

# IE 366, Work Design

## Winter Term 2006

### ***OSU Catalog Description***

Principles and techniques of work measurement, methods engineering, workplace design, work sampling, and predetermined time systems. Basic ergonomics principles applied to workplace design and physiological work measurement. (Writing Intensive Course)

### ***Prerequisites***

ST 314 or equivalent statistical material.

### ***Meeting Times and Locations***

Lecture: MW 12:30 – 1:50 in STAG 132

Labs: F 12:00 – 1:50 in MFD 105

F 2:00 – 3:50 in MFD 105

### ***Instructor: Dr. Ken Funk***

E-mail: [funkk@engr.orst.edu](mailto:funkk@engr.orst.edu)

Phone: 541-737-2357

Office: 118 Covell Hall

Office Hours: Mon – Thu 3:30 – 4:30

### ***Graduate Teaching Assistant: Mr. Javier Nicolalde***

E-mail: [NICOLAFL@engr.orst.edu](mailto:NICOLAFL@engr.orst.edu)

Office: 008 Covell Hall

Office Hours: TBA

### ***Required Text***

Konz, Stephan and Steven Johnson (2004). *Work Design: Occupational Ergonomics*. Scottsdale: Holcomb Hathaway.

### ***Course Learning Objectives***

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

1. Apply Gantt charts and the critical path method (CPM) to manage engineering projects.
2. Apply standard work documentation methods such as operations charts, product analysis process charts, and man analysis process charts to document and improve work.
3. Determine the time required to do a job, including the use of time study techniques, ratings, and allowances, as well as, occurrence sampling, standard data, and Predetermined Time Systems (PTS).
4. State and illustrate the use of general ergonomic guidelines associated with anthropometry, cumulative trauma disorders, manual materials handling, noise exposure, and slippery floor surfaces.
5. Apply standard ergonomic tools such as OWAS, RULA, the NIOSH Lift Equation, and the OSHA Noise Equation to the analysis and design work stations and work environments.
6. Apply a disciplined engineering analysis and design process to the development and evaluation of a workstation.
7. Demonstrate an understanding of current trends and issues in Industrial Engineering, Work Design, and Ergonomics.

8. Demonstrate writing skills and an understanding of writing issues pertinent to the discipline of Industrial and Manufacturing Engineering.

## **Course Elements and Policies**

### **Readings**

Reading assignments will be made from the text. See the schedule, below, for chapter assignments. Students must complete each reading before coming to the class meeting for which it is assigned.

### **Lectures**

Lectures will supplement the readings with additional material and discussion. Students must attend lectures regularly and participate actively in class discussions.

### **Workstation Design Project**

Students will work in teams assigned by the instructor on a term-long project to design a workstation. 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 be devoted to the workstation design 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 results of that phase of the work will be turned in as a progress report at the beginning of the next lab period. Two lab periods will be devoted to additional work design topics not directly related to the workstation design project.

### **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 course schedule.

<b>Coursework</b>	<b>points</b>
8 Project Progress Reports @ ½ page, 20 points	80
Project Final Report	100
Essay 1	100
Essay 2	100
10 minimally graded writing assignments	√
21 chapter notecards	√
RULA Lab Data and Analysis	10
Time Study Lab Data and Analysis	10
Midterm Exam	100
Final Exam	100
<b>Totals</b>	<b>600</b>

IE 366 is an OSU Writing Intensive Course. A substantial portion of IE 366 coursework will be written, and many of these writing assignments will be related to the workstation design project. Unless otherwise specified, all written coursework should be typed in 10-point font, single-spaced, with one-inch margins on all sides.

## **Project Progress Reports**

Team members will work together on the work assigned in a project-related lab for submission at the beginning of the next lab period. Each team member will *individually* prepare a progress report, consisting of a copy of the team's work product (e.g., a project management plan or a list of workstation requirements), prefaced by a one-half- to one-page progress report memo. An example will be provided in class.

The work product should be completed by the team together and each team member should include a copy of it with his/her progress report. However, *the memo must be completed by the individual team member alone*. This means that each team will turn in multiple progress reports, one for each team member. All of the team's progress reports will have identical work product copies, but different progress report memos.

## **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 in an 8½" X 11" three-ring binder, containing the following.

- A cover page with the title "IE 366 Workstation 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.
  - Statement of Need. A copy of this will be provided by the instructor.
  - Final Project Management Plan, based on the initial work document submitted as part of the first progress report and updated as the project progressed.
  - Final System and 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 Workstation Requirements list, developed from the Workstation Requirements V1 and V2 work products submitted earlier as part of progress reports.
  - Preliminary 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.

