DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC 318W

THE DESIGN OF INTERACTIVE COMPUTATIONAL MEDIA

Winter Term, 2002-03 (VERSION 2 — 12 January 2003)

LECTURES	Tuesdays, 4-6 P.M., BA 1170
TUTORIALS	Tuesdays, 6-7 P.M., BA 1170, BA 2159, BA 3004, BA3012
LECTURER	Ronald Baecker, Professor of Computer Science, Electrical and Computer Engineering, and Management Bahen Building Room 7228, 978-6983, rmb@ kmdi.toronto.edu Office hour: Tues. 3:00-4:00, or by appointment
TEACHING ASSISTANTS	Faye Baron, faye@cs.toronto.edu Daniel Wigdor, dwigdor@dgp.toronto.edu Mike Wu, mchi@dgp.utoronto.ca Shengdong Zhao, sszhao@dgp.utoronto.ca
ADMINISTRATIVE SUPPORT	Kelly Rankin, Bahen 7214, 946-8512, kelly@kmdi.toronto.edu

COURSE DESCRIPTION

The focus of this course is on the design of interactive computational media that enhance and support the cognitive and creative processes of their users, and on user interface design.
Topics include:
I) **Introduction**: Interactive computational media. Brainstorming and creativity. Group processes, team building, team management.
II) **Design**: The user-centred iterative design of interactive systems. Design methodologies and principles. Metaphors and mental models. Interdisciplinary design; the role of the design disciplines and the behavioural sciences. Rapid prototyping and envisionment.
III) **A design process**: requirements analysis, activity design, information design, interaction design, prototyping, evaluation
IV) **Interactive technologies and techniques**: Hardware, software, systems, and techniques.
V) **Understanding users, observation, and evaluation**: Interviews and questionnaires, observing users, testing users.
VI) **Interactive media and modalities**: Typography, layout, colour, speech input/output, natural language interfaces, non-speech audio, video, and multimedia.
VII) **The extended interface**: training, documentation, error handling, and help; ergonomics and the physical environment; interfaces for special needs.
VIII) **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-centred, iterative design of prototypes of interactive computational media based on “wearable computers”.

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

Mary Beth **Rossen** and Jack **Carroll** (2002*). Usability Engineering: Scenario-Based Development of Human-Computer Interaction **(R&C)***, Morgan Kaufmann Publishers, available at bookstore for $78.50, electronic version available at http://www.books24x7.com/marc.asp?isbn=1558607129

Ronald **Baecker** (2002). *CSC318 Lecture Notes* (To be posted to class website by Mondays 6 p.m.)

Daniel **Wigdor** (2002). *Building a Usability Prototype in Visual Basic, Dreamweaver, and Flash,* University of Toronto (on website)

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**)

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

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. (**GK**)

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

Jennifer **Preece**, Yvonne **Rogers**, and Helen **Sharp** (2002). Interaction Design: Beyond Human-Computer Interaction. John Wiley & Sons. (**PRS**)

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

The Readings Package may be purchased at Canadian Scholar's Press Inc. (CSPI), 180 Bloor St. West, Suite 801, 416-929-2774. This is on Bloor St. just West of Avenue Road and across from the ROM. The hours (Jan 6 - 18) are Mon-Fri 9am - 7pm and Sat 12-4 (for these two Saturdays only). The price is $43.95. (Note: There are also some copies available of last term's notes plus extra pages for $27.95.)

R&C, BGBG, Winograd, Landauer, PRS, and Tufte are on reserve at the Engineering Library. Edwards and GK are on reserve at the Gerstein library.

