

NIRMA UNIVERSITY

Institute:	Institute of Design
Name of Programme:	Bachelor of Design (Product and Interaction Design Prog.)
Course Code:	2DD205CC25
Course Title:	Human Factors
Course Type:	Core
Year of introduction:	2025-26

L	T	Practical component				C
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Course Learning Outcomes (CLO):

At the end of the course, the student will be able to:

1. Explain ergonomic principles and the use of anthropometric data in design (BL 2)
2. Apply ergonomic measurements to assess and improve existing products and environments (BL 3)
3. Integrate cognitive ergonomics and human-factor analysis into the design process (BL 4)
4. Create ergonomic design solutions that address usability, comfort, and cultural diversity (BL 6)

Contents

**Teaching
Hours
(Total 75)**

Unit 1 Fundamentals of Ergonomics:

3

- History and evolution of ergonomics in design.
- Understanding the human body structure, anatomy, and skeletal system.
- Anthropometry: Study of anthropometric data for adult males, females, and children (5th to 95th percentile).
- Environmental comfort factors: Sound, temperature, lighting, and their impact on human performance.
- Introduction to international ergonomic norms and standards.

Unit 2 Ergonomic Principles in Product Design:

3

- Application of ergonomics in product design and industrial design.
- Understanding human-hand functions, skills, and motor capabilities in design.
- Methods to analyze products for ergonomic considerations.
- Variations in ergonomic design based on ethnographic and cultural factors.
- Incorporating environmental factors for better usability and comfort.



Unit 3 Cognitive Ergonomics: 3

- Principles of human cognition: Memory, behavior, and decision-making in real-world scenarios.
- Applying cognitive ergonomics to improve productivity and user experience.
- Relevance of cognitive ergonomics in product design and industrial applications.
- Introduction to task analysis tools and methods for cognitive design.
- Case studies on cognitive ergonomics.

Unit 4 Advanced Applications of Ergonomics in Design: 6

- Human factors in design: Interaction between product, function, and user needs.
- Designing for usability: Context, environment, and limitations of users.
- Cognitive task analysis: Tools and methods for improving industrial design.
- Integration of ergonomic principles into user-centered design processes.
- Final project: Developing an ergonomic design solution based on anthropometric and cognitive principles.

Suggested list of Practical

60 hours

**Sr. Practical Work
No.**

1. Collect anthropometric data (stature, arm reach, hand span) from a sample of classmates and compare against 5th–95th percentile reference tables. Apply findings to evaluate a chair or desk design.
2. Conduct a reach and clearance study for a workstation (e.g., computer desk) using percentile data. Document zones of comfort, stretch, and inaccessibility.
3. Perform a posture analysis for 3 common tasks (typing, drawing, mobile use) using RULA/REBA or equivalent ergonomic tools. Identify high-risk positions.
4. Evaluate lighting, noise, and thermal comfort of a classroom or studio space using simple instruments (lux meter, sound level app, thermometer). Recommend design improvements.
5. Analyze an everyday product (e.g., kettle, stapler, or remote) for hand anthropometry and usability. Suggest ergonomic redesign features.
6. Carry out a cognitive load and memory recall test (e.g., remembering steps of a task with distractions). Relate outcomes to design of instructions or interfaces.
7. Evaluate an interface (ATM, mobile app, or ticketing machine) for control-display compatibility, visibility, and error potential. Suggest ergonomic modifications.
8. Conduct a time–motion study of a repetitive task (e.g., packaging, sketching) to observe fatigue, efficiency, and ergonomic bottlenecks.

9. Simulate usability testing of a prototype (mock-up product or interface) with 3–4 users. Record feedback on comfort, learnability, and inclusivity.
10. Group assignment: Select one existing workspace (studio, cafeteria, lab) and perform a holistic ergonomic audit (physical + cognitive + environmental). Present redesign recommendations with sketches and data.

Self Study:

Suggested Readings/References:

Books:

1. Henry Dreyfuss (1960). *Measure of Man & Woman: Human Factors in Design*. MIT Press.
2. Deb Kumar Chakrabarty (2009). *Indian Anthropometric Dimensions for Ergonomics Design Practice*. NID Publication.
3. Deb Kumar Chakrabarty (2008). *Ergonomics*. NID Publication.
4. Henry Dreyfuss (1955). *Designing for People*. Allworth Press.
5. Don Norman (2013). *The Design of Everyday Things (Revised & Expanded)*. Basic Books.

Online Resources:

1. Bridger, R., 2008. Introduction to Ergonomics. CRC Press.
2. Karwowski, W., Soares, M.M., & Stanton, N.A. (2011). Human Factors and Ergonomics in Consumer Product Design. CRC Press.

