IE 366, Work Systems Engineering

Winter Term 2008

OSU Catalog Description

Principles and techniques of work measurement, methods engineering, workplace design, work sampling, and predetermined time systems. Basic human factors engineering and ergonomics principles applied to workplace design. The work systems engineering process. 4 credits.

Prerequisites

ST 314 or equivalent statistical material.

Meeting Times and Locations

Lecture: MW 0830 - 0950
Labs: F 1000 – 1150 or
F 1200 - 1350

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Required Text

Konz, Stephan and Steven Johnson (2008). *Work Design: Occupational Ergonomics, 7th edition.* Scottsdale: Holcomb Hathaway.

Course Learning Outcomes

Students completing this course should be able to do the following.

1. State Human Factors/Ergonomic principles that influence the performance and safety of work systems (workers, equipment, and work processes).

2. Apply HF/E guidelines and use standard HF/E tools (e.g., RULA, NIOSH Lift Equation) in the design of work systems.

3. Model work systems using standard techniques, such as flow diagrams, process charts, operation charts, activity charts, block diagrams, and process maps, for purposes of work system documentation, analysis, and design.

4. Apply a structured engineering process (analysis/requirements development, design, implementation, operation, evaluation, project management) to work system development.

5. Apply engineering management principles and tools (e.g., Gantt charts, CPM) to the planning and management of work systems engineering projects.

6. Determine the time required to do a job using standard data, occurrence sampling, time study, and predetermined time systems.

7. Recognize and constructively address ethical, social, and environmental issues that arise in a work systems engineering project.

8. Demonstrate writing skills pertinent to Work Systems Engineering.

Course Elements and Policies

Readings

Reading assignments will be made for most lecture and lab meetings. Most will be from the text; a few will be from outside sources announced by the instructor. See the schedule, below, for reading assignments. Students must complete each reading and complete a notecard (see below) before coming to the class meeting for which that reading is assigned.

Lectures

Lectures will supplement the readings with additional material and discussion. Students must attend lectures regularly and participate actively in class discussions. Lecture slides will be posted to the IE 366 Blackboard *after* the lectures.

Work Systems Engineering Design Project

Students will work in teams assigned by the instructor on a term-long project to design a work system, including a work station and work processes. A systematic engineering analysis and design process will be used for this, tailored to the specific needs of work system development. Much of the course and coursework will be built around this project.

Laboratories

Most laboratories will focus on the work systems engineering project. The first part of each such lab period will be devoted to learning the methods to be used in the next phase of work and during the remainder of the period teams will be able to get started on applying those methods to their own project. Generally, the work product(s) of that phase of the project will be turned in with a progress report at the beginning of the next lab period. The remaining lab periods will be devoted to additional work design topics. Work from those labs will be turned in the day of the lab.

Coursework

The following table summarizes the coursework, with the possible points for grading purposes. These coursework elements are described in the paragraphs below and their due dates are given in the schedule.

Coursework	**points**
9 Progress/Lab Reports	90
Project Final Report	100
Work System Issue Paper	10
Chapter/reading notecards	√
Midterm Exam	100
Final Exam	100
Total	**400**

Project Progress Reports

Each team will prepare a series of progress reports for the Work Systems Engineering Project. Each progress report will consist of the work product(s) completed by the team and a one-half to one-page

cover memo written by one of the team members. The memo writing assignment will rotate through the team so that each team member writes at least two memos during the term.

Project Final Report

At the end of the term, each team will submit one final report, written by the team together (i.e., unlike the progress reports, the final report will be a group writing project). The final report should be on 8½" X 11" paper in a three-ring binder containing the following.

