Universidad Carlos III de Madrid

Design of interactive systems

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Principles of Informatics Engineering
- User Interfaces

OBJECTIVES

1. Theoretical knowledge on the development of interactive systems (PO a) (CECC1, CECC6)
2. Capacity to define usability and utility requirements, designing interactive system for everyone according to a set of specifications (PO a, e) (CECC6)
3. Capacity to design, implement and evaluate interactive systems, applying both usability and accessibility guidelines as well as respecting standards and laws (PO a, c, e) (CECC1, CECC6)
4. Teamwork, taking different roles and proving its leadership (PO d) (CECC6)
5. Capacity to integrate both Information and Communications technologies as well as business processes based on interactive systems in order to satisfy user needs (PO a, e) (CECC1, CECC6)
6. Capacity to communicate knowledge, skills, and capabilities (PO g) (CECC6)

* ABET Program Outcomes
a. An ability to apply knowledge of mathematics, science and engineering.
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.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
g. An ability to communicate effectively.

* ACREDITA+ Competences
CECC1. Ability to acquire knowledge on computational models and principles as well as to apply such knowledge to understand, evaluate, model, and develop new theories, applications and devices related to information systems.
CECC6. Ability to design and evaluate interactive systems and their usage to solve human-computer interaction design problems

DESCRIPTION OF CONTENTS: PROGRAMME

Concepts, principles, and techniques to:
i)   design and research interactive systems centered on the User Experience (UX)
ii)   work in user-centered design (UCD) processes, which include: study of the design context and field studies; ideation and generation of design concepts; prototype creation, development, and evaluation.
This knowledge draws from diverse multidisciplinary areas, such as: Interaction Design (IxD); Human-Computer Interaction (HCI); User Experience (UX) design and research; and Design Research.

1. Introduction
Description:
Introduction to designing and researching interactive systems, and to interaction design processes.
Introduction to multidisciplinary areas relevant to design and research interactive systems, and to work in user-centered interaction design processes (e.g. IxD, HCI, Design Research); and key concepts (e.g. usability, user experience or UX).
Detailed content:
- Definition of interactive system, user experience (UX), usability, and other key concepts (e.g. affordance, mapping).
- Design and research in the area of Human-Computer Interaction (HCI). Phases and different

paradigms, concepts, methods, contributions, and specific values.
- The user-centered design (UCD) process. Phases: study of the design context and field study; analysis and establishing requirements; design; evaluation.

2. Study of the design context and field work
Description:
Techniques to understand users and to study and characterize the situation, phenomenon, practice or activity to design for. IxD and HCI techniques to design studies and collect data.
Detailed content:
- Study techniques: documentation, interviews (structured, semi-structured, non-structured), questionnaires (closed, open), observation techniques (direct, indirect), focus groups.
- Study design: Study protocol creation, and key considerations to collect data.
- Documentation and data collection techniques.

3. Data analysis.
Description:
Techniques to analyze and present data.
Detailed content:
- Kinds of data and analysis: quantitative, qualitative, mixed.
- Introduction to quantitative and qualitative analysis techniques.
- Obtaining and presenting results and insights.

4. Requirements and design drives.
Description:
Techniques to present and transform results into requirements and design drives.
Detailed content:
- Stories, scenarios, personas, user stories, use cases, storyboards.
- Requirements: characteristics and types.

5. Interaction design and prototyping.
Description:
Techniques to explore the design space and to conceptualize and materialize designs. Innovation, ideation, and design techniques.
Detailed content:
- Double diamond design model for the design process: divergent and convergent design.
- Traditional and innovative techniques to generate and conceptualize designs.
- Prototype and sketch: Characteristics and differences.
- Kinds of prototypes and tools to prototype and evaluate designs.: low-fidelity prototypes (e.g. paper prototypes), and high-fidelity prototypes (e.g. functional prototypes), wireframes, mockups, Wizard of Oz technique.
- Introduction to advanced concepts and techniques to design interactive systems. Persuasive and embodied design.

