research in the Health Sciences

HLSC 5322G Theory and Application of Biomedical Signals and Images

COURSE DESCRIPTION:

Biomedical signals and images can provide a wealth of data to aid in the understanding of human anatomy and physiology, as well as early detection of changes in human health. In order to work with biomedical signals it is fundamental to understand the underlying anatomy and physiology which generate these signals, as well as the techniques used to acquire, process and interpret these signals.

This seminar course uses original literature to discuss issues in signal acquisition and processing for electroencephalography (EEG), transcranial magnetic stimulation (TMS), electromyography (EMG) and electrocardiography (ECG) signals. The physics of data acquisition and interpretation in real time ultrasound, computed tomography, magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI) are also reviewed and critiqued in terms of how they affect image acquisition, analysis and interpretation.

Sample Vocabulary:

Artifact – Unwanted information contained within a signal
Band pass filter – Filter that excludes signals information below and above specified band of frequencies.
Bio-potential - Electrical signals emitted by the body.
EEG – Electroencephalography, electrical signals emitted by the brain.
EMG - Electromyography, electrical signals emitted by the muscles.
ECG or EKG - Electrocardiogram
FFT (Fast Fourier Transform calculation) – Mathematical method of translating a signal from the time to frequency domain.
Frequency – Measured in Hertz (Hz) how often something occurs with in a second.
High pass filter – Filter that excludes signal information below specified frequency.
IIR filter – Infinite Impulse Response filter, configured as a bandpass, highpass or lowpass.
Low pass filter – Filter that excludes signals information above a specified frequency.
Notch filter – A filter that excludes a small band of frequencies.
RAW- A signal in its raw un-rectified state
Rectification – conversion of a bi-polar signal into a uni-polar signal.
RMS or Root Mean Square – A method of rectifying a RAW signal. Advances in biomedical signal

PREREQUISITES: Permission of Instructor

REQUIRED READINGS: Selected Journal articles

LEARNING OUTCOMES

On completion of this course a student should be able to:

1) Discuss the basic principles of the electrocardiogram, components of cardiac events and the principles of heart rate variability (HRV) analysis

2) Understand the physiological basis of EMG, EEG and TMS data acquisition and analysis

3) Discuss the role of filters and amplifiers in enhancing biological signals

4) Understand the role of various types of signal processing such as rectification, root mean square (RMG) and fast fourier transforms (FFT)

5) Contrast the Physics and signal processing for magnetic resonance imaging with real time ultrasound and computed tomography

6) Appreciate the complexity of functional fMRI and discuss its strengths and limitations as a means of demonstrating neuronal activation

COURSE OUTLINE

*****Dates, topics and readings are approximate and are subject to change.

Week	Topic	Date
1	Introduction to course along with required readings package	January
2	Basic principles of electrophysiological data acquisition for EEG, EMG and TMS: filtering, amplifying, averaging, artefact reduction	January (Murphy/Eklund)
3	Principles of electrophysiological data analysis: Fourier transformations, automated protocols for determining signal onsets, methods of analysing data	January (Murphy/Eklund)
4	**ECG**: Cardiac electrophysiology, relation of electrocardiogram (ECG) components to cardiac events, Heart rate variability	January (Murphy/McGregor)
5	Signal analysis applications (Carolyn McGregor Research)	February (McGregor
6	Signal analysis applications (Mike Eklund Research)	February (McGregor)
7	**Midterm**	**February**
8	Major modalities used in medical imaging: ultrasound, X-ray, CT, MRI, PET, and SPECT	March (Yielder)

9	**MRI**: Physics and signal processing for magnetic resonance imaging.	March (Yielder)
10	**fMRI:** Physics and probability	March (Eklund)
11	**fMRI:** Research protocols and design	March (Yielder/Murphy)
12	Project Presentations	April
13	Project Presentations	April

Evaluation Methods and Due Dates

Components	Mark	Due Date
Midterm	30%	February , during class time
Project: Written assignment	20%	April
Project: In-Class presentation	20%	April
Final Exam (or test)	30%	TBA

Course descriptions for elective courses cross-listed with 4th year undergraduate courses

HLSC 4412G Exercise Rehabilitation I: Cardiac, Respiratory and Metabolic Conditions. This course focuses on the role of exercise in a multi-component approach to rehabilitation. The risks and benefits of exercise, particularly with respect to sedentary individuals and/or those with medical considerations as well as the evidence for the role of exercise as a primary or adjunctive intervention for rehabilitation are considered. The second part of the course integrates this information, along with relevant pathophysiology and exercise physiology using case study presentations of clients with cardiovascular, respiratory and metabolic conditions. 3 cr, 3 lec.

HLSC 4413G Exercise Rehabilitation II: Integrated Case Studies. This course focuses on the role of exercise in a multi-component approach to rehabilitation. The risks and benefits of exercise, particularly with respect to sedentary individuals and/or those with medical considerations as well as the evidence for the role of exercise as a primary or adjunctive intervention for rehabilitation are considered. The course covers the psychology and physiology of chronic pain including the role of cognitive behavioural therapy, selection and assessment of appropriate rating scales and evaluation procedures and assessment of risk factors for exercise. The second part of the course integrates this information, along with relevant pathophysiology and exercise physiology using case study presentations of clients with neural and musculoskeletal conditions. 3 cr, 3 lec.

