UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Elements of Human-technology Interaction

2122-2-F5105P029

Learning area

Applied Experimental Psychological Sciences

Learning objectives

Knowledge and understanding

- To develop understanding of the interaction between people and technology, with focus on new technological developments such as virtual reality, augmented reality, and interactive apps. Knowledge of how these tools can be used as a means to create contexts within which human behaviour and cognition can be studied as well as of how people approach and interact with novel technologies.

Applying knowledge and understanding

- Students will be able to apply basic concepts of human-technology interaction to everyday relevant issues.

Contents

• This course provides an overview of the field of human-technology interaction, with a focus on the application of knowledge to the design life cycle.

• Students will be involved in a real software development project: they will design, create and evaluate a mobile app or a 3D interactive experience using a simple visual programming environment in project.

• The course will provide students with tools and techniques for creating, prototyping and improving interactions in different fields encompassing new technologies such as ubiquitous computing, virtual and augmented reality.

• By the end of the course, students will have learned some useful techniques and gained an understanding of systematic procedures for creating usable and useful designs and systems.

• The course is NOT programming intensive.

Learning outcomes:

• Being able to design effective interactions between humans and technology (i.e., computers, wearable devices, car systems, mobile phones, websites, apps, etc.) in specific areas (medical, entertainment, educational, etc.).

• Being able to apply design principles and knowledge from research to a new interaction problem.

• Being able to go through the iterative process of needs finding, prototyping, evaluating and revising.

• Being able to discover the goal behind a design (e.g., usability, research, behavioural change, entertainment, etc.) and to measure the effectiveness in achieving it.

• Being able to build a prototype for the evaluation of interactions with a mobile app.

Detailed program

1. Introduction.

• The place of HTI between UI, UX, HCI, IxD, Accessibility and inclusiveness

• The design cycle.

• Describe what and who is involved in the process of interaction design.

• Difference between good and poor interaction design.

• Applications and examples

2. Recap of Design Principles (especially for students who did not attend Cognitive Ergonomics or Applied Neuroscience courses)

• Identifying a task

• Human abilities and cognitive load.

• Theories, principles and heuristics: affordances, cognitive modelling, human needs and motivation, activity theory and situated cognition.

• Explain the main principles and advantages of a user-centered approach.

• Cognitive aspects of interaction design

Human Error

Attention and multitask performance

Memory limits and interaction design

Compare cognitive frameworks applied to HCI.

Mental models

• Emotional interaction

Emotions and user experience.

Emotion recognition and and its applications

Expressive Interfaces and Emotional Design

Affective Computing and Emotional AI

• Interaction Design in Practice

AgileUX

Interaction Design Patterns

Open Source Resources

Tools for Interaction Design

• Requirements Elicitation

Prepare and run data gathering program, interviews and questionnaires preparation and execution

Analyze and present collected data

Use data gathering techniques to discover requirements

• Prototyping

Translation of models and requirements in prototypes

Types of prototypes and models: verbal, paper, Wizard of Oz, wireframe, physical prototype, personas, user profiles, timelines, scenarios, storyboards, video prototyping, user modeling.

• Evaluation

• Types of Evaluation: Qualitative, Empirical and Predictive evaluations.

• Challenges of Evaluation

• Inspections: Heuristic Evaluation and Walk-Throughs

• Agile methods: A/B testing, live prototyping.

3. Social Interaction

• Social mechanisms used to communicate and collaborate.

• Social affordances

• Social presence means.

• Persuasive Technologies and Behavioral Change

• Technological support for collaboration and group participation.

• Collect, analyze and visualize data on large scale (social media) and its social impact

• New social phenomena resulting from “hyper-connection”

4 Interaction personalization

• Recommender systems

• Companions

• Search engine optimization

• Simple website recommendations without coding

5. Creating a mobile app prototype

• Research, design, and evaluation for real.

• Elements of Computational thinking: expressing problems and their solutions in ways that a computer could execute.

