

Fundamentals of Human Factors and Ergonomics

Course Syllabus (Fall 2018)

Course Description

This 8-week, asynchronous online course presents fundamental concepts from multiple disciplines that are essential to practicing ergonomics. The course begins with core topics from anatomy, kinesiology and the physiology of work as applied to human abilities and limitations. The class continues with an exploration of biomechanics, anthropometry, physical and psychosocial ergonomic risk factors and analytic methods to mitigate risk exposure. Finally, cognitive and macro ergonomics models are introduced along with considerations for the professional ergonomist. Pulling these pieces together ensures a comprehensive approach to Human Factors and Ergonomics to both minimize injury and optimize worker performance. Students will evaluate different environments based on the concepts introduced in this course.

Course Learning Outcomes

- Define ergonomics and the various disciplines that contribute to the field
- Describe the human musculoskeletal system and its limitations related to work
- Identify and quantify the demands of work in terms of primary physical risk factors associated with work-related musculoskeletal disorders (MSDs)
- Summarize other factors that are associated with work related MSDs such as personal and work psychosocial factors
- Illustrate proper application of anthropometric measurements for analysis and design
- Identify and apply common risk assessment tools to evaluate physical exposures
- Compare the physical demands of a task to human capacity and ergonomics guidelines and identify mismatches that indicate risk
- Perform a basic risk analysis of the design of existing controls and displays
- Perform a root cause analysis of observed ergonomic risk factors
- Demonstrate knowledge of ergonomic approaches to the redesign of work by developing controls that reduce hazards and mitigate risk
- Calculate a simple return-on-investment to support a proposed solution
- Describe macro ergonomics and participatory approaches to surveillance, assessment and controls to prevent MSDs and optimize performance in a large workforce
- Plan a path to certification or employment in the field of ergonomics
- Demonstrate a fundamental knowledge of the science of human factors and ergonomics and ethical responsibility in practice

Instructor Information

<p>Instructor Name</p> <p>Meg Honan, MS,PT,CPE</p>	 A portrait of Meg Honan, a woman with short, light-colored hair, wearing glasses and a grey top, smiling against a background of green foliage.
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As principle ergonomist at Genentech, Inc. in South San Francisco, Meg engages leadership and interdisciplinary teams in participatory ergonomics, including continuous improvement in workplace and equipment design, process and production engineering as well as health and safety. Her work experience includes employee work area and work method assessment, training employees to become “Ergo-Advocates” not only in the office setting, but within manufacturing, laboratory and field operations and how mobile devices, unassigned work environments and flexible work have transformed workplace ergonomics. Early research focused on keyboard design. Meg is Physical Therapist and has a Master’s in Environmental Health Sciences/Ergonomics from University of California, Berkeley. She is a Board Certified Professional Ergonomist

<p>Instructor Name</p> <p>Melissa Afterman MS-HFE, CPE</p>	 A portrait of Melissa Afterman, a woman with long, straight blonde hair, wearing a plaid shirt, smiling.
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Melissa Afterman is a consulting ergonomist working in Northern California. Her work focuses on program development, risk assessment and mitigation for biotechnology and pharmaceutical companies supporting office and mobile knowledge workers and also for laboratory and plant tools, tasks and processes. Melissa earned her Bachelor’s degree from Cal Poly SLO in BioResource/Agricultural Engineering and her Master’s degree in Human Factors/Ergonomics Engineering from San Jose State University. She is a board Certified Professional Ergonomist and regularly shares the learnings from her practice at local and national ergonomics conferences.

Course Format & Schedule

This asynchronous online course engages students with weekly activities posted on the course site. Each week students will read and/or watch resource materials, participate in online discussion forums and complete individual and paired assignments. There is no required textbooks, but some reference books are recommended and sections of texts are provided and assigned for reading. The information needed to complete the assignments and prepare for the online midterm and final exams will be included in the resource material on the course site. Grades are determined by participation in assignments and discussions and performance on midterm and final exams.

