



National University of Engineering (UNI)
School of Computer Science
Syllabus 2027-I

1. COURSE

CS2H1. User Experience (UX) (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: CS2H1. User Experience (UX)
2.2 Semester	: 7 th Semester.
2.3 Credits	: 4
2.4 Hours	: 2 HT; 4 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Mandatory
2.7 Learning modality	: Face to face
2.8 Prerequisites	: CS291. Software Engineering I. (5 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course focuses on the design, evaluation, and implementation of interactive computing systems for human use. Beyond classical HCI principles, it addresses the emerging challenges of interacting with AI systems, intelligent agents, and natural language processing software. Students will develop competencies in user-centered design, accessibility, ethical accountability, and the evaluation of both traditional interfaces and AI-driven conversational systems, acquiring skills essential for designing responsible and human-centered technology.

5. GOALS

- Understand human cognitive, physical, and emotional characteristics relevant to interactive system design.
- Apply ethical accountability and value-sensitive design principles to HCI practice, including algorithmic fairness and bias.
- Apply accessibility standards and inclusive design principles for diverse populations and abilities.
- Execute rigorous usability evaluation methods to iterate and improve user interfaces.
- Design interactive systems using user-centered and iterative design processes across multiple platforms and domains.
- Analyze the societal, ethical, and professional dimensions of interactive technology.
- Understand agent architectures and apply principles of human-agent interaction including AI assistants and autonomous systems.
- Apply natural language processing techniques to design and evaluate human-software interfaces based on language models.

6. COMPETENCES

AG-C03) Individual and Team Work: Performs effectively as an individual and as a member or leader in diverse teams. (Usage)

AG-C09) Design and Development of Solutions: Designs, implements, and evaluates solutions for complex computing problems. (Usage)

7. TOPICS

Unit 1: Understanding the User: Individual goals and interactions with others (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Human capabilities and limitations: perception, cognition, motor skills • User characteristics: demographics, expertise, cultural background • User goals, tasks, and contexts of use • Social and organizational aspects of interaction • Cognitive models and theories relevant to HCI • Emotional and affective aspects of interaction • User research methods: interviews, surveys, observations	• Describe human capabilities and limitations that affect interaction design [Describe] • Analyze how user characteristics influence interaction with computing systems [Analyze] • Identify user goals and tasks in specific contexts of use [Analyze] • Explain social and organizational factors that impact technology adoption and use [Explain] • Apply cognitive models to predict and explain user behavior [Apply] • Consider emotional and affective factors in interaction design [Analyze] • Conduct user research using appropriate methods such as interviews or observations [Evaluate]
Readings : [Norman2013], [Johnson2020]	

Unit 2: Accountability and Responsibility in Design (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Ethical considerations in HCI: fairness, transparency, accountability • Design for values and value-sensitive design • Responsible innovation and design ethics • Algorithmic accountability and bias in interactive systems • Professional responsibility in HCI practice • Legal and regulatory considerations for interactive systems	• Identify ethical issues in HCI design and implementation [Analyze] • Apply value-sensitive design approaches to technology development [Apply] • Discuss responsible innovation practices in HCI [Debate] • Analyze algorithmic accountability and bias in interactive systems [Analyze] • Describe professional responsibilities in HCI practice [Describe] • Explain legal and regulatory considerations relevant to interactive systems [Explain]
Readings : [Shneiderman2022], [Norman2013]	

Unit 3: Accessibility and Inclusive Design (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Accessibility principles and guidelines • Disabilities and assistive technologies • Inclusive design and universal design principles • Evaluation methods for accessibility • Designing for diverse abilities and contexts • Accessibility standards and compliance	• Apply accessibility principles to interactive system design [Apply] • Describe how different disabilities affect interaction with technology [Describe] • Design inclusive systems using universal design principles [Design] • Conduct accessibility evaluations of interactive systems [Evaluate] • Create designs that accommodate diverse abilities and usage contexts [Create] • Ensure compliance with accessibility standards and regulations [Evaluate]
Readings : [Johnson2020]	

Unit 4: Evaluating the Design (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Usability principles and heuristics • Evaluation methods: heuristic evaluation, cognitive walkthrough • User testing: planning, conducting, analyzing • Advanced evaluation methods: controlled experiments, field studies • UX metrics and measurement • Analytical evaluation methods: modeling and simulation	• Apply usability principles and heuristics to evaluate designs [Apply] • Conduct heuristic evaluations and cognitive walkthroughs [Evaluate] • Plan, conduct, and analyze user testing sessions [Plan] • Design and conduct controlled experiments for HCI research [Design] • Measure user experience using appropriate metrics [Evaluate] • Use analytical methods to model and predict user performance [Use]
Readings : [Norman2013], [Johnson2020]	

