

Rehabilitation of Movement Control

Kinesiology 448

Section: D100

Term: 2009 Spring

Instructor: Dr. Andy Hoffer

Office: L9003

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Office hours:

Tuesdays 9:30 - 11:20

Discussion Topics: OBJECTIVES:

This course is designed for senior Kinesiology and Biomedical Engineering students interested in (1) how the body adapts after major neurological accidents or diseases that result in muscle paralysis, movement disorders or profound sensory loss, and (2) current approaches to help restore the voluntary use of affected organs and limbs. For each disability, the full range of rehabilitation options will be explored including issues of risk, cost, benefit and ethics. Special emphasis is placed on understanding advanced neuroprosthetic approaches that use electrical stimulation to restore voluntary control of basic functions and independence in activities of daily living.

TOPICS:

Overview of normal sensorimotor system structure and function

Overview of neuromuscular control mechanisms for normal movement

Pathologies affecting sensory and motor functions

Brain, spinal cord, spinal roots, peripheral nerves, muscles; somatic and autonomic

Chronic vs. acute consequences of neurological injury or disease

Assessment of functional loss

Classification standards for impairment and disability

Approaches to restoring movement

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Capacity of neural systems for self-regeneration and repair - peripheral and central

Neuromuscular rehabilitation

- Physiotherapy
- Pharmacotherapy
- Surgical reconstruction
- Electrical stimulation

Neural prostheses

- Safe and effective electrical stimulation of excitable tissues
- Electrode properties for safe long-term interfacing with neural systems
- External vs. implanted functional electrical stimulation systems
- Assistive devices that treat chronic pain
- Assistive devices that restore lost or impaired motor functions
- Assistive devices that enhance or replace impaired sensation
- Control of artificial limbs

Movement control strategies using neuroprostheses

- Voluntary control signal sources for prosthesis control
- Sensors and sensory feedback signal sources for prosthesis control
- Open-loop vs. closed-loop control

The future of neuroprosthetics

Grading: 1 Quiz Jan. 29 - 5% of course marks

2 midterm exams Feb. 12, Mar. 12 - 30% of course marks each midterm

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final exam - date scheduled by Registrar - 35% of course marks.

Required Texts: None

COURSE LECTURE NOTES:

Posted weekly by instructor in course website

Recommended Texts:

Materials/Supplies:

Prerequisite/Corequisite: PREREQUISITES:

Either KIN 201, 205, 207, 306 or KIN 208, 306 (or consent from the instructor)

Notes: PLEASE NOTE: KIN 448 will NOT be offered in 2010. Next planned offering will be in Spring 2011.

VECTOR:

3 lecture hours Tuesdays 1:30-2:20 and Thursdays 1:30-3:20)

Failure to attend an examination

Students who miss examinations due to exceptional circumstances (such as serious illness or compassionate reasons) are required to obtain a physician's certificate, whereby the physician states that you were unable to write your midterm or final on the set date due to a medical condition beyond your control, or other supporting documents in order to obtain consideration in the course. Such documents must be filed with the School Director (via the Kinesiology office) or Registrar within four calendar days of the date on which the examination was to have been written. Exceptional circumstances must be approved by the Undergraduate Program Committee in order for a student to receive consideration.

Students must check the exam schedule when making course selections. Students are reminded that final examinations may be scheduled at any time during the examination period and that students should avoid making travel or employment arrangements for this period.

Academic honesty and student conduct

Academic honesty is a condition of continued membership in the University community.

Academic dishonesty, including plagiarism or any other form of cheating is subject to serious academic penalty, i.e. failure on an assignment, failure in a course, suspension or expulsion from the University.

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The University codes of student conduct and academic honesty are contained in policies T10.01 and T10.02 which are available in the Course Timetable and on the Web via <http://www.reg.sfu.ca>.

July 2000

This outline is derived from a course outline repository database that was maintained by SFU Student Services and the University's IT Services Department. The database was retired in 2014 and the data migrated to SFU Archives in 2015.