COURSE CALENDAR

Jan. 7 Introduction to 318 and to interactive computational media. Introduction to wearable computers.	Jan. 7 (ONE BIG TUTORIAL) Introduction to Ass. 1; individual brainstorming	Ass. 1		R&C, Ch. 1 RP #1-#2 Edwards (optional)
Jan. 14 Design, the design problem, and creativity and brainstorming Group processes, team building, team management	Jan. 14 (ONE BIG TUTORIAL) Discussion of Ass. 1a and individual ideas; introduction to Ass. 1b; group formation assistance		Ass. 1a due on Jan. 13	R&C, Ch. 2 RP #3
Jan. 21 Understanding users and user needs. Requirements analysis	Jan. 21 (4 SMALL TUTORIALS) Discussion of Ass. 1b and team ideas; introduction to Ass. 2	Ass. 2	Ass. 1b due on Jan. 20	RP #4-#8
Jan. 28 Learning from design User-centred, iterative design	Jan. 28 (ONE BIG TUTORIAL) TA presentation on surveys and interviews	Ass. 5	Ass. 2a due On Jan. 30	R&C, Ch. 3 RP #9-#12
Feb.. 4 Design methodologies and principles Activity design; metaphors and mental models	Feb. 4 (ONE BIG TUTORIAL) TA presentation on scenarios and claims analysis			R&C, Ch. 4 RP #13-#14
Feb. 11 Information design; graphic design and typography; data display and visualization	Feb. 11 (4 SMALL TUTORIALS) Introduction to Ass. 3; student presentations of current practice … “Problem Scenarios”	Ass. 3	Ass. 2b due on Feb. 13	R&C, Ch. 5 RP #15
READING WEEK				
Feb. 25 Interaction design; interaction techniques	Feb. 25 (4 SMALL TUTORIALS) Return and discussion of Ass. 2; student presentations of “Activity Design Scenarios” in process			R&C, Ch. 6 RP #16
Mar. 4 Multidisciplinary design, envisionment, and prototyping; prototyping tools	Mar. 4 (ONE BIG TUTORIAL) TA presentation on prototyping tools		Ass. 3a due on Mar. 4	R&C, Ch. 7
Mar. 11 Interaction via speech and sound I/O; System and interface evaluation	Mar. 11 (4 SMALL TUTORIALS) Introduction to Ass. 4; student presentations of prototypes in process	Ass. 4		R&C, App. RP #17
Mar. 18 System and interface evaluation	Mar. 18 (ONE BIG TUTORIAL) TA presentation on usefulness and usability evaluation		Ass. 3b due on Mar. 18	RP #18
Mar. 25 Human abilities: perceptual, cognitive, motor	Mar. 25 (4 SMALL TUTORIALS) Return and discussion of Ass. 3; student presentations of prototypes		Ass. 4a due on Mar. 25	R&C, Ch. 8 (omit 292-300) RP #19
Apr. 1 Course evaluation and discussion. Research frontiers: the extended interface and user support	Apr. 1 (4 SMALL TUTORIALS) Student presentations of usefulness and usability evaluations			R&C, Ch. 9 (omit 329-338) R&C, Ch. 10
Apr. 8 Research frontiers: global networking, collaborative systems, ubiquitous computing	Apr. 8		Ass. 4b due on Apr. 10	

REQUIRED READINGS

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

To be done by Jan. 14
[R&C] Chapter 1, Scenario-Based Usability Engineering, 1-35

[RP#1, BGBG] G. Salomon, A Case Study in Interface Design: The CHI'89 Information Kiosk, 23-34
Salomon's "storytelling prototype" corresponds to Rosson & Carroll's Activity Design Scenario, and her "functional prototype" corresponds to Rosson & Carroll's Interaction Scenario prototype
[RP#2, 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

To be done by Jan. 21
[R&C] Chapter 2, Analyzing Requirements, 37-78

[RP#3, PRS] Chapter 13, Asking Users and Experts (part), 389-407
Interviews and questionnaires

To be done by Jan. 28
[RP#4, BGBG] Chapter 2, Design and Evaluation (part), 73-80 (top of 1st column)
Approaches to the design of interactive systems
[RP#5, BGBG] C. Lewis and J. Rieman, Getting to Know Users and their Tasks, 122-127
Task-centred user interface design
[RP#6, Landauer] The Trouble with Computers, 139-140, 141-144, 239-247
Usefulness, usability, and example of user-centred design
[RP#7, BGBG] D. Norman, The Psychopathology of Everyday Things, 5-21
Affordances, conceptual models, visibility, mapping, feedback
[RP#8, GK] Introduction: Situated Design, 1-16 (skip 10-14)
Design paying attention to the workplace, including participatory design

To be done by Feb. 4
[R&C] Chapter 3, Activity Design, 79-108

[RP#9, BGBG] T. Erickson, Working with Interface Metaphors, 147-151
Choosing and evaluating metaphors
[RP#10, Winograd] T. Winograd, Kid Pix, 58-61
Functionality as user experience
[RP#11, Winograd] T. Winograd, The Spreadsheet, 228-231
The power of an effective representation
[RP#12, Winograd] L. DeYoung and T. Winograd, Quicken, 268-271
The power of a familiar metqphor

To be done by Feb. 11
[R&C] Chapter 4, Information Design, 109-157

[RP#13, BGBG] A. Marcus, Principles for Effective Visual Communication for GUI Design, 425-441
Principles abstracted from a successful information design practice
[RP#14, 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

To be done by Feb. 25
[R&C] Chapter 5, Interaction Design, 159-195

[RP#15, BGBG] Chapter 7, Touch, Gesture, and Marking, 469-482
Includes a taxonomy of input devices, gestures, and two-handed input

To be done by Mar. 4
[R&C] Chapter 6, Prototyping, 197-225

[Wigdor] Prototyping Tools

[RP#17, Winograd] Ch. 10, M. Schrage, Cultures of Prototyping, 191-205
Prototyping in the real world, especially in industrial design

To be done by Mar. 11
[R&C] Chapter 7, Usability Evaluation, 227-271

[RP#16, BGBG] Chapter 8, Speech, Language, and Audition, 525-537
Includes speech synthesis, speech recognition, multimodal interaction, and non-speech audio