HLSC 4414G Advanced Topics in Neuromuscular Physiology and Pathophysiology. This course investigates advanced topics in neuromuscular physiology and pathology that are important for the control of human movement. There is a focus on the neurophysiology underlying human movement pathologies with a contextual integration of the principles of advanced neuroscience to neuromuscular rehabilitation. 3 cr.

HLSC 4460G Selected Topics in Physical Activity and Health. Designed for senior students this course will investigate current topics in physical activity and health from multiple perspectives. A minimum of five topics will be selected for study, and each will be addressed by a team of students, with each student in the team approaching the topic from a different perspective: including but not limited to; physiological, biomechanical, social, psychological and ethical. 3 cr.

HLSC 4472G Clinical Biomechanics and Ergonomics. This course builds on and applies concepts from Biomechanics and Epidemiology to better provide students with the background to understand and prevent work-related musculoskeletal injuries. Topics include the epidemiology and mechanisms of work-related injuries, workplace assessment for injury risk, pre-employment screening and legislated guidelines. Special focus will be given to low back and upper limb injuries. 3 cr.

HLSC 4482G Advanced Exercise Prescription. This course applies scientific interpretation of physical testing results for the prescription of accurate and progressive exercise programmes for people with co-existing health problems including disease and injury. This will involve advanced application of the principles of exercise prescription in combination with scientific evidence for specific exercise modalities. The course reviews the American College of Sports Medicine and Canadian Society of Exercise Physiology guidelines for exercise prescription and progression and their scientific evidence as well as baseline history taking, rationale, contraindications, privacy issues. 3 cr.

ADMISSION REQUIREMENTS

The introduction of a new field will not necessitate any major changes to the minimum admission requirements for the approved MHSc. Each applicant who expresses a desire to pursue the field in Kinesiology in the MHSc program will be expected to have an honours undergraduate degree in Kinesiology, or a related field. The minimum grade point average of a second class B average (3.0 on a 4.3 scale) in the last two years of their respective bachelor's (honours) program is the same as that expected for all MHSc applicants, as are the following conditions:

1. To assist with the assessment of the application, the student should provide relevant course numbers, titles, a brief description of course content, textbooks used and/or chapters covered, and the grade received and a sample of their essay or dissertation writing.
2. Admission depends on the availability of a research supervisor.
3. The student must submit an official transcript from all post-secondary institutions attended.
4. All non-English transcripts must be accompanied by an official translation. International students whose first language is not English must meet the English Language Proficiency requirements of the University and the MHSc program.

Applicants to any of UOIT's graduate programs must provide a minimum of two letters of reference from persons having direct knowledge of their academic competence, proof of English proficiency if the first language is not English, and a one-page statement of interest outlining their objectives in undertaking graduate study.

7. CONTRIBUTIONS TO THE UNIVERSITY'S MISSION

As noted in Section 1 of this report, the inclusion of a field of Kinesiology in the Master of Health Sciences program will fill the demand for trained professionals who are exposed to state of the art technology, theory and skills in kinesiology. This reflects one of the key elements of the University's mission: to provide innovative programs which are responsive to the needs of students and employers and which advance the highest quality of both research and learning, teaching, and professional practice in a technologically enabled environment. In addition, focused study and research in this critical area will also support the University in its efforts to make significant contributions to the understanding and improvement of the health of Canadians on a national and global scale.

8. IMPACT OF NEW FIELD ON THE ALREADY APPROVED GRADUATE PROGRAM IN HEALTH SCIENCES

The introduction of a third field in the program will not result in the diversion of faculty from previous graduate courses and/or supervision. The students in the proposed field can be easily integrated into existing courses and the overall graduate student culture and research environment of the MHSc program. The faculty members in this program are tenured or tenure track-core faculty members. The addition of the Kinesiology field offers a needed complement to existing MHSc fields by appealing to the distinct segment of the student population interested in applying their expertise to the study of kinesiology. This will not divert supervisors away from other programs but in fact provide more appropriate coursework and better preparation for students doing research in kinesiology related areas. This new field is complementary to, rather than competitive with, existing fields and in fact will create a more cohesive and appropriate Masters pathway for kinesiology students.

9. RESOURCE IMPLICATIONS

There are minimal resource implications for the new field. We currently have five core faculty with kinesiology topics as their main research area. As enrolment in the MHSc program increases, we will need to add further core faculty members to meet the needs of the undergraduate kinesiology specialization. These new faculty hire will also contribute to post-graduate supervision in the kinesiology field. Currently we are working with the library to increase access to kinesiology and movement science journals which are needed to adequately resource the undergraduate kinesiology degree. These journals will also useful resources for the post-graduate kinesiology field. Most kinesiology supervisors require laboratory space for their own research which is a condition of employment. The nature of kinesiology research requires frequent "hands on" trouble shooting. Every effort will be made to provide work space for graduate students in the Kinesiology field that is located in an area proximate to the supervisor's lab.