Applied Industrial Ergonomics (Fall 2024)

IE 665 Monday 6:00pm-8:50pm @ FMH 106

Instructor:
Dr. Wei Yin, Email: wei.yin@njit.edu
Office: The cubic faced to FENS 216 (temporarily), FENS 255 after September
Office Hours: Monday 2 – 4 pm. Or by appointment.

Catalog Description:

Prerequisites: IE 355 (see undergraduate catalog for description) or IE 699. Introduces the fundamentals and applications of industrial ergonomics for improving equipment, tool, workplace, and job design. Engineers, as well as safety and health professionals, will benefit from the course by understanding the design principles for human operators and current issues in industrial ergonomics, and a variety of evaluating methodologies for the design.

Textbook:

***Required Textbook*:** Work Design: Occupational Ergonomics by Stephan A. Konz and Steven Johnson, latest edition ISBN 13: 978-1-890871 ISBN 10: 1-890871-79-6.

Lecture notes and other relevant material handed out are required reading for the course.

***Recommended Textbook*:** Mark R. Lehto, Stevan J. Landry (2012). Introduction to Human Factors and Ergonomics for Engineers. 2nd Ed. ISBN-13: 978-0881339499

Learning Objectives: Students learn the biological, physiological and psychological factors that affect human work capacity the ergonomic concepts for the prevention, control, or elimination of work-related injury the best practices in ergonomics and how to apply ergonomic tools to the design of products and processes to understand the breadth and scope of occupational ergonomics.

Applicable ABET Outcome for this course: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (ABET Outcome 2).

1. An ability to describe key factors to consider in creating an effective design.
2. An ability to assess different designs for addressing a particular problem/need.
3. An ability to develop a design that meets specified needs while considering public health, safety, welfare, and global, cultural, social, environmental, and economic factors.

Course Outline:

Week	Date	Topic	Textbook Chapter
1	Sep 09	Introduction to the course Introduction of occupational ergonomics – history, scope, and future direction	Handout
2	Sep 16	Skeletal Muscles – function and structure, innervation and motor unit, muscle cells, action potential, and mechanism of muscle contraction.	Handout Chapter 2:1.6
3	Sep 23	More on Muscle physiology – force regulation, length-tension relationship, energy consideration of muscle	Handout

		contraction, static and dynamic contraction, and muscle fatigue. Electromyography (EMG) Take home quiz	
4	Sep 30	Anatomy and Biomechanics – Spine, upper extremity, lower extremity, biomechanical model of lower back.	Handout Chapter 2:1,2
5	Oct 07	Circulatory and respiratory system Metabolic rate and intensity of physical work	Handout Chapter 2: 3-7
6	Oct 14	Laboratory – Muscle contraction and EMG	Handout
7	Oct 21	Temporal Ergonomics – muscle fatigue, whole body fatigue, and mental fatigue. Take home quiz Review for midterm exam	Chapter 19-1
8	Oct 28	Midterm Exam	
9	Nov 04	Engineering anthropometry and statistical calculations Workstation design – standing and seated work, computer workstation Take home quiz	Chapter 2:8-10 Chapter11:1-14
10	Nov 11	Workstation Design continued Examples	
11	Nov 18	Work-Related Musculoskeletal Disorders (MSD) Posture targeting and recording tools Take home quiz	Chapter 12
12	Nov 25	Manual Material Handling– pulling/pushing, carrying and lifting Ergonomic tools: NIOSH Lifting Equation, 3DSSPP Homework	Chapter 13
13	Dec 02	Special topic: Industrial Exoskeleton	
14	Dec 09	Review for final exam; Term Project Presentation	
	Dec 16	Final Exam	

Grade Distribution:
Quizzes and homework (8%), Lab (4%), attendance and class participation (3%)
Term project (25%).
Midterm and Final Exam (30% each)

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is the instructor's professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. Students who have questions about the code of Academic Integrity should contact the Dean of Students Office at dos@njit.edu.

Generative AI: This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area, for example, literature search and synthesis. As such, AI usage is not permitted throughout this course under any circumstance.