To be done by Mar. 18
[R&C] Appendix: Inferential Statistics, 363-372

[RP#18, BGBG] Chapter 2, Design and Evaluation (part), 80-91
Approaches to evaluating interactive systems

To be done by Mar. 25
[RP#19, PRS] Chapter 3, Understanding Users, 73-104
An overview of cognition as applied to interaction design

To be done by Apr. 1
[R&C] Chapter 8, User Documentation, 273-292, 300-302

[RP#20, 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 Apr. 8
[R&C] Chapter 9, Emerging Paradigms for User Interaction, 303-329, 338-340
[R&C] Chapter 10, Usability Engineering in Practice, 341-362

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.

ASSIGNMENTS, DUE DATES, AND METHODS OF EVALUATION

Assignment 1
1a description: Brainstorming ideas for term project
Handed out: Tues., January 7
1a due back in: **Mon., January 13, 4 p.m. !!! (via course listserv only)**
1b description: One page proposal for term project; list of team members
Handed out: Tues., January 17
Due back in: **Mon., January 20, 4 p.m. !!! (via course listserv only)**

Assignment 2
Description: Requirements analysis for computational media design project
Handed out: Tues., January 21
2a due back in: **Thurs., January 30, 4 p.m. (email)**
2b due back in: **Thurs., February 13, 4 p.m. (paper, in 2 copies)**

Assignment 3
Description: Design and prototyping for computational media design project
Handed out: Tues., February 11
3a due back in: **Tues., March 4, 4 p.m. (email)**
3b due back in: **Tues., March 18, 4 p.m. (paper, in 2 copies)**

Assignment 4
Description: Usefulness and usability evaluation of prototype system
Review and analysis of design project and design experience
Handed out: Tues, March 11
4a due back in: **Tues., March 25, 4 p.m. (email)**
4b due back in: **Thurs., April 10, 4 p.m. (paper, in 2 copies)**

Assignment 5 Oral presentation
Handed out: Tues., January 28
Due back in: Sign up early for a tutorial date between Feb. 11 and Apr. 1
Description: 3 min. oral presentation + 3 min. Q&A period on one key issue in one assignment

GRADING

Photo taken		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%	individual grade
Class participation	10%		individual grade (project work, tutorial & class participation)
FINAL EXAM		35%	individual grade

IMPORTANT NOTES ABOUT GRADES

Late assignments up to 8 school days late	**Subtract 5% of grade per school day**
Late assignments more than 8 school days late	**No credit**

Independent of your term marks, you must achieve a grade of **at least 35%** 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 2-4 will therefore include substantial written work.

Assignments 2-4 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.**

Each submission for Assignments 2-4 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.

If you need help, please consult your college writing lab.

COURSE PHOTOGRAPHS

During the first two weeks of class, student pictures will be taken by Christina Parker in BA7214 from 4 to 5:45 on Tuesdays Jan. 14th and Jan. 21st. Even better, please email a digital photograph of yourself in the form of a .jpg file to Christina@kmdi.utoronto.ca. Photographs must be received by Wednesday, January 22nd.

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 CDF machine.

You may also use the environment provided by the Department in CDF, the Gerstein Science Information Center, CDF-PC Lab, 2nd Floor, 9 King's College Rd, see http://www.cdf.toronto.edu/cdfpc/faq.html#GS1

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 AND LISTSERV

The course web site may be found at http://www.dgp.utoronto.ca/people/RMB/318/csc318.html. The course listserv is CSC318-L@LISTSERV.UTORONTO.CA. Subscribe to the listserv by sending a message to listserv@listserv.utoronto.ca. In the body of the text type the command line "subscribe csc318-L <firstname> <lastname>". Don't put any subject in and if you have an automatic signature, it must be removed.

COURSE STAFF

Ronald Baecker is the Bell University Laboratories Chair in Human-Computer Interaction at the University of Toronto. He is also a Professor of Computer Science and the Founder and Chief Scientist of the Knowledge Media Design Institute. He is an active lecturer and consultant to industry on topics including human-computer interaction and user interface design, computer-supported cooperative work and learning, multimedia, and entrepreneurship in the software industry. He has a B.S., M.S., and Ph.D. from MIT.

Faye Baron is a M.Sc. student in Computational Linguistics in the Computer Science Department at the University of Toronto. She has worked as a software systems designer and developer for 19 years.

Daniel Wigdor is a M.Sc. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He is also an experienced instructor who has taught a number of undergraduate CS courses.

Mike Wu is a M.Sc. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a B.Sc. in CS from the University of British Columbia. His interests include computer games, computer-supported cooperative learning, and memory aids.

Shengdong Zhao will soon be 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 interests include database and information retrieval, XML, digital documents and services, and eLearning.