Week 1 - Introduction to Human Factors, Anatomy & Physical Ergonomics (14 hours)

Topics	Assignment
Course Introduction	
Overview and History of Ergonomics and Human Factors	
Anatomy and Physiological Properties of Biological Tissues	
Introduction to Ergonomic Risk	
Introduction to Anthropometry	<u>Individual Assignment #1</u> : Computer User Analysis Part 1 (Due Monday of Week 2)

Week 2 - Biomechanics, Physiology & Intro to Task Analysis (15 hours)

Topics	Assignment
Basic Biomechanical Principles	
Physiology of Work	
Introduction to Task Analysis	<u>Individual Assignment #2</u> : Laundry Process Analysis Part 1 (Due Monday of Week 3)

Week 3 - Injuries, Epidemiology and Risk Assessment (14 hours)

Topics	Assignment
Occupational Musculoskeletal Disorders & Epidemiology	
Introduction to Common Physical Risk Assessment Tools	<u>Begin Individual Assignment #3</u> : Laundry Process Analysis Part 2. A written summary of each student's findings will be submitted on the Monday of Week 5; this is a 2-week assignment.
Introduction to Industry Guidelines and Resources	

Week 4 - Intro to Job Design & Additional Factors that Affect Risk (15 hours)

Topics	Assignment
Introduction to Job Design	
Environmental Factors	
Shift Work	
Introduction to Workflow Concepts	<u>Finish Assignment #3 (Due Monday of Week 5)</u>
Psychosocial Factors	

Week 5 - Applied Anthropometry in Design (15 hours)

Topics	Assignment
	<u>Midterm Exam</u>
Applying Anthropometry to Design	
Hand Tool Design	<u>Individual Assignment #4: Hand Tool Analysis (Due Monday of Week 6)</u>

Week 6 - Root Cause Analysis & Intro to Cognitive Ergonomics (16 hours)

Topics	Assignment
Root Cause Analysis and Solution Development	<u>Begin Assignment #5, Paired: Computer User Analysis Part 2. A final report will be submitted on Monday of Week 8; this is a 2-week assignment.</u>
Cost Benefit Analysis	<u>Review</u> Washington State Ergonomics Cost Calculator
Introduction to Cognitive Ergonomics	
Controls and Displays	

Week 7 - Intro to Macro Ergonomics & Professional Considerations (16 hours)

Topics	Assignment
Intro to Macro Ergonomics	<u>Finish Assignment #5 (Due Monday of Week 8)</u>
Ergonomics Program Components	
Inro to Participatory Ergonomics	

Careers, Certifications, Ethics**Week 8 (15 hours)**

Topic	Assignment
<i>No New Material</i>	<u>Final Exam</u>

Course Grading

Grades are based on the following:

20% Discussion Participation

5% Assignment #1 - Computer user and workstation analysis, part 1

5% Assignment #2 - Laundry process analysis, part 1

15% Assignment #3 – Laundry process analysis, part 2

5% Assignment #4 - Hand tool Analysis

15% Assignment #5 – Computer user and workstation analysis, part 2

15% Midterm

20% Final Exam

Required Course Materials

Tape measure

Camera (photo and video)

Microphone/headset for your computer

Recommended (Not Required) Books:

- Ergonomics for Beginners- A Quick Reference for Beginners, 3rd Edition. Jan Dul and Bernard Weerdmeester. 2008
- Handbook of Human Factors and Ergonomics Methods. Neville Stanton, Alan Hedge, Karel Brookhuis, Eduardo Salas, Hal Hendrick. 2005
- Human Factors in Engineering and Design, 7th Edition. Sanders and McCormick. 1993
- Easy Ergonomics: A Guide to Selecting Non-Powered Hand Tools. Cal/OSHA, NIOSH, CDC. 2004
- Ergonomics- How to Design for Ease and Efficiency, 2nd Edition. Kroemer. 2000
- Fitting the Human. Kroemer, 6th Edition. 2008

Videos and other resources are found on weekly course pages. A weekly course guide including video transcripts and course readings will also be available on the course site for you to download. You will be provided with links to PDF files of articles and other reference materials.

