

**Comp 341/441 - HCI**

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**Spring Semester 2020**

**Dr Nick Hayward**

## course details

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### Lecturer

- Name: Dr Nick Hayward
- Office hours
  - *Tuesday by appointment (LSC)*
- Faculty Page

# Course Schedule

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## Important dates for this semester

- Project outline and mockup - presentation & demo
  - *12th February 2020 @ 7pm*
- Spring break
  - *n.b. no formal class: Wednesday 4th March 2020*
- DEV week: 11th to 18th March 2020
- DEV week - presentation & demo
  - *18th March 2020 @ 7pm*
- Final class: 22nd April 2020
- Final presentation & demo
  - *22nd April 2020 @ 7pm*
- Exam week: 27th April to 2nd May 2020
  - *Final assessment due on 29th April 2020*

**n.b. NO final exam**

# Coursework schedule

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## Presentations, reports &c.

- project outline and mockup
  - *due Wednesday 12th February 2020 @ 7pm*
- DEV week demo
  - *due Wednesday 18th March 2020 @ 7pm*
- final team demo
  - *due Wednesday 22nd April 2020 @ 7pm*
- final team report
  - *due Wednesday 29th April 2020*

# Assignments and Coursework

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## Course will include

- weekly bibliography and reading
- weekly notes, examples, extras...

## Coursework will include

- preparatory work
  - *assigned at the end of each section*
  - *may include demos, designs, testing, prototypes...*
- final demo
  - *presentation and demo*
- final report
  - *explain implemented differences throughout semester*
    - where and why did you update the project?
    - benefits of updates
  - *clearly detail design and development process*
    - outline testing, prototypes &c.
    - explain pros and cons of existing interface
    - contrast old and new interface
    - ...
- work may be conducted individually or in groups (max. 4 persons per group) \* group report must clearly define each student's work and contributions, where applicable
  - *no attribution, no mark*

## Weekly exercises & discussions (20%)

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- exercises
  - *help develop course project*
  - *test course knowledge at each stage*
  - *get feedback on project work*
- discussions
  - *sample websites and applications*
  - *design topics, UI and UX concepts*
- extras
  - *design and application reviews*
  - *various other assessments*
  - *peer review of demos*

## Project outline & mockup assessment

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Course total = 15%

- begin outline and design of group project
- design a new or re-imagined UI and UX for a chosen application or device
- outline concept, research conducted to date
- consider applicable design patterns
- mockups, designs, paper prototypes...
  - *demo current designs, concepts, and mockups*
  - *any working tests or models...*

## Project mockup demo

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Assessment will include the following:

- brief presentation or demonstration of current project work
  - *~ 5 to 10 minutes per group*
  - *analysis of work conducted so far*
  - *presentation and demonstration*
    - outline current state of app concept and design
    - show mockups, designs, &c.
  - *due Wednesday 12th February 2020 @ 7pm*



## DEV Week Assessment

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Course total = 25%

- continue to design a new or re-imagined UI and UX for a chosen application or device
- outline concept, research conducted to date
- consider applicable design patterns
- prototyping
  - *demo current prototypes*
  - *any working tests or models etc*
- anything else to help explain your updated project and app...

# DEV Week Demo

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DEV week assessment will include the following:

- brief presentation or demonstration of current project work
  - *~ 10 minutes per group*
  - *analysis of work conducted so far*
    - e.g. during semester & DEV week
- presentation and demonstration...
  - *outline app*
  - *show prototypes and designs*
  - *explain what does & does not work*
  - *...*
- due Wednesday 18th March 2019 @ 7pm

# Final Assessment

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Course total = 40%

- continue to develop your app concept and prototypes
- working app
- explain design decisions
  - *describe patterns used in design of UI and interaction*
  - *layout choices...*
- show and explain implemented differences from DEV week
  - *where and why did you update the app?*
  - *perceived benefits of the updates?*
- how did you respond to peer review?
- final demo
  - *due on Wednesday 22nd April 2019 @ 7pm*
- final report
  - *due on Wednesday 29th April 2019 @ 7pm*

## Goals of the course

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A study of the interaction between humans and computer-based systems.

