

# HK 4240

## Occupational Biomechanics and Ergonomics - Winter 2009

### Instructor Information

Professor: Dr. Michele Oliver, P.Eng., Office: Room 1335, Thornbrough Building, Phone: (519) 824-4120 (Extension 52117), Fax: (519) 836-0227, E-Mail: [moliver@uoguelph.ca](mailto:moliver@uoguelph.ca)

Office Hours: TBA

Teaching Assistants: Ms. Micha Wallace ([wallacem@uoguelph.ca](mailto:wallacem@uoguelph.ca), 3<sup>rd</sup> Floor, Old Wing of Thornbrough Building); Ms. Leanne Conrad ([lconrad@uoguelph.ca](mailto:lconrad@uoguelph.ca), 3<sup>rd</sup> Floor, Old Wing of Thornbrough Building)

### Course and Schedule Information

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, Room 156, ANNU

Laboratory: Tuesday 2:30-4:20PM, Wednesday 2:30-4:20PM, [JTP](#), Room 215

Text: No required textbook but readings will be assigned

### Learning Objectives

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
  - WSIB
  - Economics of Ergonomics
  - Ministry of Labour
  - Functional Abilities Evaluation
- Vibration

## Marking

Activity	Percentage of Final Grade
Anthropometrics and Grip Strength Laboratory	5% (Quiz done in lab)
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 Friday March 20 <sup>th</sup> , in class) - Presentation 5% (presentations in last 4-6 classes)
Midterm Exam Wednesday February 25 <sup>th</sup> , 2009 9:30-10:20 am (In Class) (Room 156, ANNU)- Closed Book and will cover class, guest lecture and laboratory material up to and including Friday February 13, 2009	15% or 0% (whichever provides the highest course grade)
Final Exam - Thursday April 16, 2009 11:30-1:30 pm (Location TBA) - Open Book	30% or 45% (whichever provides the highest course grade)

### **Ergonomics Group Project (written report due March 20<sup>th</sup>, in class)**

Students are asked to get into groups of 4 or 5 (no groups will be allowed to be larger or smaller than this). Each group must have both engineering and HHNS students in it. If at all possible, you should be with people who are in the same HK\*4240 laboratory section as you are. By **Wednesday January 21st**,

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. 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 consult with the course instructor to verify that your selected task 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 (for free unfortunately). 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 also 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 4-6 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 - double; 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

- If a student does not write the midterm exam, the percentage weighting will be shifted to the final exam such that the final exam will be worth 45% of the student's final grade.
- In order to pass the course, students must pass both the laboratory/group project and exam course portions. Students must obtain a grade of 50% or higher on the exam portion of the course in order for the laboratory write-up/laboratory quiz/group project portions of the course to count towards the final grade. Similarly, students must also obtain a grade of 50% or higher on the laboratory write-up/laboratory quiz/group project portions of the course in order for the examination portion of the course to count towards the final grade. Students must attend and complete all laboratories, laboratory individual write-ups, laboratory quiz, 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. You will not pass the course without attending and completing the laboratories.
- Late materials - Labs and the group project report will be assessed a 10% deduction per day late

Grading Scale (as per the 2008-2009 University of Guelph Undergraduate Calendar)

Letter Grade	Percent Range
A+	90-100%
A	85-89%
A-	80-84%
B+	77-79%
B	73-76%
B-	70-72%
C+	67-69%
C	63-66%
C-	60-62%
D+	57-59%
D	53-56%
D-	50-52%
F	0-49%

Disclaimer

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.