# CS 236 – Foundations of Computer Science II
# Course Syllabus and Calendar – Summer 1998

*Instructor: Don Colton*

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## Abstract

- **Course Number:** CS 236
- **Title:** Foundations of Computer Science II
- **Course Description:** Graphs, directed graphs, minimal spanning trees, depth-first search, finite automata, regular expressions, context-free grammars, propositional logic, predicate logic. (Prereq: CS 235).
- **Textbook:** *Foundations of Computer Science, C Edition*, by: Alfred V. Aho and Jeffrey D. Ullman
- **Class Time:** MWF 1:00–2:50 PM
- **Classroom:** GCB 143
- **Instructor (me):** Don Colton
- **My email:** don@cs.byuh.edu
- **My Office:** GCB 104, Phone: 293-3478
- **My Office Hours:** Summer 1998: MWF 8–9, 11–1, 3–4, (subject to change) or drop-in or by arrangement (send email or call for appointment).

## 1 Why Take This Course?

In programming, there are certain "tricks of the trade" that you as a computer scientist are simply expected to know. This knowledge is the foundation of computer science as we know it today, and much of it is taught in this course.

## 2 Course Content

The full "course" is organized into two halves, CS 235 and CS 236, which should be taken in that order. The first half covers program running time (big-oh notation), probability and counting (how long would a program run if it had to look at every case before it found the solution?), trees, lists, and sets. CS 235 is formally listed as a prerequisite for this class, and I hold you responsible to know all the material from that part of the textbook.

CS 236, the second half depends on the first half, and covers relations, graphs, automata, and logic. It covers chapters eight through twelve and chapter fourteen of the textbook.

## 3 Attendance

There will be quizzes (which cannot be made up) that count for a small part of your grade and help both you and me know how well you are grasping the material. There will be delightful discussions of the internal workings of computer algorithms. There will be explanations of things that are also in the book, with the chance to ask me questions. If you cease to attend, you will become disconnected from the flow of the material, your interest will probably grow cold, and your odds of passing the course will be greatly reduced.

Also, I notice when you are absent. I am personally disappointed whenever attendance falls off. I take some steps to start class right on time, including rewarding those that are in class early.

Due to immigration and veterans requirements the Vice President for Student Life has requested to be notified whenever a student misses four consecutive periods. I comply with this request.

## 4 Lecture Policies

I typically use a flexible and open lecture style, rather than a regimented sequence of slides. I try to focus on interesting aspects of the subject matter, instead of simply repeating what you have read in the textbook. My goal is that you develop intuition about the subject matter, and get unstuck if you have become stuck. Accordingly, I devote as much time as necessary to answering your questions, especially when those questions seem to be of general interest to the others in the class. (Questions of narrow interest may be deferred to my office.) Otherwise, the time is generally spent in discussion of some topic or other that is closely related to the material in the textbook. I may pose a problem to the class and moderate as we work through it together. This can serve as a jump-start for understanding and mastering new material. My method of teaching is based on the view that learning is a shared activity between the teacher and the student, and that learning proceeds most quickly when interaction occurs.

## 5 Work Load

In the United States, the expectation for accredited university-level course work is that there be an average of three hours of work per week for every hour of credit awarded. In a lecture class this means one hour in class and two hours outside of class. Some of you are accustomed to working more and others less. It is my goal to keep the work load for an average member of the class at these levels.

**I expect you to read regularly in the textbook. It is excellent. The authors are highly respected, have a nice presentation style, and they know their material. It is a good book. You will benefit from reading it.**

There is an average of 10 pages of reading per class hour (about 350 pages for the course). Much of it requires careful thought (like mathematics) but some of it is easier to understand (like story). The course calendar lists (often by chapter and section) the topics that will be discussed. You are requested to read the relevant sections before attending class.

A substantial amount of homework will be assigned. Generally reading and homework together will not exceed two hours per class period. If you find the workload to be heavier than that, please let me know.

## 6 Grading

Grades will be computed on the basis of points earned on homework, quizzes, lab work, and tests. The weighting is as follows:

The midterms will be given in the testing center.

- **10%** homework and quizzes
- **45%** lab work (programming assignments)
- **45%** exams (two midterms and a final)
- **100%** total

**Homework:** The primary purpose of homework is to encourage students to master the course material in a low-stress setting where resources such as the textbook can be consulted in a leisurely way. It is my policy that **regular homework in this course can be done with the aid of other students, and that answers can be compared.** It is not in anyone's best interest if answers are simply copied from person to person without at least some attempt at understanding. Generally homework means answering questions from the end of each section in the book. **Extra-credit (bonus) homework problems may be assigned from time to time. These add to your homework score, but are not required. Unlike regular homework, these must be done without the aid of other people, except that you can consult books or ask me (the instructor) for assistance.**

**Late Homework:** Homework assignments are due at the start of class, and should be turned in to me (at the front of the classroom) when you arrive. Typically I like to discuss a homework assignment on the day that it is turned in, or on the day that I return the graded assignment to the students of the class. This often involves disclosing the answers and discussing how the answers were derived. No late work is accepted **after the homework is discussed in class,** except when I approve it in unusual circumstances.

