Course Syllabus

COMP 341/441 - Human-Computer Interface Design

Dr Nick Hayward

Semester - Spring 2019

Overview

- Lecturer: Dr Nick Hayward
- 2.5 hours weekly taught class
- Units: 3
- Graduate course

Sample course website is currently available at the following URL,

- http://csteach441.github.io/

Sample course GitHub repositories can be found at the following URL,

- https://github.com/csteach441

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Description & Technologies

This course studies the interaction between humans and computer-based systems. The course will provide students with the methods for evaluating, designing, and developing better interfaces between humans and computer-based systems.

Students will acquire an awareness of different design and evaluation methods as well as practical, effective, and cost-conscience methods for improving systems and their interfaces.

The course has been structured to provide logical, contiguous groupings of material relative to considerations of design and human interaction with computer-based systems. The student is exposed to design components and elements that help us develop interactions with such systems. This is complemented by a sound and clear understanding of the logic and psychological reasoning for such patterns and design choices. Examples are available throughout the course, and theory is offered alongside demonstration.

Goals
The careful study of such design reasoning and patterns should allow a user to consider, modify, and redesign an existing interface or product. In effect, they should be able to clearly outline design and interaction issues with their chosen product or application, and then suggest logical, reasoned modifications and improvements based upon the material covered within the course.

Throughout the course, each student and project group is required to demonstrate application of their design learning relative to their chosen project. With this in mind, the final goal of the course is a re-imagined, and re-designed, prototype of their chosen application or product. They should also be able to coherently describe and justify their chosen modifications, thereby demonstrating their applied knowledge of the course.

**Course Assessment**

Course assessment will include a combination of group exercises throughout the semester, a development (or DEV) week project, and a final project demonstration and report.

**Weekly exercises & discussions - 20%**

Weekly exercises and discussions will constitute twenty percent of the overall grade, and provide a test of knowledge acquired and understood for each defined section within the course.

Weekly exercises may be defined as either individual or group. They are used to help develop the course project, whilst also helping to test acquired knowledge. They are scheduled, and organised, to complement course material per week.

An additional weekly component is an occasional discussion of a chosen HCI-related topic or resource. The class is asked to discuss different design considerations and options per week.

**Preparatory work for final assessment - 15%**

Preparatory work for the final assessment of the course will be assigned at the end of each course section. This work may include demonstrations, a group presentation, updated designs and prototypes, or simply outlines of work completed each week towards the final project.

However, assigned preparatory work will reflect the content and theme of a given course section.

**DEV week project - 25%**

The DEV week project is scheduled for week 10 of the semester with group presentations of results. This project is a re-designed application built upon the theory and research discussed and outlined in the first nine weeks of the semester.

One of the many goals of this initial development is the successful demonstration of considered understanding of HCI concepts and underlying principles.

Each project group is also required to outline the following in their class presentation,

- any research conducted towards this project development
- a description of HCI concepts and principles chosen for their application
- prototypes, patterns, and designs considered
Such designs should include a consideration of UI and UX material covered in class, and in the course’s extra notes.

DEV week presentations also include anonymised, collated feedback from peer reviews during class. This helps each project group consider and respond to feedback and suggestions for modifications and improvements, which can then be applied, where appropriate, towards the final project assessment.

**Final project - 40%**

The final project assessment is a continuation of the group work developed as a part of the preparatory work throughout the course. The primary goal is the modification of the initial project outline to demonstrate concepts and theory learnt throughout the semester.

Each group is also required to respond to the collated feedback received following the DEV week project presentations, and then demonstrate how and where they have incorporated suitable updates and modifications in the final application. For example,

- where and why did a project group update their application?
- what are the perceived and tested benefits of these updates?

In effect, it is a combination of this semester long preparatory work, and a final demonstration and written report.

The final demonstration is scheduled for the end of the semester, and is an opportunity for each project group to showcase their chosen project, and the work they have developed throughout the semester.

**Course sections**

The semester long course is divided into the following contiguous sections, which naturally complement each other in the overall development of a web application.

**Section 1 - An intro to HCI and UI design rules**

As we start to consider HCI, and the many associated, disparate disciplines, it’s important to gain a clear understanding of the inherent nature of HCI. We begin with a clear introduction to HCI, and associated user interface (UI) design rules. A part of this initial learning is an understanding of how, where, and when to apply such UI rules and considerations. This gentle introduction provides our first consideration of such rules, and their practical application.

This introduction is the initial consideration of the many aspects of HCI, which include amongst them

- Guidelines
- Methods
- Models
- Principles
- Techniques
- Theories

We consider each of the above as we progress through the course.

**Section 2 - Colour, vision, perception, and interface considerations**
A key aspect of design and interaction is a clear understanding of what and how humans perceive colour. For example, how does the perception of colour, from colour blindness to cultural differences, affect our design choices and options.

