CS 112 **GREAT IDEAS IN COMPUTER SCIENCE II** **Spring 1993**

SYLLABUS
REVISED VERSION, 8 FEBRUARY 1993

PREREQUISITE: The prerequisite for this course is CS 111. ***NO*** student may take this course who did not take CS 111! (Such students will receive a grade of F.)

Staff:

Professor: Dr. William J. Rapaport, 214 Bell Hall, 645–3193,
Office Hours: TTh 1:00–2:00 P.M., and by appointment.

Teaching Assistant: Ms. Elissa Feit, 333 Bell Hall, 645–2879,
Office Hours: M 1:00–3:00 P.M. *in the Baldy 213 lab*, and by appointment.

Class Meetings:

CLASS	INSTRUCTOR	REGISTRATION NO.	DAYS	FROM	TO	LOCATION
Lecture	Rapaport	304223	MWF	10:00 A.M.	10:50 A.M.	**322 Fillmore**
Recitation L2	Feit	304278	T	11:00 A.M.	11:50 A.M.	213 Baldy
Recitation L4	Feit	304234	W	11:10 A.M.	12:00 NOON	213 Baldy

Laboratory:

213 Baldy Hall. Open Lab. Contains 25 Macintosh LC II computers. Staffed by Computer Science assistants. Hours: M 1:00–7:00 P.M., TTh 1:00–4:00 P.M. and 7:00–10:00 P.M., W & Sun 2:00–10:00 P.M., F & Sat 2:00–6:00 P.M.. Closed holidays. Call the lab before coming over if you're not sure if it will be open: 645–3197.

Course Materials:

Texts:

1. Alan W. Biermann, *Great Ideas in Computer Science: A Gentle Introduction* (Cambridge, MA: MIT Press, 1990); from CS 111 last semester—available in the bookstore.
2. Weizenbaum, Joseph (1976), *Computer Power and Human Reason: From Judgment to Calculation* (San Francisco: W. H. Freeman); to be purchased at the bookstore.

Software: *THINK Pascal* (available on the machines in the lab).

Disks: You'll need at least two 3.5-inch, high-density or double-density, double-sided disks (e.g., Sony MFD-2HD); to be purchased in the labs, at the UB Micro store in the Commons, or at the bookstore (or elsewhere).

Who this course is for:

This course is designed for students who have successfully completed CS 111 and who intend to use CS 111–CS 112 to satisfy the mathematical sciences requirement or who wish to continue their study of the great ideas of computer science.

Topics:

This is the second semester of a 2-semester course in computer *science* (not merely computer *programming*) that is intended to satisfy the mathematical sciences requirement of the core curriculum. It will provide you with knowledge, skills, and tools that will be useful in later science courses (as well as other courses). And it will provide you with an appreciation for some of the most interesting and significant results of computer science, as well as an appreciation of its intellectual and social significance.

This semester, we will continue our study of algorithmic problem solving. The theme of the course is: *What can be computed?* We will look at (1) *theoretical* limits to computation: things that can or *absolutely* cannot be computed; (2) *practical* limits to computation: things that can or cannot be computed *efficiently*; and (3) *ethical* or *moral* limits to computation: things that *shouldn't* be computed.

We will review and extend what we learned in CS 111 about what computers *can* do. Next, we will study *how* computers do what they do, by studying "hardware": a bit of electric circuitry and machine architecture, and low-level software: assembly-language programming. Then we will look at what computers *can't* do, either for *practical* reasons (e.g., a computation that would take longer to do than the age of the universe *can't* be done for any practical purpose) or for *theoretical* reasons (e.g., some things are *logically* impossible to compute). Finally, we will consider what computers *shouldn't* do for moral or ethical reasons. If time permits, we will look briefly at a problem area whose computability is an open question: artificial intelligence—whether computers can think (whether thinking is computable).

Attendance:

You will be expected to attend all lectures and recitations. Homework and lab assignments will be announced during lecture. Be sure to get a classmate's phone number,[1] so that you will not miss assignments in the unlikely event that you miss a class.

Important Dates:

Monday	January	25	First Lecture
Week of	January	25	First meetings of Recitations
no earlier than ...			
... TUESDAY	MARCH	3	*** MIDTERM EXAM ***
			The Midterm Exam will be given after we finish Chs. 4 & 6 of Biermann's text. I expect to finish Ch. 6 by Fri., Feb. 26. If I don't, I reserve the right to postpone the exam. However the Midterm Exam will be given no *later* than Wed., Mar. 17
Friday	March	19	*** Last day to withdraw with a grade of 'R' ***
Monday–Sunday	April	5–11	Spring break; no classes
Tuesday, Thursday	May	4, 6	Last meetings of Recitations
Friday	May	7	Last Lecture
	May	10–14	Exam Week (Assume our exam is Friday afternoon)

[1] For instance, 1 or 2 people sitting next to you in class, whoever they are!

