ECE 209: Computer Systems Programming
Syllabus – Summer 2018

Section 652 (Asheville): Mon, Tues, Wed @ 2:00pm – 3:15pm

Instructor: Dr. Greg Byrd, Professor, ECE, gbyrd@ncsu.edu, 919-513-2508

Office Hours: gbyrd.youcanbook.me

Asheville Classroom Facilitator: Jeremy Brown, jabrown4@ncsu.edu

Course Content and Student Learning Outcomes

This course continues your introduction to computing systems by focusing on **programming**. In particular, you will learn more about the C programming language, how its features can be implemented using a processor's instruction set, and how to use *data structures* in C to write programs to solve complex problems.

By the end of this course, you will be able to:

- Convert the following C language elements to LC-3 assembly language: statements, functions, pointers, arrays, structs.
- Demonstrate the use of C compilers and debugging tools.
- Design and implement a C program that performs a specified task.
- Implement the following data structures in C: array, list, hash table.
- Define, implement, and use an abstract data type.
- Analyze a loop for parallel execution.

This class includes an associated problem session, in which you will be given short programming assignments. The problem sessions are designed to give you hands-on experience with C programming tools, and practice with programming constructs.

Prerequisites

In order to take this class, you must have completed ECE 109 (Introduction to Computer Systems), with a grade of C- or better. There will be very little review of ECE 109 material. In particular, you should be very comfortable with the LC-3 instruction set and LC-3 assembly language before taking this class.

GER Information

This course is *not* designated as a General Education Requirement.

Textbooks

There are two textbooks, one required and one optional:

- *Required*:
  Yale N. Patt, Sanjay J. Patel.
  Introduction to Computing Systems: From Bits and Gates to C and Beyond, 2nd edition
  McGraw-Hill, 2004, ISBN 0-07-246750-9. Amazon price: $82.
  (You should already have this book from ECE 109.)
- *Optional, but highly recommended:*
  Stephen Prata. *C Primer Plus*, 6th edition.
  Addison-Wesley, 2013, ISBN 0321928423. Amazon price: $29.
  (The 5th edition of this book is also fine, and is available online via the NCSU Libraries.)

In addition, this book is recommended as a very good reference. This is a good investment if you expect to pursue a career in embedded systems programming.

- *Recommended:*
  Brian W. Kernighan, Dennis M. Ritchie.
  The C Programming Language, 2nd edition.
  Prentice-Hall, 1988, ISBN 0-13-110362-8. Amazon pice: $36.

Students will also be required to use two on-line tools:

- **CodeLab** for coding homeworks. The CodeLab registration fee is $25.
- **Top Hat** for weekly quizzes. Top Hat is free for NC State students – login using your Unity ID and password.

Topics and Reading Assignments

The following is an approximate schedule of topics covered, with the number of 75-minute lectures devoted to each and the associated textbook chapters/sections. Textbooks are indicated as follows: PP = Patt and Patel, CPP = C Primer Plus, KR = Kernighan and Ritchie.

Topic	***Lectures***	***Text Chapters/Sections***
Intro and review of LC-3 and C basics C programming tools: compiler and debugger	3	CPP: 2-5, PP: 11-12, KR: 1-2
Control structures	3	CPP: 6-7, PP: 13, KR: 3
Functions and recursion	2	PP: 14, 17, CPP: 9, KR: 4
Arrays, pointers, strings	2	PP: 16.3, KR: 5.3-5.4, CPP: 10-11
Exam 1	1	--
Pointers	3	PP: 16.2, KR: 5.1-5.2
strings	3	PP: 16.3, KR: 5.3-5.4, CPP: 10-11
File I/O, Dynamic memory allocation	2	CPP: 13, PP: 19.4, KR: B5
Exam 2	1	--
C structs	2	CPP : 14, PP: 19.1-19.3, KR: 6.1-6.4
Elementary sorting algorithms	2	notes
Linked lists	3	CPP: 17, PP: 19.5
Abstract data types	2	CPP: 17
TOTAL	**29**	

