CSC 318S
THE DESIGN OF INTERACTIVE COMPUTATIONAL MEDIA
Spring Term, 2004-05

LECTURES	Wednesday, 6-8 P.M., CC 3150
TUTORIALS	Wednesday, 5-6 P.M., (check course calendar for locations)
LECTURER	Wael Aboelsaadat
	Kaneff Center 112D, 416-731-4438, wael@cs.toronto.edu
	Office hour: Wednesday 4:30-5:00, 8-9:30 P.M., or by appointment
TEACHING ASSISTANTS	Shengdong Zhao and Al-Mustansir Bin Mukhles

COURSE DESCRIPTION

The focus of this course is on the design of interactive computational media that enhance and support the cognitive, communication, and creative processes of their users, and on user interface design for computational media. The text refers to all of this as *interaction design*.

TOPICS

1. **Introduction**
   Interactive computational media. Group processes, brainstorming, team building, team management.
2. **Design**
   The user-centered iterative design of interactive systems. Design methodologies and principles. Metaphors and mental models. Multidisciplinary design: the role of the design disciplines and the behavioral sciences. Rapid prototyping and envisionment.
3. **Design process**
   Requirements analysis, concept design, physical design, prototyping, evaluation
4. **Interactive technologies and techniques**
   Hardware, software, systems, and techniques.
5. **Understanding users, observation, and evaluation**
   Interviews and questionnaires, observing users, testing users.
6. **Interactive media and modalities**
   Typography, layout, color, information display; speech input/output, natural language interfaces, non-speech audio; video and multimedia.
7. **The extended interface**
   Training, documentation, error handling, and help; brief mention of ergonomics, the physical environment, and interfaces for special needs.
8. **Research frontiers**
   Global networking, ubiquitous computing, mobile computing.

This term all students will work in multidisciplinary **4-5** people teams on a semester-long course project to carry out the user-centered, iterative design of prototypes of interactive computational media based on *wearable computers*.

COURSE OBJECTIVES

1. To introduce the student to key issues in interactive media design and user interface design.
2. To introduce the student to some of the literature of these fields.
3. To stress the importance of good user interface design, acquaint the student with basic principles whereby this may be accomplished, and give the student experience in trying to carry this out.
4. To give the student concrete experience in:
   - a. Conceiving of and designing novel computational media and their interfaces
   - b. Thinking deeply about user needs
   - c. Thinking critically about user interfaces
   - d. Building effective prototypes of new computational media
   - e. Working in multidisciplinary design teams
   - f. Writing clear, understandable English descriptions of systems, interfaces, issues
   - g. Verbalizing, articulating, and discussing concepts and issues.
5. To prepare the student for further courses in related areas, such as CSC428, and for real-world software, systems, new media, and user interface design.

TEXTS

➢ Jennifer **Preece**, Yvonne **Rogers**, and Helen **Sharp** (2002). *Interaction Design: Beyond Human-Computer Interaction*. John Wiley & Sons. (**PRS**) (Available at bookstore for $75.95)

➢ Daniel **Wigdor** (2002). *Building a Usability Prototype in Visual Basic, Dreamweaver, and Flash*, University of Toronto (linked from the course website)

➢ *CSC318 Lecture Notes* (To be posted on class website by Wednesday night).

➢ Course readings package (RP), with excerpts from:

→ Ronald **Baecker**, Jonathan **Grudin**, William **Buxton**, and Saul **Greenberg** (1995). *Readings in Human-Computer Interaction: Towards the Year 2000.* Morgan Kaufmann. (**BGBG**)

→ Alistair K. **Edwards** (Ed.) (1995). *Extraordinary Human-Computer Interaction: Interfaces for Users with Disabilities*. Cambridge University Press.

→ Joan **Greenbaum** and Morten **Kyng** (Ed.) (1991). *Design at Work: Cooperative Design of Computer Systems*. Lawrence Erlbaum Associates.

→ Julia A. **Jacko** and Andrew **Sears** (Eds.) (2003). *The Human-Computer Interaction Handbook*. Lawrence Erlbaum Associates.

