SEMESTER 3

HUMAN COMPUTER INTERACTION

Course Code	PBAIT304	**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 learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI and learn the user interface guidelines.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Foundations of HCI: The Human**: I/O channels – Memory – Reasoning and problem solving; **The Computer**: Devices – Memory – processing and networks; **Interaction**: Models – frameworks – Ergonomics – styles –elements – interactivity- Paradigms **- Case Studies**.	**6**
2	**Fundamentals of Interactive Design and HCI in Software Development:** **Interactive Design**: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. **HCI in software process**: Software life cycle – usability engineering – Prototyping in practice – design rationale. **Design rules**: principles, standards, guidelines, rules. **Evaluation Techniques –** Universal Design.	**8**
3	**Models, Theories, Mobile HCI:** **HCI Models**: Cognitive models: Socio-Organizational issues and stakeholder requirements **–Mobile Ecosystem**: Platforms, Application frameworks**- Types of Mobile Applications**: Widgets, Applications, Games**-** Mobile Information Architecture, Mobile 2.0, **Mobile Design**: Elements of Mobile Design, Tools. **-** Case Studies	**10**
4	**Web Interface Design:**	**12**

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	Designing Web Interfaces - Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow **- Case Studies.**	

Suggestions on Project Topics

1. Designing a Multi-Device Interaction System

- **Project Objective**: Develop a system that allows seamless interaction between multiple devices (e.g., smartphone, tablet, desktop, and smart TV) with shared content, such as a collaborative drawing or note-taking app.
- **Focus Areas**: Cross-platform user interface design, synchronization, and consistency of the user experience across devices.
- **Outcome**: Prototype a multi-device interface and test it with users for effectiveness, ease of switching devices, and user satisfaction.

2. Voice User Interface (VUI) for Smart Homes

- **Project Objective**: Build a voice-controlled interface for a smart home system, allowing users to control devices like lights, thermostats, and security cameras through voice commands.
- **Focus Areas**: Speech recognition, natural language processing (NLP), user feedback, and voice command accuracy.
- **Outcome**: Prototype a VUI and conduct user testing to evaluate voice command performance, user comfort, and error rates.

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3. User-Centered Design of a Virtual Reality (VR) Application for Education

- **Project Objective**: Design a VR-based educational tool for immersive learning experiences, such as virtual field trips or interactive lab simulations.
- **Focus Areas**: Interaction design for VR, usability, cognitive load, and how VR affects learning outcomes.
- **Outcome**: Develop a VR prototype and conduct usability tests to gather feedback on user engagement and educational effectiveness.

4. Designing an Accessible Mobile Application for Seniors

- **Project Objective**: Create a mobile application tailored to the needs of elderly users, focusing on improving accessibility through larger buttons, high contrast, and simple navigation.
- **Focus Areas**: Accessibility guidelines (WCAG), usability testing for seniors, and interface design for older adults.
- **Outcome**: Prototype a user-friendly app for seniors, conduct usability testing, and provide recommendations for enhancing usability and accessibility.

5. Gesture-Based Interface for Public Information Systems

- **Project Objective**: Develop a public information kiosk that uses gesture recognition (e.g., through a camera or sensor) to allow users to interact with the system without physical contact.
- **Focus Areas**: Gesture recognition, interaction without touch, real-time feedback, and user engagement.
- **Outcome**: Build a working prototype of the gesture-based interface and test it in real-world public settings (e.g., at museums, airports).

6. Developing a Mobile App for Mental Health and Well-being

- **Project Objective**: Design a mobile application that helps users manage mental health through daily mood tracking, mindfulness exercises, and relaxation techniques.
- **Focus Areas**: UX design for mental health, user engagement, data privacy, and personalized recommendations.
- **Outcome**: Create a functional prototype of the app and conduct user testing to evaluate its effectiveness in improving mental well-being.

7. Augmented Reality (AR) for Retail Shopping Experience

- **Project Objective**: Build an AR-based shopping app that allows users to visualize how furniture or clothes would look in their homes or on their bodies before purchasing.
- **Focus Areas**: AR interface design, user experience, and integration with e-commerce platforms.
- **Outcome**: Develop an AR prototype, test it with users, and gather feedback on usability and how it influences purchase decisions.

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8. Designing a Collaborative Online Platform for Remote Teams

- **Project Objective**: Design an online platform that facilitates collaboration among remote teams by integrating features like video calls, task management, file sharing, and team discussions.
- **Focus Areas**: Interface design for remote collaboration, task-flow design, real-time communication, and user engagement.
- **Outcome**: Prototype the platform, conduct user testing with remote teams, and refine the system based on feedback.

