Weber State University
CS 4110 @ SLCC
Concepts of Formal Languages and Algorithms for Computing
Fall 2015

Instructor: Larry Cousin
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Class Purpose:

To learn about some of the language forms that make up and drive the fundamentals of computers, computer science, and programming. We will learn that form and function are highly interconnected when it comes to formal language and computing. The student will learn how these formal constructs interrelate, some of the powers they posses, and will learn some ways they can be used to solve problems.

Book: Introduction to Computer Theory, Second Edition
By: Daniel I. A. Cohen
Publisher: Wiley – Don't use the International Version! It has differences.

Class Time:

5:30 – 7:20pm M, W

Class Location:

SLCC Redwood Campus: 4600 S Redwood Road, Salt Lake City, UT 84130
Room: Business Building 320

Class Dates:

Aug. 31 – Dec. 11, 2015

Published Prerequisites:

CS 2420 and (MATH 1630 or CS 2130)

What I expect you to do for the class:

1) Learn many of the concepts in the book: Introduction to Computer Theory by Cohen. You will be responsible for the material in the assigned chapters. Any of it could be on a test.
2) Have experience working on software projects that show the application of formal languages.
3) Do the assigned problems from the book.
4) Write a paper and present information on a topic assigned by the instructor.
5) Participate, ask questions, and state your point of view with mutual respect.
6) Work hard and try your best.
7) Do your own work unless specified to work with a partner.

What you can expect from the Instructor:

1) Presentations of material that will help you understand the fundamental nature of computing.
2) Fairness.
3) Experience with tools that will help you understand the importance of the theory of formal languages.

What your grade will be composed of:

1) Work on three software projects with one partner: 30%
   * You both get the same grade for each project (10% each)
2) Two Tests—two midterms: 30%
   * MT1, MT2 (your paper if the 'final' assignment)
3) Homework for the assigned chapters: 15%
4) Paper to be assigned by Instructor: 10%
5) Attendance 15%

Grades:

A	95-100	C	74-77
A-	91-94	C-	71-73
B+	88-90	D+	68-70
B	84-87	D	64-67
B-	81-83	D-	61-63
C+	78-80	E	0-60

What are the projects?

1) (10%) You will learn enough about jFlex (lex) to build a simple lexical analyzer (scanner/lexer) for the SmallSQL DBMS.
2) (10%) You will learn enough about BYACC/J (yacc) to build a context-free grammar for a subset of the SmallSQL DBMS.
3) (10%) You will experiment with a tool that allows you to write Turing Machines and execute them.
4) As part of the homework you will experiment with a tool (JFLAP) that helps you translate one formal language form to another and visualize the constructs that we manipulate. This will be part of the homework grade.

What deliverables are required for the projects?

1) Source code listing.
2) Screen shots of the executable and/or,
3) A demonstration to the professor.

Paper:

8 to 10 pages, double-spaced and typed; ONLY on a computer theory topic to be assigned by instructor (those below or suggest one).

Presentation:

A 10 minute presentation of paper's main points will be given.

What if homework, projects, or other deliverables are turned in late?

For projects, your grade will be reduced at least an additional 25% per class that it is late. Homework will NOT be accepted if it is late! You should do the homework in preparation for the exams, but it will not be graded and you will not receive credit for it.

Class cancellation announcement:

SLCC will cancel classes based on SLC weather (not the weather on the main Weber campus). However, if Weber cancels classes at the main campus, and SLCC still holds classes then I will probably hold class. You will be responsible for making up any missed work. It's not my responsibility to make sure you are made up—it's yours!

Accommodations for disabilities:

Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Service Center.

Cheating:

Students are expected to maintain academic ethics and integrity in regards to performing their own work. The WSU Student Code states:

a. Cheating, which includes but is not limited to:

1) Copying from another student's test paper;
2) Using materials during a test not authorized by the person giving the test;
3) Collaborating with any other person during a test without authority;
4) Knowingly obtaining, using, buying, selling, transporting, or soliciting in whole or in part the contents of any test, without authorization of the appropriate official;
5) Bribing any other person to obtain any test;
6) Soliciting or receiving unauthorized information about any test;
7) Substituting for another student or permitting any other person to substitute for oneself to take a test.

b. Plagiarism, which is the unacknowledged (uncited) use of any other person or group's ideas or work. This includes purchased or borrowed papers;

c. Collusion, which is the unauthorized collaboration with another person in preparing work offered for credit;

d. Falsification, which is the intentional and unauthorized altering or inventing of any information or citation in an academic exercise, activity, or record-keeping process;

e. Giving, selling or receiving unauthorized course or test information;

f. Using any unauthorized resource or aid in the preparation or completion of any course work, exercise or activity;

g. Infringing on the copyright law of the United States which prohibits the making of reproductions of copyrighted material except under certain specified conditions; If a student is caught cheating, the student will receive an automatic failure for the course. If it occurs again, the student will be expelled from the program for a period of one semester (not including summer). The third occurrence will result in dismissal from the program.

