# University of Engineering and Technology
# School of Computer Science
# Syllabus of Course – Academic Period 2017-I

1. **Code and Name:** CS2H1. Computer Human Interaction
2. **Credits:** 3
3. **Hours of theory and Lab:** 1 HT; 4 HP;
4. **Professor(s)**
   Meetings after coordination with the professor
5. **Bibliography**


[Bux07] Bill Buxton. *Sketching User Experiences: Getting the Design Right and the Right Design*. Morgan Kaufmann Publishers Inc., 2007.

[Dix+04] Alan Dix et al. *Human-computer Interaction*. 3 ed. Prentice-Hall, Inc, 2004.

[Joh10] Jeff Johnson. *Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules*. 3 ed. Morgan Kaufmann Publishers Inc., 2010.

[LS06] M. Leavitt and B. Shneiderman. *Research-Based Web Design & Usability Guidelines*. Health and Human Services Dept, 2006.

[Mat11] Lukas Mathis. *Designed for Use: Create Usable Interfaces for Applications and the Web*. Pragmatic Bookshelf, 2011.

[Nor04] Donald A. Norman. *Emotional Design: Why We Love (or Hate) Everyday Things*. Basic Book, 2004.

[RS11] Y. Rogers and J Sharp H. & Preece. *Interaction Design: Beyond Human-Computer Interaction*. 3 ed. John Wiley and Sons Ltd, 2011.

[Sto+05] D. Stone et al. *User Interface Design and Evaluation*. Morgan Kaufmann Series in Interactive Technologies, 2005.

[WW11] D. Wigdor and D. Wixon. *Brave NUI World: Designing Natural User Interfaces for Touch and Gesture*. Morgan Kaufmann Publishers Inc, 2011.


6. **Information about the course**

   (a) **Brief description about the course** Language has been one of the most significant creations of humanity. From body language and gesture, through verbal and written communication, to iconic symbolic codes and others, it has made possible complex interactions Among humans and facilitated considerably the communication of information. With the invention of automatic and semi-automatic devices, including computers, The need for languages or interfaces to be able to interact with them, has gained great importance. The utility of the software, coupled with user satisfaction and increased productivity, depends on the effectiveness of the User-Computer Interface. So much so, that often the interface is the most important factor in the success and failure of any computer system. The design and implementation of appropriate Human-Computer Interfaces, which in addition to complying with the technical requirements and the transactional logic of the application, consider the subtle psychological implications, sciences and user facilities, It consumes a good part of the life cycle of a software project, and requires specialized skills, both for the construction of the same, and for the performance of usability tests.

   (b) **Prerrequisites:** CS393. Sistemas de Infomación. ($6^{to}$ Sem)

   (c) **Type of Course:** Mandatory

7. **Competences**

   - Know and apply criteria of usability and accessibility to the design and construction of human-computer interfaces, always looking for technology to adapt to people and not people to technology.

- That the student has a vision focused on the user experience by applying appropriate conceptual and technological approaches.
- Understand how emerging technology makes possible new styles of interaction.
- Determine the basic requirements at the interface level, hardware and software for the construction of immersive environments.

**8. Contribution to Outcomes**

**b)** An ability to design and conduct experiments, as well as to analyze and interpret data. (**Familiarity**)

**c)** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. (**Assessment**)

**d)** An ability to function on multidisciplinary teams. (**Usage**)

**g)** The broad education necessary to understand the impact of computing solutions in a global, economic, environmental, and societal context. (**Familiarity**)

**o)** Improve the conditions of society by putting technology at the service of the human being. (**Familiarity**)

**9. Competences (IEEE)**

**CS8.** Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, multimedia systems and mobile systems..⇒ **Outcome b**

**C7.** Being able to apply the software engineering principles and technologies to ensure that software implementations are robust, reliable, and appropriate for their intended audience.⇒ **Outcome c**

**C9.** Understanding of computing's limitations, including the difference between what computing is inherently incapable of doing vs. what may be accomplished via future science and technology.⇒ **Outcome o**

