

# HK 4240

## Occupational Biomechanics and Ergonomics - Winter 2017

### Instructor Information

*Professor:* Dr. Steve Brown, PhD, E-Mail: [shmbrown@uoguelph.ca](mailto:shmbrown@uoguelph.ca)

*Office Hours:* by appointment or drop-in (office # 330B ANNU)

*TAs:* Maggie Kirkwood ([mkirkwoo@uoguelph.ca](mailto:mkirkwoo@uoguelph.ca)) and Dennis Larson ([larsond@uoguelph.ca](mailto:larsond@uoguelph.ca))

### Course Goals

*Course Description:* This course introduces the methods available for reducing musculoskeletal injuries in the workplace. Topics include: biomechanical, psychophysical, physiological, and integrated approaches to performing physical demands analyses, anatomy and etiology of low back injuries and upper limb disorders, principles of redesigning tasks to reduce the risk of injury, pre-employment screening and legislated guidelines. Students apply the course material to ergonomic assessments performed in industrial environments.

*Prerequisites:* 1 of [ENGG\\*1210](#), [HK\\*3270](#), ([HK\\*2270](#), [HK\\*3600](#))

*Class Time:* Lecture: Monday/Wednesday/Friday - 9:30-10:20 am, ANNU 156

*Laboratory:* JTP 208B

*Text:* "Ergonomics and Injury Prevention" by Jim Potvin

- This book is available in the bookstore - mandatory

### Learning Outcomes:

Upon successful completion of this course, students should be able to:

- Identify occupational tasks that may cause injuries and/or fatigue
- Identify the specific tissues that may be injured coupled with their injury mechanisms
- Redesign operations to reduce the demands on heavily and/or repetitively loaded tissues
- Have consideration for the unintended effects that ergonomic interventions may have
- Understand why and how to optimize ergonomic interventions

### Major Topics Covered:

- Biomechanics of Injury

- Occupational Injuries
  - Low Back
  - Upper Limb
- Quantifying risk in manual material handling
  - Guidelines
  - Quantification Tools
- Quantifying risk in repetitive and/or prolonged upper limb tasks
  - Guidelines
  - Quantification Tools
- Workplace design and redesign
- Optimization of ergonomic interventions
- Vibration

**EVALUATION:**

Activity	Percentage of Final Grade
Anthropometrics and Grip Strength Laboratory	5% (Due one week after the lab is performed)
Quantification of Manual Lifting Laboratory (Individual Write-up)	10% (Due one week after the lab is performed)
Arm Tasks & Demands Description Laboratory (Individual Write-up)	10% (Due one week after the lab is performed)
Ergonomics Group Project	- Written Report 25% (due date: TBA) - Presentation 5% (presentations in last 4 classes)
Midterm Exam (February 15 <sup>th</sup> in class)	20%
Final Exam (April 20 <sup>th</sup> 11:30am - 1:30pm)	25%

## **Ergonomics Group Project:**

Students are asked to get into groups of 5 or 6 (no groups will be allowed to be larger or smaller than this). If at all possible, you should be with people who are in the same HK\*4240 laboratory section.

By **Wednesday January 25th, 2017** you must submit a sheet in class with the names and signatures of each group member. You must then go out into the Guelph area and find a business or company that is willing to let your group come into their environment and perform an ergonomics analysis. You must let me know the name and contact for this business by **Friday February 10<sup>th</sup>**. Try to find an occupational task that places both the low back and the upper limbs at some risk of injury (this task can be anything from an industrial job, some manual job on campus, a task you perform as a component of your part-time job, etc.).

### **You must let me know your task to verify that it is appropriate for the project.**

Your group will play the role of an ergonomics consulting company being hired by a company to improve the workplace. Each group will submit one "Ergonomics Report" to summarize their findings. This report is expected to be professional and it is **mandatory** that a second hard copy be submitted to the company you worked with. The students must **ADDITIONALLY** submit an electronic copy of their final report to the professor.

Students are encouraged to use any of the assessment tools discussed in this course to strengthen their report. In addition, the group will present their project in class (last 4 classes).

**Note:** everyone in a group will normally receive the same mark for the project. However, the instructor reserves the right to assign a higher or lower mark to individuals who have done much more or much less than their share of the allotted work, by consensus of their group.

### **Report Format:**

Font - 11 pt Times Roman or Arial, Margins - 1 inch on all sides; Page numbering - mandatory; Spacing -1.5; Tables & Figures - clearly labelled, should fully explain the figure or table. Reports should also include a table of contents. Further details will be provided later.

### **General Policies:**

1. In order to pass the course, students **MUST** pass the final exam.
2. Students must attend and complete all laboratories, laboratory individual write-ups, group project including the group project report and group project presentation in order to pass the course. If a laboratory is missed due to illness

or other appropriately documented extenuating circumstance, arrangements must be made with the instructor and TA to complete a make-up lab.

3. **Late materials** - Labs and the group project report will be assessed a 10% deduction per day late

#### **Email Communication:**

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

#### **When You Cannot Meet a Course Requirement:**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

#### **Accessibility:**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.csd.uoguelph.ca/csd/>

#### **Academic Misconduct:**

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community - faculty, staff, and students - to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:  
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

#### **Recording of Materials:**

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

#### **Resources:**

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>