

ENV H / INDE 566 - Introduction to Ergonomics
Winter 2012

- Course Description:** ENV H 566/ INDE 566 (Three Quarter Credits). Basic principles of ergonomics in the work environment applied to the worker. Topics include musculoskeletal disorders, assessing physical exposure in the workplace, workplace and work tool design, evaluating lifting and material handling activities, applied biomechanics, and implementing ergonomic programs.
- Prerequisites:** Basic human anatomy and physiology or permission of instructor
- Location and Time:** Thursdays 9:30 – 12:20 HSB T 635
- Instructors:** Peter Johnson, PhD; Associate Professor, Department of Environmental and Occupational Health Sciences, phone: 221-5240; e-mail: petej@uw.edu
- Jeong Ho (Jay) Kim, PhD Candidate; Department of Industrial and Systems Engineering, phone: 543-4544; e-mail: jhkim01@uw.edu
- Office Hours:** Drop in or by appointment, 4225 Roosevelt Way NE, Room 119 and 120
- Textbooks:** Occupational Ergonomics – Principal and Applications F. Tayyari and J.L. Smith Manufacturing Systems Engineering Series, Vol. 3, 1997, 464 p., Hardcover, ISBN: 0-412-58650-9
Supplemental reading materials to be distributed electronically on class website
- Class Website:** <http://moodle.washington.edu>, find the course Winter 2012 ENVH/INDE 566 INTRODUCTION TO ERGONOMICS, course login “ergo”
- Learning Objectives:** At the end of this course, the student will be able to:
1. Identify and be familiar with the physical, individual and organizational factors which can contribute to musculoskeletal disorders.
 2. Identify and be familiar with common musculoskeletal disorders which can result from occupational activities.
 3. Identify and be familiar with the structure and anatomy of the upper extremities and low back
 4. Use various assessment tools to identify and evaluate various upper extremity hazards in the workplace.
 5. Use various assessment tools to identify and evaluate lifting and manual material handling activities:
 6. Identify ergonomics hazard and implement solutions in office and manufacturing environments.
 7. Use various economic techniques to identify, propose and justify implementing ergonomic solutions in the workplace.
 8. Be able to set-up, establish and maintain a workplace ergonomics program
- Grading:** 10% Class participation, 15% Homework, 20% Midterm Exam, 25% Research Assignment, 30% Final Exam
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COURSE SCHEDULE

Week 1 – January 5, 2012

1. No Class – Semiahmoo Conference in Blaine, WA with the UW, Simon Fraser and UBC

Assigned readings for January 12 – Book and Reader Week 2:

1. Book - Chapters 1, 2 (pp 18 – 22), 4, 8 (pp 154 - 164) and 9 (pp 191 – 192, 208 – 212)
2. Chapter 10 – NRC
3. NIOSH Yellow Book Executive Summary
4. 2011 BLS Injury Data
5. 2011 BLS Lost Work Time

Week 2 – January 12, 2012

1. Introduction to Ergonomics
2. Anthropometry Overview
3. Research Application of Anthropometry
4. Anatomy of the back

Assigned readings for January 19 – Book and Reader Week 3:

1. Book - Chapters 3, 5 and 9 (pp 192 – 208)
2. NIOSH Guide to Manual Material Handling
3. ACGIH Lifting TLV
4. Washington State Ergonomics Standard Lifting Guide – Appendix B
5. Russell – Lifting Tool Comparisons

Homework

1. Job Opening - Create a Resume (Practitioner) or CV (Researcher) **and** supply a one page cover letter why you feel you are suitable for our job opening as an ergonomics consultant (Practitioner) or ergonomic researcher (Researcher) posted on the class website. Due as an email with cover letter and resume/CV attached before class January 19th.
2. Anthropometry Homework: Consider the things you encounter in everyday activities, **identify 10** designs that were likely developed using reach distances and **identify 10 design** considerations that were likely developed based on the clearance needed. Examples: 1. For a car, the size of the opening of the driver's door would be a clearance consideration, 2. For a light switch, the height of the light switch would be a reach distance consideration. Extra credit, provide 5 example of things you encounter during everyday activities with improperly designed reach or clearance considerations. Due January 19th at the beginning of class.
3. Design a “safety shower” using the diagram from class. Answer the questions: a. Who will use it? b. What is the function it needs to serve? Then, determine the height of the shower head and the position (height and reach) of the handle. Explain your rationale. Use only the design presented in class – do not redesign. You are free to use the anthropometric tables from class or others that you research on your own. Due January 20th at the beginning of class.