• Introduction to code free APP developing tools.

6 Voice Interaction System Design

• What Is a Conversation

• Natural Language Interfaces

• Conversational UX Design Process

• Conversational UX Patterns

• Introduction to code free Conversational System prototyping tools

7 Interaction in Other Realities

• Introduction to code free immersive interaction systems prototyping tools

• Hardware

The Convergence of AR and VR

VR Input Devices

HMD System Calibration

HMD Latency Reduction

• VR Perception

Perceptual Constancies, Adaptation, Attention

Perceptual Stability, Attention, and Action

Distal and Proximal Stimuli

Sensation vs. Perception

Bottom-Up and Top-Down Processing

Limited Field of View, Exploration and Saliency

Motion Perception

• VR Interaction Concepts, Patterns and Techniques

Immersion, Presence, and Reality Trade-Offs

Interaction Fidelity

Proprioceptive and Egocentric Interaction

Reference Frames

Sickness and Fatigue

Visual-Physical Conflict and Sensory Substitution

Interaction Selection, Manipulation, Viewpoint Control, Indirect Control, and Compound Patterns

8 Human Robot Interaction

• Introduction to code free HRI prototyping tools (in simulation for the moment)

• Hardware: success and failures

• Anthropomorphism Applications in Interaction Design and Human Robot Interaction

• Theory of mind and intention recognition

• Spatial Interaction

• Nonverbal Interaction

• Verbal Interaction

• Robots in Society

9. Interaction design lessons from science fiction movies.

• Some interfaces that appeared in sci-fi movies and T.V. shows will be discussed and evaluated in the class. Students will try to answer the following questions: Should they work that way? How could they be improved?

10. Latest news from HTI

• Students talk to the class about some recent documents of their choice and approved by the instructo

Prerequisites

Good knowledge of the basis of Psychology enables a more aware use of the course contents, in particular: perception, memory, learning; research methods, experimental design. Students lacking such knowledge are encouraged to ask for a list of basic references that will be supplied during the course. Students are strongly recommended to attend Cognitive Ergonomics or Applied Neuroscience before taking this course.

Teaching methods

Teaching mixes frontal lessons with active discussion on case studies and research practice.

Students are encouraged to design and test interactive systems starting from the introductory material provided by the instructor

Course attendance is strongly recommended in order to take advantage of interactive lessons, research activity and hands-on with technology.

****Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.****

Assessment methods

For course-attending students: the assessment includes one multiple-response test (during the course) on the course material (slides, papers, hands-on experiences), an oral presentation of a research paper (during the course), an oral presentation of the class project at the end of the course. Presentations can be organized as a

group of at most two students, in which case the group has to present two papers. Course-attending students who prefer an alternative to the oral presentation of a research paper and/or the participation in the project can opt for an oral interview.

For non-attending students: the assessment includes an oral interview on the course material (slides and papers) and a project (at the end of the course).

Multiple-response tests will assess the student’s understanding of the theoretical background presented in the class. Oral presentation of research papers will assess the abilities to understand research papers, select the most salient information, and present data. With the project students will be able to apply their understanding of the subject and test their soft skills such as problem solving and managing time.

Textbooks and Reading Materials

- The material will be downloadable from eLearning and from the Bicocca digital library.
- Slides discussed during the lessons in PDF format will be downloadable from eLearning.
- Papers and book chapters in PDF will be downloadable from the Bicocca Digital Library and/or from eLearning.
- Suggested books:

  Interaction Design beyond human computer interaction

  The Encyclopedia of Human-Computer Interaction, 2nd Ed.

  The VR Book Human-Centered Design for Virtual Reality

  Unity Virtual Reality Projects

  Conversational UX Design: A Practitioner's Guide to the Natural Conversation Framework

  Research methods in human computer interaction
- Real life examples: videos, hands-on with prototypes and final products.
- Practice tasks: Collaborative design with prototyping tools and evaluation