6. Evaluation.
Description:
Techniques to study and evaluate the interaction and experience with designs and prototypes.
Detailed content:
- Evaluation: benefits and impact.
- Diverse objects and kinds of evaluation: formative and summative evaluation; with and without users; inspection methods, and predictive models and evaluations; experimental evaluations.
- Evaluation environments.
- Study and evaluation protocols.
- Evaluation methods: predictive modeling, A/B testing, Heuristics, Cognitive Walkthrough, usability and user experience studies, embodied evaluation techniques.
- Techniques employed in evaluation studies: observation techniques, think aloud, established questionnaires.

LEARNING ACTIVITIES AND METHODOLOGY
  - Theoretical lectures: 1.5 ECTS (PO a) (CECC1, CECC6)
Lectures presenting theoretical concepts and techniques to design and study interactive systems.
  - Practical lectures: 1.0 ECTS (PO a, c) (CECC6)
Labs to work on, and put to practice, the concepts and techniques learnt in class. Guidance to solve the project will be provided.
  - Follow-up meetings: 0.5 ECTS (PO a, g) (CECC1, CECC6)

Split into work groups, students will attend supervision meetings in the lab to review the development of the project.
- Individual study: 0,5 ECTS (PO a) (CECC1)
Study of theoretical and practical concepts for the design and study of interactive systems.
- Project development: 2.5 ECTS (PO a, c, d, e, g) (CECC6)
Project-based learning. Analyzing, designing, and evaluating an interactive system in a work group. As a result, students will create and submit different design products, and publicly present and defend their work.

ASSESSMENT SYSTEM

- Exam testing theoretical and practical knowledge: 40% (PO a) (CECC1)
- Project: 60% (PO a, c, d, e, g) (CECC1, CECC6)

Students will finish the course being able to investigate the design context and to conceptualize, design, develop and evaluate functional and non-functional design prototypes. These will be designed and studied centered on the user experience, and applying concepts and methods from Interaction Design (IxD) and Human-Computer Interaction (HCI). For this, students will work in groups in the different phases of a user-centered design (UCD) process: study of the design context and field study; analysis and establishing requirements; design; evaluation. The project will be divided in three submissions that will be evaluated:

P1 ¿ study of the design context and field study
P2 ¿ ideation, design, and prototyping
P3 ¿ evaluation

Grades for each of these deliverables are as follows:
P1 (2p) + P2 (3p) + P3 (1p) = 6p

To pass the continuous assessment, it is mandatory to obtain a MINIMUM GRADE of 3 over 10 in the exam and 3 over 6 in the project.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Alan Bryman Social Research Methods , Oxford University Press, 2015

- Alan Cooper, Robert Reimann, David Cronin, & Christopher Noessell About Face: The Essentials of Interaction Design, Wiley, 2014
- Bill Buxton Sketching User Experiences: Getting the Design Right and the Right Design., Morgan Kaufmann, 2007

- Don Norman The Design Of Everyday Things, Basic Books, 2013

- Helen Sharp, Jennifer Preece, & Yvonne Rogers. Interaction Design: Beyond Human-Computer Interaction, John Wiley & Sons, Inc., 2019
- Jakob Nielsen Designing Web Usability: The Practice of Simplicity, New Riders, 1999

- James Kalbach Mapping Experiences: A Complete Guide to Creating Value through Journeys, Blueprints, and Diagrams, O'Reilly Media, 2016
- Jeffrey Rubin, & Dana Chisnell Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests , Wiley, 2008
- Paul Dourish Where the Action Is: The Foundations of Embodied Interaction, The MIT Press, 2001

- Steve Krug Don't Make me Think. A Common Sense Approach to Web Usability, Pearson, 2013

- William Lidwell, Kritina Holden, & Jill Butler Universal Principles of Design, Revised and Updated: 125 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions, and Teach Through Design., Rockport, 2010