9. Wearable Health Monitoring System with User Interface

- **Project Objective**: Create a wearable health monitoring system that tracks vital signs (e.g., heart rate, steps, calories) and provides real-time feedback through a mobile app.
- **Focus Areas**: Wearable technology integration, mobile app interface design, and real-time data visualization.

- **Outcome**: Design and prototype the wearable and app interface, then test it with users to ensure usability and effectiveness.

10. Personalized Learning Interface for E-Learning Platforms

- **Project Objective**: Design a personalized learning experience within an e-learning platform that adjusts content, quizzes, and tutorials based on the learner's progress, interests, and preferences.
- **Focus Areas**: Adaptive learning technologies, user profile management, and personalized content delivery.
- **Outcome**: Create an adaptive learning interface prototype and evaluate its impact on learner engagement and knowledge retention.

11. Emotion-Aware System for Interactive Media

- **Project Objective**: Develop a system that adjusts the content (e.g., music, movies, or games) based on the user's emotional state, detected through facial expressions or voice tone.
- **Focus Areas**: Affective computing, emotion recognition algorithms, and real-time interaction.
- **Outcome**: Build a working prototype and test it with users to assess its effectiveness in creating personalized media experiences.

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12. Designing a Digital Library for People with Visual Impairments

- **Project Objective**: Create an accessible digital library that includes features such as text-to-speech, screen reader compatibility, and tactile feedback for visually impaired users.
- **Focus Areas**: Accessibility guidelines, assistive technology, and inclusive design principles.
- **Outcome**: Develop a prototype of the digital library and conduct usability testing with visually impaired users.

13. Haptic Feedback in Wearable Devices for Navigation Assistance

- **Project Objective**: Design a wearable device (e.g., a bracelet or glove) that uses haptic feedback (vibrations or pulses) to help users with navigation in unfamiliar environments.
- **Focus Areas**: Haptic technology, user experience design, and navigation algorithms.
- **Outcome**: Build a prototype that provides haptic feedback for direction and distance, and test it with users in a real-world navigation scenario.

14. Interactive Storytelling Using Mobile AR

- **Project Objective**: Design an interactive storytelling experience using augmented reality (AR), where users can explore story elements and interact with characters through their mobile devices.
- **Focus Areas**: AR interface design, narrative design, and interactive storytelling.
- **Outcome**: Develop a mobile app prototype with AR features and test user engagement with interactive stories.

15. Sustainable HCI: Eco-Friendly App for Reducing Carbon Footprint

- **Project Objective**: Create an app that helps users track their carbon footprint and suggests eco-friendly alternatives for reducing energy consumption, transportation emissions, and waste.
- **Focus Areas**: Sustainability in HCI, user behavior change, and app design for environmental impact.
- **Outcome**: Develop a functional prototype of the eco-friendly app and test it with users to assess its effectiveness in promoting sustainability.

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 subdivisions. • Each question carries 6 marks. **(4x6 = 24 marks)**	**40**

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the fundamental concepts of Human-Computer Interaction (HCI), including human cognitive processes, computer architecture, and interaction models.	**K2**
CO2	Describe the principles of interactive design, usability engineering, and prototyping techniques in the software development process.	**K2**
CO3	Apply HCI models and theories to analyze user requirements and design user-friendly mobile applications with appropriate frameworks and architecture.	**K3**
CO4	Implement effective web interface design principles using modern interaction techniques such as drag-and-drop, contextual tools, and process flows.	**K3**

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

CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Human Computer Interaction (Module I, II &III)	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale	Pearson Education	3/e, 2004
2	Mobile Design and Developm (Module III)	Brian Fling	O'Reilly Media Inc.,	1/e, 2009.
3	Designing Web Interfaces (UNIT-IV)	Bill Scott and Theresa Neil	O'Reilly	1/e, 2009.

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Interaction Design: Beyond Human-Computer Interaction	Jenny Preece, Yvonne Rogers, and Helen Sharp	Wiley	5/e, 2019
2	Handbook of Human-Computer Interaction	M.G. Helander, T.K. Landauer, and P.V. Prabhu	Elsevier Science	3/e, 2014
3	The Design of Everyday Things	Don Norman	Basic Books	1/e, 2013

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://nptel.ac.in/courses/106106575
2	https://nptel.ac.in/courses/106106177

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