Course title and code	***IE 341 Human Factors Engineering 3(2,1,2)***
Catalog Data	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.
Prerequisite	None
Co-requisites	IE-333 – Design and Analysis of Experiments
Level	7
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.
Learning Objectives	The course introduces the students to the field of human factors 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 acquire knowledge regarding the following: 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, h**]. 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**].

Topics to be covered:

	Topic	Week	Contact, hr
1.	Introduction, Human-Machine systems.	**0.5**	**2.5**
2.	Information Input and Processing.	**1**	**5**
3.	Human Capabilities: Hearing, Vision, and Psychomotor Skills.	**1.5**	**7.5**
4.	Human-Machine Interfaces, Display Design.	**1.5**	**7.5**
5.	Control Design, Feedback and Control.	**1.5**	**7.5**

	6.	Hand Tools and Devices.	**1.5**	**7.5**
	7.	Workplace Design.	**1.5**	**7.5**
	8.	Environmental and Thermal Factors, Lighting, Air Pollutants, Noise, Vibration.	**1**	**5**
	9.	Physical Work and Manual Materials Handling.	**1.5**	**7.5**
	10.	Work-Related Musculoskeletal Disorders.	**1**	**5**
	11.	Ergonomic work assessment techniques	**0.5**	**2.5**
	12.	Design Applications.	**1**	**5**

Total contact hours per semester	Lecture: **28**	Tutorial: **14**	Laboratory: **28**	Practical/Field work/Internship:	Other:

Additional private study/learning hours expected for students per week.

1-2 hour per week expected for project and report

3-5 hours per week self-learning of course material and problem-solving.

Domains of Learning

(A) Knowledge

a) Knowledge to be acquired:

1- Full recognition of the abilities and limitations of the human (operator or user) in order to enhance certain desirable values such as safety, job satisfaction, efficiency, wellbeing.
2- Understanding how to optimize the relationship between people and technology.

b) Teaching strategies to be used to develop that knowledge:

1- Knowledge is delivered through the course lectures
2- Interactive learning process through discussions in lecture and class.
3- Tutorials to help students understand the course material and solve problems
4- Periodic follow-up for students in their project work.

c) Methods of assessment of knowledge acquired:

1- Exams and homework are used to assess the acquired knowledge on the subject.
2- Short quizzes at the end of each topic are used to evaluate the student understanding.
3- Follow-up the students' understanding of project requirements.

(B) Cognitive Skills

a) Cognitive skills to be developed:

1- The ability to calculate information transferred among different senses.
2- The ability to evaluate and determine human capabilities.
3- The ability to design display and control units.
4- The ability to evaluate environmental and thermal factors.
5- The ability to evaluate physical work and manual materials handling.
6- The ability to evaluate speech communications.

b) Teaching strategies to be used to develop these cognitive skills

1- Lectures include numerous examples, some of which are practical in nature, to illustrate steps involved in evaluating human capabilities, workplace design.
2- Tutorials are used for further explanations and applications on different problems.
3- Engaging students in classroom interactions with questions and answers.

c) Methods of assessment of students' cognitive skills:

1- Exams, quizzes and homework include problems which require critical thinking and solving skills for engineering problem analysis.
2- Evaluate student performance through class participation and work carried out in the project.

(C) Interpersonal Skills and Responsibility

a) Interpersonal skills and capacity to carry responsibility to be developed

1- Students should submit accurate and professional results and reports.
2- Student should take the responsibility to solve given assignments on their own and submit the solution on time.
3- Students should engage in teamwork with full interaction with other students in the group during the work in the project.
4- Students should learn to manage their time between self-study, solving assignments and submitting project reports during the course materials.

b) Teaching strategies to be used to develop these skills and abilities

1- Special attention and mark rewards are appointed to submitting accurate results and professional reports.
2- Assignment is given to the students at regular intervals for them to solve and submit.
3- Participation of students in classroom discussion and presentations.
4- Forming groups of 2-4 students to participate in project work, to encourage working in a teamwork environment.

c) Methods of assessment of students' interpersonal skills and capacity to carry responsibility:

1- Class attendance of students at lectures is recorded.
2- Recording of submission of assignment and grades.
3- Participation of students in lecture discussions and in project teamwork is evaluated at the end of the semester.
4- Participation of students in tutorial discussions and problem-solving is evaluated at the end of the semester.

(D) Communication, Information Technology and Numerical Skills

a) The skills to be developed in this domain:

1- Ability of the students to apply basic knowledge of mathematics in solving problems.
2- Use of computer software in weight lifted in manual tasks.
3- Ability of submitting and presenting calculations and reports in a professional way.

b) Teaching strategies to be used to develop these skills

1- Encouraging students to submit their assignments and project reports in a neat and professional way.
2- Assisting the students in tutorials in any difficulties they face in interpreting, analyzing and solving problems.

c) Methods of assessment of students numerical and communication skills:

1- Assessments of students assignment and project work include expectation of adequate use of analytical and communication skills.
2- Special portion of marks are dedicated for achieving professional standards in assignments and project reports.

Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (e.g. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm 1 Exam	Within the sixth week	10%
2	Midterm 2 Exam	Within the twelfth week	10%
3	Project Report and Presentation	Within the fifteenth week	10%
4	Lab Activities (Report and Attendance)	Every week (weeks 3-12)	10%
5	Final Exam	As scheduled by the registrar	40%
6	Assignments	Every 3-4 weeks	5%
7	Quizzes	Every other week	10%
8	Lectures Attendance	Each lecture	5%

Laboratory and Practical/Field work/Internship

1. Reaction time measurements
2. Grip strength test
3. Anthropometric measurements and applications
4. Physiological functions measurements
5. Thermal factors measurements
6. Noise measurement

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.
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*).
Estimated Category Content	Engineering science: 1.5 credit hours (50%) Engineering design: 1.5 credit hour (50%)
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Preparation Date	Revised: June 5, 2012