→ Thomas K. **Landauer** (1995). *The Trouble with Computers: Usefulness, Usability, and Productivity*. MIT Press.

→ Carolyn **Snyder** (2003). *Paper Prototyping. The Fast and Easy Way to Design and Refine User Interfaces*. Morgan Kaufmann.

→ Edward **Tufte** (1983). *The Visual Display of Quantitative Information*. Graphics Press.

→ Terry **Winograd** (Ed.) (1996). *Bringing Design to Software*. Addison-Wesley.

→ **ACM ToCHI.** *ACM Transactions on Computer-Human Interaction.*

Note: the Readings Package may be purchased at the Copy Center, South Building 1132, (905) 828-5248

Short Term References

In addition to the course text (PRS and RP), the following references have been placed on short term loan in the library:

➢ Mary Beth Rossen and Jack Carroll (2002). Usability Engineering: Scenario-Based Development of Human-Computer Interaction (R&C), Morgan Kaufmann Publishers. (Available online at: http://www.books24x7.com/marc.asp?isbn=1558607129)

➢ Landauer, Thomas K. The trouble with computers : usefulness, usability, and productivity

➢ Ronald Baecker, Jonathan Grudin, William Buxton, and Saul Greenberg (1995). Readings in Human-Computer Interaction: Towards the Year 2000. Morgan Kaufmann.

COURSE CALENDAR

Lecture (Wed. 6-8pm)	Tutorial (Wed. 5-6pm)	Project		Readings
Week of Jan. 5 Introduction to 318 and to interactive computational media Domain specific needs	No tutorial	Ass. 1 handed out		PRS Ch1, 6.1-6.2 RP #2,#5
Week of Jan. 12 Design, the design problem, and creativity and brainstorming Group processes, team building, team management	(1 BIG TUTORIAL in SE1143) - Discussion of Ass. 1a and individual ideas; introduction to Ass. 1b - Group formation assistance		Ass. 1a due on Jan 12 @ 4:00pm	PRS 6.3, Ch7, 9.1-9.4 Optional: RP #1
Week of Jan. 19 Requirements analysis Understanding users and user needs.	(2 TUTORIALS in KN132 , CC3124) - Discussion of Ass. 1b and team ideas; introduction to Ass. 2 - Individual student presentations	Ass. 2 handed out	Ass. 1b due on Jan 19 @ 4:00pm	PRS 9.5, Ch12, 13.1-13.3 RP #7
Week of Jan. 26 An example illustrating principles for user-centered, iterative design Learning from design	(1 BIG TUTORIAL in SE1143) - TA presentation on surveys and interviews - TA presentation on scenarios and claims analysis		Ass. 2a due on Jan 30 @11:00pm	PRS 2.1-2.4, Ch3
Week of Feb. 2 Conceptual design; cognition Metaphors, mental models	(2 TUTORIALS in KN132 , CC3124) - Discussion of Ass. 2 - Individual student presentations			RP #6,#8,#9,#10,#11 PRS 2.5-2.6
Week of Feb. 9 Physical design, envisionment, and prototyping; prototyping tools	(2 TUTORIALS in KN132 , CC3124) - Introduction to Ass. 3; - Individual student presentations	Ass. 3 handed out	Ass. 2b due on Feb 11 @ 6:00pm	PRS Ch8 RP #3,#4 Wigdor
Week of Feb. 16 READING WEEK				
Week of Feb. 23 Information design; visual perception; graphic design and typography; information visualization	(2 TUTORIALS in KN132 , CC3124) - Return and discussion of Ass. 2 - Individual student presentations			RP #18,#13 Optional: RP #12
Week of Mar. 2 Interaction design; motor skills; interaction techniques	(1 BIG TUTORIAL in SE1143) TA presentation on prototyping tools	Ass. 4 handed out	Ass. 3a due on Mar 4 @11:00pm	RP#14, #15 PRS Ch10
Week of Mar. 9 Interaction via speech and sound I/O; System and interface evaluation	(2 TUTORIALS in KN132 , CC3124) - Introduction to Ass. 4 - Individual student presentations			PRS Ch11, 14.1-14.3
Week of Mar. 16 System and interface evaluation	(1 BIG TUTORIAL in SE1143) - TA presentation on usefulness and usability evaluation		Ass. 3b due on Mar 18 @ 6:00pm	PRS 13.4-13.5, 14.4 Optional: RP #17
Week of Mar. 23 Course evaluation and discussion. Research frontiers: the extended interface and user support	(2 TUTORIALS in KN132 , CC3124) - Return and discussion of Ass. 3 - Individual student presentations		Ass. 4a due on Mar 25 @ 6:00pm	RP #19
Week of Mar. 30 Research frontiers: global networking, collaborative systems, ubiquitous computing. Course review.	(2 TUTORIALS in KN132 , CC3124) - Individual student presentations			PRS 4.1-4.2, 15.1-15.3
Week of Apr. 6 Project presentations (Ass. 5)	(1 BIG TUTORIAL in SE1143) Q&A re material covered over the term		Ass. 4b due on Apr 9 @11:00pm	