Assignments and Grading

The overall class grade will be a weighted average of the following components:

- Weekly quizzes (10%)
- Homework (10%)
- Mini-programs (5%)
- Programming assignments (20%)
- Midterm exams (30%)
- Comprehensive final exam (25%)

Weekly Quizzes (10%)

Weekly quizzes are in the form of Top Hat "Homework" assignments. They will include many of the same questions that are given in the lecture videos. Answers are graded: 70% for participation and 30% for correctness. Late or missed quizzes will not be dropped or made up. Quizzes will automatically transition to "Review" questions after the due date.

To calculate your in-class grade, divide the Course Average in the Top Hat gradebook by 8.5, and round to the nearest tenth. The maximum grade is 10, so if your overall Top Hat average is 85 or better, you get all 10 points.

Homework (10%)

Homework will be done using CodeLab. Most exercises will involve writing code. CodeLab will compile, execute, and test your code, giving you immediate feedback on whether it is correct. There are unlimited attempts, so you can keep trying until you get the correct answer.

Unless otherwise specified by me, all homework assignments are to be done *individually*. (Some in-class assignments will allow group collaboration.) Though you can consult with other students, the instructor, and the TAs, it is crucial that you know how to do every assignment on your own. This is the same material that will be on the exams. Evidence of copying or other unauthorized collaboration will be investigated as a potential academic integrity violation. **The minimum penalty for**

cheating on homework is a grade of -100. If you are tempted to copy because you're running late, you will be better off missing the assignment and taking a zero.

Late homework will not be accepted. Assignments missed because of documented illness or extended absences will be dropped. Because homework is electronic, you will be expected to submit assignments on or before the deadline, even if you miss a class due to an absence. All dropped homework grades must be approved by the instructor. (I will be more likely to excuse an assignment if you contact me before the due date.)

Both homework and in-class assignments will be "frozen" at the due date. However, once grades have been recorded, they will be unfrozen, so that you can go back and do (or review) assignments that you missed. (But you won't get credit for this.)

Mini-Program Assignments (5%)

Mini-programs are short programming assignments that are meant to reinforce the topics that are covered in class and/or needed for programming assignments. They are similar to the "problem session" assignments from previous semesters, but they are done on your own time. Each assignment is designed to take no longer than 90 minutes to complete.

These assignments will be graded for correctness, but most credit will be given for effort. You will be allowed to collaborate with classmates, but it is important that you learn how to do every assignment. This material will be on the exams, and are designed to help you complete the programming assignments.

Assignments must be submitted by the due date. There will be no extensions. Assignments missed due to university-excused absences may be dropped, depending on the circumstances.

Programming Assignments (20%)

There will be three programming assignments during the semester. The grade on your highest program will count twice. (Therefore, your best grade counts as 10% of the course grade, and the other two count 5% each.)

Each programming assignment must be completed individually. Evidence of copying or other unauthorized collaboration will be investigated as a potential academic integrity violation. **The minimum penalty for cheating on a programming assignment is a grade of -100 on the assignment.** If you are tempted to copy because you're running late, you will be better off missing the assignment and taking a zero.

No late programs will be accepted, except for university-excused absences.

The program due dates will be posted at the beginning of the semester. Plan accordingly.

Exams (55%)

There will be two regular exams (15% each) and one comprehensive final exam (25%). All exams will be closed book and closed notes. Regular exams will be administered during regular class periods, on or close to the dates listed below.

- Exam 1: June 12
- Exam 2: July 3
- Final: July 30 or July 31 (time TBD)

Attendance at all exams is mandatory. Only University-approved excuses will be accepted, provided that they are accompanied by the appropriate official documentation. Makeup exams may be given for excused absences, at the discretion of the instructor. (Warning: Makeup exams tend to be a little harder than the regular exam.) If you miss an exam without an acceptable excuse, you will receive a zero for that exam.

