DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Ashok Raj Path, PATNA 800 005 (Bihar), India

Phone No.: 0612 – 2372715, 2370419, 2370843, 2371929, 2371930, 2371715 Fax – 0612- 2670631 Website: www.nitp.ac.in

CSXX2026: Human-Computer Interaction

L-T-P-Cr: 3-0-0-3

Pre-requisites: Fundamental knowledge of computer science, psychology, mathematics, and statistics.

Course Objectives.

1. To learn the concepts and history of Human-Computer Interaction (HCI).
2. To learn the importance of HCI for interactive computing system design.
3. Summarize a variety of user research and evaluation techniques in HCI.
4. To discuss principles of user-centered design.
5. To identify the role of human factors in system usability.
6. To apply HCI principles to (UI) User Interface design and to enhance for User-centered Design (UCD) and Human-centered Design (HCD).

Course Outcomes – After completing this course, students should be able to:

CO-1. *Recall* theories of basic physiological, perceptual, and cognitive components of human learning and memory.

CO-2. *Examine* the fundamental aspects of designing user interfaces and analyze interaction problems from a technical, cognitive, and functional perspective.

CO-3. *Identify*, *examine*, and *develop* an awareness of the range of general Human-Computer Interaction (HCI) issues that must be considered when designing information systems.

CO-4. *Discuss* the multimodal displays for conveying and presenting information and have practiced a variety of simple methods for designing and evaluating the quality of user interfaces and spatial displays.

CO-5. *Design and determine* the User Interface and User Experience (UI/UX) with HCI principles to (UI) User Interface design for evaluating UI effectiveness.

CO-6. *Develop and Design* are based upon an explicit understanding of users, tasks, and environments which are driven and refined by user-centered evaluation for UCD and HCD.

Course Outcomes–Cognitive Levels–Program Outcomes Matrix –

[H: High relation (3); M: Moderate relation (2); L: Low relation (1)]

Course Outcomes	Program Outcomes											
	PO-1 (Engineering knowledge)	PO-2 (Problem analysis)	PO-3 Design/development of solutions)	PO-4 (Conduct investigations of complex problems)	PO-5 (Modern tool usage)	PO-6 (The engineer and society)	PO-7 (Environment and sustainability)	PO-8 (Ethics)	PO-9 Individual and team work)	PO-10 Communication)	PO-11 (Project management and finance)	PO-12 Life-long learning
CO-1	3	3	3	3	3	3	1	2	3	3	1	3
CO-2	3	3	3	3	3	3	1	2	3	3	1	3
CO-3	3	3	3	3	3	3		2	3	3	1	3

CO-4	3	3	3	3	3	2		1	3	3	1	3
CO-5	3	3	3	3	3	3	2	1	3	3	1	3
CO-6	3	3	3	3	3	3			3	3	1	3

UNIT I: Introduction- History and importance of HCI: User-centered design and human factors, The human: Input-output channels, Human memory, Thinking, Emotion, Psychology, and the design of interactive systems, The computer: Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors, and special devices, The interaction: Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of WIMP interface, Interactivity, The context of interaction, Experience, engagement and fun, Paradigms for interaction. **Lectures: 8**

UNIT II: Design Process- Interaction design basics: Design, Process of design, design scenarios, Navigation design, Screen design and layout, Iteration and prototyping, HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping, Design rationale, Design rules: Principle to support usability, Design standard and guidelines, Golden rules and heuristics, HCI patterns, Universal design: Universal design principles, Multi-modal interaction, Designing for diversity, User support: Requirements of user supports, Approaches of user support, Designing user support systems
Lectures: 8

UNIT III: Design models and theories- Goals and task hierarchies, Models of HCI, formal models, Linguistic models, Physical and device models, Cognitive architecture and cognitive model (KLM/GOMS), hybrid models, communication and collaboration models: Text-based communication, Group working, Task analysis: Task analysis difference with other techniques, Task decomposition, Knowledge-based analysis, Entity – relationship-based techniques, Sources of information and data collection, Dialog notations and design: Dialog design notation, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design, Models of system and modeling rich interaction: Interaction models, Status-event analysis, Low intention and sensor-based interaction.
Lectures: 9

UNIT IV: Interface design methods and evaluation- User-centered design, LUCID model, User task analysis, Formal methods for user interface (UI) specifications (including Grammar, Menu Selection Tree, Transition Diagram, Statechart, and User action notation), Prototyping, Storyboards, Design principles and rules, Process of interface design & its elements. Interface evaluation methodologies, Usability issues, ISO 9241 framework of usability, Usability testing steps, Expert reviews, Heuristic evaluation, Cognitive walkthrough, Benchmarks and experiments, Surveys, Acceptance test, and interface case studies **Lectures: 8**

UNIT V: UI/UX Interface Design- Introduction to UI/UX, Design Thinking, Define UX design roles and responsibilities, Adapting UX design and Usability Principles and Guidelines, Realizing that UIs are "visualized requirements", Base the design thinking on business requirements, Adapt a user-centered business analysis and UX design methodology, UI/UX tools, Industry trends, and case studies. **Lectures: 6**

UNIT VI: User-centered Design- Introduction of User-Centered Design (UCD), Seven principles for transforming difficult tasks into simple ones, Make things visible: bridge the gulfs of execution and evaluation, Human-centered design (HCD), Design thinking for social innovations and case studies **Lectures: 3**

References

1. David Benyon, “Designing Interactive Systems – 2nd Edition”, Addison Wesley.
2. Alan Dix et. al., “Human-Computer Interaction”, Pearson Education.
3. Ben Shnerderman, “Designing the user interface: Strategies for Effective Human-Computer Interaction”, Pearson Education.
4. Jenny Preece, “Human-Computer Interaction”, Addison Wesley.

5. Emrah Yayici, "UX Design and Usability Mentor Book: With Best Practice Business Analysis and User Interface Design Tips and Techniques", Paperback, 2014.
6. Christine Faulkner, "The Essence of Human-Computer Interaction", Prentice Hall.
7. Don Norman, “Design of Everyday Things”, Basic books, 2nd Edition.
8. IDEO, “The field guide to Human-Centered Design”, 2015.