REQUIRED READINGS

READINGS <u>SHOULD BE DONE</u> IN THE WEEK ASSIGNED, BECAUSE THE LECTURES WILL ASSUME THIS HAS BEEN DONE. IT ALSO PREVENTS FALLING BEHIND.

To be done by Jan. 5
- PRS Chapter 1, What is Interaction Design, 1-30
    Unlike PRS, we shall distinguish three classes of goals: usefulness, usability, and user experience
- PRS Sections 6.1-6.2, The Process of Interaction Design (first part), 165-170
    Their four "basic activities" will be elaborated over the next 10 weeks
- RP#2, [from Edwards] A. Newell, Extra-ordinary Human-Computer Interaction, 3-15
    Why designing for special needs is challenging, exciting, and beneficial for the advance of HCI ?
- RP#5, [from Landauer] The Trouble with Computers, 139-140, 141-144, 239-247
    Usefulness, usability, and examples of user-centered design

To be done by Jan. 12
- PRS Section 6.3, The Process of Interaction Design (second part), 170-182
    Comment on software patents on page 179 is incorrect
- PRS Chapter 7, Identifying Needs and Establishing Requirements (omit 7.6.2,7.6.3), 201-226, 231-235
    Methods of establishing requirements will be elaborated over the next two weeks
- PRS Sections 9.1-9.4, User-centered Approaches to Interaction Design (omit 9.4.1,9.4.2), 279-293
    Including applying ethnography in design
- *Optional:* RP #1, Design and Evaluation

To be done by Jan. 19
- PRS Section 9.5, User-centered Approaches to Interaction Design, 306-312
    Involving users in design: participatory design
- RP#7, [from Greenbaum and Kyng] Introduction: Situated Design, 1-6
    Design paying attention to the workers and the workplace: participatory design
- PRS Chapter 12, Observing Users, 359-386
    Observing potential users will help as you try to understand them to do your requirements analysis
- PRS Sections 13.1-13.3, Asking Users and Experts, 389-407
    Asking users via interviews and questionnaires

To be done by Jan. 26
- PRS Sections 2.1-2.4, Understanding and Conceptualizing Interaction, 35-60
    Conceptual models and interface metaphors
- PRS Chapter 3, Understanding Users, 73-104

Cognition in the service of interaction design

To be done by Feb. 2

- RP#6, [from BGBG] D. Norman, The Psychopathology of Everyday Things, 5-21
  Affordances, conceptual models, visibility, mapping, feedback
- RP#8, [from BGBG] T. Erickson, Working with Interface Metaphors, 147-151
  Choosing and evaluating metaphors
- RP#9, [from Winograd] Kid Pix, 58-61
  Functionality as user experience
- RP#10, [from Winograd] The Spreadsheet, 228-231
  The power of an effective representation and conceptual model
- RP#11, [from Winograd] L. DeYoung and T. Winograd, Quicken, 268-271
  The power of a familiar metaphor
- PRS Sections 2.5-2.6, Understanding and Conceptualizing Interaction, 60-69
  Interaction paradigms, conceptual models, physical design