Completion of Course Modules

Students are expected to complete all modules, including viewing all videos and lectures; completing all required readings and individual activities; and fully participating in class discussions and group activities.

Participation in Course Activities and Discussions

Students are expected to engage with the asynchronous course **material** on a weekly basis and complete the activities, quizzes and assignments as outlined in the course schedule. Completion of activities is mandatory; participation will contribute to the final course grade.

Students' contributions to some **assignments** are collected in a cloud-shared worksheet of data that other students in this course will access for subsequent activities.

Midterm serves as a knowledge check of the first four weeks of material. It will be completed online and performance contributes to the final course grade. Midterm will include multiple-choice, true/false and short answer questions.

Discussion forums: Students are expected to participate in weekly online discussion forums; they serve as knowledge checks in lieu of quizzes and live classroom conversation. Participation contributes to the final course grade. Initial responses to Discussion topics are due by 12:00pm PST on Saturday each week and the peer responses are due by the following Monday at 5:00pm PST.

Assignments

Students will complete the following individual and paired assignments as listed in the course schedule. Assignment details and shared data collection and report submission procedures are found on the course site and will be reviewed in class discussions.

1. **Individual Assignment:** Computer User Analysis Part 1- Anthropometric measurements pertaining to a computer workstation. Students contribute personal measurements to a cloud-shared class worksheet and compare to standard anthropometry data chart to determine where they fit within population distribution. Course facilitators will review the individual contributions in the shared worksheet.
2. **Individual Assignment:** Laundry Task Analysis Part 1- Material handling data and findings pertaining to their personal laundry room and process. Students contribute work area measurements, lift reaches, distances and weights and workflow findings to a cloud-shared class worksheet. Course facilitators will review the individual contributions in the shared worksheet.
3. **Individual Assignment:** Laundry Task Analysis Part 2- Comparison of data to industry guidelines. Students will analyze laundry process data gathered in part 1 with measurement tools to

identify potential risk exposure. Students will complete a written summary of their findings for review by the course facilitators. This is a 2-week assignment.

4. **Individual Assignment:** Hand Tool Analysis. Students will analyze a tool from their kitchen to identify potential physical exposure. They will enter pertinent data and findings into a shared worksheet, which will be reviewed by the course facilitators.
5. **Paired Assignment:** Computer User Analysis Part 2- Analysis of anthropometric data and solution development. Students will work in pairs, analyzing each other's anthropometric measurements and photos from part 1. A written report will include findings, root cause analysis and solutions to reduce risk. Students will peer review each other's report to provide feedback before submitting for review by the course facilitators. This is a 2-week assignment.

Assignment Requirements:

- Cloud-shared worksheet (Google Drive) contributions will be reviewed for completion and timeliness
- For written assignments:
 - Computer generated and electronically submitted via Canvas
 - Standard written English

Points will be deducted for errors in these areas. Any assignment not received when due will be given an automatic 10% deduction for each day it is late. It is the student's responsibility to seek clarification regarding the requirements for any assignment if the student has questions or is unclear about those requirements. With paired assignments, both students will receive the same grade.

Exams

Details about the length of the exams and the materials you will be allowed to use during the exams will be posted on the course site.

Course Communication

As we move through the course materials, we want to hear how the course is going for you, your questions as well as how your personal and professional experiences add to our conversation. You can learn a lot from discussing the material in this course with each other and we encourage you to take advantage of the interactive components of the course to learn from each other.

Announcements

Announcements will be posted on the homepage of the course site. Please check regularly for updates.

Course mail

Course announcements will also be sent out through Canvas' notification system. The default is to receive announcements via the Course Mail system, so make sure to check your Course Mailbox for message or wherever you receive notifications.