Tentative Schedule:

Text/Section	Topic (B = Biermann; W = Weizenbaum)	Lecture Dates
W, pp. ix–16	Review of CS 111, intro to CS 112	Jan 25, 27
B, pp. 113–125; W, Chs. 1–2	Subroutines summary of W ix-16 due Feb 1 summary of W Ch 1 due Feb 8	Jan 29–Feb 12
B, Ch. 6; W, Chs. 3–4	Electric circuits summary of W Ch 2 due Feb 15 summary of W Ch 3 due Feb 22	Feb 12–Feb 26
W, Ch. 5	Review for Midterm summary of W Ch 4 due Mar 1	Mar 1
	MIDTERM EXAM ?	Mar 3
	Review of Midterm	Mar 5
B, Ch. 9; W, Chs. 6–8	Machine architecture & assembly-language programming summary of W Ch 5 due Mar 8 summary of W Ch 6 due Mar 15 summary of W Ch 7 due Mar 22	Mar 8–Mar 24
B, Ch. 13; W, Chs. 9–10	Noncomputability summary of W Ch 8 due Mar 29 summary of W Ch 9 due Apr 12	Mar 26–Apr 19 [Spring Break: Apr 5–11]
B, Ch. 11	Program execution time summary of W Ch 10 due Apr 19	Apr 21–23
	Discussion of Weizenbaum & Terry Winograd, "Computers, Ethics, and Social Responsibility" (to be handed out in lecture)	Apr 26–30
B, Ch. 14	Artificial intelligence	May 3–5
	Semester Review	May 7

Keeping Up with the Reading:

1. I will expect you to have read each chapter *before* the first day of my lecture on it.
2. I strongly recommend that you *re*-read each chapter *after* my lectures on it.
3. See the handout, "How to Read (a Computer Science Text)".
4. Not all material in the text will be covered in lecture (in lecture, we shall only cover interesting or hard material, plus occasionally material that is *not* in the text), but you are responsible for *all* material in the text and lectures.
5. Although I will not lecture directly on the material in Weizenbaum's book, I will expect you to read 1 chapter per week (some of the material overlaps with Biermann's text). See item 9, in the next section.

Keeping Up with the Homeworks and Lab Exercises:

1. **Homework assignments** will be of the "paper-and-pencil" variety, to be done at home.
2. **Lab exercises** will involve you in designing algorithms, coding them in Pascal and in assembly language, and running, testing, and debugging the programs on the Macintoshes. Lab exercises will normally be done in the labs on your own time, though some of them may be done in your recitation section, and you will have to do the preliminary design of them at home. The programs you will be asked to write will be relatively short and will be chosen to illustrate particular techniques or issues.
3. The purposes of homeworks and lab exercises are:
   (a) to give you hands-on experience with relatively small problems and to give you hands-on experience in designing, coding, testing, debugging, and documenting programs
   (b) to give you a chance to assess the level of your understanding
4. There will be approximately 1 HW or Lab each week. Some of them may be time-consuming (but fun, I hope!). You should plan to spend at least an hour or two each week in the lab.
5. Due dates will be announced in lecture when the homework or lab is assigned. HWs and labs will be collected at the *start* of lecture on the due date. If you try to hand yours in after they have been collected, it will not be accepted. To repeat:

   NO LATE HOMEWORKS OR LABS WILL BE ACCEPTED.

   This is so that the instructor can discuss the homework in the class period when it is due.
6. Put your full name, date, and your recitation (L2, L3, L4, L7) at the **top right-hand side** of the first page or in a comment section at the top of every program, and secure all pages with a **staple** in the **top left-hand corner**.
7. **Note:** The lowest homework or lab grade will be dropped; you should assume that you will fail to turn in one homework or lab (oversleep, get stuck in traffic, etc.)—that's the one that will be dropped. If you know *now* that you will regularly be late, see me to make alternative arrangements for turning in your work. Your graded HW or lab will be returned in recitation.
8. Just as you cannot expect to learn how to drive a car by reading about it or by watching other people do it, the same holds true for programming a computer. Do your work on time—this is one course you simply cannot cram for at the last minute, so don't even try! I cannot stress this strongly enough. Remember that the homeworks and labs may be fairly time-consuming, so please consider your other commitments, and plan your time accordingly.
9. **Chapter Summaries of Weizenbaum:** As part of your homework, you will be asked to write a 1-page summary of each chapter of Weizenbaum's book each week (1 chapter per week). These will be collected, read, and recorded, but not graded. You must turn in chapter summaries for all

chapters. Failure to do so will lower your final grade by 1/3 of a letter grade. There will be no penalty for handing in late summaries.