To be done by Feb. 9

- PRS Chapter 8, Design, Prototyping, and Construction, 239-278
  Including both conceptual design and physical design
- RP#3, [from Snyder] Introduction, 3-8, Making a Paper Prototype, 69-93(top)
  Explaining how to do paper prototyping, which is especially useful in the conceptual design phase
- RP#4, Myers, B., Hudson, S.E., and Pausch, R., Past, Present, and Future of User Interface Software Tools, *ACM Transactions on Computer-Human Interaction* 7(1), March 2000, 3-28
  Includes what worked, what didn't worked, and future prospects and visions
- [Wigdor] Prototyping Tools
  Providing an introduction to Dreamweaver, Flash, and Visual Basic

To be done by Feb. 23

- RP#18, [from Jacko and Sears] S. Watzman, Visual Design Principles for Usable Interfaces, 263-285
  Principles abstracted from a successful information design practice
- RP#13, [from Tufte] Visual Display, Ch. 1, 13-15, 28–31, 46 (last par.)–51; Ch. 2, 53–9; Ch. 4, 91-5
  Visual wisdom from the master of information visualization
- *Optional:* RP#12, Principles for Effective Visual Communication for GUI Design

To be done by Mar. 2

- RP#14, [from BGBG] Chapter 7, Touch, Gesture, and Marking, 469-482
  Includes a taxonomy of input devices, gestures, and two-handed input
- RP#15, [from BGBG] Chapter 8, Speech, Language, and Audition, 525-537
  Includes speech synthesis, speech recognition, multimodal interaction, and non-speech audio
- PRS Chapter 10, Introducing Evaluation, 317-337

What, when, and why to evaluate, including an interesting case study

To be done by Mar. 9
- PRS Chapter 11, An Evaluation Framework, 319-358
  What, when, and why to evaluate, including an interesting case study
- PRS Sections 14.1-14.3, Testing and Modeling Users, 429-443
  User testing

To be done by Mar. 16
- PRS Section 14.4, An Evaluation Framework, 443-448
  Experiments
- PRS Sections 13.4-13.5, Asking Users and Experts, 407-424
  Asking experts
- *Optional:* RP#17, Design and Evaluation

To be done by Mar. 23
- RP#19, [from BGBG] J. Carroll & R. Mack, Learning to Use a Word Processor: By Doing, …, 698-717
  Learning software by doing, by thinking, and by knowing

To be done by Mar. 30
- PRS Sections 4.1-4.2, Designing for Collaboration and Communication, 105-128
  Including social mechanisms and collaborative technologies
- PRS Sections 15.1-15.3, Design and Evaluation in the Real World: Communicators …, 461-482
  Designing mobile communicators

THE PROJECT

The job of each project team is to conceive, design, prototype, and evaluate a novel approach to this design problem. Further details appear in the handouts for the following set of assignments.

> **Assignment 1**
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> | | |
> |---|---|
> | **Handed out:** | Week 1 |
> | **1a description:** | Brainstorming ideas for term project |
> | **1a due back in:** | **Jan 12, 4:00 p.m. !!! (via bulletin board on course website)** |
> | **1b description:** | One page proposal for term project; list of team members |
> | **1b due back in:** | **Jan 19, 4:00 p.m. !!! (via bulletin board on course website)** |

> **Assignment 2**
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> | | |
> |---|---|
> | **Handed out:** | Week 3 |
> | **Description:** | Requirements analysis for computational media design project |
> | **2a due back in:** | **Jan 30, 11:00 p.m. (via UTM submit app)** |
> | **2b due back in:** | **Feb 11, 6:00   p.m. (via UTM submit app + on paper in dropbox)** |

> **Assignment 3**
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> |---|---|
> | **Handed out:** | Week 6 |
> | **Description:** | Design and prototyping for computational media design project |
> | **3a due back in:** | **Mar 4,   11:00 p.m. (via UTM submit app)** |
> | **3b due back in:** | **Mar 18, 6:00 p.m. (via UTM submit app + on paper in dropbox)** |

