The Field of Human Factors in Engineering (HFE) is diverse, multidisciplinary, and constantly evolving. Below you will find a selection of definitions of the HFE that come from different sources (the complete compilation can be found at http://www.hfes.org/Web/EducationalResources/HFEdefinitionsmain.html). Your team must find at least five of the most common concepts that appear in these definitions, and draw a mind-map that shows the interconnections of these concepts. One member of your team will present the mind-map using the camera projector.

TIME :

- determination of key concepts and generation of mind-map: 30 minutes.

- presentation: 3 minutes per team.

A. Definitions from Professional Societies

1. Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Ergonomists contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people. (developed by the International Ergonomics Association http://www.iea.cc/ergonomics/)

2. Human Factors is concerned with the application of what we know about people, their abilities, characteristics, and limitations to the design of equipment they use, environments in which they function, and jobs they perform. (developed by the Human Factors and Ergonomics Society)

B. Definitions from Scientific Literature

3. This definition is from *The Dictionary for Human Factors/Ergnomics* by James H. Stramler (Boca Raton, LA: CRC Press, 1993):

Human Factors is that field which is involved in conducting research regarding human psychological, social, physical, and biological characteristics, maintaining the information obtained from that research, and working to apply that information with respect to the design, operation, or use of products or systems for optimizing human performance, health, safety, and/or habitability.

4. The following definition is from the article by Alphonse Chapanis, "To Communicate the Human Factors Message, You Have to Know What the Message Is and How to Communicate It," Human Factors Society *Bulletin* , Volume 34, Number 11, November 1991, pp 1-4:

Human Factors is a body of knowledge about human abilities, human limitations, and other human characteristics that are relevant to design. Human factors engineering is the application of human factors information to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable, and effective human use.

5. A concise definition by Dempsey et al. (2000; http://www.ergoweb.com/news/detail.cfm?id=345)

Ergonomics is the design and engineering of human-machine systems for the purpose of enhancing human performance.

Dempsey, Patrick G., Wogalter, Michael S., & Hancock, Peter A. (2000). What's in a name? Using terms from definitions to examine the fundamental foundation of human factors and ergonomics science. *Theoretical Issues in Ergonomics Science*, *1*(1), 3-10.

C. Definitions from Government Agencies

6. National Aeronautics and Space Administration (NASA).

This definition is found at http://humanfactors.arc.nasa.gov/web/library/library.html

Human factors is an umbrella term for several areas of research that include human performance, technology design, and human-computer interaction. The study of human factors in the Human Factors Research and Technology Division at NASA Ames Research Center focuses on the need for safe, efficient and cost-effective operations, maintenance and training, both in flight and on the ground.

7. This definition comes from http://media.nasaexplores.com/lessons/02-048/9-12_1.pdf:

Ergonomics is the scientific study of human work conditions, especially the interaction between man and machine. Ergonomics is a term taken from the Greek work "ergon," meaning work, and "nomos," meaning natural laws. The goal of ergonomics is to make work more comfortable and to improve both health and productivity. It is an interdisciplinary science of designing the job, products, and place to fit the worker. Psychology, industrial engineering, computer science, biomechanics, and safety engineering all play a role in ergonomics.

8. National Research Council (US) Karl Kroemer prepared this definition (found at http://www.nsc.org/issues/ergo/define.htm):

Ergonomics is the study of human characteristics for the appropriate design of the living and working environment. Ergonomic researchers strive to learn about human characteristics (capabilities, limitations, motivations, and desires) so that this knowledge can be used to adapt a human-made environment to the people involved. This knowledge may affect complex technical systems or work tasks, equipment, and workstations, or the tools and utensils used at work, at home, or during leisure times. Hence, ergonomics is human-centered, transdisciplinary, and application-oriented.

D. Definitions from Industry

9. *Medical Device and Design Industry* magazine. Barry Beith prepared this definition for *MDDI* (found at http://www.devicelink.com/mddi/archive/99/06/009.html):

Human factors focuses on system usability and designing system interfaces to optimize the users' ability to accomplish their tasks error-free in a reasonable time and, therefore, to accept the system as a useful tool. The discipline is rooted in understanding how people use tools, products, and systems to accomplish desired tasks, and it seeks to eliminate or, at least, manage the human errors that sometimes do occur. Human factors engineering is an applied science that takes research about human abilities, limitations, behaviors, and processes and uses this knowledge as a basis for the design of tools, products, and systems. Applying human factors principles leads to designs that are safer, more acceptable, more comfortable, and more effective for accomplishing their given tasks. Human factors engineering is often considered synonymous with other terms such as ergonomics, human engineering, human factors, usability engineering, and user-centered design. It is a multidisciplinary field in which individuals trained in human factors come from such diverse backgrounds as engineering, psychology, computer science, anthropology, and informational sciences. Specialists apply findings and principles from a range of disciplines including cognitive psychology, organizational psychology, industrial engineering, anthropometrics, biomechanics, motor skills, perception, and specific engineering areas such as vibration and noise.

10. CETENA (The Italian Ship Research Company)
This definition is found at http://www.cetena.it/ergostoria.htm:

Ergonomics is the study of human performance and its application to the design of technological systems. The goal of this activity is to enhance productivity, safety, convenience and quality of life. Example topics include models and theories of human performance, design and analytical methodology, human-computer interface issues, environmental and work design, and physical and mental workload assessment. Human factors engineering requires input from disciplines ranging from psychology and environmental medicine to statistics.

E. Definitions from Open Sources

11.Wikipedia. http://en.wikipedia.org/wiki/Human_factors:

"Human factors" is a term used mainly in the United States. Variants include "human factors engineering", an extension of an earlier phrase, "human engineering". In Europe and the rest of the world, the term "ergonomics" is more prevalent.

"Human factors" is an umbrella term for several areas of research that include human performance, technology, design, and human-computer interaction. It is a profession that focuses on how people interact with products, tools, procedures, and any processes likely to be encountered in the modern world.

Human factors practitioners can come from a variety of backgrounds; though predominantly they are Psychologists (Cognitive, Perceptual, and Experimental) and Engineers. Designers (Industrial, Interaction, and Graphic), Anthropologists, and Computer Scientists also contribute. Whereas ergonomics tends to focus on the anthropometrics for optimal human-machine interaction, human factors is more focused on the cognitive and perceptual factors.

Areas of interest for human factors practitioners may include the following: workload, fatigue, situational awareness, usability, user interface, learnability, attention, vigilance, human performance, control and display design, stress, visualization of data, individual differences, aging, accessibility, shift work, work in extreme environments, and human error.

Simply put, human factors involves working to make the environment function in a way that seems natural to people. Although the terms "human factors" and "ergonomics" have only been widely known in recent times, the field's origin is in the design and use of aircraft during World War II to improve aviation safety.