**C15.** Understanding of the essential concept of process as it relates to professional activity, especially the relationship between product quality and the deployment of appropriate human processes during product development.⇒ **Outcome g**

**CS10.** Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems. This should include tools for software control including version control and configuration management.⇒ **Outcome d**

**10. List of topics**

1. Foundations
2. Factores Humanos
3. User-centered design and testing
4. Designing Interaction
5. New Interactive Technologies
6. Collaboration and communication

**11. Methodology and Evaluation**
**Methodology**:

**Theory Sessions:**
The development of the theoretical sessions is focused on the student, through his active participation, solving problems related to the course with the individual contributions and discussing real cases of the industry. The students will develop throughout the course a project of application of the tools received in a company.

**Lab Sessions:**
Practical sessions are held in the laboratory. Laboratory practices are performed in teams to strengthen their communication. At the beginning of each laboratory the development of the practice is explained and at the end the main conclusions of the activity in group form are highlighted.

**Oral Presentations :**
Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

**Reading:**
Throughout the course different readings are provided, which are evaluated. The average of the notes in the readings is considered as the mark of a qualified practice. The use of the UTEC Online virtual campus allows each student to access the course information, and interact outside the classroom with the teacher and with the other students.
**Evaluation System:**

.

**12. Content**

| **Unit 1: Foundations (8)** | |
|---|---|
| **Competences Expected: CS8** | |
| **Learning Outcomes** | **Topics** |
| • Discuss why human-centered software development is important [Familiarity]<br>• Define a user-centered design process that explicitly takes account of the fact that the user is not like the developer or their acquaintances [Familiarity]<br>• Summarize the basic precepts of psychological and social interaction [Familiarity]<br>• Develop and use a conceptual vocabulary for analyzing human interaction with software: affordance, conceptual model, feedback, and so forth [Familiarity] | • Contexts for HCI (anything with a user interface, e.g., webpage, business applications, mobile applications, and games)<br>• Usability heuristics and the principles of usability testing<br>• Processes for user-centered development, e.g., early focus on users, empirical testing, iterative design<br>• Principles of good design and good designers; engineering tradeoffs<br>• Different measures for evaluation, e.g., utility, efficiency, learnability, user satisfaction |
| **Readings :** [Dix+04], [Sto+05], [RS11] | |

| **Unit 2: Factores Humanos (8)** | |
|---|---|
| **Competences Expected: CS8** | |
| **Learning Outcomes** | **Topics** |
| • Create and conduct a simple usability test for an existing software application [Familiarity] | • Cognitive models that inform interaction design, e.g., attention, perception and recognition, movement, and memory; gulfs of expectation and execution<br>• Physical capabilities that inform interaction design, e.g., color perception, ergonomics<br>• Accessibility, e.g., interfaces for differently-abled populations (e.g., blind, motion-impaired)<br>• Interfaces for differently-aged population groups (e.g., children, 80+) |
| **Readings :** [Dix+04], [Sto+05], [RS11], [Mat11], [Nor04] | |

**Unit 3: User-centered design and testing (16)**

**Competences Expected: C7, CS8, CS10**

| Learning Outcomes | Topics |
|---|---|
| • Conduct a quantitative evaluation and discuss/report the results [Familiarity]<br>• For an identified user group, undertake and document an analysis of their needs [Familiarity]<br>• Discuss at least one national or international user interface design standard [Familiarity]<br>• Explain how user-centred design complements other software process models [Familiarity]<br>• Use lo-fi (low fidelity) prototyping techniques to gather, and report, user responses [Usage]<br>• Choose appropriate methods to support the development of a specific UI [Assessment]<br>• Use a variety of techniques to evaluate a given UI [Assessment]<br>• Compare the constraints and benefits of different evaluative methods [Assessment] | • Approaches to, and characteristics of, the design process<br>• Functionality and usability requirements<br>• Techniques for gathering requirements, e.g., interviews, surveys, ethnographic and contextual enquiry<br>• Techniques and tools for the analysis and presentation of requirements, e.g., reports, personas<br>• Task analysis, including qualitative aspects of generating task analytic models<br>• Consideration of HCI as a design discipline<br>– Sketching<br>– Participatory design<br>– Sketching.<br>– Participatory Design.<br>• Prototyping techniques and tools, e.g., sketching, storyboards, low-fidelity prototyping, wireframes<br>• Low-fidelity (paper) prototyping<br>• Quantitative evaluation techniques, e.g., keystroke-level evaluation<br>• Evaluation without users, using both qualitative and quantitative techniques, e.g., walkthroughs, GOMS, expert-based analysis, heuristics, guidelines, and standard<br>• Evaluation with users, e.g., observation, think-aloud, interview, survey, experiment<br>• Challenges to effective evaluation, e.g., sampling, generalization<br>• Reporting the results of evaluations<br>• Internationalization, designing for users from other cultures, cross-cultural |