> **Assignment 4**
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> | | |
> |---|---|
> | **Handed out:** | Week 9 |
> | **Description:** | Usefulness and usability evaluation of prototype system Review and analysis of design project and design experience |
> | **4a due back in:** | **Mar 25, 6:00 p.m. (via UTM submit app)** |
> | **4b due back in:** | **Apr 9, 11:00 p.m. (via UTM submit app + on paper in dropbox)** |

> **Assignment 5**
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> |---|---|
> | **Description:** | Group oral presentation + Q&A period |
> | **Date:** | **Apr 6, starts 6:10 p.m. (in class CC 3150)** |

GRADING

Photo	1%	individual grade (0% or 1%)
Assignment 1a	1%	individual grade (0% or 1%, not marked)
Assignment 1b	3%	group grade
Assignment 2a	3%	group grade
Assignment 2b	12%	group grade
Assignment 3a	3%	group grade
Assignment 3b	12%	group grade
Assignment 4a	3%	group grade
Assignment 4b	12%	group grade
Assignment 5	5%	group grade
Participation	10%	individual grade (tutorial and class participation)
FINAL EXAM	35%	individual grade
Best Project Prize	5%	group grade

IMPORTANT NOTES ABOUT GRADES

Late assignments up to 7 school days late	**Subtract 15% of grade per school day**
Late assignments more than 7 school days late	**No credit**

Independent of your term marks, you must achieve a grade of **at least 45%** on the **final exam** in order to pass the course.

WRITTEN WORK

Your ability to conceive of, design, and implement new computational tools and new user interfaces that truly meet the needs of a class of users depends critically upon your ability to communicate with these users. This requires effective writing and speaking skills. Assignments 2b-4b will therefore include substantial written work.

Assignments 2b and 4b must be typed and submitted on 8.5"X11" paper in **2 copies**. Structure and organization, spelling, grammar, word usage, and document appearance will count for roughly 20% of your grade on the written work**. If reports are not in satisfactory English prose, they will be returned for rewriting. If you need help, please consult your college writing lab.**

Each submission for Assignments 2b-4b must include a title page with a meaningful title, your names, your student ID#s, your tutor's name, the course name and number, and the date. The second page should be a one paragraph executive summary of the document, and a table of contents.

COURSE PHOTOGRAPHS

You are required to submit a digital photograph of yourself (head and shoulders only) in the form of a .jpg file, dimensions 100 pixels x 150 pixels to wael@cs.toronto.edu SUBJECT LINE: 318 photo. Please include your name and student number in the email. Please, do not send a photo larger than 150KB.

Photographs must be received the end of week 3.

FACILITIES

Students may wish to use their own computer facilities for prototyping as long as you absolutely sure your prototype will be viewable on the Web from any standard Web browser or viewable on a UTM-CS machine.

You may also use the environment provided by the Department in the CS-labs. There you will find PCs with software prototyping tools: Macromedia Flash, Macromedia Dreamweaver, and Microsoft Visual Basic. Further details are in the document by Wigdor.

COURSE WEB SITE, ELECTRONIC FORUM, SUBMIT APPLICATION AND DROPBOX

The course web site may be found at http://ccnet.utoronto.ca/20051/csc318h5s/.

On the course website, you will find an electronic bulletin board. This will be used to submit assignments 1a and 1b, and can be used generally to communicate with students in CSC318.

The UTM submit application may be found at https://endor.utm.utoronto.ca/cgi-bin/submit/init.php (linked from course website)

The course dropbox is located in SE2043 (the main big room of the Computer Center in the South Building)

COURSE STAFF

Wael Aboelsaadat is a Ph.D. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a M.Sc. in HCI from the University of Toronto. Wael's research interests include innovative interaction techniques, sketch-based interfaces, and empirical evaluation of user interfaces and devices.

Shengdong Zhao is a Ph.D. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a M.Sc. in Information Management and Systems from the University of California at Berkeley. His research interests include database and information retrieval, XML, digital documents and services, and eLearning.

Al-Mustansir Bin Mukhles is an M.Sc. student in the Computer Science Department at the University of Toronto. His research interests include artificial intelligence, machine learning, and Human Computer Interaction.