

SPPH565 ERGONOMICS COURSE OUTLINE

Instructor: Judy Village, Certified Professional Ergonomist, Adjunct Faculty, UBC School of Occupational and Environmental Hygiene, Judy Village & Associates, (H/W 604 929-7243; C 604 787-9078)
email: village@interchange.ubc.ca or jvillage@shaw.ca

Course Description:

A lecture/seminar course on the application of knowledge about human capabilities and limitations to the design of workplaces, work methods and jobs for optimal safety, efficiency, productivity and comfort.

Topics include: systems design and task analysis, muscle use and anthropometry, workspace design, activity-related soft tissue disorders, back injuries, shiftwork, organizational and psychosocial aspects of work, skilled work and mental activity and regulations in ergonomics.

Objectives:

- to increase awareness of the need for and role of ergonomics in occupational health
- to obtain basic knowledge in the application of ergonomic principles to design of industrial workplaces and the prevention of occupational injuries
- to understand the breadth and scope of occupational ergonomics

Method of Presentation:

A lecture/seminar format will be used to introduce the various topics. Readings will be assigned from the **course textbook: Introduction to Ergonomics, Third Edition, R.S. Bridger, CRC Press (2009)**. Readings and links will also be posted on UBC Blackboard, along with lecture powerpoints. During lectures, pictures and examples of the content will be provided from various industries and applied research projects. Through in-class group work, home reading and the final project, students will practice the application of ergonomics.

Evaluation:

Course evaluation will be based on one in-class midterm (worth 30%), three take-home assignments (worth 10% each) and a final project (40%). Students will choose either a research paper or a practical project for their final project. They will be expected in each case to define a problem, review the literature corresponding to the problem, take measurements (if doing a practical project), summarize the information and present practical recommendations. Final projects will be presented in written and oral presentations.

LECTURE OUTLINE (based on 3-hour lectures)

- 1. September 11, 2017:
Introduction to Ergonomics, Definition and History of Ergonomics,
Introduction to Systems Design and Task Analysis**

Definitions of ergonomics and its history, ergonomics in systems design, and steps to performing a task analysis. In class practice performing a task analysis.

**Reading for Lecture 1: Chapter 1, page 1-38,
Scan through content lists of the various ergonomics journals to see the scope
of ergonomics literature**

**Reading for Lecture 2: Chapter 3, page 75-109; Chapter 4, page 115-150,
and page 162.**

- 2. September 18, 2017:
Muscle Use and Anthropometry and Workspace Design**

Muscular work including dynamic and static work, nervous control of movement, skilled work and ways to improve work efficiency. Anthropometry is the study of the size and shape of the human body. Use of anthropometric data in ergonomics.

Principles of workspace design, including seated work, standing work, work reaches and working heights, the office environment and visual work.

Reading for Lecture 3: Chapter 5, page 165-203

Assignment 1: Workspace Design (due Oct 2, 2017)

- 3. September 25, 2017:
Activity-related soft tissue disorders (ASTDs)**

Definition of ASTDs, examples of ASTDs accepted by WCB, how injuries are adjudicated, pathology of disorders, work-relatedness, psychosocial factors, risk factors (repetition, awkward posture, forceful exertions, hand-arm vibration, etc.) defined, and guidelines in literature for risk factors.

Reading for Lecture 4: page 316-320

- 4. October 2, 2017:
Analysis of Risk of ASTDs in the Workplace**

Assessing a workplace for risk of ASTDs - various tools and techniques available-qualitative to quantitative. Developing solutions to jobs with ASTD risks.

Psychosocial and Organizational Aspects of Work

Discussion of the influence of work organization and psychosocial factors such as control over work, supervisory support and skill discretion in the workplace.

Reading for Lecture 5: Chapter 6, page 215-240, and page 248-251

Assignment 2: Analysis of ASTDs (due October 16, 2017)

October 9, 2017: Thanksgiving – no class

5. October 16, 2017: Analysis of Risk for Back Injuries in the workplace

Mechanism of injury for back and shoulder overexertion injuries, compensation for such injuries, major risk factors (eg. manual materials handling, awkward postures, prolonged standing and sitting, whole body vibration, etc).

