

DEPARTMENT OF COMPUTER SCIENCE  
UNIVERSITY OF TORONTO

CSC 428F/2514F

**HUMAN-COMPUTER INTERACTION**

Fall Term, 1997-98 (FINAL — VERSION 5 — 1 December 1997)

- LECTURES:** Mondays and Wednesdays, 4:00-5:00 P.M., GB119
- TUTORIALS:** Thursdays, 4:00-5:00 P.M., GB220, RW 142
- LECTURER:** Ronald Baecker, Professor of Computer Science,  
Electrical and Computer Engineering, and Management  
SF4306E, 978-6983, rmb@dgp  
Office hour: Wednesdays, 3:00-3:45 P.M., or by appointment
- SPECIAL LECTURER:** Dr. Ben Barkow, President  
Behaviourial Team  
dr.ben@bteam.com
- TEACH. ASS'Ts:** Jade Rubick, jade@dgp  
Joanna McGrenere, joanna@dgp
- LAB SUPPORT:** Neil Enns, ennsnr@dgp
- CDF SUPPORT:** admin@cdf

**COURSE DESCRIPTION**

This course presents basic concepts in the theory and practice of human-computer interaction, motivated by and rooted in the goal of designing effective interactive computer systems and their user interfaces.

Topics include interactive system design methodologies, understanding users and user needs, task analysis, interviews and questionnaires, the psychology of the user, modelling users and systems, user interface development tools and processes, interface evaluation, video analysis, experimental design, designing for a work context, and groupware and computer-supported cooperative work.

All students will work in 3-4 person teams on a variety of assignments exploring basic approaches and techniques used in human-computer interaction. No single-person teams are allowed.

This course is cross-listed at the 4th year undergraduate and 1st year graduate levels. The major difference between the undergraduate and the graduate courses is that graduate students are expected to contribute more to class discussion, to ask deeper questions, and to present more detailed analyses in their assignments. It is recommended that graduate students attempt to cluster together in their own project teams.

## OBJECTIVES

1. To introduce the student to key issues in human-computer interaction.
2. To introduce the student to the literature of the field of human-computer interaction.
3. To stress the importance of human factors in the design of interactive computer systems
4. To provide the future interface designer with concepts and strategies for making design decisions.
5. To give the student concrete experience in:
  - a. Thinking critically about user interfaces
  - b. Knowing which human-computer interaction techniques to apply
  - c. Knowing when and how to apply these techniques
  - d. Working in project teams
  - e. Writing clear, understandable English descriptions of systems, interfaces, issues
  - f. Verbalizing, articulating, and discussing concepts and issues.
6. To prepare the student for real-world software and systems design, of which human-computer interaction and user interface design is an essential component.
7. To facilitate communication between soon-to-be computer scientists and human factors engineers on interactive computer system and user interface development projects.

## TEXTS

Ronald Baecker (1997). *CSC428F Lecture Notes*. (**Baecker**) (To be posted to class WWW site).

William M. Newman & Michael G. Lamming (1995). *Interactive System Design*. Addison-Wesley. (**NL**)

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

## COURSE PHOTOGRAPHS

During the second week of class, pictures of students will be taken at the CSSU. It is **strongly recommended** that you do this.

## COMMUNICATION WITH THE CLASS

News about changes in the class, the course notes, assignments, etc. will be posted on the [ut.cdf.csc428h@cdf](mailto:ut.cdf.csc428h@cdf) newsgroup. You are expected to stay in touch this way.