Week 3 – January 19, 2012

1. Introduction to Statics
2. Material Handling/Back Protection
3. NIOSH Lifting Equation
4. ACGIH Lifting Standard/TLV
5. Washington State Ergonomics Standard Lifting Guide – Appendix B
6. 3DSSPP
7. Comparison of Lifting Tools

Assigned reading for January 26 – Book and Reader Week 4

1. Book - Chapters 2 (pp 13 - 17, 22), 8 (pp 164-186), and 18(pp 390 – 403)
2. Perceived Exertion and Pain Scales

Homework

1. Static Analysis Problem Set (example 3). Due beginning of class January 26th.
2. Solve the hopper lifting problem in the NIOSH Guide to Manual Materials Handling using both the NIOSH lifting equation and the ACGIH Lifting TLV (due beginning of class January 26th)
3. Targeted Research Assignment. Choose one of the following topics (or propose your own topic) and write a maximum 10 page paper double spaced providing an introduction and the state of the art knowledge in your proposed topical area. The content should be based on a minimum of five sources (peer reviewed journal articles preferred). Students will present a 12 minute PowerPoint presentation to the class. Topic must be presented and approved by instructors by January 26th, presentations will be given in class March 1st or 8th and the paper is due at the beginning of class March 8th .

Potential Topics: ergonomics and productivity, ergonomic standards, lean manufacturing and ergonomics, ergonomics and the fishing industry, hand tool design, construction ergonomics, office ergonomics, manufacturing ergonomics, manual material handling, patient handling, whole body vibration, hand-arm vibration, agricultural ergonomics, instrumentation, electromyography, goniometry, inclinometry

Week 4 – January 26, 2012

1. Upper extremity anatomy
2. Upper Extremity Musculoskeletal Disorders
3. Objective and Subjective Measurements Methods
4. Examples of Ergonomic Assessments

Assigned reading for February 2 – Book and Reader Week 5:

1. Book - Chapters 14 and 15

Week 5 – February 2, 2012

1. Midterm
2. Statics and Lifting Analysis Homework Review
3. Noise, Hand arm and Whole Body Vibration

Assigned reading for February 9 – Book and Reader Week 6:

1. Book - Chapters 18 (pp 403 – 405) and 19
2. Hamrick Article – Ergonomics and productivity

Homework

Internet Assignment – Find 10 ergonomic-related websites and submit the top three websites (due beginning of class February 9th)

Week 6 – February 9, 2012

1. Midterm - review
2. Guest Lecturer, Walt Rostykus CIH, CPE, CSP, MPH, Humantech Inc
 - Manufacturing Ergonomics and Lean
 - Ergonomic process/program development and implementation
 - Justifying costs of ergonomic solutions

Assigned reading for February 16 – Book and Reader Week 7:

1. Book - Chapters 10
2. ACGIH HAL TLV
3. Moore Article - Strain Index
4. Appendix B from the Washington State Standard
5. MacAtamney – RULA
6. Buchholz, PATH

Homework

Justifying the cost of an ergonomic intervention (due beginning of class February 16th)

Week 7 – February 16, 2012

1. Summary of ergo resource sites
2. ACGIH HAL TLV, Strain Index, RULA
3. Hand Tool Design
4. Construction Ergonomics

Assigned reading for February 23 – Book and Reader Week 8:

1. Book – Chapter 13 and 17
2. Gerr Article – Incidence of WMSDs among computer workers
3. Office Ergonomics Materials

Homework

Upper Extremity Case Study - Use the ACGIH HAL TLV, the Strain Index and the RULA to evaluate the video posted on the website. Write a three to five page summary of your findings comparing and contrasting the tools (due beginning of class February 23rd).

Week 8 – February 23, 2012

1. Guest Lecturer, Meg Honan CPE, MPH, Genentech, Inc
 - Office Ergonomics,

Week 9 – March 1, 2012

1. Student targeted reading presentations

Week 10 – March 9, 2012

1. Student targeted reading presentations

Final Exam: Wednesday, March 14, 2012, 10:30-12:20 Location: HSB T – 474