ECE 209: Computer Systems Programming
Syllabus – Fall 2024

Lecture: Mon, Wed @ 11:45am-1:00pm, EB3 2207
Problem Session: Does not meet every week -- watch course schedule and listen for announcements.

401: Tues, 3:00-4:50pm, EB2 1014
402: Tues, 5:20-7:10pm, EB2 1014
403: Wed, 1:30-3:20pm, EB2 1014
404: Thurs, 5:20-7:10pm, EB2 1014
405: Thurs, 7:30-9:20pm, EB2 1014
406: Fri, 12:50-2:40pm, EB2 1014
407: Thurs, 3:00-4:50pm, EB2 1014

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

Office Hours:
Use gbyrd.youcanbook.me to set up an in-person or Zoom appointment.

Course Content and Student Learning Outcomes

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

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

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

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.

Attendance and Course Delivery Mode

At NC State, attendance is required for all 200-level classes. Attending class is the best way to learn the material, because it gives you the chance to ask questions, engage with the concepts, and devote time to this specific class. We will have some online interactive activities, so you should bring your laptop to class. You may not use your laptop to browse other websites, play games, or work on other classes.

For all sections, **exams will be held at the scheduled class times.** If you have an anticipated university-excused absence for an exam, you must contact me ahead of time to make alternate arrangements. Students eligible for testing accommodations will be given extended time and will arrange a separate location/time for the exam.

Problem sessions meet in person, according to the announced schedule. The problem session assignment must be done during the scheduled time, and it must be turned in by the end of the problem session. Attendance is strongly encouraged, because help will be provided by TAs and other students. During weeks with no problem session, that time will be used for TA office hours.

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 required textbooks:

- *Required*:

Yale N. Patt, Sanjay J. Patel.
Introduction to Computing Systems: From Bits and Gates to C and Beyond, 3rd edition
McGraw-Hill, 2020, ISBN 1260150534. Amazon price: $89 (ebook purchase).
(You should already have this book from ECE 109. Use of the 2nd edition is acceptable.)

- *Required*:

Online text from zyBooks: $89 (includes zyLab programming exercises)

Sign in or create an account at learn.zybooks.com.
Enter zyBook code: NCSUECE209Fall2024
Subscribe and select section 001/602 (Byrd).

Students will also be required to use the following tools:

- **CLion** for programming exercises. CLion has a free student license, renewable as long as you are a student. (The license also includes other JetBrains tools for other languages: Python, Java, Ruby, ...)
- **Moodle** for accessing all course materials and announcements, and for submitting some assignments. Submissions are also done in the zyBook.
- **Top Hat** for in-class activities (ungraded).
- **Discord** for asking questions online, and especially for getting help with programming assignments. If you ask a question, other students can answer in addition to the TA/instructor, and everyone benefits from seeing the question and answer. We may also post hints and suggestions on assignments. You can ask a private question, with your code attached, to get individual help with assignments.
- **Github and Copilot** for using AI-generated code on assignments. Copilot is free for students, but you have to sign up.

Topics and Reading Assignments

The following is a planned schedule of topics covered and the associated textbook chapters/sections. Textbooks are indicated as follows: PP = Patt and Patel, ZY = zyBook. The instructor reserves the right to change the order in which topics are covered, especially to coordinate with programming assignments. Pay attention to announcements and assignments in class; they will take priority over this plan.

Dates	***Topics***	***Text Chapters/Sections***
Aug 19 - Sep 9	High-level languages: compiler, interpreter Expressions: types, literals, variables, operators, function calls Statements: assignment, if, loops Basic I/O	PP: 11, 12, 13 ZY: 2, 3, 4
Sep 11	Exam 1	
Sep 16 - Oct 7	Function definitions File I/O Arrays, pointers, strings	PP: 14, 16 ZY: 5, 6, 7, 8
Oct 9	Exam 2	
Oct 16 - Oct 30	Structs Multi-file programs Sorting	PP: 19 ZY: 9, 11
Nov 4	Exam 3	
Nov 6 - Dec 2	Linked Lists Abstract data types	PP: 19
Dec 9	*Comprehensive Final Exam*	

Probable problem session weeks (subject to change):

PS1: Sep 3 - Sep 9 (Tues to Mon)
PS2: Sep 18 - Sep 24 (Wed to Tues)
PS3: Sep 30 - Oct 4
PS4: Sep 21 - Sep 25

PS5: Nov 4 - Nov 8
PS6: Nov 18 - Nov 22

Assignments and Grading

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

- Homework: ZyBook assignments (25%)
- Problem Sessions (5%)
- Programming assignments (20%)
- In-class Exams (37.5%)
- Comprehensive final exam (12.5%)

Homework Assignments (25%)

The ZyBook has interactive participation and challenge activities in most sections, reinforcing key concepts. While these are graded for correctness, there is no limit to the number of attempts for each activity.

Each weekly homework will be divided into multiple parts: **reading** (due Mon/Wed before class) and **programming** (due Fri). Only the **participation activities** will be assigned for reading homeworks, though you are encouraged to do the challenge activities, as well. The percentage associated with each component will be shown in the zyBook assignment.

Assignments are shown on the righthand side of the screen in the zyBook, under the "Assignments" tab. Only specific assigned sections are required. You are encouraged to complete the activities in all sections, because that will help you learn.

Each homework 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 homework assignment is a grade of zero on the assignment.**

Problem Sessions (5%)

Problem sessions include short programming assignments that are meant to reinforce the topics that are covered in class and/or needed for programming assignments. Each assignment is designed to take no longer than 90 minutes to complete.

