



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Computer Applications

Level: Post Graduate

Course / Subject Code: MC03094041

Course / Subject Name: Human Computer Interface

w. e. f. Academic Year:	2025-26
Semester:	3
Category of the Course:	Elective Group-1

<b>Prerequisite:</b>	Basic knowledge of software development principles, programming fundamentals, and operating systems. Familiarity with user-level interaction on computer applications and exposure to GUI-based tools will be beneficial.
<b>Rationale:</b>	<p>Human-Computer Interface (HCI) is a critical domain that bridges technology and human behavior. As computing systems become more integrated into everyday life, the design and evaluation of user-friendly, accessible, and intuitive interfaces become essential. This course aims to equip students with a foundational understanding of how users interact with technology and how to design systems that are efficient, effective, and satisfying to use. By incorporating principles from cognitive science, design, and usability engineering, students will be better prepared to create technology solutions that meet the diverse needs of users. The course also introduces emerging interaction paradigms such as voice, gesture, and virtual interfaces, preparing students for future interface innovations.</p> <p><b>Pedagogy:</b></p> <p>The course on Human-Computer Interface will follow an experiential and learner-centered pedagogy. It integrates interactive lectures with real-time case discussions, hands-on lab sessions, and iterative design practices. Emphasis will be placed on user-centered design thinking, encouraging students to empathize with users and iterate solutions based on usability feedback. Open-source tools will be employed for wireframing, prototyping, accessibility testing, and usability evaluation to build practical skills. Collaborative projects, peer reviews, and heuristic evaluations will nurture teamwork, creativity, and analytical thinking. The course also incorporates reflective learning through continuous feedback and demonstration-based assessments.</p>

## Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level*
1	Describe the foundations of Human-Computer Interaction and its principles	UN
2	Analyze the user-centered design process and interaction paradigms	AN



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3	Apply usability principles to design intuitive user interfaces	AP
4	Evaluate interface designs through heuristic evaluation and usability testing	EL
5	Create basic prototypes using HCI tools and techniques	CR

\*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

### Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

### Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	Introduction to HCI: Definition, human factors, history, HCI paradigms	6	13
2	Human Capabilities: Perception, cognition, memory, errors	7	15
3	Interaction Design Process: UCD, task analysis, scenarios, prototyping	10	22
4	Interface Design Principles: Guidelines, heuristics, visual design, accessibility	10	22
5	Usability Engineering and HCI in Emerging Tech: Usability testing, VR, AR, voice UI	12	28
<b>Total Hours:</b>		<b>45</b>	<b>100%</b>

### Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
5	20	20	20	20	15

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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## **References/Suggested Learning Resources:**

### **Open Source HCI Tools**

#### **1. Pencil Project**

Use: GUI prototyping and wireframing

Platform: Windows, macOS, Linux

Website: <https://pencil.evolus.vn>

Use in Lab: Design simple wireframes for desktop or mobile apps

#### **2. Inkscape**

Use: Vector-based graphic design, UI component design

Platform: Cross-platform

Website: <https://inkscape.org>

Use in Lab: Create high-fidelity interface elements, icons, layouts

#### **3. GazeRecorder (Free version)**

Use: Eye-tracking for usability analysis (limited free use)

Platform: Windows

Website: <https://www.gazerecorder.com>

Use in Lab: Understand visual attention on screen layouts (optional with webcam eye-tracking)

#### **4. NVDA (NonVisual Desktop Access)**

Use: Screen reader for accessibility testing

Platform: Windows

Website: <https://www.nvaccess.org>

Use in Lab: Test if interfaces are usable by visually impaired users

#### **5. Quant-UX**

Use: UX design, interactive prototyping, and analytics

Platform: Web-based

Website: <https://quant-ux.com>

Use in Lab: Build and test interactive prototypes with user session tracking

#### **6. Arch Accessibility Tools (Linux)**

Use: Evaluate interfaces for WCAG compliance and assistive tech

Tools Include: Orca (screen reader), Accerciser (accessibility inspection)

Use in Lab: Simulate and test accessible application features

#### **7. OpenViBE**

Use: Brain-Computer Interface (BCI) design and simulation

Platform: Windows, Linux



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Website: <http://openvibe.inria.fr>

Use in Lab: Explore advanced HCI like BCI for research projects

## 8. ClickHeat

Use: Open-source heatmap tracking tool

Platform: PHP-based, Web

Website: <https://www.labsmedia.com/clickheat/index.html>

Use in Lab: Track user interactions on web interfaces (as part of usability testing)

## Reference Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale – Human-Computer Interaction, Pearson
2. Ben Shneiderman et al. – Designing the User Interface, Pearson
3. Donald Norman – The Design of Everyday Things, Basic Books
4. Jenny Preece – Interaction Design: Beyond Human-Computer Interaction, Wiley
5. Jeff Johnson – Designing with the Mind in Mind, Morgan Kaufmann
6. R. Jacob – Brain-Computer Interaction: A New Frontier, Springer
7. Steve Krug – Don't Make Me Think, New Riders

## Suggested Course Practical List: if any

To perform followings Lab work:

Sr. No.	Title of Practical	Tool(s) used	Outcome Mapped
1	Introduction to wireframing and prototyping concepts	Pencil Project	CO1, CO3
2	Create low-fidelity wireframes for a mobile or desktop application	Pencil Project, Inkscape	CO3
3	Design UI components and layout using vector design principles	Inkscape	CO3
4	Create an interactive prototype with basic navigation	Quant-UX	CO3, CO5
5	Conduct heuristic evaluation on a peer group's prototype	Manual + Nielsen's Heuristics	CO2, CO4
6	Perform usability testing with task-based scenarios and record findings	Quant-UX	CO4
7	Analyze visual attention using webcam-based eye tracking (optional setup)	GazeRecorder (Free version)	CO4, CO5



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8	Test the accessibility of a simple web form using screen readers	NVDA	CO4
9	Simulate a non-visual interface experience for visually impaired users	NVDA	CO4
10	Evaluate accessibility properties using Linux tools (Orca, Accerciser)	GNOME Accessibility Tools	CO4
11	Record and analyze click heatmaps for a simple HTML page	ClickHeat	CO4
12	Introduction to Brain-Computer Interface simulation and visualization	OpenViBE	CO5
13	Design a voice or gesture-based interaction scenario (concept + mock-up)	Manual/Tool-based	CO2, CO5
14	Final Project: Design and prototype a small multi-page interface with usability review	Tools as needed	CO3, CO4, CO5
15	Final Project Demonstration and Reflection	-	All COs

### CO- PO Mapping:

Semester	Course Name :							
	POs							
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	-	-	-	2
CO2	2	3	2	2	2	-	-	2
CO3	2	2	3	3	2	1	-	3
CO4	2	3	2	3	1	1	1	3
CO5	1	2	3	3	3	2	1	3

*Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.*

**Note: The CO-PO mapping is indicative; the institute/faculty member can change as required.**

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