## **Essays**

Each student will write two versions of a two- to four-page essay on the social impact of Industrial and Manufacturing Engineering (details to be provided in class). The first version will be a draft, which will be carefully evaluated and commented by an editor. The final version will be prepared based upon the editor's feedback.

## **Minimally Graded Writing Assignments**

Students will complete several minimally graded writing assignments to facilitate learning and discussion. Most will be completed and submitted in class. Details will be given in class.

## **Chapter Notecards**

For each chapter of the text assigned for reading, every 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.

## **Other Laboratory Work**

For the two labs unrelated to the workstation design project, each student will fill out a data sheet and complete and summarize the analysis of the data. Details will be given in class.

## **Examinations**

The midterm examination will cover all material from the beginning of the term through the class period 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 chapter notecard (see above) may be used for each chapter the exam covers.

## **Grading**

### **Grading Criteria**

Reports, essays, 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 word choice and sentence structure to a technical audience;

- o grammar – the extent to which the writing conforms with accepted rules of English grammar;
- o spelling – the extent to which words are spelled correctly; and
- o 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.

Minimally graded writing assignments and chapter notecards will be graded only on completeness and timeliness – i.e., whether or not the work 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.

Minimally graded writing assignments and 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.

90% – 100%	A- – A
80% – 89%	B- – B+
70% – 79%	C- – C+
60% – 69%	D- – D+
0% – 59%	F

In addition, if there are any late or missing minimally graded writing assignments or chapter notecards, an adjustment will be made to the final grade, as follows.

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

## 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, but will also be referred to the Student Conduct Coordinator for action under Oregon Revised Statute 351.070.

## **IE 366 Winter Term 2006 Schedule** (as of 6 Jan 06)

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.

<b>Day</b>	<b>Date</b>	<b>Reading (chaps.)</b>	<b>Topic</b>	<b>Work Due</b>
Mon	9-Jan-06		Introduction and Overview, Course Policies and Procedures	
Wed	11-Jan-06	6, 7	The Work Design Process	
Fri	13-Jan-06	9 (sec.10)	Lab: Statement of Need, Project Management	
Mon	16-Jan-06		MLK Day observed (no class)	
Wed	18-Jan-06	1 - 3	Social Implications of IME	
Fri	20-Jan-06		Lab: Requirements Management, User Requirements, Environmental Requirements	Progress Report: Project Management Plan
Mon	23-Jan-06	9 (secs. 3-9)	Operations Analysis: Pareto Analysis, Fish Diagrams, etc.	
Wed	25-Jan-06		Operations Analysis: Process Analysis and Charting	
Fri	27-Jan-06		Lab: SME Interviews, System Analysis, Process analysis	Questions for SMEs and Progress Report: Workstation Requirements V1
Mon	30-Jan-06	4	Anatomy, Biomechanics, and Work Physiology	
Wed	1-Feb-06	5	Anthropometry	
Fri	3-Feb-06		Lab: Task Analysis	Progress Report: System Model, Process Models
Mon	6-Feb-06	11	Macroergonomics	
Wed	8-Feb-06	12	Organization of Workstations	Essay V1
Fri	10-Feb-06		Lab: Preliminary Design	Progress Report: Task Descriptions
Mon	13-Feb-06		Midterm examination	
Wed	15-Feb-06	13	Workstation Design	
Fri	17-Feb-06		Lab: Detailed Design, Introduction to DELMIA	Progress Report: Workstation Requirements V2

Day	Date	Reading (chaps.)	Topic	Work Due
Mon	20-Feb-06	14	Lab: Workstation Design Using DELMIA (meet in BAT 045)	
Wed	22-Feb-06		Musculoskeletal Disorders	
Fri	24-Feb-06	15	Lecture: Manual Material Handling	Progress Report: Preliminary Design Specifications
Mon	27-Feb-06	16	Hand Tools	
Wed	1-Mar-06	17, 18	Displays and Controls	
Fri	3-Mar-06		Lab: Heuristic evaluation	Progress Report: Detailed Design Specifications
Mon	6-Mar-06	20	Industrial Safety	
Wed	8-Mar-06	24	Hearing and Noise	
Fri	10-Mar-06		Lab: Rapid Upper Limb Assessment (RULA)	Progress Report: Design Evaluation and RULA results
Mon	13-Mar-06	27, 28	Time/Job, Time Study	Essay V2
Wed	15-Mar-06	29	Predetermined Time Systems	
Fri	17-Mar-06		Lab: Time Study	Time study results
Mon	20-Mar-06			Project Final Report (by noon in 118 COVL)
Thu	23-Mar-06		Final exam, 9:30 - 11:20	