We’re also interested in an understanding of how human vision is interpreted, and how it is used relative to interface design and interaction. A clear understanding how we, as humans, perceive our environment helps us as designers provide a more intuitive, less overloaded interactive environment for our users. For example, we may consider the following,

- colour and vision
- vision, contrast, and resolution
- vision and interfaces

A complementary consideration is how our users actually interact with interfaces. This includes, for example,

- users and interaction
- users and mental models

**Section 3 - Human memory and cognitive load**

In section three, we consider how learning techniques and patterns may influence a user’s short-term, or working, memory, and help in their transfer to long-term memory. We also consider context, and the role it plays in helping to establish an application within a user’s short-term memory. In this section, we cover the following topics relative to design and interaction,

- human memory and cognitive load
- testing - eg: using the KLM-GOMS model
- reducing cognitive load
- working memory, concept of flow...
- gamification

We also outline pertinent design considerations to help us leverage our knowledge of human memory, and its application within our designs.

**Section 4 - Processing visual information and visual attributes**

In the first three sections, we consider many disparate components of HCI, including human vision, human memory, interaction in general, and cognitive load. Complementary to this material is, of course, a deeper understanding of how our users actually process visual information and interactions within our applications.

For example, how does a user actually read a page or given places within an application? Our users predominantly process visual information using set patterns, which we can review and consider for our designs. We’ll also consider further testing options, for example eye tracking applications and patterns, and the influence they may exert on our design choices.

Within this section, we also carefully review and test the *Gestalt Laws of Perception*, and their application to our work in HCI. In particular, their use and development in the design and implementation of visual attributes for our interface designs.

**Section 5 - Usability, user experience, and design**
In section five, we can begin to review general concepts of usability in application design and development. Often a difficult concept to evaluate in a given product, we can consider usability relative to learning and user experience with designs and interactions. For example, concepts such as memorisation, behaviour, feedback, and efficiency relative to a user’s general experience with a product or application.

How does ease of learning and efficiency influence a user’s perception of a design, and its available interaction options? By examining a user’s experience, we can start to appreciate issues with design and interaction in numerous different products.

By considering a user’s reactions to an application, both positive and negative, their general experience with an application, from the design and interface to the interaction and potential results and outcomes, we can start to consider the overall UX for the application.

In essence, it is more than simply a consideration of the design or its look and feel. We need to consider the underlying functionality, in effect what a given application or product can actually do for a user.

Section 6 - Users and skills, Principles for usability...

In section six, as we continue to consider our application’s users, we start to realise that a primary challenge involves considering how to make our product, and hence its interface, both comprehensible and learnable for beginners, whilst also ensuring that we do not hinder expert users from optimal productivity.

Therefore, we need to carefully consider user skill levels, and be aware of some of the inherent changes these skill levels may undergo over time. We also need to be aware of practical ways to help our users attain and improve their skill levels.

By understanding user skill levels, and their attainment and improvement, we have a much better chance of understanding the application of interaction concepts and principles.

A part of this consideration and understanding is an awareness of the broader principles for usability. For example,

- consistency
- visibility
- affordance
- mapping
- feedback
- constraints
- naming

Section 7 - Designing and developing interaction

In this section, we start to consider how to plan and design an application’s interaction concept.

As designers and developers, we may consider an application’s interaction concept as a basic summary of our base, fundamental idea of how the user interface will actually work. It describes how the interface will be presented to the user, and the general interaction concepts that allow a user to complete given tasks.

We can then sub-divide these concepts as follows,
Section 8 - Design and specification

We may also consider and outline various techniques for designing and specifying user aspects of an application’s design. Effectively, how might we communicate such options, choices, and design concepts to a given audience. For example, prototypes and mockups play an important role in this process, and may include highly detailed visual representations of any potential final application or product. They can, however, be quick and simple thereby acting as an initial guide for future development.

We outline and test both low-fidelity and hi-fidelity mockups and prototypes for our designs and projects.

Section 9 - Testing and evaluating usability

In this final section, we can also consider some of the options we might employ to help us examine and effectively test usability within our applications. Not all of these options will be suitable for all evaluation scenarios, but we can simply pick and choose the most appropriate options for our testing purposes.

For example, we might use some of the following options

- user observation
- cognitive walkthrough
- analytics
- focus groups
- questionnaires and surveys
- heuristic evaluation

Supporting Material

The following includes samples of ongoing materials, which form a core part of each semester’s course. Each student has access to these materials on the course’s website and GitHub account, and these resources are updated on a weekly basis.

Sample Course Notes

Example weekly notes can be found on the course’s GitHub repository, which is available at the following URL,

- https://github.com/csteach441

Sample Bibliography

A sample bibliography can be found on the course website, which is available at this following URL,

- course bibliography

Sample Links & Resources
Sample links and references used within the course can be found at the following URL,

- links & resources