Grading:

All graded work will receive a letter grade, 'A', 'A–', 'B+', 'B', 'B–', 'C+', 'C', 'C–', 'D+', 'D', or 'F'. Your course grade will be calculated as a weighted average of all letter grades according to the following weights:

Midterm Exam	20%
Final Exam	30%
Homeworks and Lab Exercises	50%
Total	100%

Incompletes:

It is University policy that a grade of Incomplete (with a default grade) is to be given only when a small amount of work or a single exam is missed due to circumstances beyond the student's control, and that student is otherwise doing passing work. I will follow this policy. Incompletes will normally have to be made up by the end of the Fall 1993 semester. The default grade will automatically be assigned after that if the work has not been completed.

Academic Honesty:

While it is acceptable to discuss general approaches with your fellow students, the work you turn in must be your own. *If the work of two or more students appears unjustifiably similar, penalties will be assessed to all concerned.* If you have any problems doing the homeworks or projects, consult the TAs or Prof. Rapaport. Do not loan or give non-empty disks or program listings to any other student under any circumstances! Also, see the handout on the university's policy on computer ethics ("Conditions of Use of the Computing Center Facilities"), appended to this syllabus.

CONDITIONS OF USE OF THE COMPUTING CENTER FACILITIES

Academic Computing Services
University Computing Services
State University of New York at Buffalo

The use of SUNY/Buffalo academic computer systems by members of the university community is authorized by Academic Computing, University Computing Services. All classes of users (students, faculty, and staff members) have equal privileges and equal access to the Computing Center's facilities, and all have the responsibility to use the Computing Center's services in an effective, efficient, ethical, and legal manner.

Every computer account issued by SUNY/Buffalo is the responsibility of the person in whose name it is issued. As a result, acquiring an account in another person's name, or using an account without the explicit permission of the owner and the full knowledge of Academic Computing will be considered to be theft of services, and will be dealt with according to the "Student Rules and Regulations" and/or Chapter 514 of the New York State Penal Law.

It is mandatory that the owner of an account be careful to keep the account secure by keeping the password secret, changing the password often, and reporting to Academic Computing when anyone else is using the account without permission.

1 Authorized Use.

As a condition for use of the Academic Computing systems, all users are expected:

1. To respect the privacy of others. For example, users shall not intentionally seek information on, obtain copies of, or modify files or passwords belonging to others.
2. To respect the integrity of the SUNY/Buffalo computing systems. For example, users shall not intentionally develop or use programs that harass other users, infiltrate a computing system, or damage or alter the software components of a computing system.
3. To not develop programs or use any mechanisms to alter or avoid accounting for the use of computing services or to employ means by which the facilities and systems are used anonymously or by means of an alias. For example, users shall not send messages or mail, or print files which do not show the username of the user using the system or which exhibit a username other than that of the sender.
4. To respect the legal protection provided by copyright and licenses held by the Computing Center. For example, users shall not make copies of a licensed computer program to avoid paying additional license fees.
5. To use the accounts only for University related purposes. For example, users shall not authorize individuals who are not associated with the University to use an account nor use the academic computers for non-university related work, without prior arrangements with Academic Computing.

Violation of these conditions, i.e., unauthorized use of another person's account, tampering with other users' files or passwords, or harassment of other users is certainly unethical and possibly a criminal offense. Whenever Academic Computing becomes aware of a possible violation of these conditions, Academic Computing will initiate an investigation. In order to prevent further unauthorized activity, Academic Computing may suspend the authorization of computing services to the individual. Confirmation of unauthorized use of the facilities may result in the closing of accounts permanently, billing for computer time used for non-university endeavors, disciplinary action, and/or legal action.

2 Responsible Use.

Users are expected to use computing resources in a responsible and efficient manner consistent with the instructional, research, and administrative goals of the University. Users are expected to refrain from engaging in deliberately wasteful practices such as printing large amounts of unnecessary listings, performing endless unnecessary computations, or unnecessarily holding public terminals, tape drives, dial-up phone lines for long periods of time when others are waiting for these resources. In addition, the playing of games or using networks for purely recreational purposes when others are waiting for terminals represents irresponsible use of the equipment.

Academic Computing prefers not to act as a disciplinary agency or to engage in policing activities. However, in cases of unauthorized or irresponsible behavior, Academic Computing does reserve the right to take remedial action, commencing with an investigation of the possible abuse. Users, when requested, are expected to cooperate in such investigations.