

GEM Trailblazer Summer Programme

DETAILED COURSE INFORMATION

Academic Year	:	AY2022-2023
Session	:	Summer 2023
Course Code & Title	:	CZ2004 Human-Computer Interaction
Academic Units	:	3
Pre-requisite (if any)	:	NIL
Delivery mode	:	Physical
Taught by	:	Dr Owen Noel Newton Fernando

Brief Course Description

This course aims to provide an introduction to human-computer interaction, with an overarching goal of inculcating into you the habit of adopting a user-centric perspective on usability when designing, evaluating and innovating new user interfaces. More specifically, the objectives are to get you to: (a) appreciate and understand the significance of considering usability issues in interface development, including user requirements, measurements and various usability tests; (b) acquire vocabulary to frame and articulate HCI issues and considerations for different computing applications; (c) learn first principles in user interface design and develop basic ability to apply design considerations to both current and future interface modalities; (d) obtain a perspective of how HCI needs to be aligned with human thought processes and physical abilities, and (e) be aware of the large range of user interfaces in society today, and appreciate how HCI design is applied in various sectors of the computing industry.

1. Intended Learning Objectives (ILOS)

Upon the successful completion of this course, you shall be able to:

1. Articulate the rationale for user-centric interface design;
2. Describe and apply methods and principles for creating and evaluating good user interfaces;
3. Implement important steps in a UI design process, with focus on creating lo-fidelity and high-fidelity design prototypes;
4. Elaborate on the different sensing and actuation modalities of both humans and existing user interfaces;
5. Use and explain various concepts and terminology that is widely used in the UI/UX community.

2. Course Syllabus/Topics

Lesson	Topic/s
1	Introduction The origin, development, and significance of human-computer interaction. Case studies: successful and failure examples of software and hardware products involving HCI, novel devices etc.
2	Usability and Application Spaces Life critical, industrial, commercial, entertainment and sociotechnical application types. Influence of age, gender, intellect, language, personality, and disability (e.g., colour blindness). Case studies such as digital camera operations and satellite navigation.
3	Guidelines and Principles Guidelines for navigation, organization, attention and data entry. Principles: Eight golden rules.
4	Prototyping and Evaluating Interface Designs Expert review, Usability labs, acceptance testing, surveys, and on-going feedback. Case studies: various prototype techniques.
5	Understanding Humans, Modelling Users Human senses, higher-level perception, attention; human memory, reasoning and problem solving, mental models, affect, personality traits; motor coordination, verbal and non-verbal communication.
6	Human-Computer Interfaces Evolution of computing interfaces; keysets, handwriting, speech, pointing interfaces, sketching, natural motion, affective computing, brain-computer interface; 2D and 3D displays, audio, haptics, motion simulators, scent synthesis.
7	Interaction and Design Analysis Major interaction metaphors (instruction, conversation, object and ego manipulation), peripheral feedback; anthropomorphism, software posture; affordances, metaphors, idioms; widgets, interface builders, design and pattern languages.

3. Learning Outcomes

- (a) **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
- (b) **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- (c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- (d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

- (e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- (f) **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- (g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
- (h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- (i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- (j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- (k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- (l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

4. Course Assessments

Components	Group/Individual	Weighting
Final Examination	Individual	60%
Lo-fi Prototype	Individual	18%
Usability Evaluation Report	Individual	6%
Hi-fi Prototype	Individual	16%
Total		100%

5. References/Recommended Reading List

1. Designing the User Interface: Strategies for Effective Human-Computer Interaction, by Ben Shneiderman and Catherine Plaisant, Pub. Addison Wesley, 5th Ed, 2009, ISBN 978 0 321 53735 5.
2. Human-Computer Interaction, by Alan Dix, Janet Finlay, Gregory Abowd and Russell Beale, Pub. Prentice-Hall, 3rd edition, 2004, ISBN 978-0-130-46109-4
3. About Face 3: The Essentials of Interaction Design, by Alan Cooper, Robert Reimann and David Cronin. Pub. Wiley, 3rd edition, 2007, ISBN 978-0-470-08411-3
4. Interaction Design: Beyond Human-Computer Interaction, by Helen Sharp, Yvonne Rogers and Jenny Preece. Pub. Wiley, 2nd edition, 2007, ISBN 978-0-470-01866-8
5. The Inmates Are Running the Asylum: Why High Tech Products Drive Us Crazy and How to Restore the Sanity, by Alan Cooper, Pub. SAMS Publishing, 2004, ISBN 978-0-672-32614-1
6. Sketching User Experiences: Getting the Design Right and the Right Design, by Bill Buxton, Pub. Morgan Kaufmann, 2007, ISBN 978-0-123-74037-3
7. Sketching User Experiences: The Workbook, by Saul Greenberg, Sheelagh Carpendale, Nicolai Marquardt and Bill Buxton, Pub. Morgan Kaufmann, 2011, ISBN 978-0-123-81959-8

8. Designing Interfaces, by Jenifer Tidwell, Pub. O'Reilly, 2nd edition, 2011, ISBN 978-1-449-37970-4
9. The Design of Everyday Things, by Donald Norman, Pub. Basic Books, 2002, ISBN 978-0-465-06710-7

6. Other requirements

NA

7. Instructor Details

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