**Quizzes:** The primary purpose of quizzes is to measure student learning on a topic-by-topic basis. It shows me how the students are doing, and it shows you where you might need more attention before the big test.

**Quiz Makeup:** Because quizzes are a small part of the final grade, they cannot be made up except when I approve it in unusual circumstances.

**Programming:** There are three programming assignments in this class. The first is to create a library of abstract data types. The second is to implement Floyd's shortest paths algorithm (section 9.9 of the book). The third is to implement a simple compiler based on table-driven parsing techniques (section 11.7 of the book). The emphasis is on developing your programming skills, including specification reading, debugging, and documenting your work.

You may also be asked to write programs for homework, quizzes, or tests, but these will be read by a human rather than being compiled and executed by a machine. The emphasis will be demonstrating your understanding of the algorithms and problems discussed in class and in the textbook, rather than on your skill at debugging and testing your work. Accordingly, well-commented pseudocode is expected.

**Tests:** The primary purpose of tests (examinations) is to gauge student learning by measuring performance in a (possibly timed) supervised situation. It is understood that such a situation creates additional stress for many students. For this reason testing is not used exclusively in the grading process. Each test will receive a scaled (normalized) score and a letter grade indicating the final course grade that would be earned by consistent performance at the level reflected on that test. The final counts twice as much as a midterm.

**Test Makeup:** The exams count for a total of 45% of the grade and cannot be made up except when I approve it in unusual circumstances.

**Grading Scale:** I use the following grading scale, both for individual assignments and for the course as a whole.

| | | | | | |
|---|---|---|---|---|---|
| 93%+ | A | 90–92.9% | A- | 87–89.9% | B+ |
| 83–86.9% | B | 80–82.8% | B- | 77–79.9% | C+ |
| 73–76.9% | C | 70–72.9% | C- | 67–69.9% | D+ |
| 63–66.9% | D | 60–62.9% | D- | 0–59.9% | F |

**Final Exam:** Even though the final exam may count for just a small percentage of your overall grade, you

must pass the final exam (60.0% or better) in order to pass the class.

**Other notes:** I reserve the right to up-scale the scores on any assignment, exam, or whatever, if I feel the absolute numeric grading is too harsh. The transformation may even be non-linear, but in any case, absolute rank order will be preserved and no score will go down.

Whenever you think grading may be unfair or incorrect, I encourage you to discuss specific instances of grading with the me, and to argue for a different grade than I initially assigned. Some very good learning occurs in these settings (for you **and** for me). The best time to do this is during my office hours, or immediately before or after class if the issue is brief. As an alternative, you can submit your argument in writing, together with the original graded work.

Final grades are generally issued by email soon after the final exam, or in-person if I feel that some discussion might be beneficial. Students are invited to visit my office to claim any exams or homework that I am still holding, and to discuss their academic progress. Interim progress reports are issued to the students several times during the course, generally after the midterm exams and before the final exam.

## 7 Office Hours

Office hours are posted outside my office door and given on the first page of this syllabus. Office hours are subject to change, as I might discover the need to attend some meeting somewhere, or visit the men's room, or talk to someone in the computer lab.

Students for whom the posted hours are not convenient, or who just want a guaranteed appointment, can come by whenever my door is open (which is most of the time) or contact me by email or telephone to make an appointment.

My "open-door policy" is posted on my office door as follows: "If my door is open (even just a bit) feel free to knock and come in. – Bro. Colton"

When there are several activies competing for my attention, visits that become long may need to be interrupted and continued later.

## 8 Communication by Email

When I want to say something, or when you want to say something, if we are not in the same room, my first choice is to do it by email. I far prefer it to telephone calls, for instance. When there is an announcement, I will generally tell you in class or send it to you by email. Such announcements might include clarifications on the homework assignments. You are requested to maintain an email account and to provide me with a valid email address.

## 9 Computer Accounts

As a member of this class, or as a CS major, you are entitled to a computer account in the CS lab. This account gives you access to UNIX systems, software (including compilers and assemblers), email, web surfing, some storage (currently 10 megabytes to start with), and some paper printing (currently 100 pages per CS class). There are also a few modems for dial-in access. If you had a CS account recently, it is probably still active. If not, see me or a lab person (GCB 101) to get set up.

## 10 Subject to Change

I like to avoid mutual unhappiness, so I avoid changes as much as I can. The course number, title, and description will not change, but I do reserve the right to change anything else in this syllabus at any time for any reason. This includes the grading policies and the course calendar. If you think my changes are unfair, you have the right to complain. As I said, I like to avoid mutual unhappiness, so I avoid changes as much as I can. Any important change will be communicated in class and by email to those affected.

## 11 Course Calendar

The course calendar is subject to change by me at any time for any reason. To avoid disruption and unhappiness, I avoid changes (especially exam dates) as much as I can. Any substantial change will be communicated in class and by email.