- A cover page with the title "IE 366 Work Systems Engineering Design Project", the names of all team members, and the date of submission.
- The following sections, separated by tabbed, labeled dividers.
    - A two- to four-page summary of the project, organized according to the remaining final report sections (see below). All team members should contribute about equally to the writing of the summary.
    - Final System Models, developed from the initial versions of these work products submitted earlier as part of a progress report.
    - Final Process Models, developed from the initial versions of these work products submitted earlier as part of a progress report.
    - Final Task Descriptions, developed from the initial version of this work product submitted earlier as part of a progress report.
    - Final Work System Requirements, developed from the Work System Requirements V1 and V2 work products submitted earlier as part of progress reports.
    - Basic Design Specifications, a clean copy (i.e., without grader's marks) of the work product submitted earlier as part of a progress report.
    - Design Evaluation, a copy of the evaluation team's evaluation of the design team's specifications, along with a list of changes made by the design team in response to that evaluation.
    - Final Detailed Design Specifications, based on the work product submitted as part of a progress report and incorporating any changes made subsequent to that version.
    - Final Task Procedures, based on the work product submitted as part of a progress report and incorporating any changes made subsequent to that version.

Work System Issue Paper

Each student will identify and take a position on a contemporary issue relating to work, then write a short paper explaining and defending that position. Details for this assignment will be provided by the instructor.

Notecards

For each chapter of the text or outside reading assigned by the instructor, each student will prepare one notecard summarizing the material and will turn it in at the beginning of the class period for which the reading was assigned. Notecards will be returned promptly and may be used in examinations. Each notecard must be on 4" X 6" card stock (not thin paper) and handwritten – not typed or photocopied. It is recommended that each notecard submitted at the beginning of a class have some space remaining for notes on additional material to be covered in class that may not have been covered in the reading.

Other Laboratory Work

For the labs not directly related to the work systems engineering project, each student will complete a brief laboratory report summarizing data collection and analysis. Details will be given in class.

Examinations

The midterm examination will cover all material from the beginning of the term through the class period (lecture or lab) immediately preceding the midterm examination. The final examination will be over all material covered after the midterm and through the last class period. Both examinations will be closed book, closed notes, except that one notecard (see above) may be used for each chapter or reading the exam covers.

Grading

Grading Criteria

Reports, papers, other laboratory work, and examinations will be graded on content criteria. All reports and essays will be graded on content criteria and writing criteria. Content criteria include

- completeness – the extent to which the work addresses all of the requirements for the coursework – and
- technical accuracy – the extent to which the work uses a correct method or approach, uses it correctly, and arrives at a correct result.

Writing criteria include

- factual accuracy – the extent to which the written material is factually correct;
- logic – the extent to which conclusions drawn in the written material follow logically from the premises;
- organization – the extent to which the written material follows a rational, understandable order;
- clarity – the extent to which the writing makes the content understandable to a reader;
- style – the appropriateness of the writing style to a technical audience;
- wording – the appropriateness of word choice to the context;
- grammar – the extent to which the writing conforms to accepted rules of English grammar;
- spelling – the extent to which words are spelled correctly;
- punctuation – the extent to which punctuation conforms to accepted rules; and
- formatting – the extent to which document formatting (headings and subheadings, text font, face, indentation, bullets and numbering, page breaks, etc.) are used to enhance organization and clarity.

Chapter notecards will be graded only on completeness and timeliness – i.e., whether or not it was fully completed and submitted on time.

Late Work

Coursework, except minimally graded writing assignments and chapter notecards,

turned in	is worth
later on the day the coursework is due	90% of the original value,
after the day the coursework is due	50% of the original value,
one week or more after the coursework is due	0% of the original value.

Chapter notecards that are late will not be accepted.

Grading Scale

Points will be assigned to coursework as shown above and each student's final course grade will be based on the percentage of maximum possible points earned, according to the following table.

93% - 100%	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	D
70% - 72%	C-
67% - 69%	D+
63% - 66%	D
60% - 62%	D-
0% - 59%	F

In addition, if there are any missing notecards, an adjustment will be made to the final grade, as follows.

0 – 2 missing	no penalty
3 – 4 missing	penalty of one +/- step (e.g., B drops to B-)
5 – 6 missing	penalty of two +/- steps (e.g., B drops to C+)
7 or more missing	penalty of one letter grade (e.g., B drops to C)

The instructor will keep the class informed of how many of these items are required. It is each student's responsibility to know how many he/she has submitted.