Do not ask for permission to take the final exam early or late because of family travel plans. These requests will not be granted.

Evidence of cheating on any exam will be investigated. If there is sufficient cause, the incident will be referred to the Office of Student Conduct as an Academic Integrity violation. **The minimum penalty for cheating on an exam is a grade of zero on the exam.** See the NCSU Code of Student Conduct for information about what constitutes cheating.

Final Course Grade

The final grade for the course will be based on a weighted average of the above components. The +/- grading system will be used for this course.

Numerical Score	Letter Grade	Numerical Score	Letter Grade
97 ≤ score ≤ 100	A+	77 ≤ score < 80	C+
92 ≤ score < 97	A	72 ≤ score < 77	C
90 ≤ score < 92	A-	70 ≤ score < 72	C-
87 ≤ score < 90	B+	66 ≤ score < 70	D+
82 ≤ score < 87	B	60 ≤ score < 66	D
80 ≤ score < 82	B-	55 ≤ score < 60	D-
		0 ≤ score < 55	F

Class Policies and Resources

Computer Resources

Course web site: http://wolfware.ncsu.edu

All class announcements will be posted to the Announcement Forum on Moodle. The web site will also contain homework assignments and solutions, lecture notes, past exams, and other relevant information. The instructor may choose to broadcast an email message to the entire class for time-critical announcements. For the most part, however, you are responsible for getting information in class or from the web site.

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/ncsu/summer2018/ece209/home

Please make sure that posted material is appropriate and course-related. Do not post off-color jokes, offensive material, job listings, for-sale ads, virus alerts, etc. **Do not post homework solutions. Do not post any code that may be used for programming assignments.** If the forums are abused, they will be deleted, and the abusers will be referred to the Office of Student Conduct.

If you want to post a question that only the instructors can see, make it a private post. Use this, for example, if you have specific questions about code, or questions that contain code. Again, this is better than email, because the instructor and all of the TAs will see the question, and we will all see the responses, as well.

Programs and some in-class assignments will be submitted electronically via Wolfware Classic at **submit.ncsu.edu**. Make sure you know how to do this before it is required of you.

Office Hours

Office hours are by appointment. It is very easy to book an appointment -- just go to **gbyrd.youcanbook.me** and select an available slot. Bookings can be for 30, 60, or 90 minutes. These slots are synched with my calendar. A new appointment will appear on my calendar, and will send me an email. I can meet with you by phone, Skype or Google Hangout. Specify what sort of meeting you want, and you should initiate the meeting at the designated time. (If you want to discuss code, Google Hangout would be the best choice, so that we can use screen sharing.)

Late Submissions and Absences

Late submissions of homework, in-class assignments, problem sessions, and programs will not be accepted.

Homework and Weekly Quizzes: Homeworks are intended to get you to prepare for class, and they are due 30 minutes before the beginning of class. Quizzes are due at 11pm on Wednesdays. Late submissions are not accepted in either case.

Programming assignments: Due on the date and time specified by the assignment. Wolfware allows us to check the date and time at which assignments are submitted. **Submit early** to avoid last-minute problems with Wolfware or differences between your clock and the Wolfware clock. It's easy to resubmit if you make changes later, up until the due date. (Each submission of a file will overwrite the previous version. Earlier versions cannot be recovered.)

Late programs *due to excused absences only* may be accepted, if you (a) email your program to the instructor as soon as possible, and (b) discuss the absence and excuse with the instructor. NOTE: Forgetting the due date/time is not excused.

Missing the deadline by a couple of minutes is not excused. There is ample opportunity to work on the program before it's due, and there's no reason for you to be working up until the last minute without submitting anything. Submit early and often, and work incrementally.

Incomplete Grades

An incomplete grade will be assigned when a student cannot complete the course due to *unforeseeable* conflicts or obstacles. The incomplete will normally be made up by completing the work during the following semester, on a schedule agreed upon by student and instructor.