CS Department policy dictates that any verifiable evidence of student academic cheating, as defined and determined by the instructor, will result in: 1) an automatic failing grade for the class and 2) a report to the Dean of Students that will include the student's name and a description of the student's dishonest conduct.

The instructor reserves the right to modify this outline without prior notice.

Class Schedule:		Projects Due:	Homework Assignments Due:
Aug.			
31	Introduction / Chapters 4 / jFlex + Lab		
Sept.			
2	jFlex Lab		49: 2, 3
7	**Labor Day - No Classes**		
9	**No Class – work on jFlex Lab**		
14	jFlex Lab		
16	Chapters 1, 2, 3	**jFlex Project**	
21	Chapters 5, 6	**jFlex Project**	p. 19: 1, 3; p. 20: 14, 18(i); p. 28: 1, 2
23	Chapters 7 (part 1)		p. 71: 1, 2; p. 88: 1, 2
28	Chapters 7 (part 2) / JFLAP / Review		pp. 143-144, 3(i, ii)
30	**EXAM I**		
Oct.			
5	Chapters 8, 9		pp. 143-144, 4(i), 5(i), 6(i)
7	Chapters 10, 11		pp. 164-165: 1(i, iv), 3 (i, iii); p. 185: 1, 5
12	Chapters 12, 13		pp. 203-204: 1(i), 3; pp. 217-218 1, 6
14	Chapters 14, 15		pp. 254-256: 1, 3(i), 7(ii); pp. 285-287: 1(i), 3(i), 11(i)
19	Chapters 16, 17, 18		pp. 312-313: 1, 3(i); p. 348: 1(i), 3
21	BYACC/J Lab		p. 374: 4(i, ii), p. 398: 1(i, ii); p. 429: 1(i, ii)
26	BYACC/J Lab/Review		
28	**EXAM II**		
Nov.			
2	BYACC/J Lab		
4	BYACC/J Lab	**BYACC/J Project**	
9	Chapters 19, … / Turing Machine Lab	**BYACC/J Project**	
11	Turing Machine Lab		p. 454: 1(ii), 3(i)
16	Turing Machine Lab		
18	Turing Machine Lab		
23	Turing Machine Lab	**Turing Machine Project**	
25	**"The Enigma Machine"**		
30	Present papers		
Dec.			
2	Present papers		
7	Present papers		
9	Present papers		

Questions from the class?

Possible paper topics:

1) Alan Turning and the Turing Test
2) Noam Chomsky
3) Alonzo Church
4) Stephen Kleene
5) John von Neumann
6) David Hilbert
7) P = NP prize
8) IBM Watson project
9) Encryption—past, present, and future with quantum computers (to factor prime numbers quickly)
10) Charles Babbage and Ada Lovelace
11) Andrey (Andrei) Andreyevich Markov and Markov models/chains
12) Kurt Gödel
13) Bertrand Russell
14) What is being researched today for computer theory
    - Read and explain a recent scholarly article on computer theory (e.g., Journal of the ACM)
15) Samuel Morse
16) Howard Aiken and Grace Hopper
17) Claude Shannon and Information Theory
18) Cybernetics / Norbert Wiener
19) Stephen Wolfram and Wolfram Alpha
20) Richard Feynman and the Connection Machine
21) Ancient computers: Greek (Antikythera), Chinese, Maya, Aztec, Stonehenge, etc.
22) Henry Markram and the Blue Brain Project
23) Jan Lukasiewicz
24) Augustus De Morgan
25) IBM's new TrueNorth chip
26) Blaise Pascal's 1642 mechanical calculator
27) Elon Musk, Stephen Hawking, and Steve Wozniak: will artificial intelligence take over the world--yes?
28) Propose your own…