

Course Objectives and Approach

This graduate course is designed to introduce the basic principles of ergonomics to engineering, industrial hygiene, occupational health nursing and occupational medicine students. The course focuses on the biomechanical basis of the design of the workplace, tasks and tools and will cover topics of human anatomy, anthropometry, and statics. In addition, the topics cognitive human factors, vision issues and work, work organization and psychosocial issues will be introduced. Students will perform a job analysis in the field where they will apply exposure assessment tools introduced in the course. Students will also design interventions for that job to reduce high priority risks.

Learning objectives:

- Understand the human musculoskeletal system and its limitations related to work.
- Understand methods to measure force, vibration, posture and motion in the workplace and the limitations of these methods.
- Be able to apply anthropometry methods to workplace, workstation and tool design.
- Be able to apply statics to estimate shoulder and low back tissue forces.
- Be able to perform a comprehensive job analysis and prioritize risks.
- Be familiar with ergonomic approaches to the redesign of work.

Grading:

Quizzes	20%
Job Analysis	20%
Intervention	20%
Final Exam	40%

Texts/Reader:

- Kodak's Ergonomic Design for People at Work, 2nd Ed, Wiley, 2004.
- On-line Course Reader: www.me.berkeley.edu/ergo/ph269c/classlinks/

Spring 2006
Fridays 2-5pm

Occupational Biomechanics (Ergonomics)
BioE C279 (07558) / PH C269C (76331)

Instructor: Rempel
Dwinelle 156

1	January 20	David Rempel	Introduction / upper extremity disorders / posture measurement / statics
2	January 27	David Rempel	Upper extremity risk factors / workplace surveillance methods / statics
3	February 3	Niklas Krause David Rempel	Spine disorders / risk factors Anthropometry
4	February 10	David Rempel	Muscle fatigue / psychophysics / Introduction to job analysis
5	February 17	Ira Janowitz	Job analysis methods
6	February 24	Fadi Fathallah	Spine loading measurement methods
7	March 3	Dave Zalk Ira Janowitz	Posture targeting Job analysis methods
8	March 10	Ira Janowitz	Job analysis methods / Design of work: spine loading
9	March 17	Tim Dalby / Ira Janowitz	Visual and lighting issues / Computer work
10	March 24	Ira Janowitz	Workstation design
11	March 31		No class – Spring Recess
12	April 7	David Rempel	Student presentations: Job Analysis
13	April 14	Pat Tittiranonda Delphine Cody	Software ergonomics / Cognitive human factors
14	April 21	Bernard Martin David Rempel	Vibration measurement and control / Design of work: upper extremity and tools
15	April 28	Julia Faucett	Psychosocial issues and injury / work organizational interventions
16	May 5	David Rempel	Student presentations: Interventions / Ergonomics Programs

READINGS

Week	Kodak Readings ¹ PAGES	Other Readings
1	18-27, 99-112, 511-512	Handout in Reader (D Rempel)
2		Handout in Reader (D Rempel) Roquelaure Y et al. Occupational and personal risk factors for carpal tunnel syndrome. Scand J Work Environ Health 1997; 23:364-9. Silverstein B et al. Hand wrist cumulative trauma disorders in industry. Br J Industrial Med 1986; 43:779-84.
3	27-73	Handout in Reader (D Rempel) Handout in Reader (N Krause) Krause N, et al. Determinants of duration of disability and return-to-work after work-related injury and illness: challenges for future research. Am J Ind Med. 2001 Oct; 40(4): 464-84. Loisel P, et al. A population-based, randomized clinical trial on back pain management. Spine 1997,22:2911-8.
4	112-121, 435-449	Handout in Reader (D Rempel)
5	121-152, 458-470, 162-164	Handout in Reader (I Janowitz)
6	152-159, 174-179	Handout in Reader (F Fathallah)
7	179-181	Posture Targeting articles in Reader: Corlett EN et al. Posture targeting: a technique for recording working postures, Ergonomics 1979; 22:357-366. Zalk DM et al. Grassroots Ergonomics: An effort to modify custodial training. Am Soc Safety Eng March 1997, 21-23.
8	181-185; 511-559	Handout in Reader (I Janowitz)

9	203-217, 228-234, 292-294; 496-499; 565-578	Handouts in Reader (Tim Dalby, Ira J):
10	191-203; 249-268; 449-457	Handout in Reader (I Janowitz)
11		SPRING RECESS
12		Student Presentations
13	326-341, 373-410	Handout in Reader (P Tittiranonda) Handout in Reader (D Cody)
14	1-17, 74-81, 294-327, 343-363, 617-630,	Handout in Reader (B Martin) Handout in Reader (D Rempel)
15	411-421	Huang GD, Feuerstein M, Sauter SL. Occupational stress and work-related upper extremity disorders: concepts and models. Am J Ind Med. 2002 May;41(5):298-314. Musculoskeletal Disorders and the Workplace. National Research Council, Institute of Medicine. 2001. Chapter 8: Interventions in the workplace. Pp. 301-329.
16		Student Presentations California OSHA Ergonomics Rule, 1997 www.dir.ca.gov/Title8/5110.html

¹ Kodak's Ergonomic Design for People at Work, 2nd Ed, Wiley, 2004.

