

**IE-341**

**Section 1, CRN: 30512/513/514**

**Section 2, CRN: 30515/516/517**

**Section 3, CRN: 46950/951/952**

**First Semester 1435-36 H (Fall-2014) – 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**

<b>Section 1</b>	<b>Section 2</b>
Lecture (30512): 01:00 – 02:50 PM; W: A1-46/3; Dr. El-Sherbeeny	Lecture (30515): 10:00 – 10:50 AM; Tu, Th: A1-46/3; Dr. El-Sherbeeny
Exercises (30513): 09:00 – 09:50 AM; W: A1-46/3; Dr. El-Sherbeeny	Exercises (30516): 10:00 – 10:50 AM; S: A1-46/3; Dr. El-Sherbeeny
Lab. (30514): 01:00 – 02:50 PM; M: Ergonomics Lab (AG-65); Engr. Tawheed	Lab (30517): 01:00 – 02:50 PM; Th: Ergonomics Lab (AG-65); Engr. Tawheed
<b>Section 3</b>	
Lecture (46950): 03:00 – 03:50 PM; M : A1-52 / 10:00 – 10:50 AM; W: A1-54/1; Dr. El-Sherbeeny	
Exercises (46951): 11:00 – 11:50 AM; W: A1-54/1; Dr. El-Sherbeeny	
Lab. (46952): 10:00 – 11:50 AM; M: Ergonomics Lab (AG-65); Engr. 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](mailto:Ahmed.Tawheed2020@yahoo.com)

Office: Ergonomics Lab (AG-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: **S, Tu, Th: 11 AM – 12 Noon; M: 01 – 03 PM.**

**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)

[http://en.wikipedia.org/wiki/Human\\_factors](http://en.wikipedia.org/wiki/Human_factors)

[http://reliability.sandia.gov/Human\\_Factor\\_Engineering/human\\_factor\\_engineering.html](http://reliability.sandia.gov/Human_Factor_Engineering/human_factor_engineering.html)

### Computer Usage

Standard packages are 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 the 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 type 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. I will try my 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 may 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 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	Taken <i>beginning</i> of every class	5%
Homework	Assigned about every 1-2 weeks	5%
Project	One semester project	10%
Lab reports	Lab report is required for each session (6 labs)	10%
Quizzes	Assigned once every 1-2 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. Workplace design (5 classes)
3. Information input and processing (3 classes)
4. Human capabilities: hearing, vision, and psychomotor skills (5 classes)
5. Human-machine interfaces, display design (4 classes)
6. Control design, feedback and control (4 classes)
7. Hand tools and devices (4 classes)
8. Environmental and thermal factors, lighting, air pollutants, noise, vibration (3 classes)
9. Physical work and manual materials handling (4 classes)
10. Work-related musculoskeletal disorders (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)

### Course Outline\*

Week	Date: G (H)	Topic*	Activity*
1	Aug 31 – Sep 04, '14 (9-5 ذو القعدة, 1435)	<b>Student Registration</b> Syllabus, course content 1. Introduction to human-machine systems	
2	Sep 07 – 11, '14 (16-12 ذو القعدة, 1435)	Cont. Introduction to human-machine systems 2. Workplace design	HW 1 Quiz 1 Lab 1
3	Sep 14 – 18, '14 (23-19 ذو القعدة, 1435)	Cont. Workplace design 3. Information input and processing	Lab 2
4	Sep 21 – 25, '14 (26 ذو القعدة – 1 ذو الحجة, 1435)	Cont. Information input and processing 4. Human capabilities: hearing, vision, and psychomotor skills*	HW 2 Quiz 2 Lab 3
<b>National Day (اليوم الوطني) BREAK</b>			
5	Sep 28 – Oct 02, '14 (8-4 ذو الحجة, 1435)	<b>MID-SEMESTER (عيد الأضحى) BREAK</b>	
6	Oct 05 – 09, '14 (15-11 ذو الحجة, 1435)	<b>MID-SEMESTER (عيد الأضحى) BREAK</b>	
7	Oct 12 – 16, '14 (22-18 ذو الحجة, 1435)	5. Human-machine interfaces, display design	
8	Oct 19 – 23, '14 (29-25 ذو الحجة, 1435)	<b>FIRST MIDTERM: Sun. Oct 19, 2014</b>	
		6. Control design, feedback and control Review	
9	Oct 26 – 30, '14 (6-2 محرم, 1436)	7. Hand tools and devices	Lab 4

10	Nov 02 – 06, '14 (09-13 محرم, 1436)	<b>Cont. Hand tools and devices</b>	Quiz 3 Lab 5
11	Nov 09 – 13, '14 (16-20 محرم, 1436)	<b>8. Environmental and thermal factors, lighting, air pollutants, noise, vibration</b>	Lab 6
12	Nov 16 – 20, '14 (23-27 محرم, 1436)	<b>9. Physical work and manual materials handling</b>	Lab 7 Projects
13	Nov 23 – 27, '14 (01-05 صفر, 1436)	<b>10. Work-related musculoskeletal disorders</b>	HW 3
14	Nov 30 – Dec 04, '14 (08-12 صفر, 1436)	<b>11. Ergonomic work assessment techniques*</b>	<b>SECOND MIDTERM: Sun. Nov 30, 2014</b>
15	Dec 07 – 11, '14 (15-19 صفر, 1436)		<b>PROJECT PRESENTATIONS : Thurs, Dec. 11, 2014</b>
16	Dec 14 – 18, '14 (22-26 صفر, 1436)	<b>12. Design applications*</b>	
17	Dec 21 – 25, '14 (29 صفر – 3 ربيع الأول, 1436)	<b>Cont. Design applications*</b>	

\* Tentative