

IE-341

Section 1, CRN: 31895/896/897

Section 2, CRN: 56070/071/072

Second Semester 1436-37 H (Spring-2016) – 3(2,1,2)

“HUMAN FACTORS ENGINEERING”

Course Description

Course-in-brief

Introduction to Human Factors; Human-Machine Systems; Information Theory; Human capabilities; Display and Control Design; Hand Tools and Devices; Workplace Design; Environmental and Thermal factors; Physical Work and Manual Materials Handling and Speech Communications.

Level: 7

Estimated Category Content:

Engineering science: 1.5 credit hours

Engineering design: 1.5 credit hours

Prerequisite:

None

Co-requisite:

IE 333 – Design and Analysis of Experiments

Time and Place

Section 1	Section 2
Lecture (31895): Sun, Thu: 09:00 – 09:50 AM (1-A-60) Dr. Park	Lecture (56070): Mon: 09:00 – 09:50 AM (1-A-46/3) Wed: 09:00 – 09:50 AM (1-A-54) Dr. El-Sherbeeney
Exercises (31896): Tue: 09:00 – 09:50 AM (1-A-60) Dr. Park	Exercises (56071): Mon: 01:00 – 01:50 PM 1-A-54/1 Dr. El-Sherbeeney
Lab (31897): Tue: 01:00 – 02:50 PM G-A-65 (Ergonomics Lab) Dr. Park	Lab (56072): Wed: 01:00 – 02:50 PM G-A-65 (Ergonomics Lab) Engr. Ahmed Tawheed

Course Resources

Resources for the course include the instructor; references; class notes and handouts; your teammates; the library; and the World Wide Web.

Instructor

Ahmed M. El-Sherbeeney, PhD

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Teaching Assistant

Ahmed Tawheed, BSME; email: Ahmed.Tawheed2020@yahoo.com

Office: Ergonomics Lab (G-A-65)

Office Hours

I adopt an open-office policy. You are encouraged to come to my office and ask questions, consult, provide feedback, or give suggestions at anytime during the day. Best times to find me in the office this semester are: **Sun: 11:00 AM – 12:00 Noon; Mon, Wed: 8:00 – 9:00 AM; or by appointment.**

Textbook: *Human Factors in Engineering and Design*. Mark S. Sanders, Ernest J. McCormick. Seventh Edition. McGraw: New York, 1993. ISBN: 0-07-112826-3.

Reference: *Bodyspace: Anthropometry, Ergonomics and the Design of Work*. Stephen Pheasant, Christine M. Haslegrave. Third Edition. Taylor and Francis: Boca Raton, 2006. ISBN: 0-415-28520-8.

Websites (sample)

Human factors and ergonomics: http://en.wikipedia.org/wiki/Human_factors

Human Factors

Society: http://reliability.sandia.gov/Human_Factor_Engineering/human_factor_engineering.html

Computer Usage

Standard packages may be required for analyzing results, comparing between post and pre-intervention results, and using computerized assessment tools to measure ergonomic risk factors (such as QEC and RULA).

Project Work

The project entails the following activities: performing an ergonomic evaluation of a certain industrial case, measuring the current case situation and proposing the required ergonomic intervention (and if possible) measuring or predicting the effects of intervention, performing a full analysis of the existing methods, and developing a proposed method. Alternatively, you may be asked to perform a literature review related to advances on one of the human factors engineering topics discussed in this course.

Course Objectives

The course introduces students to the field of human factors engineering so that they can make full recognition of the abilities and limitations of human beings (operator or user) in order to enhance certain desirable values such as safety, job satisfaction, efficiency, and wellbeing. The course helps the student in understanding how to optimize the relationship between people and technology.

Intended Learning Outcomes

At the end of this course, students are expected to:

1. Understand the types of interactions (and the interfaces needed) between humans and any physical entity [c].

2. Learn the process of information processing and how it affects the behavior and capabilities of humans [a].
3. Have the ability to recognize human capabilities and limitations [c, f].
4. Have the ability to make ergonomic assessments and propose improvements for controls, hand tools, devices, and the workplace [a, b, c].
5. Learn the importance of anthropometric considerations in the design of machines, tools, devices, products, and workplaces [a, b, c].
6. Learn how humans are affected by environmental and thermal factors, lighting, and vibrations [f].

Course Policies

Homework Policy

Problems will be assigned and collected often. We will try our best to grade and promptly return the results to you in order to stay up-to-date with your progress in the course. Your solution must be organized and neat, otherwise it will be returned to you ungraded. The solution must include a problem statement, all pertinent solution steps, equations used and assumptions made, and **boxed** answers with proper units. Use only one side of a sheet and start the solution of a new problem on a new page.

Attendance

Attendance is a must! Attendance will be taken at the beginning of each class period. In case you are not present when attendance is taken, you will be counted as absent; no exceptions. Students who absent themselves during a semester for more than 25% of the required number of lectures will not be allowed to continue the course, denied from sitting for the final examination, and assigned a course grade of DN which is reported in their transcript.

