SEMESTER S6

APPLIED ERGONOMICS

Course Code	PBIET604	CIE Marks	60
Teaching Hours/Week (L:T:P: R)	3:0:0:1	ESE Marks	40
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To provide a detailed understanding of ergonomics and its application in the real working environments.
2. To provide an adequate insight about the functioning and capability of humans in work settings.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Introduction to ergonomics:** Definition, multidisciplinary engineering approach in ergonomics, various disciplines of ergonomics- industrial ergonomics, visual ergonomics and organizational ergonomics. **Human Technological System (HTS):** Concept and classifications, design of HTS, conceptual design, advanced development, detailed design and development, system reliability and modelling.	11
2	**Design of displays and controls:** Definition and measurement of information, information processing in human, information processing model, design of visual, auditory, tactual and olfactory displays, input and output in displays, usage of text, graphics, symbols and codes in design of visual displays, motor skills in human, human control of systems, design of controls, design of hand tools and devices.	11
3	**Biomechanics and occupational stress:** Biomechanics, mechanics of upper extremity of hand, lower extremity, and foot, bending, lifting and carrying,	11

	human physiology, oxygen consumption, energy expenditure, cardiovascular and respiratory effects, work capacity and fatigue, occupational stress and musculoskeletal disorders.	
4	**Design of workplace and work environment:** Anthropometry and workplace, workspace and work surface design, principles of seat design, environmental factors influencing human performance, effects of illumination, noise and vibration in design of workplaces, design of virtual environments and applications, safety and security aspects in workplaces, assessment of risks in workplaces.	**11**

Suggestion on Project Topics: Each student team can choose some simple close to real life projects from the areas discussed in the syllabus, such as

- Workplace design with digital human modelling software
- Design of thermal environment with software support
- Physiological measurement with heart rate monitor
- Anthropometric data collection of different demographic segments

Course Assessment Method
(CIE: 60 marks, ESE: 40 marks)

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Continuous Internal Evaluation Marks (CIE):

Attendance	Project	Internal Ex-1	Internal Ex-2	Total
5	**30**	**12.5**	**12.5**	**60**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 2 marks **(8x2 =16 marks)**	• 2 questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 2 sub divisions. • Each question carries 6 marks. **(4x6 = 24 marks)**	**40**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcomes		Bloom's Knowledge Level (KL)
CO1	Apply ergonomic concepts in design and modelling of human technological systems.	**K3**
CO2	Make use of display and control concepts in design of systems.	**K3**
CO3	Apply biomechanics and human physiology in reduction of workplace risks.	**K3**
CO4	Develop workplaces that fits to the worker and to identify safe work environments.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping (Mapping of Course Outcomes with Program Outcomes)

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

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introduction to Human Factors and Ergonomics	Bridger, R. S.	CRC	4th Edition, 2017
2	Human Factors in Engineering and Design	Sanders, M. S.	McGraw Hill	7th Edition, 1992
3	Human Factors Engineering.	Phillips, C. A.	John Wiley & Sons.	1th Edition, 2000

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	A Guide to Human Factors and Ergonomics	Helander M.	CRC Press	2nd Edition, 2002
2	Designing for People: An Introduction to Human Factors Engineering	John D. Lee, Christopher D. Wickens, Liu Y., Boyle L. N.	CreateSpace	3rd Edition, 2017
3	Fitting the Human - Introduction to Ergonomics / Human Factors Engineering	Kroemer K. H. E.	CRC Press	7th Edition, 2017
4	Handbook of Standards and Guidelines in Human Factors and Ergonomics	Karwowski W., Szopa A., Soares M. M.	CRC Press	2nd Edition, 2021

Video Links (NPTEL, SWAYAM…)	
Link ID	https://archive.nptel.ac.in/courses/110/105/110105162/

PBL Course Elements

L: Lecture (3 Hrs.)	**R: Project (1 Hr.), 2 Faculty Members**		
	Tutorial	**Practical**	**Presentation**
Lecture delivery	Project identification	Simulation/ Laboratory Work/Workshops	Presentation (Progress and Final Presentations)
Group discussion	Project Analysis	Data Collection	Evaluation
Question answer Sessions/ Brainstorming Sessions	Analytical thinking and self-learning	Testing	Project Milestone Reviews, Feedback, Project reformation (If required)
Guest Speakers (Industry Experts)	Case Study / Field Survey Report	Prototyping	Poster Presentation/ Video Presentation: Students present their results in a 2 to 5 minutes video

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Assessment and Evaluation for Project Activity

Sl. No	**Evaluation for**	**Allotted Marks**
1	Project Planning and Proposal	5
2	Contribution in Progress Presentations and Question Answer Sessions	4
3	Involvement in the project work and Team Work	3
4	Execution and Implementation	10
5	Final Presentations	5
6	Project Quality, Innovation and Creativity	3
Total		**30**

1. **Project Planning and Proposal (5 Marks)**
    - Clarity and feasibility of the project plan
    - Research and background understanding
    - Defined objectives and methodology

2. **Contribution in Progress Presentation and Question Answer Sessions (4 Marks)**
    - Individual contribution to the presentation
    - Effectiveness in answering questions and handling feedback

3. **Involvement in the Project Work and Team Work (3 Marks)**
    - Active participation and individual contribution
    - Teamwork and collaboration

4. **Execution and Implementation (10 Marks)**
    - Adherence to the project timeline and milestones
    - Application of theoretical knowledge and problem-solving
    - Final Result

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5. **Final Presentation (5 Marks)**
    - Quality and clarity of the overall presentation
    - Individual contribution to the presentation
    - Effectiveness in answering questions

6. **Project Quality, Innovation, and Creativity (3 Marks)**
    - Overall quality and technical excellence of the project
    - Innovation and originality in the project
    - Creativity in solutions and approaches