### Course will provide

- methods for evaluating, designing, and developing better interfaces
- focus upon interface design
  - *guidelines and examples*
  - *prototyping*
  - *testing...*
- additional details on interaction
- acquire an awareness of different design and evaluation methods
- practical and effective methods for improving interfaces and interaction

# Course Resources

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## Website

- course website is available at <http://csteach441.github.io>
  - *timetable*
  - *course overview*
  - *course blog*
  - *assignments & coursework*
  - *bibliography*
  - *links & resources*
  - *notes & material*

## n.b. NO Sakai

## GitHub

- course repositories available at <http://github.com/csteach441/>
- weekly notes, examples, and source code (where applicable)

## Slack

- Slack group available at <https://csteach441.slack.com/>
  - <https://csteach441.slack.com/>
- course updates, information on weekly assignments, general news, discussions...

## Trello

- Trello group available at <https://trello.com/csteach441>
  - <https://trello.com/csteach441>

- project groups, weekly assignments, organise research and development...

## Group projects

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- add project details to course's Trello group, *COMP 441 - Spring 2020 @ LUC*
  - *Week 1 - Project Details*
  - *<https://trello.com/b/7ynUXBGN/week-1-project-details>*
- create channels on Slack for group communication
  - *please add me to the private channel*
- start working on an idea for your project
- plan weekly development up to and including DEV Week
  - *11th to 18th March 2020*
  - *DEV week demo on 18th March 2020*

# An Introduction to HCI - 1

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## What is human-computer interface design?

- inherently a simple topic or concept
- simple act of inserting a mediating computer
- eg: a user wants to send a message or play some music...
  - *could use paper and pen, or play an instrument*
  - *may involve an intermediary tool*
  - *essence of design and usage bears some resemblance to HCI*
  - *related discipline of human factors*
- it is the computer that makes HCI distinctive



## An Introduction to HCI - 2

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### Adding a computer

- transforms the representation of a task and required skills
- changes our user's act of writing or playing a musical instrument
  - *flesh out a message or story*
  - *compile, contrast, splice, and manipulate our music*
- add users, become a crowd or group
- add networks and more machines
- disparate variants of computer mediation forming our concept of HCI

### HCI Components

- an object, an artifact that needs engineering and implementing
- the process of design for the interaction, and the objects themselves
- the principles, theories, abstractions, guidelines, facts... surrounding HCI

### We can consider these as

- engineering interaction
- designing interaction
- the actual science of interaction itself

## HCI as a technology

- importance of linking engineering, design, and science together
- technologies largely derived from other technologies
  - *Brian Arthur, W. 'The Nature of Technology: What it is and how it evolves.' Free Press. 2011.*
- technologies composed of disparate parts, each technologies as well
- technologies devolve to a point where they cease to be a technology
  - *this is the point where science plays a role*
  - *eg: keyboards and electrical capacitance*
- exploitation of natural occurrence of capacitance
  - *provides HCI function of signaling known, reliable interaction*

For example, text editor keypress demo

## HCI and Science

- science should continue to play an important role in the development of HCI
- development and promotion of theory
- enables further *explanatory evaluation*
  - *expand upon rudimentary A-B testing*
  - *limited without an understanding of why*
- enables *generative design*
  - *allows us to modify design based upon an understanding of interaction*
  - *adjust design according to interaction*

# User-Interface Design Rules - 1

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## Historical Background

- advent of interactive computer systems and promotion of *good* design
- publication of user-interface design guidelines
- notable examples since early 1976
  - 1976: *CHERITON* and early interactive computer systems
  - 1983: *NORMAN's rules for designing user-interfaces based upon human cognition*
  - 1986: *SMITH & MOSIER* penned one of the most comprehensive sets of user-interface design guidelines
  - 1987: *SHNEIDERMAN's "Eight Golden Rules of Interface Design"*, which is now in its fifth edition.
  - 1988: *BROWN* wrote a set of design guidelines, simply entitled "*Human-Computer Interface Design Guidelines*"
  - 1990: *NIELSEN & MOLICH* suggested a set of design rules for the application of heuristic evaluation of user interfaces.
  - 1992: *MARCUS* presented guidelines for graphic design in online documents and user interfaces