**Project Guidelines:
Job Analysis****GENERAL**

The primary assignment in the Ergonomics course is to do a job analysis in the field. This project is designed to demonstrate the knowledge obtained during the lectures and the readings by having students complete an ergonomic analysis of a workstation or a production line where a worker(s) spends most of his or her time. The project will be performed in cross-disciplinary task groups of 2 students. The project is to be presented to the class on next 2 class days. Sign up for presentation dates will be on first-come-first-serve basis. The written report is due on the second day of presentations.

OBJECTIVE

The aim of the project is to perform an ergonomic job analysis and report the findings and the analysis in a **quantitative** manner in the form of a report and a presentation to the class.

IDENTIFYING THE PROJECT

Students will self-select into groups of 2 students. Students must be from different disciplines (e.g., medicine & engineering, nursing and industrial hygiene). The group must select and enroll the study site themselves. The job task to be studied must be one that includes repetitive or static activities that are performed for more than 2 hours per day; the only work that cannot be studied is computer work. The job must also have more than 2 people doing similar work since 2 or more workers must be studied.

Approval by the instructor will be based on a brief description of a workstation/ task/process, its relation to ergonomics, and the proposed method of analysis. The project will then be briefly described in writing on the "project form" (attached) which is signed by the instructor for final approval. All projects must be approved by the instructor by the end of February.

ERGONOMIC ANALYSIS

Methods used in ergonomics analysis for exposure assessment will be introduced to the class during the semester. Selected readings on ergonomic methods are included in the reader. Each task group will choose one or two methods best suited to the project they have chosen. Students are welcome to modify an existing method. The method used will be briefly described on the "project form." Some force measurement equipment can be borrowed for 1-3 days but must be reserved in advance. Call Betsy Llosa to reserve this equipment (665-3403).

INSTRUCTOR MEETINGS

Students will meet with the course instructor at least two times during their project assignment: once to have the project approved and the second time during the execution of the project at a time chosen by the group to review the analysis methods. All group members should attend these meetings. Each meeting will be noted on the "project form".

JOB ANALYSIS REPORT

The project report should contain the following sections. A maximum length for each section is proposed. In the Discussion section, the findings should be prioritized based on the best estimate of risk. The report should be submitted as both a hard copy and a Work document with pictures burned on a CD-ROM. The submitted report should also include a video (may be on CD-ROM) of multiple typical cycles of the task and copies of the signed consent forms.

Section	Maximum Length (pages)
1. Executive summary	0.5
2. General description of the workplace/task/process	1
3. The problem	0.5
4. Methods and approach to analysis	1
5. Results and significant findings	2
6. Discussion and prioritization of risks	2
7. References/Appendix	

CLASS PRESENTATION

Student groups will present their projects to the class. The group should plan a 10 minute, and no more than 10 minute, presentation. Each student should be involved in the presentation. The presentation should include components 2 – 6 of the written report. Students can use PowerPoint, video or overhead to present in the class.

EVALUATION

The evaluation of the presentation and report will be based on the following items:

- Includes components of 'Ergonomics: Job Analysis'
- Appropriate identification of risk factors
- Appropriate quantitative estimates of risk factors
- Justification of ranking of risks

Project Guidelines: Ergonomics Intervention

GENERAL

Following the job analysis, the group will design interventions that will reduce the identified risk factors. The interventions can be workstation, tool, task, product or job modifications, but should address the high priority risk factors identified in the job analysis. Costs should not be considered during this design phase.

The interventions should be as quantitative as possible, to the point of calling out dimension changes of equipment or products or time changes within work/break cycles. If appropriate, engineering drawings of proposed interventions should be prepared. If several interventions are planned for the same problem, the interventions should be ranked based on estimated effectiveness of solving the problem.

INTERVENTION REPORT

Students will prepare a follow-up report to the job analysis. The report should be submitted as both a hard copy and a Work document with pictures burned on a CD-ROM. The report should contain the following sections.

Section	Maximum Length (pp)
1. Executive summary	0.5
2. Summary of primary risks identified in job analysis	0.5
3. Ranked proposed interventions with discussions of estimated effectiveness	6
4. References	

CLASS PRESENTATION

Just before finals, the groups will present their proposed interventions to the class. The group should plan a 10 minute presentation of sections 2 and 3. Again, each student should be involved in the presentation. Students can use video, PowerPoint computer projection or overhead to present the report. Students are also encouraged to present their findings to employees and management at the workplace studied.

EVALUATION

The evaluation of the presentation and report will be based on the following:

- Creativity and effectiveness of interventions
- Quantification / specification of interventions
- Appropriate prioritization of interventions

Project Form *

Group Members Names _____

Title of Project _____

Location of Analysis _____

Aim of Project _____

Description of job _____

Method of analysis _____

Instructor notes: _____

Meeting 1: _____

Meeting 2: _____

*Bring this form to each consulting meeting with the instructor.