# CS 236 Tentative Course Calendar Summer 1998

| mtg | day | date | time | read | Topic | pct |
|---|---|---|---|---|---|---|
| 1 | Wed | Jun 24 | 1pm | | Introduction, Syllabus, Grading form, pretest | |
| 2 | Wed | Jun 24 | 2pm | 1-4 | Review of CS235 | |
| 3 | Fri | Jun 26 | 1pm | 5-7 | Review of CS235 | |
| 4 | Fri | Jun 26 | 2pm | 8.1-2 | Intro, Relations | |
| 5 | Mon | Jun 29 | 1pm | 8.3-5 | Keys, Storage, Indexing | |
| 6 | Mon | Jun 29 | 2pm | 8.6-7 | Navigation, Implementation | |
| 7 | Wed | Jul 1 | 1pm | 8.8+ | Algebra, Summary | |
| 8 | Wed | Jul 1 | 2pm | 9.1-2 | Introduction | |
| | Fri | Jul 3 | | | BYUH Holiday: Independence Day | |
| 9 | Mon | Jul 6 | 1pm | 9.3 | Implementing Graphs | |
| 10 | Mon | Jul 6 | 2pm | 9.4 | Connected Components | |
| 11 | Wed | Jul 8 | 1pm | 9.5 | Minimal Spanning Trees | |
| 12 | Wed | Jul 8 | 2pm | 9.6 | Depth-First Search | |
| 13 | Fri | Jul 10 | 1pm | 9.7 | Uses of Depth-First Search | |
| 14 | Fri | Jul 10 | 2pm | 9.8 | Dijkstra's One Shortest-Path Algorithm | |
| | Fri | Jul 10 | 5pm | | Lab 1 due: ADT library | 15.0 |
| 15 | Mon | Jul 13 | 1pm | 9.9 | Floyd's All Shortest-Paths Algorithm | |
| 16 | Mon | Jul 13 | 2pm | 9.10+ | Graph Theory, Summary | |
| 17 | Wed | Jul 15 | 1pm | 8-9 | Review for Midterm 1 | |
| 18 | Wed | Jul 15 | 2pm | 10.1-2 | Intro, State Machines, Automata | |
| | Wed | Jul 15 | 8am | | Midt 1 begins in Testing Center | 11.1 |
| 19 | Fri | Jul 17 | 1pm | 10.3 | Determinism in Automata | |
| 20 | Fri | Jul 17 | 2pm | 10.4 | Converting Nondeterminism | |
| | Fri | Jul 17 | 8pm | | Midt 1 ends | |
| 21 | Mon | Jul 20 | 1pm | 10.5-7 | Regular Expressions | |
| 22 | Mon | Jul 20 | 2pm | 10.8 | Converting Regular Expressions to Automata | |
| 23 | Wed | Jul 22 | 1pm | 10.9+ | Converting Automata to Regular Expressions | |
| 24 | Wed | Jul 22 | 2pm | 11.1-2 | Intro, Context-Free Grammars | |
| 25 | Fri | Jul 24 | 1pm | 11.3-4 | Languages, Parse Trees | |
| 26 | Fri | Jul 24 | 2pm | 11.5 | Ambiguity | |
| | Fri | Jul 24 | 5pm | | Lab 2 due: Floyd's Paths | 15.0 |
| 27 | Mon | Jul 27 | 1pm | 11.6 | Constructing Parse Trees | |
| 28 | Mon | Jul 27 | 2pm | 11.7 | Table-Driven Parsing | |
| 29 | Wed | Jul 29 | 1pm | 11.8+ | Comparison, Summary | |
| 30 | Wed | Jul 29 | 2pm | 10-11 | Review for Midterm 2 | |
| | Wed | Jul 29 | 8am | | Midt 2 begins in Testing Center | 11.1 |
| 31 | Fri | Jul 31 | 1pm | 12.1-3 | Intro, Expressions | |
| 32 | Fri | Jul 31 | 2pm | 12.4-5 | Truth Tables, Boolean Funcs, Logical Exprs | |
| | Fri | Jul 31 | 8pm | | Midt 2 ends | |
| 33 | Mon | Aug 3 | 1pm | 12.6 | Karnaugh Maps | |
| 34 | Mon | Aug 3 | 2pm | 12.7-8 | Tautologies | |
| 35 | Wed | Aug 5 | 1pm | 12.9-10 | Tautologies, Deduction | |
| 36 | Wed | Aug 5 | 2pm | 12.11+ | Proofs, Summary | |
| 37 | Fri | Aug 7 | 1pm | 14.1-3 | Intro, Predicates, Expressions | |
| 38 | Fri | Aug 7 | 2pm | 14.4-5 | Quantifiers, Interpretations | |
| | Fri | Aug 7 | 5pm | | Lab 3 due: Simple Compiler | 15.0 |
| 39 | Mon | Aug 10 | 1pm | 14.6-7 | Tautologies | |
| 40 | Mon | Aug 10 | 2pm | 14.8-9 | Proofs | |
| 41 | Wed | Aug 12 | 1pm | 14.10+ | Truth, Summary | |
| 42 | Wed | Aug 12 | 2pm | 12,14 | Review for Final Exam | |
| | Fri | Aug 14 | 1-3 | | Final Exam in normal classroom | 22.2 |
| | Tue | Aug 18 | noon | | Final Grade notification by email (probably) | |