# User-Interface Design Rules - 2

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## 21st Century Approach

- growing popularity of mobile platforms and online systems
- new and targeted user-interface guidelines
- notable examples include
  - *2005: STONE et al outlined general guidelines for user-interface design and evaluation*
  - *2006: KOYANI et al addressed design and usability guidelines specifically for research-based web design*
  - *2007: JOHNSON suggested some common user-interface design do's and don'ts*
  - *2009: SHNEIDERMAN updated his well-known tome to its current 5th edition*

# User-Interface Design Rules - 3

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## Platform Guidelines

- new century saw more platform specific publications
  - *Apple, Google, Microsoft...many, many others*
- each set promotes design suggestions, preferences, rules for their given platform
- examples include
  - *Apple - UI Design Basics*
  - *Gnome - Human Interface Guidelines*
  - *Google - Material Design*
  - *Microsoft - Guidelines for Windows Runtime apps*
  - *and many, many more...*

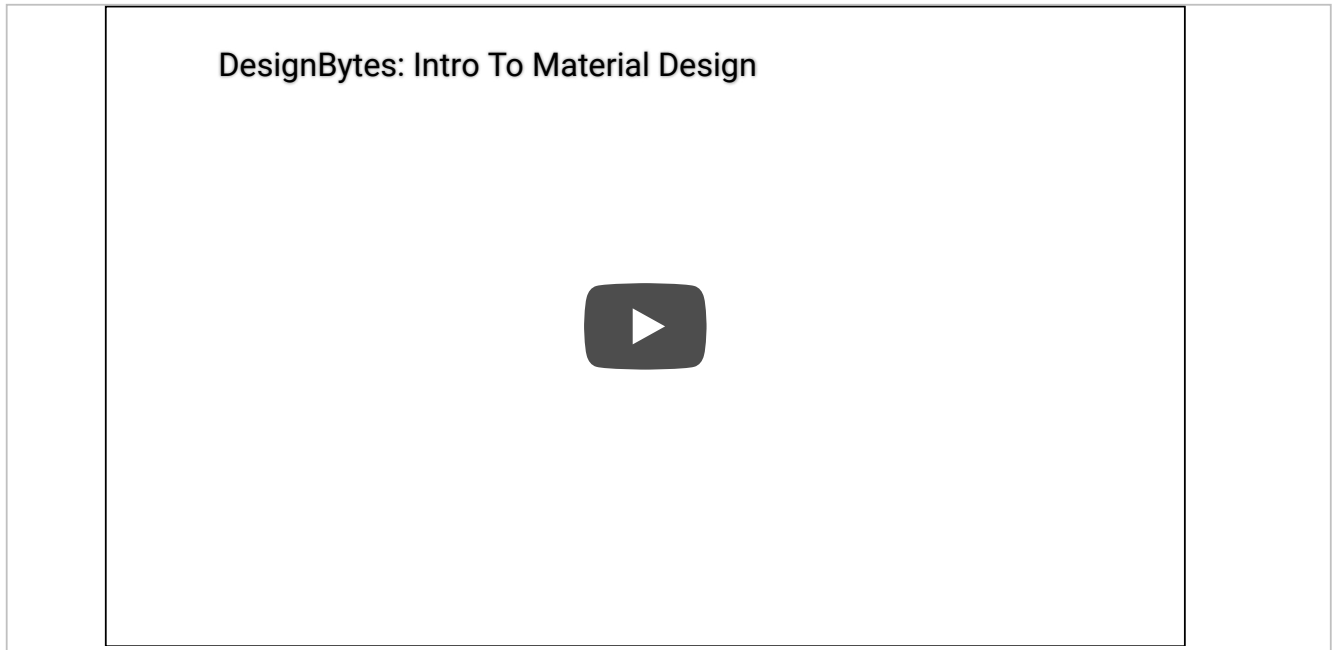
## Links & Resources

More to come later in the semester.