Office hours

Weekly office hours are held with your instructors on Thursdays from 12:00-1:00 pm (PST). Login details for the online video conference call will be provided. If you are unable to be present, you are welcome to email your instructors through Canvas with private questions or group discussions boards.

Policies

Due Dates

Assignments must be completed and submitted by 5:00 pm PST on the Monday of the week after they were assigned, unless otherwise indicated on the syllabus. Initial responses to Discussion topics are due by 12:00pm PST on Saturday each week and the peer responses are due by the following Monday at 5:00pm PST.

Late Assignments

Please communicate with instructors using Canvas Course Mail if you will not be able to meet course deadlines ahead of the deadlines. All individual, pair/ group activities must be completed before receiving course credit.

Student Support Contact Information

Technical Problems with Canvas

If you encounter any technical problems with Canvas such as problems opening the course site, accessing quizzes, discussions or submitting assignments or problems with mobile apps contact the Canvas 24/7 support from "Help" inside the course sites or directly using phone, chat or email:

- Canvas Support Hotline: 855-308-2758 (24/7)
- Chat: https://secure.livechatinc.com/licence/2695732/open_chat.cgi?groups=38
- Email: support@instructure.com

Broken Links, Missing Course Files

If you find any broken links or missing course files on the course site, please alert your course facilitators and identify the location of the problem on the course site.

Netiquette

In an online environment it is not possible to read your body language, tone of voice, or facial expressions. Therefore, a special set of rules has emerged for online communications (e.g., course discussions) called Netiquette. Here are some basic Netiquette guidelines that should be followed in this course.

- Adhere to the same standards of behavior online that you follow in real life. Never mail or post anything you wouldn't say to your reader's face.
- Before posting to a discussion board, you should read prior messages to get a sense of the flow and language of the discussion. Keep your questions and comments relevant to the topic of the discussion.
- Don't be afraid to ask questions within the course discussion group, or to share what you know.
- If you post a different viewpoint, first acknowledge what someone else has said. If you disagree with someone, it is better to start a message by briefly restating what the other person has said in your own words. This lets the other person know that you are trying to understand him/her.
- Support the points you make with examples or evidence from lecture, readings and/or from your own professional experience.
- Email messages should be considered private and not shared with others or quoted without permission. However, whatever you post to a newsgroup or discussion board is public. You never know who might read what you posted.
- Consider that a post may be the first – and lasting - impression you make on someone: Make sure your postings contain correct information. Check your spelling.
- Do not use ALL CAPS. It gives the impression that you are shouting.
- Do not send "Me Too!" or "Thank You" etc. messages to the entire group. Send those directly to the original poster.
- Cite all quotes, references and sources and respect copyright and license agreements.

Accreditation

Certified Professional Ergonomists

Certified Professional Ergonomists may be eligible to earn up to 120 contact hours for this course. Visit http://www.bcpe.org/wp-content/uploads/BCPE_CoC_FAQs_April2016.pdf for more information.

Registered Nurses

Provider approved by the California Board of Registered Nursing, Provider Number 12983, for 120 contact hours.

Registered Environmental Health Specialists

This course has been approved for 120 contact hours, REHS. The Center for Occupational and Environmental Health (COEH) UC Berkeley is a Registered Environmental Health Specialist (REHS) Program Continuing Education Accreditation Agency approved by the California Department of Public Health.

Occupational Therapists

Occupational Therapists may be eligible to earn up to 120 contact hours for this course. Visit http://www.bot.ca.board_activity/laws_regs/cc_regulations.shtml for more information.

Industrial Hygienists

ABIH® Diplomates may be eligible to earn up to 120 contact hours for this course. Visit <http://www.abih.org/maintain-certification/cm-credit-education-events> for more information.

Safety Professionals

Certified Safety Professionals may be eligible to earn up to 120 contact hours for this event. Visit <http://www.bcsp.org/Certifications/Recertification> for more information.