Unit 5: System Design (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Design process: user-centered design, iterative design • Interaction design: concepts, principles, patterns • Prototyping techniques: low-fidelity, high-fidelity, interactive • Information architecture and navigation design • Advanced interaction techniques: gesture, voice, multimodal • Design for specific domains: mobile, web, ubiquitous computing • Collaborative and social computing systems	• Apply user-centered design processes to develop interactive systems [Apply] • Design interactions using established principles and patterns [Design] • Create prototypes at different fidelity levels for design exploration [Create] • Structure information and navigation for effective user interaction [Structure] • Implement advanced interaction techniques such as gesture or voice interfaces [Implement] • Design interactive systems for specific domains and platforms [Design] • Design collaborative systems that support group interaction [Design]
Readings : [Johnson2020], [Norman2013]	

Unit 6: Society, Ethics, and the Profession (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Social impact of interactive technologies • Ethical issues in HCI research and practice • Professional practice in HCI • Cultural and cross-cultural considerations in HCI • Sustainability and HCI • Future trends and challenges in HCI	• Analyze the social impact of interactive technologies on individuals and society [Analyze] • Address ethical issues in HCI research and design projects [Evaluate] • Describe professional practices and career paths in HCI [Describe] • Design systems that account for cultural differences and contexts [Design] • Incorporate sustainability considerations into HCI design [Integrate] • Discuss emerging trends and future challenges in HCI [Debate]
Readings : [Shneiderman2022], [Norman2013]	

Unit 7: Agents and Cognitive Systems (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Agent architectures (e.g., reactive, layered, cognitive) • Agent theory (including mathematical formalisms) • Rationality, Game Theory: – Decision-theoretic agents – Markov decision processes (MDP) – Bandit algorithms • Software agents, personal assistants, and information access: – Collaborative agents – Information-gathering agents – Believable agents (synthetic characters, modeling emotions in agents) • Learning agents • Cognitive systems: – Cognitive architectures (e.g., ACT-R, SOAR, ICARUS, FORR) – Capabilities (e.g., perception, decision making, prediction, knowledge maintenance) – Knowledge representation, organization, utilization, acquisition, and refinement – Applications and evaluation of cognitive systems • Multi-agent systems: – Collaborating agents – Agent teams – Competitive agents (e.g., auctions, voting) – Swarm systems and biologically inspired models – Multi-agent learning • Human-agent interaction: – Communication methodologies (verbal and non-verbal) – Practical issues – Applications: * Trading agents, supply chain management * Ethical issues of AI interactions with humans * Regulation and legal requirements of AI systems for interacting with humans	• Characterize and contrast the standard agent architectures [Evaluate] • Describe the applications of agent theory to domains such as software agents, personal assistants, and believable agents, and discuss associated ethical implications [Describe] • Describe the primary paradigms used by learning agents [Describe] • Demonstrate using appropriate examples how multi-agent systems support agent interaction [Demonstrate] • Construct an intelligent agent using a well-established cognitive architecture (ACT-R, SOAR) for solving a specific problem [Apply]
Readings : [RussellNorvig2021], [Shneiderman2022]	

Unit 8: Natural Language Processing (8 hours)	
Competences Expected: AG-C03,AG-C09	
Topics	Learning Outcomes
• Deterministic and stochastic grammars • Parsing algorithms: – CFGs and chart parsers (e.g., CYK) – Probabilistic CFGs and weighted CYK • Representing meaning/Semantics: – Logic-based knowledge representations – Semantic roles – Temporal representations – Beliefs, desires, and intentions • Corpus-based methods • N-grams and HMMs • Smoothing and backoff • Examples of use: POS tagging and morphology • Information retrieval: – Vector space model: * TF & IDF – Precision and recall • Information extraction • Language translation • Text classification, categorization: – Bag of words model • Deep learning for NLP: – RNNs – Transformers – Multi-modal embeddings (e.g., images + text) – Generative language models	• Define and contrast deterministic and stochastic grammars, providing examples to show the adequacy of each [Define] • Simulate, apply, or implement classic and stochastic algorithms for parsing natural language [Apply] • Identify the challenges of representing meaning [Analyze] • List the advantages of using standard corpora. Identify examples of current corpora for a variety of NLP tasks [List] • Identify techniques for information retrieval, language translation, and text classification [Analyze] • Implement a TF/IDF transform, use it to extract features from a corpus, and train an off-the-shelf machine learning algorithm using those features to do text classification [Apply]
Readings : [JurafskyMartin2024], [RussellNorvig2021]	

8. WORKPLAN

8.1 Methodology

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

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

Theory Sessions:

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

Lab Sessions:

In order to verify their competences, several activities including active learning and roleplay will be developed during lab sessions.

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 our virtual campus allows each student to access the course information, and interact outside the classroom with the teacher and with the other students.

The final grade NF depends on the following grades:

- PE : Partial Exam.
- FE : Final Exam.
- P : Permanent Evaluation (Average of practical work and graded assignments).

The final grade NF is calculated as follows:

$$NF = \frac{PE + FE + P}{3}$$

10. BASIC BIBLIOGRAPHY