Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus of

DJS22 Honors Program

in

Smart Computing

With effect from the Academic Year: 2025-2026

Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA: 3.18)

Department of Computer Science and Engineering (IoT and Cyber Security with Block Chain Technology)

Proposed Scheme for Honors Degree Program in Smart Computing : Semester: VII (Autonomous)

(Academic Year 2025-2026)

Sr. No.	Course Code	Course	Teaching Scheme			Continuous Assessment (A)					Semester End Examination (B)						Aggregate (A+B)	Credits
			Theory (hrs.)	Practical (hrs.)	Tutorial (hrs.)	Term Test 1 (TT1) -a	Term Test 2 (TT2) - b	Total (a+b)	Term work	CA Total	Duration	Theory	Oral	Pract	Oral & Pract	SEE Total		
SEM V																		
1	DJS22ICHN1C1	Smart Technologies	4	--	--	20	15	35	--	35	2	65	--	--	--	65	100	4
SEM VI																		
2	DJS22ICHN1C2	Cognitive Computing	4	--	--	20	15	35	--	35	2	65	--	--	--	65	100	4
	DJS22ICHN1L1	Cognitive Computing Laboratory	--	2	--	--	--	--	25	25	2	--	25	--	--	25	50	1
SEM VII																		
3	DJS22ICHN1C3	Human Computer Interaction	4	--	--	20	15	35	--	35	2	65	--	--	--	65	100	4
	DJS22ICHN1L2	Human Computer Interaction Laboratory	--	2	--	--	--	--	25	25	2	--	25	--	--	25	50	1
SEM VIII																		
4	DJS22ICHN1C4	Social Cybersecurity	4	--	--	20	15	35	--	35	2	65	--	--	--	65	100	4
		Total	**16**	**4**	**0**	**80**	**60**	**140**	**50**	**190**	**12**	**260**	**50**	**0**	**0**	**310**	**500**	**18**

Prepared by

Checked by

Head of Department

Vice Principal

Principal

Program: B.Tech in Computer Science and Engineering (IoT and Cybersecurity with Block chain Technology) with Honors in Smart Computing	Final Year B.Tech	Semester : VII
Course: Human Computer Interaction	Course Code: DJS22ICHN1C3	
Course Laboratory: Human Computer Interaction Laboratory	Course Code: DJS22ICHN1L2	

Teaching Scheme (Hours / week)				Evaluation Scheme							
				Continuous Assessment Marks (A)			Semester End Examination Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Total	Theory			
				20	15	35	65			100
				Term Work			Laboratory Examination			
4	2	--	5	Laboratory Work	Tutorial / Mini project / presentation/ Journal/ Practical	Total Term work	Oral	Practical	Oral & Practical	50
				15	10	25	25	–	–	

Prerequisite:

1. Cognitive Computing
2. Web Technologies

Course Objectives: The objectives of the course are:

1. To understand the key skills of Human Computer Interactions.
2. To analyse the human cognitive principles with modern communicational Applications.
3. To explore cutting-edge interaction technologies used in HCI deployments.
4. To analyze real world problems of HCI trends.

Course Outcomes: On completion of the course, learner will be able to:

1. Understand the fundamental concepts of HCI and its relevance in computing systems.
2. Apply human cognitive and perceptual principles to design effective interfaces.
3. Design basic prototypes based on HCI best practices.
4. Examine Interaction Model and framework based on user feedback.
5. Explore advanced Interaction Techniques in Human Computing Environment.
6. Analyze Quantum Computing with real-world applications in HCI.

Detailed Syllabus:

Unit	Description	Duration
1	**Fundamentals of Human Cognition in Design:** Introduction to Human cognition and Human perception in Interaction Design, Human Perception and Attention, Cognitive Load Theory (CLT), and Principles of CLT, Types of Cognitive Load- Intrinsic Load and Extraneous Load, Machine Learning and Adaptive Interfaces, Types of Adaptive Interfaces- Content Adaptation, Interface Adaptation and Behavioral Adaptation, Technique-Machine Learning Models.	07
2	**Conceptualizing and Cognitive Interaction:** Exploring cognition in interaction design and Applying cognitive frameworks, Smart Assistive Technologies for Accessibility, Categories of Smart Assistive Technologies- Cognitive & Communication Assistance, Augmentative Communication Devices, Affective Computing Emotion Recognition, Stress and Fatigue Detection in HCI, Methods of Stress and Fatigue Detection in HCI- Physiological Signals-Based Detection and Machine Learning-Based Detection.	07
3	**Designing Interactive Systems:** Speech and multimodal interaction in HCI, Applications of Multimodal Interaction, AI-driven interactions, AI-driven interaction Methods- Conversational AI & Voice Interfaces, Visualization-Based Interactions, Predictive & Context-Aware Interactions, Ubiquitous computing- Technologies Enabling Ubiquitous Computing like Edge Computing, Digital Twins, 5G and Wireless Communication, intelligent environments, Speech and Voice Interaction Systems.	06
4	**Interaction Models and Frameworks:** Natural Language Processing for HCI, NLP Techniques in HCI-Rule-Based NLP, Deep Learning-Based NLP in HCI, Adaptive User Interfaces and Universal Usability, Ethical Considerations in design, Frameworks & Guidelines for Ethical HCI, Ethical & Responsible AI, AI regulations for fair Human interactions- General Data Protection Regulation, The Algorithmic Accountability Act and UNESCO AI Ethics Guidelines.	06
5	**Advanced Interaction Techniques:** Natural User Interfaces (NUIs), Augmented Reality (AR) & Virtual Reality (VR) in HCI, Direct interaction using neural signals, AI-driven interfaces that adjust based on user behavior, Gesture-Based Interfaces- Vision, Sensor, and Electromyography (EMG) Based Gesture Recognition, Brain-Computer Interfaces, Brain-Computer Interfaces Technologies- Active BCI, Passive BCI and Hybrid BCI.	07
6	**Quantum Computing and Human Computer Interaction** Introduction to Quantum Computing in HCI, Differences between classical and quantum computing, Quantum-enhanced algorithms for AI-driven interfaces, how quantum computing can improve natural language processing (NLP) and machine learning (ML) in HCI, Quantum cryptography and its implications for HCI, Ethical considerations in AI-driven HCI with quantum processing.	06
	Total	39