**Readings :** [Dix+04], [Sto+05], [RS11], [Mat11], [Bux07]

| **Unit 4: Designing Interaction (8)** | |
|---|---|
| **Competences Expected: CS8, CS15** | |
| **Learning Outcomes** | **Topics** |
| • Create a simple application, together with help and documentation, that supports a graphical user interface [Usage] | • Principles of graphical user interfaces (GUIs)<br>• Elements of visual design (layout, color, fonts, labeling)<br>• Handling human/system failure<br>• User interface standards<br>• Presenting information: navigation, representation, manipulation<br>• Interface animation techniques (e.g., scene graphs)<br>• Widget classes and libraries<br>• Internationalization, designing for users from other cultures, cross-cultural<br>• Choosing interaction styles and interaction techniques |
| **Readings :** [Dix+04], [Sto+05], [RS11], [Joh10], [Mat11], [LS06] | |

**Unit 5: New Interactive Technologies (8)**

**Competences Expected: C9**

| Learning Outcomes | Topics |
|---|---|
| • Describe when non-mouse interfaces are appropriate [Familiarity]<br>• Understand the interaction possibilities beyond mouse-and-pointer interfaces [Familiarity]<br>• Discuss the advantages (and disadvantages) of non-mouse interfaces [Usage]<br>• Describe the optical model realized by a computer graphics system to synthesize stereoscopic view [Familiarity]<br>• Describe the principles of different viewer tracking technologies [Familiarity]<br>• Determine the basic requirements on interface, hardware, and software configurations of a VR system for a specified application [Assessment] | • Choosing interaction styles and interaction techniques<br>• Approaches to design, implementation and evaluation of non-mouse interaction<br>– Touch and multi-touch interfaces<br>– Shared, embodied, and large interfaces<br>– New input modalities (such as sensor and location data)<br>– New Windows, e.g., iPhone, Android<br>– Speech recognition and natural language processing<br>– Wearable and tangible interfaces<br>– Persuasive interaction and emotion<br>– Ubiquitous and context-aware interaction technologies (Ubicomp)<br>– Bayesian inference (e.g. predictive text, guided pointing)<br>– Ambient/peripheral display and interaction<br>• Output<br>– Sound<br>– Stereoscopic display<br>– Force feedback simulation, haptic devices<br>• System architectures<br>– Game engines<br>– Mobile augmented reality<br>– Flight simulators<br>– CAVEs<br>– Medical imaging |

**Readings :** [Dix+04], [Sto+05], [RS11], [WW11], [Mat11]

| **Unit 6: Collaboration and communication (8)** | |
|---|---|
| **Competences Expected: CS8, CS9** | |
| **Learning Outcomes** | **Topics** |
| • Describe the difference between synchronous and asynchronous communication [Familiarity]<br>• Compare the HCI issues in individual interaction with group interaction [Familiarity]<br>• Discuss several issues of social concern raised by collaborative software [Usage]<br>• Discuss the HCI issues in software that embodies human intention [Assessment] | • Asynchronous group communication, e.g., e-mail, forums, social networks<br>• Social media, social computing, and social network analysis<br>• Online collaboration, 'smart' spaces, and social coordination aspects of workflow technologies<br>• Online communities<br>• Software characters and intelligent agents, virtual worlds and avatars<br>• Social psychology |
| **Readings :** [Dix+04], [Sto+05], [RS11] | |