

COURSE CONTENT

Course Code	M4857 / DR2011
Course Title	Human Factors for Design
Pre-requisites	nil
No of AUs	3
Contact Hours	Lecture : 19 hours Studio work : 20 hours Total : 39 hours

Course Aims

This course aims to introduce human factors (HF) theory and practice to you, the design students, so that you can apply knowledge of human factors to improve the function and usability of products, environments, and services.

Intended Learning Outcomes (ILO)

Upon the successful completion of this course, you should be able to:

1. design products (or systems) with good attributes in physical and cognitive ergonomics.
2. solve practical problems related to health and safety issues encountered in industrial and service environments.

Course Content

Key topics covered in this course include:

1. Introduction to Human Factors for Design (1 hour)
 - a) Basic Terms and Fundamental Design Concepts
 - b) User-Centred Design Process
 - c) Human Factors in Systems
2. Physical Ergonomics (9 hours – about 1 lecture hour per topic)
 - a) Anatomical & Physiological Considerations
 - b) Biomechanical Considerations
 - c) Anthropometry & Population Diversity
 - d) Working & Lifting Postures
 - e) Design of Hand Tools
 - f) Musculoskeletal Disorders
 - g) Workplace & Workstation Design

- h) Environmental Considerations
 - i) Users with Specific Needs
3. Cognitive Ergonomics (9 hours – about 1 lecture hour per topic)
- a) Model of Human Information Processor
 - b) Memory & Mental Models
 - c) Decision Making, Attention & Workload
 - d) Human Perception & Information Graphics
 - e) Visual Display for Dynamic Information
 - f) Auditory, Tactual and Olfactory Display
 - g) Speech Communications
 - h) Display Compatibility & Population Stereotype
 - i) Design of Controls

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual
Project 1 – Physical Ergonomics	1, 2	EAB SLO: b, c, d, h, i, j, k, l	50%	Team
Project 2- Cognitive Ergonomics	1, 2	EAB SLO: b, c, d, h, i, j, k, l	50%	Team
Total			100%	

* EAB SLO stands for the Engineering Accreditation Board Student Learning Outcomes. The list is below:

- a) **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems
- b) **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

- d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
- e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- f) **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
- h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Reading and References

- 1) Kroemer K.H.E. Fitting the Human: Introduction to Ergonomics (6th ed), CRC Press, 2008.
- 2) Sanders M.S., McCormick E.J., Human Factors in Engineering and Design, McGraw Hill, 1993.
- 3) Tilley A. R., Henry Dreyfuss Associates, The Measure of Man and Woman: Human Factors. in Design, John Wiley & Sons, 2002.
- 4) Wickens C.D., Hollands J.G., Banbury S., Parasuraman R., Engineering Psychology & Human Performance, Routledge, 2013.
- 5) van Gorp T., Adams E., Design for Emotion, Morgan Kaufmann, 2012.

Course Policies and Student Responsibilities

As a student of the course, you are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct. The university also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of your mental health and wellbeing. These policies and codes concerning students can be found in the following link:

<http://www.ntu.edu.sg/SAO/Pages/Policies-concerning-students.aspx>

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	- Introduction to user-centred design - Basics of physical ergonomics	1 & 2	Nil
2	- Anthropometry - Working & lifting posture - Musculoskeletal disorders	1 & 2	Nil
3	- Design of chair & hand tools	1 & 2	Project 1
4	- Design of workstation & workplaces	1 & 2	Project 1
5	- Environmental considerations	1 & 2	Project 1
6	- User with specific needs	1 & 2	Project 1
7	- Basics of cognitive ergonomics	1 & 2	Project 1
8	- Human factors in system - Human information processing - Human perception	1 & 2	Nil
9	- Visual, auditory, tactual & olfactory display	1 & 2	Project 2
10	- Engineering human cognition	1 & 2	Project 2
11	- Display compatibility & population stereotype	1 & 2	Project 2
12	- Design for automation	1 & 2	Project 2
13	- Service & experience Design	1 & 2	Project 2