

## HUMAN FACTORS IN ENGINEERING

<b>Course Code</b>	20ME2601B	<b>Year</b>	III	<b>Semester</b>	II
<b>Course Category</b>	Open Elective	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	Nil
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

**Course Outcomes:** Upon successful completion of the course, the student will be able to

CO	Statement	Skill	BTL	Units
CO1	Discuss the fundamentals of Human factors, Physical work, Anthropometry, Ergonomics, Machine controls, Seating design, Colour - Light, Temperature - Humidity –Illuminations and Measurement of sound.	Understand	L2	1,2,3,4,5
CO2	Identify the role of Anthropometry and Ergonomics in product design.	Apply	L3	2
CO3	Choose the effective seating design and Machine controls for improvement of human workplace.	Apply	L3	3
CO4	Represent the importance of colour and light, Temperature - Humidity – Illumination, Measurement of sound in human workplace.	Apply	L3	4,5

### Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H: High(3), M: Medium(2), L:Low(1))

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2	1	1	2			1		3	1	2	3
CO2	1		2	1	1	2			1		3	1	2	3
CO3	1		2	1	1	2			1		3	1	2	3
CO4	1		2	1	1	2			1		3	1	2	3

### Syllabus

UNIT	Content	Mapped CO
I	<b>Fundamentals of Human Factors Engineering:</b> Human Biological, Ergonomic and psychological capabilities and limitations, Concepts of human factors engineering and Ergonomics, Man-Machine system and Design philosophy. <b>Physical work and energy expenditure:</b> Manual lifting, Work posture, Repetitive motion, Provision of energy for muscular work, Heat stress, Role of oxygen physical exertion, Measurement of energy expenditure, Respiration, Pulse rate and blood pressure during physical work, Physical work capacity and its evaluation.	CO1
II	<b>Anthropometry:</b> Physical dimensions of the human body as a working machine, Motion size relationships, Static and dynamic anthropometry, Anthropometric design principles, Using anthropometric measures for industrial design.	CO1, CO2

	<b>Ergonomics and product design:</b> Ergonomics in automated systems, Expert systems for ergonomic design, Anthropometric data and its application in ergonomic design, Limitations of anthropometric data, Use of computerized database.	
<b>III</b>	<b>Machine controls:</b> Improvement of human work place through controls, Displays and Controls, Shapes and sizes of various controls and displays, Multiple display and control situations, Design of major controls in automobiles and machine tools, Principles of hand tool design. <b>Work place and seating design:</b> Design of office furniture, Redesign of instruments, Work process: Duration of rest periods, Design of visual displays, Design for shift work.	<b>CO1, CO3</b>
<b>IV</b>	<b>Color and light:</b> Color and the eye, Color consistency, Color terms, Reactions to color and color continuation, Color on engineering equipments. <b>Temperature-Humidity-Illumination and Contrast:</b> Use of Photometers, Recommended illumination levels, the ageing eye, Use of indirect (Reflected) lighting, Cost efficiency of illumination. Special purpose lighting for illumination and quality control.	<b>CO1, CO4</b>
<b>V</b>	<b>Measurement of sound:</b> Noise exposure and hearing loss, Hearing protectors, Analysis and reduction of noise, Effects of noise, Performance annoyance of noise and interface with communication, Sources of vibration and performance effect of vibration.	<b>CO1, CO4</b>

<b>Learning Recourse(s)</b>
-----------------------------

<b>Text Book(s)</b>
---------------------

- |  |
|--|
| 1. . M. S. Sanders and E. J. McCormick, Human Factors in Engineering Design, VII Edition, McGraw Hill International, 1993. |
|--|

<b>Reference books</b>
------------------------

- |  |
|--|
| 1. P. V. Karpovich and W. E. Sinning, Physiology of Muscular Activity”, VII Edition, Saunders (W.B.) Co Ltd., 1971.                                  |
| 2. Applied Ergonomics Handbook, I.P.C. Science and Technology Press Limited, 1974.   |
| 3. M. Helander, A Guide to the Ergonomics of Manufacturing, II Edition, CRC Press, 1997.   |
| 4. K. H. E. Kroemer, H. B. Kroemer, K. E. Kroemer Elbert, Ergonomics: How to design for ease and efficiency, II Edition, Pearson Publications, 2001. |