

Indian Institute of Technology, Kanpur
Proposal for a New Course

1. Course No. DESxxx

2. Name of the Course: ***Cognitive Principles in Product Design***

Course Type: Elective (B.Tech/B.S/ M.Des / M.Tech)

3. Per Week Lectures: 03 (L), Tutorial: 0 (T), Laboratory: 0 (P), Additional Hours [0-2]: 0 (A)

Credits (3*L+2*T+P+A): 9

Duration of Course: Full Semester

4. Proposing Department: Design

Other Departments/IDPs which may be interested in the proposed course:

Other faculty members interested in teaching the proposed course:

5. Proposing Instructor(s): Prof. J. Ramkumar

Need of the Course:

This course introduces the role of human cognition in product design, focusing on how **perception, memory, decision-making, and mental models influence the way users interact with products**. The course integrates principles from cognitive psychology, human factors, ergonomics, and design methods to help students design intuitive, usable, and human-centered products. Through lectures, case studies, and design exercises, students will learn to translate cognitive principles into practical product design strategies.

Course Learning Objectives

By the end of the course, students will be able to:

- Understand fundamental concepts of human cognition relevant to design.
- Apply cognitive psychology principles in product design decisions.
- Analyse user interaction with products through mental models and perception.
- Evaluate products using cognitive usability principles.
- Develop design solutions that align with human cognitive capabilities and limitations.

6. Course Structure (40 Lectures)

Sr. No.	Topic Description	Remark
Module 1: <i>Introduction to Cognition and Product Design</i>	Lecture 1: Introduction to cognitive science and design	Cognitive science fundamentals, Cognitive ergonomics, Product usability
	Lecture 2: Human cognition and product interaction	
	Lecture 3: Evolution of human-centred product design	
	Lecture 4: Role of cognition in everyday products	
	Lecture 5: Case studies of cognitively intuitive products	
Module 2: <i>Human Perception and Product Interaction</i>	Lecture 6: Visual perception in design	Visual perception, Sensory integration, Perceptual mapping, Product affordances
	Lecture 7: Gestalt principles in product interfaces	
	Lecture 8: Multisensory perception in product experience	
	Lecture 9: Affordances and signifiers in product interaction	
	Lecture 10: Designing for perceptual clarity	
Module 3: <i>Memory, Learning and Mental Models</i>	Lecture 11: Human memory systems	Working memory, Cognitive load theory, Mental models, Learning and usability
	Lecture 12: Cognitive load in product use	
	Lecture 13: Mental models in product interaction	
	Lecture 14: Learning curves and product usability	
	Lecture 15: Designing for intuitive understanding	
	Lecture 16: Case study: cognitive simplification in product design	
Module 4: <i>Decision Making and Behaviour in Product Use</i>	Lecture 17: Human decision-making processes	Behavioural psychology, User decision-making, Emotional design
	Lecture 18: Heuristics and biases in product interaction	
	Lecture 19: Behavioural design principles	
	Lecture 20: Emotional cognition and product experience	
	Lecture 21: Motivation and user engagement	
	Lecture 22: Behavioural insights in product innovation	
Module 5: <i>Cognitive Ergonomics and Human Factors</i>	Lecture 23: Cognitive ergonomics in product design	Human factors, Error prevention
	Lecture 24: Human factors engineering principles	
	Lecture 25: Information processing models	
	Lecture 26: Designing for errors and safety	
	Lecture 27: Cognitive workload in complex products	
	Lecture 28: Case studies in cognitive ergonomics	
	Lecture 29: Cognitive task analysis	

Module 6: Cognitive Design Methods and Tools	Lecture 30: User journey mapping and cognitive mapping	Cognitive task analysis, cognitive mapping
	Lecture 31: Usability evaluation methods	
	Lecture 32: Think-aloud protocols and usability testing	
	Lecture 33: Cognitive walkthrough method	
	Lecture 34: Design heuristics and evaluation techniques	
Module 7: Emerging Applications	Lecture 35: Cognition in intelligent products	Effect of AI in cognition decision
	Lecture 36: Human-AI interaction in product design	
	Lecture 37: Cognitive principles in smart products	
	Lecture 38: Future trends in cognitive design	
Module 8: Design Integration and Case Studies	Lecture 39: Integrating cognition into product design workflow	
	Lecture 40: Live product case study demonstration	
	Total Lectures	40

*Each module typically includes a small project that requires applying the concepts learned in both the current and previous modules, helping to reinforce understanding and build practical skills.

Pre-requisites, None. Only attentiveness and a willingness to grasp new concepts in product design are desirable.

Assessment Scheme

Assignments- 20%

Mid-semester exam - 20%

Final project - 20%

End Semester - 40%

Design Exercises

Cognitive analysis of an everyday product

Redesigning a product to reduce cognitive load

Mental model mapping of a product interface

Usability testing of a product prototype

References (suggested readings):

1. The Design of Everyday Things, by Don Norman
2. Emotional Design, by Don Norman
3. Mental Models: Aligning Design Strategy with Human Behavior by Indi Young
4. Designing with the Mind in Mind, by Jeff Johnson
5. Design for How People Think: Using Brain Science to Build Better Products by John Whalen
6. Cognitive Psychology: A Student's Handbook, by Michael W. Eysenck and Mark T. Keane, 8th edition (2020),
7. Principles of Cognition: Finding Minds by Eduardo Mercado (III)
8. Principles of Cognitive Psychology By Michael W. Eysenck
9. Universal Principles of Design, by William Lidwell
10. Cognitive Psychology and Its Implications, by John R. Anderson
11. Research papers and other reference materials (based on project)

Additional References

1. Interaction Design: Beyond Human-Computer Interaction
2. About Face: The Essentials of Interaction Design — Alan Cooper
3. The Laws of Simplicity — John Maeda
4. Laws of UX: Using Psychology to Design Better Products & Services by Jon Yablonski

Dated: 30.03.2026



Proposer: Prof. J. Ramkumar

Dated: _____

DPGC Convener: _____

This Course is approved / not approved

Chairman, SPGC

Dated _____