Missed Exams

Attendance at all exams is mandatory. Only University-approved excuses will be accepted, provided that they are accompanied by the appropriate official documentation. Makeup exams may be given for excused absences at the discretion of the instructor. If you miss an exam without an acceptable excuse, you will receive a zero for that exam.

For more information about University-approved absences, see:
https://policies.ncsu.edu/regulation/reg-02-20-03-attendance-regulations/

Academic Integrity

High-level discussions with other students on homework and programming assignments is allowed, but copying of solutions or source code is not. Students may discuss high-level concepts and strategies only, not specific solutions or code. You must be very careful to avoid sharing code and/or solutions with other students. **Only the TAs or the instructor may look at your code.** There are **no exceptions** to this policy; do not show your code to your friends, parents, tutor, mentors, therapist, etc.

Example of high-level discussion (allowed): "First find the maximum value in the array. Then look at each value in the array, and increment a counter if the max is a multiple of that value."

Example of code-level discussion **(not allowed)**: "Write a for-loop that makes i go from 1 to n-1. Create a variable named max and initialize it to x[0]. Inside the loop, compare x[i] to max to see if it's greater…"

If in doubt, stop talking!!! If your classmate keeps asking detailed questions or wants to see your code, tell him or her to talk with the instructor or TA. You may want to help, but you are expected to comply with the NCSU Code of Student Conduct, and with the academic integrity policies of this class. Do not, under any circumstances, look at anyone else's code or give your code to anyone else.

Any work submitted for this class (homework, exam, programming assignment) is subject to the *Honor Pledge*: "I have neither given nor received unauthorized aid on this test or assignment." An Honor Pledge statement must be explicitly signed for every exam. For other assignments, it is the understanding and expectation of the instructor that the submission of work with your name on it means that you neither gave nor received unauthorized aid.

Evidence of copying or any other use of unauthorized aid on exams, homeworks, quizzes, or labs will be investigated and potentially referred to the Office of Student Conduct as a violation of the Code of Student Conduct.

For more information on the Code of Student Conduct, see:
https://studentconduct.dasa.ncsu.edu/
http://policies.ncsu.edu/policy/pol-11-35-01

The instructor and TAs will use the MOSS system to check for cheating on programming assignments. Submissions with high levels of similarity will be investigated and potentially referred to the Office of Student Conduct. For more information about MOSS, see http://theory.stanford.edu/~aiken/moss/.

Students with Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Student Health Services Building, 2815 Cates Avenue, Suite 2221, 515-7653. http://dso.dasa.ncsu.edu/

If you are eligible and wish to have additional time on exams, you must make arrangements with me and with UNCA staff well in advance.

For more information on NC State's policy on working with students with disabilities, please see: http://dso.dasa.ncsu.edu/

Course Evaluations

Online class evaluations will be available for students to complete during the last several days of class. Students will receive an email message directing them to a website where they can login using their Unity ID and complete evaluations. All evaluations are confidential; instructors will never know how any one student responded to any question, and students will never know the ratings for any particular instructors.

Evaluation website: https://classeval.ncsu.edu Student help desk: classeval@ncsu.edu
More information about ClassEval: http://www2.acs.ncsu.edu/UPA/classeval/

Laboratory Safety, Physical Activity, and Field Trips

There is no laboratory, physical activity, or field trip associated with this course.

Extra Expenses

In addition to required textbooks, students must register for the CodeLab online tool. The registration fee is $25 for the semester.

Transportation

As there are no field trips or internships associated with this course, there are no expected transportation requirements.

Important Dates

May 16	First class for ECE 209.
May 28	Memorial Day, no classes
June 4	First program due at 11:45pm
June 12	Exam 1
June 25	Second program due at 11:45pm
July 3	Exam 2
July 4	Independence Day, no classes
July 25	Last day of class, final program due at 11:45pm
Dec 5	Final exam