**COURSE CALENDAR (Subject to change)**

<i>Monday LECTURE</i>	<i>Wednesday LECTURE</i>	<i>Thursday TUTORIAL</i>
Sept. 8 1. Introduction to HCI and to CSC428F	Sept. 10 2. An example of user-centred iterative design: Time-based information management	Sept. 11 Intro. to Assignment 1 and to heuristic evaluation and user testing
Sept. 15 3. Interactive system design methodologies & HCI	Sept. 17 4. Understanding users and user needs; research and evaluation methodologies	Sept. 18 More on user testing
Sept. 22 5. User and task analysis: interviews and questionnaires	Sept. 24 6. Interviews and questionnaires; contextual inquiry	Sept. 25 Exercises in heuristic evaluation
Sept. 29 7. Understanding users: the psychology of the user — perception (Barkow)	Oct. 1 8. Understanding users: the psychology of the user — cognition (Barkow)	Oct. 2 Intro. to Assignment 2
Oct. 6 9. Understanding users: the psychology of the user — human performance (Barkow)	Oct. 8 10. Interactive systems analysis and design; task models	Oct. 9 More on interviewing and questionnaires; ethics with human informants
Oct. 13 THANKSGIVING	Oct. 15 11. Design and envisionment; metaphors and mental models	Oct. 16 Discussion of Assignment 1
Oct. 20 12. User interface development tools	Oct. 22 13. User interface development tools	Oct. 23 Intro. to Assignment 3 and to prototyping in Metacard
Oct. 27 14. Style guidelines and the development process	Oct. 29 Guest Lecture: Karel Vredenberg, IBM	Oct. 30 More prototyping in Metacard
Nov. 3 15. Interface evaluation: experiments (Barkow)	Nov. 5 16. Interface evaluation: sample experiments (Barkow)	Nov. 6 Discussion of Assignment 2
Nov. 10 17. Understanding users and user needs; research and evaluation methodologies 2	Nov. 12 18. Examples of HCI research and evaluation in interactive system development	Nov. 13 Intro. to Assignment 4 and to video analysis
Nov. 17 19. Modeling users and systems: a framework	Nov. 19 20. Modeling users and systems; GOMS and Keystroke models	Nov. 20 Discussion of Assignment 3
Nov. 24 21. How to solve HCI questions (Barkow)	Nov. 26 Guest panel: Paul Eisen, CIBC; Mary Lytwyn, Bank of Montreal	Nov. 27 Question and answer
Dec. 1 22. Modeling users and systems; GOMS and the TAO workstation	Dec. 3 23. Groupware and CSCW	Dec. 4 Question and answer

**ASSIGNED READINGS**

FOR BEST UNDERSTANDING OF THE LECTURES, DO THESE BEFORE THE DATE LISTED!!!!

*September 10 2. User-centred iterative design*

[NL] Chapter 1, Introduction, 3-13

[NL] Chapter 2, Defining the Problem, 15-39

[BGBG] Preface (part), xi-xv

[BGBG] Part I, Introduction to Human-Computer Interaction, 1-3

*September 11 Tutorial on usability inspection*

[NL] Chapter 8.6, Heuristic Evaluation, 182-186

[BGBG] Heuristic Evaluation with Usability Guidelines, 82-84

[BGBG] Usability Testing, 84-86

*September 15 3. Interactive system design methodologies*

[NL] Chapter 4, Design Processes and Representations, 69-87

[BGBG] Chapter 2, Design and Evaluation (part), 73-80(top of 1st column)

[BGBG] Chapter 3, Software Development Contexts, 273-278

*September 17 4. Understanding users and user needs; research and evaluation methodologies*

[BGBG] Chapter 2, Design and Evaluation (part), 80(top of 1st column)-89

*September 22 5. User and task analysis: interviews and questionnaires*

[NL] Chapter 5, User Study Methods, 91-108

[BGBG] Lewis and Rieman, Getting to Know Users and their Tasks, 122-127

*September 24 6. Interviews and questionnaires; contextual inquiry*

[BGBG] Holtzblatt and Jones, Conducting and Analyzing a Contextual Interview, 241-253

[NL] Case B: Designing a Human Memory Aid (part), 411-423

*September 29 7. Understanding users; the psychology of the user — perception*

[NL] Chapter 3, The Human Virtual Machine, 41-68

*October 1 8. Understanding users; the psychology of the user — cognition*

[BGBG] Chapter 9, Human Information Processing (part), 573-578

*October 6 9. Understanding users; the psychology of the user — sensori-motor skills*

[NL] Chapter 12, Interaction Styles (for those without CSC318 or its equivalent), 293-322