# Video - User-Interface Design Rules - 4

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## Introduction to Google's Material Design



## YouTube - Google's Material Design



# Image - User-Interface Design Rules - 5

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Microsoft's platform convergence...



MS One Design

# User-Interface Design Rules - 5

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## Resolving Conflicts

- following user-interface design guidelines is not always simple
- aspirational goals of design rules and guidelines
  - *inherently general to broaden potential application*
  - *often open to broad interpretation*
- many rules will appear to be suitable for a given design situation
- applicable design rules will often appear to conflict
- application of these rules will suggest potentially different designs
- designers will need to choose their preferred design rule for a given situation...
- designers choose an order of precedence for their design

# User-Interface Design Rules - 6

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## Conflicting Goals

- design problems and scenarios will often present conflicting goals
- potential for conflicting design guidelines and rules
- examples such as
  - *Powerful and Simple*
  - *High Resolution and Fast Loading*
  - *Multifunctional and Easy to Learn*
  - *WYSIWYG and Accessible for the Blind*
- designers need to address such conflicts and make informed decisions
- decisions guided, not restricted or dominated, by design guidelines and rules

# User-Interface Design Rules - 7

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## Application of Laws

- consider user-interface design rules and guidelines as a set of laws
  - *instead of step-by-step recipes*
- laws interpreted and applied by experienced practitioners
- understand the basis for user-interface rules
- learn from experience the application of these rules
- focus upon an understanding of how to apply these guidelines
- understand the underlying rationale of user-interface rules

## User-Interface Design Rules - 8

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### Quick Comparison: User-Interface Design Guidelines

Nielsen & Molich (1990)	Shneiderman & Plaisant (2009)
Aesthetic & minimalist design	Cater to universal usability
Consistency & standards	Design task flows to yield closure
Error prevention	Make users feel they are in control
Flexibility & efficiency of use	Minimise short-term memory load
Help users recognise, diagnose, and recover from errors	Offer informative feedback
Match between system and real world	Permit easy reversal of actions
Provide online documentation & help	Prevent errors
Recognition rather than recall	Strive for consistency
User control & freedom	
Visibility of system status	

# User-Interface Design Rules - 9

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## Origin of Design Guidelines

- similarity between each set of rules is not simply due to coincidence or inheritance
  - *not the result of author's whim...*
- noticeable similarity, and close association in context and emphasis
- due to the influence of human psychology
  - *how we learn, perceive, reason, remember, process and convert intentions into actions*
- many authors of guidelines had a background in psychology
  - *this was then applied to the design of computer interfaces*
- Brown, Molich, Nielsen, Norman, and Shneiderman...
  - *applied knowledge of cognitive and perceptual psychology*
  - *improve the design of interactive systems*

***User-Interface guidelines are based upon human psychology.***

## Image - Design Example - 1

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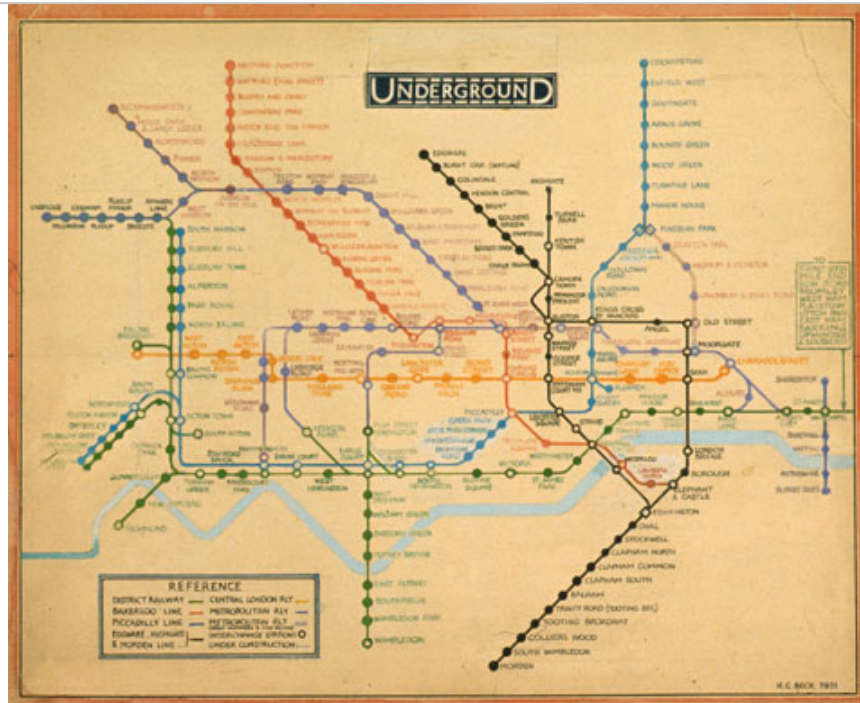
The world is awash with poorly designed things...