List of Laboratory Experiments:	
Sr. No.	**Suggested Experiments**
1	To Implement an AI-driven adaptive UI that changes based on user behavior using Python or TensorFlow/PyTorch.
2	To Implement a hand gesture-based interface using OpenCV.
3	To Evaluate accuracy and user experience in speech-based systems based on Test voice commands.
4	To Develop a voice and gesture-based multimodal interface by using Google Speech-to-Text API.
5	To investigate how Brain-Computer Interfaces (BCIs) enable users to control a UI using neural signals.
6	To build a chatbot using Natural Language Processing (NLP) for user interaction using Python.
7	To conduct a usability analysis of an existing system (e.g., ATM, online form) using Norman's model.
8	To Analyze how users visually navigate a web interface by using eye-tracking to determine areas of high attention.
9	To Explore how quantum computing enhances speech and text processing for voice assistants and chatbots.
10	To Explore Quantum-enhanced machine learning can analyze facial expressions and emotions in real-time.
11	To Evaluate how quantum-enhanced computing can optimize UI response times by using AI-driven interface prediction Algorithm.
12	To develop a simple keystroke-based authentication system and analyze user data patterns.
13	To build a basic AR/VR application using Unity and analyze usability, (Consider any Domain for Application like Education system, Hospital, Library and Hotel systems).
14	To Use Figma or Adobe XD to create a wireframe for a mobile banking app based on user personas
15	To create a simple AR-based educational application using Unity and Vuforia SDK.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2004.
2. Wilbert O. Galitz, The Essential Guide to User Interface Design, Wiley Publication.
3. Sharp, H, Y, Rogers, J, Preece, INTERACTION DESIGN beyond human-computer interaction, John Wiley & Sons (2019)
4. Jenny Preece, Yvonne Rogers, Helen Sharp, Interaction Design: Beyond Human-Computer Interaction, (2nd Edition, 2011), Wiley India ISBN: 9788126512867.
5. Rogers, Interaction Design: Beyond Human-Computer Interaction, New Delhi Wiley 2011, ISBN: 9788126544912.

Reference Books:

1. Alan Cooper, Robert Reimann, David Cronin, About Face 3: Essentials of Interaction Design, Wiley Publication.
2. Donald A. Norman, The Design of Everyday Things, Basic Books; Revised and Expanded edition (November 5, 2013).
3. SEARS, ANDREW, Human-Computer Interaction: Fundamentals, CRC PRESS 2009.

Web resources:

1. Introduction Gestalt Principles:
   https://www.interaction-design.org/literature/topics/gestalt_principles
2. Memory and Learning in HCI:
   https://www.slideshare.net/slideshow/chapter-3-hci-human-factors-cognition-perceptionpptx/255074860
3. AI-Driven Interactions:
   https://globalresearchandinnovationpublications.com/HCI/article/view/74
4. Interaction Models and Frameworks:
   https://itcraftapps.com/blog/a-guide-to-designing-application-interaction-models/#:~:text=Interaction%20models%20describe%20the%20relationship,satisfying%20experience%20for%20the%20user.
5. Adaptive User Interfaces and Universal Usability:
   https://www.sciencedirect.com/science/article/abs/pii/S1574013721000034

Online Courses: NPTEL / Swayam

1. Introduction to Human Computer Interaction, By Prof. Ponnurangam Kumaraguru, IIT Delhi https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs23
2. Human Computer Interaction, By Prof. Rajiv Ratn Shah, IIT Delhi. https://onlinecourses.nptel.ac.in/noc25_cs38/preview
3. User-centric Computing For Human-Computer Interaction By Prof. Samit Bhattacharya IIT Guwahati. https://onlinecourses.nptel.ac.in/noc25_cs72
4. Augmenting Design Thinking with Human-Computer Interaction, By Prof. Sonal Atreya, IIT Roorkee. https://onlinecourses.nptel.ac.in/noc25_de09/preview
5. Design & Implementation of Human-Computer Interfaces, By Prof. Samit Bhattacharya, IIT Guwahati. https://onlinecourses.nptel.ac.in/noc22_cs125/preview

Evaluation Scheme:

Continuous Assessment (A):

Theory:

1. One term test of 20 marks and one term test/presentation/assignment/course project/Group discussion/any other of 15 marks will be conducted during the semester.
2. Total duration allotted for writing Term Test 1 paper is 1 hr.
3. Total duration allotted for writing Term Test 2 paper is 45 minutes.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks

ii. Journal documentation (Write-up and/or Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Semester End Examination (B):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral examination will be based on the entire syllabus including, the practical's performed during laboratory sessions

Prepared by | Checked by | Head of the Department | Vice Principal | Principal