*October 8 10. Interactive systems analysis and design; task models*

[NL] Chapter 6, Systems Analysis and Design, 109-139

*October 15 11. Design and environment: metaphors and mental models*

[NL] Chapter 13, Conceptual Design: The User's Mental Model, 323-346

[BGBG] Erickson, Working with Interface Metaphors, 147-151

*October 20 12. User interface development tools*

[NL] Chapter 11, User Interface Notations, 271-291

[BGBG] Chapter 5, Development Tools, 313-318

*October 22 13. User interface development tools*

[BGBG] Myers, State of the Art in User Interface Software Tools, 323-343

- October 27*      *14. Style guidelines and the development process*  
[NL] Sections 15.1-15.6, Designing to Guidelines, 373-391  
[BGBG] Wiecha, et al., ITS: A Tool for Rapidly Developing Interactive Applications, 373-389
- November 3*      *15. Interface evaluation; experiments*  
[BGBG] McGrath, Methodology Matters: ... Research in the Behavioral and Social Sciences, 152-169
- November 5*      *16. Interface evaluation; sample HCI experiments*  
[NL] Chapter 10, Experiments in Support of Design, 215-247
- November 10*      *17. Understanding users & user needs; research & evaluation methodologies 2*  
[NL] Chapter 9, Prototyping and Evaluation, 189-212  
[BGBG] Suchman & Trigg, Understanding Practice: Video... for Reflection and Design, 233-240
- November 12*      *18. Examples of HCI research and evaluation in interactive system development*  
[BGBG] Egan, et al., Behavioral Evaluation and Analysis of a Hypertext Browser, 843-848  
[BGBG] Case C: A Multimedia Communication System, 867-869  
[BGBG] The Freestyle System: A Design Perspective, 871-880
- November 17*      *19. Modeling users and systems; a framework*  
[NL] Chapter 8, Usability Analysis and Inspection, 165-186  
[BGBG] Chapter 9, Human Information Processing (part), 578-583
- November 19*      *20. Modeling users and systems; GOMS and Keystroke models*  
[BGBG] Card & Moran, User Technology: From Pointing to Pondering, 587-602  
[BGBG] Olson & Olson, The Growth of Cognitive Modeling in HCI Since GOMS (part), 603-606
- November 19*      *21. How to solve HCI questions*  
[BGBG] Landauer, Lets Get Real: A Position Paper on... Cognitive Psychology....., 659-665
- December 1*      *22. Modeling users and systems; GOMS and the TAO workstation*  
[NL] Case Study A, Evaluation and Analysis of a Telephone Operator's Workstation, 249-268  
[BGBG] Gray, et al., GOMS Meets the Phone Company....., 634-639
- December 3*      *23. Research frontiers: Groupware and computer-supported cooperative work*  
[BGBG] Chapter 5, Considering Work Contexts in Design. 187-196  
[BGBG] Chapter 11, Groupware and Computer-Supported Cooperative Work, 741-749

## **FACILITIES**

Assignments 1 and 3 will be carried out on Sun workstations located in Rooms 201 and 203 of CDF. Assignment 4 will be carried out in the CSC428F Video Analysis Lab, EA107. Further details will be provided with the Assignments.

## TEAM WORK

Students will team up in groups of **three** for their assignments (two with permission of their TA). The assignments are a considerable amount of work and require a team to exchange ideas, pool skills, carry out and observe human-computer interactions, and help manipulate equipment. Teams are also the standard fashion in which real-world user interface design is carried out.

You are expected to form a team for Assignment 1. You can keep this team for the remainder of the semester, or make changes before Assignment 2. You must keep the same team for Assignment 2, 3, and 4, because these assignments are linked together as part of a series.

A few rules about teams.

1. Students will need to find their own team members. A portion of the time in tutorials can be used to talk with other students and build a team. It is strongly recommended that you allocate time each week before or after a class to meet with your team members.
2. In extreme cases, students can break with a team (i.e., divorce), but the entire team must come to the teaching assistant together and give good reasons why they are breaking up, and must also propose which new teams they are joining (see 3 below). Otherwise a team will be considered in place from Assignment 2 through the end of the term.
3. In extreme cases, students can join new teams (i.e., remarry), but the new team must confirm to the teaching assistant that they are willing to accept the new member.
4. No single membered teams will be permitted. The assignments are simply too much work.
5. Note: You will sometimes have to work with other people in your life who you feel are not carrying their share of the load or doing the work at the level you desire. Your teaching assistant will be happy to help resolve problems if this occurs, and you are having trouble in dealing with team members or negotiating compromises.