Class Discussion

Communication is very important in achieving collective goals and objectives. Feel free to voice your opinions and ask questions anytime during a class period. Practice your right and freedom to learn.

Help Sessions

Help sessions will be organized at convenient times as needed upon request from students.

Make-up Tests and Late homework Policy

No makeup test will be given and late homework will not be accepted unless the reason is beyond the student's control. A valid, official excuse must be presented.

Expected Behavior

Practicing engineers are expected to conduct themselves in an ethical and professional manner. This includes attending all class activities; meeting deadlines; observing common courtesies to fellow students, teachers, and staff; being honest; making a diligent effort to learn; and not engaging in any disruptive, irresponsible manner. Legitimate collaboration is encouraged but academic dishonesty will not be tolerated.

Assessment and Evaluation

Many aspects of the course will receive on-going, real-time assessments and feedback to help improve students' performance. This will be done by discussing performance in class and by arranging individual meetings.

Assessment in the following areas will be converted to points, to compute your final grade in the course:

Assessment Item	Comment	Marks*
Participation	Coming on time; Answering questions in class, etc.	5%
Homework	Assigned about every 3-4 weeks	5%
Project	One semester project	10%
Lab activities	Lab report for each session (6 labs); lab exam	10%
Quizzes	Assigned once every 2-3 weeks	10%
Midterms	Two midterms	20%
Final Exam	Exams period	40%

* Tentative

Course Curriculum:

Course topics*:

1. Introduction to human-machine systems (2 classes)
2. Information input and processing (3 classes)
3. Human capabilities: vision, hearing, and speech communications (5 classes)
4. Human-machine interfaces, display design (4 classes)
5. Control design, feedback and control (4 classes)
6. Hand tools and devices (4 classes)
7. Physical work and manual materials handling (4 classes)
8. Workplace design (5 classes)
9. Work-related musculoskeletal disorders (3 classes)
10. Environmental and thermal factors, lighting, air pollutants, noise, vibration (3 classes)
11. Ergonomic work assessment techniques (2 classes)
12. Design applications (3 classes)

Laboratory topics*:

1. Determination of reaction time under noise (1 session)
2. Determination of reaction time with multiple alternatives (1 session)
3. Anthropometric measurements and applications (2 sessions)
4. EMG (Electromyogram) measurement (1 session)
5. ECG (Electrocardiogram) measurement (1 session)
6. Skin resistance (1 session)

* Tentative

Course Outline*

Week	Date: G (H)	Topic*	Activity*
1 (1A)	Jan 17 – 21, '16 ربيع الآخر، (11-7) (1437)	Student Registration Syllabus, course content	
2 (2A)	Jan 24 – 28, '16 ربيع الآخر، (18-14) (1437)	1. Introduction to human-machine systems	Lab 1
3 (3A)	Jan 31 – Feb 04, '16 ربيع الآخر، (25-21) (1437)	2. Information input and processing	Quiz 1 Lab 2
4 (4A)	Feb 07 – 11, '16 ربيع الآخر – (28) جمادى الأولى، (1437)	Cont. Information input and processing	HW 1 Lab 3
5 (5A)	Feb 14 – 18, '16 جمادى الأولى، (9-5) (1437)	3. Human capabilities: vision, hearing, and speech communications*	Lab 4
6 (6A)	Feb 21 – 25, '16 جمادى (16-12) الأولى، (1437)	Cont. Human capabilities: vision, hearing, and speech communications*	Quiz 2 Lab 5
7 (7A)	Feb 28 – Mar 03, '16 جمادى (23-19) الأولى، (1437)	4. Human-machine interfaces, display design Review	Lab 6
8 (8A)	Mar 06 – 10, '16 جمادى الأولى (26) جمادى الآخرة 1 – (1437)	FIRST MIDTERM: Sun. Mar 06, 2016 5. Control design, feedback and control*	
9	Mar 13 – 17, '16 جمادى الآخرة (8-4) (1437)	SPRING BREAK (أجازة الربيع)	
10 (9A)	Mar 20 – 24, '16 جمادى (15-11) الآخرة، (1437)	6. Hand tools and devices*	HW 2 Lab 7

11 (10A)	Mar 27 – 31, '16 جمادى 22-18) الآخرة ، 1437	7. Physical work and manual materials handling	Quiz 3
12 (11A)	Apr 03 – 07, '16 جمادى 29-25) الآخرة ، 1437	8. Workplace Design*	Projects
13 (12A)	Apr 10 – 14, '16 1437، رجب، 7-3)	9. Work-related musculoskeletal disorders*	HW 3
14 (13A)	Apr 17 – 21, '16 ، رجب، 14-10) 1437	10. Environmental and thermal factors, lighting, air pollutants, noise, vibration*	
SECOND MIDTERM: Sun. Apr 17, 2016			
15 (14A)	Apr 24 – 28, '16 ، رجب، 21-17) 1437	11. Ergonomic work assessment techniques*	
PROJECT PRESENTATIONS :			
Thurs, Apr 28, 2016			
16 (15A)	May 01 – 05, '16 ، رجب، 28-24) 1437	12. Design applications*	Quiz 4

* Tentative