

### NIRMA UNIVERSITY

<b>Institute:</b>	Institute of Technology, School of Technology
<b>Name of Programme:</b>	MTech CSE
<b>Course Code:</b>	6CS267ME25
<b>Course Title:</b>	Human-Computer Interaction
<b>Course Type:</b>	Department Elective-II
<b>Year of Introduction:</b>	2025-26

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#### Course Learning Outcomes (CLO):

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

1. build multimodal applications based on sensory signal-driven UI (BL3)
2. apply an appropriate interaction style for implementing interaction between human and computer (BL3)
3. analyse various HCI techniques to design multimodal UI (BL4)
4. evaluate user interfaces to detect usability problems. (BL5)

Unit	Contents	Teaching Hours (Total 30)
Unit-I	<b>Introduction to Human-Computer Interaction (HCI):</b> Human factors engineering and user experience design; Human perception: perception, gestalt perception; Information presentation: typography, color, graphic design, displays, paper, and other output devices; layout: forms design and information visualization, virtual reality, context-sensitive interfaces	05
Unit-II	<b>User Interface Design and Principles:</b> principles of HCI, the ubiquity of feedback cycles, the importance of direct manipulation, and the extent of human abilities as they relate to computer interfaces, understanding of user tasks and activities, HCI heuristics; Creating good user interfaces: need-finding, prototyping potential interfaces, and evaluating those interfaces with users, research ethics underlying the design life cycle, as well as applications of this life cycle to the modern era of rapid prototyping	06
Unit-III	<b>Interactive Devices, User Interfaces and Interaction styles:</b> Input devices and ergonomics: multi-touch, haptics, wearables, brain computer interface headset, eye tracker, gesture enabled camera and tangibles; User interfaces: web/mobile, mixed reality, virtual reality, brain computer interface, gesture enabled and multimodal interfaces; basic technologies for handling: speech, vision, gesture, thought, pen-based interaction, and other modalities, as well as various techniques for combining modalities; Interaction styles: metaphor, direct manipulation,	12

widget survey, other interaction styles, and choosing among interaction styles

Unit-IV	<b>Applications:</b> Exploration into the applications of HCI to open areas like augmented reality, education, social computing, mental health, healthcare, medical science, and assistive applications for differently abled.	07
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### Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

### Suggested Readings/ References:

1. Ben Shneiderman, Catherine Plaisant, et al. Designing the User Interface, Addison Wesley
2. Surbhi Bhatia Khan, Suyel Namasudra, Fatos Xhafa. Innovations in Artificial Intelligence and Human-Computer Interaction in the Digital Era, Academic Press,
3. Yang Li, Otmar Hilliges. Artificial Intelligence for Human Computer Interaction: A Modern Approach, Springer
4. Stanley Harmon et al. Human-Computer Interaction: Emerging Trends Murphy & Moore Publishing
5. Preece, Sharp & Rogers, Interaction Design: Beyond Human-Computer Interaction, John Wiley & Sons
6. Dix A., Finlay J., Abowd G. D. and Beale R., Human Computer Interaction, Pearson Education.
7. Orestis Georgiou, William Frier, Euan Freeman et al. Ultrasound Mid-Air Haptics for Touchless Interfaces (Human-Computer Interaction Series), Springer.
8. Benjamin Weyers, Judy Bowen, Alan Dix, Philippe Palanque. The Handbook of Formal Methods in Human-Computer Interaction (Human-Computer Interaction Series), Springer
9. Jean Vanderdonckt. Handbook of Human Computer Interaction (Springer Handbooks)
10. Cooper, Reimann, Cronin, & Noessel., About Face: The Essentials of Interaction Design, Wiley
11. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T., Human Computer Interaction, Addison-Wesley.

### Suggested List of Experiments:

Sr. No.	Name of Experiments/Exercises	Hours
1	To design voice-controlled robots. Build the robot chatbot using cloud services such as: conservation service, Text to speech conversion, language translator and speech to text conversion services. Applications can be built on IBM/Google/Any other cloud platform and the application needs to be deployed on Arduino/Raspberry PI	02
2	To design voice-controlled applications using Alexa skills and install the skill on an Alexa device	04
3	To design an application that senses vibrotactile feedback/tacton using haptics technology and behave accordingly	02
4	To design an application that senses the tactile perception using any one type of mechanoreceptors: Merkel disks, Ruffini cylinders, Pacinian	04

	corpuscles, Meissener's corpuscles and based on the perception different functions are executed	
5	To design application that detects gestures, bodily position, weight, or movement of the muscles, tendons, and joints using various sensors (kinesthetic haptics) and uses that information to build a customized application	04
6	To study the working of Brain interface devices (Emotiv EPOC+/any other EEG device) and learn to configure and calibrate it for experiment use	02
7	To record brain signals for users using Emotiv EPOC+ when they perform a specific task (Ex: reading a passage) and to do the analysis of the recording using Emotiv Pro / similar software	04
8	To study the working of an Eye Tracker device and learn to configure and calibrate it for experiment use	02
9	To analyze the eye responses for interpreting/predicting the perception of a user for the viewed/read content from the user screen/ visual field	04
10	To use various wearable devices and/or sensory input devices to record various sensory signals and use the signals to build a novel application.	02