Questions about Grading

Any questions or concerns about the grading of specific work must be brought to the attention of the Graduate Teaching Assistant within one week of when the graded work is returned.

Examples of Coursework for Accreditation Review

Engineering instructors at Oregon State University routinely retain copies of graded student work for inspection by reviewers from the Accreditation Board for Engineering and Technology (ABET). ABET reviewers use these examples to assess the content and quality of instruction not to evaluate individual students. However, any student strongly objecting to his/her coursework being used for this purpose should contact the instructor.

Students with Disabilities

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

Academic Honesty

The following is adapted from the *OSU Student Conduct Regulations* website. For further information, please refer to http://oregonstate.edu/admin/stucon/regs.htm.

Academic dishonesty is defined as an intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work. It includes

- "cheating" (intentional use or attempted use of unauthorized materials, information, or study aid),
- "fabrication" (intentional falsification or invention of any information),
- "assisting in dishonesty" (intentionally or knowingly helping or attempting to help another commit an act of dishonesty),
- "tampering" (altering or interfering with evaluation instruments and documents), and
- "plagiarism" (intentionally or knowingly representing the words or ideas of another person as one's own).

Any acts of academic dishonesty in this course will be handled initially by the Industrial and Manufacturing Engineering department. Any such matters not quickly resolved will also be referred to the Student Conduct Coordinator for action under Oregon Revised Statute 351.070.

Preliminary IE 366 Winter Term 2008 Schedule

This schedule is subject to change. Any changes to this schedule will be announced in class. Students are responsible for being aware of and responsive to announced changes.

Day	Date	Reading	Topic	Work Due
Mon	7-Jan-08	Chapter 1	Introduction, Term Projects	
Wed	9-Jan-08	6	Work Systems Engineering, Introduction to Project Management, Gantt Charts	
Fri	11-Jan-08	TBA	Lab: Requirements Engineering, System Analysis	
Mon	14-Jan-08	6	Traditional IE Process Analysis and Modeling	
Wed	16-Jan-08	6	Critical Path Method	
Fri	18-Jan-08		Lab: Introduction to IDEF0 Process Analysis and Modeling	Project Progress Report 1: Requirements V1

Mon	21-Jan-08		Martin Luther King Day observed (no class)	
Wed	23-Jan-08	2	Anatomy, Biomechanics	
Fri	25-Jan-08		Lab: IDEF0 Process Analysis and Modeling	Progress Report 2: System Analysis
Mon	28-Jan-08	2	Work Physiology, Anthropometry	
Wed	30-Jan-08	3	Ethical and Social Issues of Work Systems Engineering	
Fri	1-Feb-08		Lab: Task Analysis	Progress Report 3: IDEF0 Process Model
Mon	4-Feb-08	9	Organization of Workstations	
Wed	6-Feb-08	11	Workstation Design	Work System Issue Paper
Fri	8-Feb-08		Lab: Basic Work System Design	Progress Report 4: Task Analysis & Requirements V2
Mon	11-Feb-08		**Midterm examination**	
Wed	13-Feb-08	12	Musculoskeletal Disorders	
Fri	15-Feb-08		Lab: Detailed Design using DELMIA Human	Progress Report 5: Preliminary Work System Design Specifications
Mon	18-Feb-08	13	Manual Material Handling	
Wed	20-Feb-08	14	Hand Tools	RULA Lab Report
Fri	22-Feb-08		Lab: Rapid Upper Limb Assessment (RULA)	
Mon	25-Feb-08	15	Controls	
Wed	27-Feb-08	16	Displays	
Fri	29-Feb-08		Lab: Evaluation	Progress Report 6: Detailed Work System Design Specifications
Mon	3-Mar-08	24, 25	Time/Job, Time Study	
Wed	5-Mar-08	26	Predetermined Time Systems	
Fri	7-Mar-08		Lab: Time Study	Evaluation of other team's design; Time Study Lab Report
Mon	10-Mar-08	17	Human Error	
Wed	12-Mar-08	18	Industrial Safety	
Fri	14-Mar-08		Lab: Project Presentations	Work Systems Engineering Project Final Report