**DEPARTMENT OF INFORMATION TECHNOLOGY, NITK SURATHKAL**

**Course Plan for IT351: Human Computer Interaction (3-0-2)4 (January - May 2021)**

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| **Faculty in-charge** | **Prof G. Ram Mohana Reddy** | **Year and Semester** | **January - May 2021** |
| **Course Code:** | **IT351** | **Course Name:** | **Human Computer Interaction** |
| **Core/Elective/MLC:** | **Core** | **L-T-P:** | **(3-0-2): 4** |
| **Pre-requisites:** |  | **Contact Hours:** | **3 Th. Classes per Week,**  **2 Lab Classes per Week**  **Virtual Class (Online through IRIS (Moodle/BBB and MS Team))**  **Online Lab Assignment/Quiz/Test (through Moodle/MS Team)** |
| **Type of Course:**  **(Lecture/Tutorial/Seminar/Project)** | **Lecture** | **Grading Scheme:** | **Weekly Lab Assignments - 20% (15% for Assignments + 5% for Quiz)**  **Mid Semester Examination - 15% (Online Quiz/Test through Moodle)**  **Mini / Minor Course Project - 40% (*Design and Implementation: 15%;***  ***Results, Analysis and Discussion: 10%;***  ***Innovation: 10%; Project Report: 5%*)**  **End Semester Examination - 25% (Online Quiz/Test through Moodle)** |
| **Course Description:** HCI is a multidisciplinary field involving inputs from computer science, behavioural sciences and design sciences. It studies the interactions between a human and computer. Interactions between humans and computers happen through interfaces on devices be they physical or virtual. HCI involves hardware and software. The design of physical input devices such as keyboards, mouse, joystick, touch screen, etc as well as graphics on screens are of interest. The definition given by the Association of Computing Machinery – ACM states that HCI is "a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them".  Usability Engineering is concerned with HCI and specifically with conceptualizing, designing, constructing and prototyping interfaces as in software and as in hardware (products). Achieving highest possible user satisfaction in the use of the product is the prime aim. Human beings and their limitations both cognitive as well as physical are researched and engineered into the designs. Graphical user interface, gestural and sound interfaces; vision and perceptual interfaces, brain and thought operated interactions are some of the areas on which usability engineers work upon. Usability engineering inputs come from cognitive sciences and engineering sciences as well as computer sciences. Usability engineers are both creative designers as well as engineers building products. Usability Engineering is new and emerging academic area of specializations and incorporates in its fold sub areas in Creative Design such as Interaction Design (ID), User Experience Design (UXD) and User Centered Design (UCD).  The course covers HCI principles; The Process of Developing Interactive Systems: Models, Theories, Design Process and Evaluation; Interacting with Computers: Vision, Graphic Design, and Visual Displays -Touch, Gesture and Marking, Speech, Language and Audition; Psychology and Human Factors. It covers understanding of HCI tools for audio, visual, animation and other sensors related to IoT. Human Information Processing, Designing to fit human capabilities, Ubiquitous Computing, Augmented /Virtual /Mixed Realities and Research Trends.  ***Course Educational Objectives (CEOs)*:**  *1. To provide the students for basic understanding of Human Computer Interaction*   * *Concepts and Fundaments of HCI, different kinds of interaction scenarios and design process.* * *Design techniques for different HCI systems, different models for communication and theories to understand which will help in building applications.*   *2. To provide students for understanding the novel design and tools for building HCI applications with respect to Effective interfaces and Affective user experience*s.   * *Design techniques for different HCI systems.* * *Tools and models for implementing the HCI applications.* * *Use of ambient, wearable and vision based sensors in IoT and smart building/smart class/smart campus/smart city/smart home applications.