Assignment 1 will be handed in and graded individually. Assignments 2, 3, and 4 will be graded as a team, with an individual participation measure to be described later in the term.

## ASSIGNMENTS, DUE DATES, AND METHODS OF EVALUATION

### Assignment 1

**Handed out:** Thursday, September 11, 4:10 p.m.

**Due back in:** Thursday, October 2, 4:10 p.m.

**Description:** Usability testing and comparative heuristic evaluation of 3 interfaces

### Assignment 2

**Handed out:** Thursday, October 2, 4:10 p.m.

**Protocol due in:** Tuesday, October 14, 4:10 p.m.

**Due back in:** Thursday, October 30, 4:10 p.m.

**Description:** User/task analysis in problem domain

### Assignment 3

**Handed out:** Thursday, October 23, 4:10 p.m.

**Due back in:** Thursday, November 13, 4:10 p.m.

**Description:** Design and development of prototype system for problem domain

**Assignment 4****Handed out:** Thursday, November 13, 4:10 p.m.**Due back in:** Thursday, December 4, 4:10 p.m.**Description:** Video analysis of usage of prototype system**Grading**

Assignment 1	15%
Assignment 2	15%
Assignment 3	15%
Assignment 4	15%
Class participation	10%
FINAL EXAM	30%

Each assignment will be passed back with a grade sheet indicating the criteria that were applied.

**Late assignments**

Up to 7 school days late

**Subtract 7.5% of grade per day**

More than 7 school days late

**No credit****Final exam**

Please note that, independent of your term marks, you must achieve a grade of at least 35% on the final exam in to order to pass the course.

**Grade redress policy**

It is sometimes possible that a TA or the course instructor mis-interpreted your work in some crucial way or that the points for the assignment or exam were added incorrectly. If you feel that this is the case, please see your TA within a week of any such occurrence.

**Written work**

All of the assignments will include written work.

All written assignments must be typed and submitted on 8.5"x11" paper using a 10 point or 12 point type for the body text. Structure and organization, spelling, grammar, word usage, and document appearance will count for roughly 20-25% of your grade on the written work. If reports are not in reasonable English prose, they will be returned for rewriting.

Each submission 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 contain a one paragraph executive summary of the document, and a table of contents.

Why is this? In order to analyze and synthesize effective methods of human-computer interaction, you must be able to understand and communicate with users. This requires effective writing and speaking skills. Your work must reflect competence in these skills.

If you need help, please consult a university writing lab. We will distribute a list of such labs.

**COURSE STAFF**

Ronald Baecker is Professor of Computer Science, Electrical and Computer Engineering, and Management at the University of Toronto, and Director of the Knowledge Media Design Institute of the University. 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 is the author or co-author of four books, *Readings in Human-Computer Interaction: A Multidisciplinary Approach* (with Bill Buxton), *Human Factors and Typography for More Readable Programs* (with Aaron Marcus), *Readings in Groupware and Computer-Supported Cooperative Work: Facilitating Human-Human Collaboration*, and *Readings in Human-Computer Interaction: Toward the Year 2000* (with Jonathan Grudin, Bill Buxton, and Saul Greenberg), and the author of two published videotapes, *Sorting Out Sorting* and *The Dynamic Image*. He has a B.S., M.S., and Ph.D. from MIT.

Ben Barkow is adjunct course faculty and President of Behavioural Team, a company consulting in Applied Psychology. Since leaving Bell Labs in 1969, he has completed 475 projects and papers of which 120 are specific to computing interfaces. Computer projects include financial software, media and networks, military systems, transportation automation, training, smart devices, and voice/phone systems. He was in charge of mounting the compendium of human factors (MIL SPEC 1472) in HyperCard. Ben is the current Chair of ACM's ToRCHI and is registered as a Psychologist. His Ph.D. is from York University where initially he taught in Fine Arts.

Joanna McGrenere is a Ph.D. student in Computer Science specializing in human-computer interaction. She has a M.Sc. in Computer Science from the University of British Columbia

Jade Rubick is a M.Sc. student in Computer Science specializing in human-computer interaction. He has bachelor's degrees in Computer Science, Japanese, and Far Eastern Studies from the University of Oregon.