6. October 23, 2017: Assessing the Risk of Back Injuries in the Workplace

Assessing a workplace for risk of overexertion injuries - tools and techniques for quantifying injury risk (NIOSH, Snook tables, Mitel tables) - advantages and disadvantages. Developing risk control solutions for overexertion injury risk. In-class practice with techniques.

Assignment 3: Assessing Risk of Back Injuries (due November 6, 2017)

7. October 30, 2017: Midterm Exam (all material to date)

Readings for Lecture 8: Chapter 12, page 457-500, and page 309-316.

8. November 6, 2017: Skilled Work, Control-Display Design and Mental Activity; Shiftwork

Stages of information processing, skilled behavior, memory, attention, and stereotypes. Analysis of information processing demands and minimizing cognitive overload and under-load. Design of systems considering mental workload. Design of controls and displays, including coding and inspection. **Shiftwork:** Minimizing the effects of shiftwork on worker health and safety.

9. November 13, 2017: Ergonomics Programs: How to develop an ergonomics program. Overview of WCB Ergonomics Regulations.

10. November 20, 2017: Possible Guest Speaker

11. November 27, 2017; Final Presentations

Final Assignment: Review Paper of Special Topic in Ergonomics or Applying Ergonomics to a Workplace Problem

Review Paper:

Choose a topic that you are particularly interested in, making sure there is sufficient literature documented. Let me know which topic you are pursuing. Review the current literature on that topic (preferably within the last 10 years) and prepare a review paper that addresses the following:

1. Objective of your review clearly stated (i.e. to review various methods for measuring mental workload in occupational applications and recommend those most useful)
2. Summary (overview of entire paper)
3. Review of literature (with references)
4. Conclusions
5. Recommendations relevant to industry (or classmates who will work in industry)
6. References

The paper should be 15-20 pages DOUBLE-SPACED. Make sufficient copies of the summary page for classmates

Distribution of Marks: (40% of ergonomics mark)

Marks based on:

Objective clearly defined and stated (5%)

Demonstration of understanding of current literature (breadth and scope) (50%)

Conclusions, based on literature reviewed (10%)

Recommendations to industry based on objective and the review (15%)

Communication of problem and solutions to industry through written report (10%)

Oral Presentation (10%)

Sample Topics:

- patient safety and human factors
- how to design a job rotation
- human computer interaction design
- user experience (design of software and testing usability)
- mental workload assessment techniques
- designing work-rest ratios
- human error - designing jobs to minimize
- human computer interface - designing user-friendly devices
- visual displays related to traffic signage
- systems analysis methods (not included in course)

- participatory ergonomics - what it is and how it works
- ergonomics of control room design
- human factors of public transportation
- human factors and design for the disabled or elderly
- ergonomics of consumer product safety
- validity and reliability of job observation as a tool for assessing problems
- biomechanical vs. psycho social factors related to back injuries
- psychophysical methods of analysing work - pros and cons
- scientific evidence for training in prevention of back injuries

Applying Ergonomics to a Workplace Problem

If you know of a current ergonomics problem in a specific industry, you may approach me to discuss whether an applied project would be feasible. A consent form will need to be signed by the company. If you alternatively have an idea but need an employer, you may approach me to see if I can find someone interested in having you conduct an applied project. The project must be reasonably contained such that it can be completed within a half semester with up to three visits to the worksite to collect data.

Sample Projects from Other Years:

- Determining the “fit” of computer workstations at B.C. Hydro and if fit can be predicted from some basic anthropometric data of workers (such as height and gender)
- Evaluation of risk factors for surgeons performing laproscopic surgery
- Evaluation of materials handling injuries at Dairyland
- Ergonomic assessment of the anaesthiologists work space and equipment
- Evaluation of injury risk to tree-planters and recommendations for reducing risk
- Recommendations for control room design in pulp mills

Distribution of Marks: (40% of ergonomics mark)

Objective clearly defined and stated (5%)

Collection of background evidence and review of relevant literature (20%)

Task analysis (10%)

Risk assessment (25%)

Development of risk control solutions (even if at feasibility stage) (20%)

Communication of problem and solutions to industry through written report (10%)

Oral Presentation (10%)