*   *3. To provide the basic understanding of HCI tools like Google Glass, Kinect, Myo, Leap Motion, Wiimote, Ocolus Rift, Sense 3D, Guile 3D Studio, Arduino UNO, YUN and other environmental sensors for the design and implementation of HCI applications.*   * *Tools for Speech, Image, Animations and other Arduino Based Environmental Sensors* * *Application Case Studies using HCI Tools (Smart Building / Campus / Class / City / Home, IoT, Health Care, Socialmedia, Learning Environments, Sports & Games and so on).*   *4. Ubiquitous Computing, Augmented / Virtual / Mixed Realities*   * *Introduction to Ubiquitous Computing.* * *Groupware, Augmented Virtual and Mixed Realities.*   *5. To provide students for understanding the human psychology and context aware processing.*   * *Study of human cognition nature and status of mind.* * *Building intelligent systems for different kinds of people.* * *Study of stress analytics, behavior analytics and emotional analytics based on the text, audio and video with respect to human centered computing*   *6. To provide students for understanding the research issues in HCI. Future Trends in HCI and its importance in different fields.*  ***Course Plan:***  ***Week 1:*** Introduction to fundamentals of Human Computer Interaction.  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, User Experience Design (UXD)  ***Week 2:*** Humans in HCI, Computers in HCI, Designing Human-Computer Interactions, Designing for Diversity The Development Process, Emerging Phenomena in HCI.  Visual Design Principles for Usable Interfaces, Globalization, Localization, and Cross-Cultural User-Interface Design, Speech and Language Interfaces, Applications, and Technologies, Multimedia User Interface Design, Multimodal Interfaces, HCI in Health Care, Why We Play: Affect and the Fun of Games, Older Adults/IT: Opportunities and Challenges, HCI for Kids, Computing Technologies for Deaf and Hard of Hearing Users, HCI and Software Engineering for User Interface Plasticity, Augmenting Cognition in HCI: 21st Century Adaptive System Science and Technology, Social Networks and Social Media, HCI for Development: Changing HCI to Change the World.  ***Week 3, 4, 5, 6:*** Effective Interfaces and Affective User Experiences.  Fundamentals of HCI Tools like Google Glass, Kinect, Oculus Rift, Myo, Leap Motion, Sense 3D, Guile 3D Studio, Face-Shift and its Implementation. Use of ambient, wearable and vision based sensors and IoT appplications for smart building, smart campus, smart class, smart city, smart home etc.  ***Week 7, 8, 9, 10:*** Case Studies using the HCI Tools for Augmented Reality, Virtual Reality & Mixed Reality, Affetive Computing, Learning Environments, GAIT analysis, Human Activity Recognition, Smart Building, Smart Class, Smart Campus, Smart City, Smart Home, IoT, Social Multimedia, Learning Environments, Healthcare Analytics, Context-Aware Applications and it’s perspective as well as impact.  ***Week 11, 12:*** Case Studies using other HCI tools for Haptic, Speech, Gesture and IoT based sensors (like Arduino UNO, YUN and other environmental sensors).  ***Week 13, 14****:* Case Studies of Cognitive Models and Ubiquitous Computing.  **Course Outcomes (COs):**  CO1: Design and Development of HCI Systems using Principles of Interactive Design, Design Rules, Implementation Support, Evaluation Techniques, Universal Design, User Support including the Effective and Affective User Experience.  CO2: Design and Development of HCI Systems using Tools like Google Glass, Kinect, Oculus Rift, Myo, Leap Motion, Sense 3D, Guile 3D, Face-Shift, Arduino UNO, YUN etc.  CO3: Design and Deveopment of HCI Systems using the basic concepts of Groupware, Ubiquitous Computing, Augmented Reality, Virtual Reality & Mixed Reality and Applications.  CO4: Understanding/Recognizing Ethical Issues such as Copyright infringement while developing HCI systems using Principles of Human Psychology and Context-aware Processing.   * **Course Mini/Minor Project Evaluation Components: (40%)**   + Design Methodology and Implementation (15 Marks)   + Results, Analysis and Discussion (10 Marks)   + Innovation & Creativity (10 Marks)   + Project Report (5 Marks)   **Assessment COs Matrix:**   |  | | --- | | **Assessment Type** | | **Course Outcomes (COs)** | | | | | **CO1** | **CO2** | **CO3** | **CO4** | | Mid Semester Examination | X |  |  | X | | **End Semester Examination** | X | X | X | X | | Weekly Lab Assignments | X | X |  |  | | **Mini/Minor Project** |  | X | X | X |   **Recommended References:**   1. Julie A. Jacko, The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications, 3rd Edition, CRC Press, 2012. 2. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", Association for Computing Machinery and Morgan and Claypool Publishers, 2015. 3. Kelly S. Hale, Kay M. Stanney (Eds.), "Handbook of Virtual Environments: Design, Implementation, and Applications", CRC Press, Second Edition, 2015. 4. Samit Bhattacharya, "Human-Computer Interaction: User Centric Computing for Design", McGraw Hill Education (India) Pvt. Ltd, First Edition, 2019. 5. Jenny Preece, Helen Sharp, Yvonne Rogers- Interaction Design: Beyond Human Computer Interaction, John Wiley and Sons Ltd, Fifth Edition, 2019. 6. Bowman, Doug A.; Kruijff, Ernst; LaViola Jr., Joseph J.; Poupyrev, Ivan, "3D User Interfaces: Theory/Practice", Addison-Wesley, 2nd Edition, 2017. 7. Alan Dix, Janet Finlay, Gregory Abowd and Russell Beale, Human Computer Interaction, Pearson Education and Prentice Hall, Third Edition, 2004. 8. Philip Kortum, HCI beyond the GUI: Design for Haptic, Speech, Olfactory and Other Nontraditional Interfaces, Morgan Kaufmann/Elsevier, 2008. 9. Ben Shneiderman, Catherine Plaisant, Designing the User Interface: Strategies for Effective HCI, 5th Edition, Pearson Education, 2009. 10. IEEE, ACM, Elsevier, Springer Journals and Conferences Papers on HCI, Affective Computing, and Augmented/Virtual/Mixed Realities. 11. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/index.htm> 12. <https://ocw.mit.edu/courses/media-arts-and-sciences/mas-630-affective-computing-fall-2015/index.htm> 13. <https://www.coursera.org/courses?query=human%20computer%20interaction> 14. NPTEL Course on User centric Computing for HCI, IIT Guwahati (<https://nptel.ac.in/courses/106/103/106103220/>) 15. NPTEL Course on HCI, IIT Guwahati (<https://nptel.ac.in/courses/106/103/106103115/>) 16. NPTEL Course on HCI, IIIT Delhi (<https://nptel.ac.in/courses/106/106/106106177/>) 17. Shakshat Virtual Lab, IIT Guwahati (<https://hci-iitg.vlabs.ac.in/>) 18. Virtual Human Interaction Lab, Stanford University (<https://vhil.stanford.edu/>)   ***Detailed Course Objectives and Outcomes:***   |  |  |  |  | | --- | --- | --- | --- | | ***Strategic Objective*** | ***Course Outcome*** | ***Course Activity*** | ***Course Assessment*** | | Knowledge | ***CO1:*** Understand the importance of sound theoretical knowledge in Human Computer Interaction. | Present examples  Involving Real World Applications of HCI. | Make students to implement the  real life applications of HCI. | | Learning | ***CO2:*** Understand the basic principles of interactive design, design rules, implementation support, evaluation techniques, universal design and user support w.r.t. Effective Interfaces and Affective User Experiences. | Explain the important concepts and designs. | Make students to learn the  HCI designs by casestudies. | | Problem Solving | ***CO3*:** Understand the working principles of HCI tools like Kinect, Oculus Rift, Myo, Leap Motion, Sense 3D, Guile 3D Studio, Face-Shift, Arduino UNO, YUN and other environmental sensors. | Discuss/Analyze  various generic and  specific application environments. | Make students present such extensions and special cases as part of assignment. | | Teamwork | ***CO3:*** Understand the basic concepts of Groupware, Ubiquitous Computing, Augmented Reality, Virtual Reality & Mixed Reality and their Applications. | Encourage students  towards Team Projects. | Form teams of students and ask  them to present their project topics. | | Ethics | ***CO4*:** Recognize the ethical issues such as Copyright infringement while developing systems using HCI principles and Understand the fundamentals of Human Psychology and Context-aware Processing. | Educate students the importance of academic integrity and ethics | Enforce strict rules and avoid breaches | | | | |
| **Course Instructor: TAs:**  Prof. Ram Mohana Reddy Guddeti Mrs. Priya Darshini, Mrs. Thanmayee, Mr. Natesh B V, Mr. Ranjith Kolkar, Mrs. Rashmi, Mr. Ramu | | | |