Remote controls are a prime example!

## Image - Design Example - 2

and many good things aswell...



1931 London Underground Map

1931 London Underground Map



## Image - Design Example - 3

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Does it really matter if things are poorly designed?



No Camping!

You may camp in the wrong place, and at the wrong time...

## Image - Design Example - 4

### Confusion due to poor design

**Confusion at Palm Beach County polls**  
Some Al Gore supporters may have mistakenly voted for Pat Buchanan because of the ballot's design.

Although the Democrats are listed second in the column on the left, they are the third hole on the ballot.

Punching the second hole casts a vote for the Reform party.

ELECTORS FOR PRESIDENT AND VICE PRESIDENT (A vote for the candidates will actually be a vote for their electors.) (Vote for Group)	
(REPUBLICAN)	3
GEORGE W. BUSH - PRESIDENT DICK CHENEY - VICE PRESIDENT	
(DEMOCRATIC)	5
AL GORE - PRESIDENT JOE LIEBERMAN - VICE PRESIDENT	
(LIBERTARIAN)	7
HARRY BROWNE - PRESIDENT ART OLIVIER - VICE PRESIDENT	
(GREEN)	9
RALPH NADER - PRESIDENT WINONA LA DUKE - VICE PRESIDENT	
(SOCIALIST WORKERS)	11
JAMES HARRIS - PRESIDENT MARGARET TROWE - VICE PRESIDENT	
(NATURAL LAW)	13
JOHN HAGELIN - PRESIDENT NAT GOLDHABER - VICE PRESIDENT	

(REFORM)	4
PAT BUCHANAN - PRESIDENT EZOLA FOSTER - VICE PRESIDENT	
(SOCIALIST)	5
DAVID McREYNOLDS - PRESIDENT MARY CAL HOLLIS - VICE PRESIDENT	
(CONSTITUTION)	8
HOWARD PHILLIPS - PRESIDENT J. CURTIS FRAZER - VICE PRESIDENT	
(WORKERS WORLD)	10
MONICA MOOREHEAD - PRESIDENT GLORIA La RIVA - VICE PRESIDENT	
WRITE-IN CANDIDATE To vote for a write-in candidate, follow the directions on the long stub of your ballot card.	

Sun-Sentinel graphic

Ballot Paper

### 2000 USA Presidential Ballot in Florida

## Resources

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- Brown, CM. "Human-computer interface design guidelines." Ablex Publishing Corp. 1988.
- Cheriton, DR. "Man-machine interface design for time-sharing systems." *Proc ACM National Conference*. 1976. PP.362-380.
- Koyani, SJ. et al. "Research-based web design and usability guidelines." *U.S. Dept of Health and Hum Serv*. 2006.
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- Nielsen, J. & Molich, R. "Heuristic evaluation of user interfaces." *Proc ACM CHI'90 Conference, Seattle*. 1990. PP.249-256. (NB: Updated by Nielsen, J. & Mack, RL. "Usability Inspection Methods." John Wiley & Sons, Inc. 1994.)
- Norman, DA. "Design rules based on analysis of human error." *Commun ACM*. 1983. PP.254-258.
- Norman, DA. "Design principles for human-computer interfaces." In Janda, A. ed. *Proceedings of the CHI-83 conference on human factors in computing systems, Boston*. ACM Press. 1983.
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- Stone, D. et al. "User interface design and evaluation." Morgan Kaufmann. 2005.