Problem sessions will not meet every week. See the course schedule on Moodle for specific dates. For the weeks when no problem session is assigned, TAs will be available for open office hours.

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

This should be a *low-risk, low-stress* opportunity to practice and ask questions. Your effort will pay off in better outcomes on the exams and programs. Try your best to complete each assignment in 60-90 minutes, and don't spend a lot of time on them -- but if you struggle, that will help guide what you study and where you need extra help or explanations.

Missed problem sessions cannot be made up. If you have an excused absence, the grade will be dropped (and the other problem sessions will carry more weight). You will not be allowed to attend a different problem session. If you do not have an excused absence, you will receive a zero on the assignment. All problem session assignments will be posted on the Moodle site, and you will have the opportunity to do the assignment on your own time, for no grade.

Programming Assignments (20%)

There will be three programming assignments during the semester. Programming assignments involve more significant design and coding, compared to homework and problem sessions. You will be given at least two weeks to complete a programming assignment -- do not wait until the last minute to start!

Programs will be due at **11:45pm on Fridays**. Every student is granted one 24-hour extension for any reason, with no penalty. If you have used your 24-hour extension, you can submit up to 24 hours late with a 15-point penalty. No submissions will be graded that are more than 24 hours late, unless excused by the instructor. (Extensions will be granted only for documented university-excused absences.)

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 zero on the assignment.**

Midterm Exams (37.5%)

There will be three midterm exams, each worth 12.5% of your grade.

Each exam will be preceded by a no-credit practice quiz on Moodle, which can be completed on your own schedule, and attempted as many times as you like. Questions will cover similar material as the upcoming quiz. The practice quiz will close around two days prior to the quiz, to discourage cramming.

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 a quiz is a grade of zero on that exam.** See the NCSU Code of Student Conduct for information about what constitutes cheating.

If you miss an exam because of an excused absence, talk with the instructor as soon as possible. At the instructor's discretion, you may be required to take a makeup exam, or there may be some other arrangement regarding the exam grade. (A makeup exam is much more likely.)

Final Exam (12.5%)

A final exam will be given during the time scheduled for this class. The final exam will be longer than a regular exam and will be comprehensive, but it has the same weight as the other exams.

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. These score breakpoints are specific and absolute; *grades will not be rounded up*. There are always adjustments made on exam grades throughout the semester, and any sort of rounding has already been baked into your final grade.

Numerical Score	Letter Grade	Numerical Score	Letter Grade
$97 \leq \text{score} \leq 100$	A+	$77 \leq \text{score} < 80$	C+
$92 \leq \text{score} < 97$	A	$72 \leq \text{score} < 77$	C
$90 \leq \text{score} < 92$	A-	$70 \leq \text{score} < 72$	C-
$87 \leq \text{score} < 90$	B+	$66 \leq \text{score} < 70$	D+
$82 \leq \text{score} < 87$	B	$60 \leq \text{score} < 66$	D
$80 \leq \text{score} < 82$	B-	$55 \leq \text{score} < 60$	D-
		$0 \leq \text{score} < 55$	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 Moodle site will also contain lecture notes, past exams, and other relevant information. Every student in the class is automatically subscribed to receive notifications from the Announcements forum. Make sure that these emails are not going to your spam folder, and please read the announcements when they are posted. (I promise to only use the Announcements forum for information relevant to all students.)

Discord will be used for class discussion. Rather than emailing questions to the teaching staff, I encourage you to post your questions on the forums. When asking for help with a program, post a *private* message with your code attached.

Please make sure that posted material is appropriate and course-related. Do not post insulting 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.** Any post that contains specific code must be private. 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 TAs and I 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 all of us will see the question, and we will all see the responses, as well.

Office Hours

Individual office hours are by appointment. It is very easy to book an appointment -- just go to `gbyrd.youcanbook.me` to select an available slot. Bookings are for 30-minute slots. 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 in person or via Zoom. Specify what sort of meeting you want. (If you want to discuss code, Zoom would be the best choice, so that we can use screen sharing.)

If you set up a Zoom meeting with me, my preference is that you enable your video. It's your choice, but I would much rather see the person with whom I am talking.

My personal Zoom meeting room is set up to use a Waiting Room. This allows me to control when someone connects. If I am having a private meeting with someone else (e.g., discussing grades or some other personal information), you may end up waiting for a bit. Please be patient -- I will connect you as soon as it is appropriate.

Late Submissions and Absences

Late submission of homework, exam, or final exam will not be accepted. These things may be excused or made up if you have a university-excused absence. It is your responsibility to contact the instructor in case of an excused absence.

Problem sessions will not be made up and cannot be submitted late. If you miss a problem session due to an excused absence, the grade will be dropped. Contact the instructor in case of an excused absence. You will not be scheduled to attend a different problem session; you are strongly encouraged to do the posted assignment on your own time.

For programming assignments, every student is granted one 24-hour extension for any reason, with no penalty. If you have used your 24-hour extension, you can submit up to 24 hours late with a 15-point penalty. No submissions will be graded that are more than 24 hours late, unless excused by the instructor. (Extensions will be granted only for documented university-excused absences.)

Incomplete Grades

An incomplete grade will be assigned when a student cannot complete the course due to *unforeseeable* conflicts or obstacles. Per University policy, the incomplete must be resolved by the end of the next enrolled regular semester. For more information about IN grades, see this NC State policy: https://policies.ncsu.edu/regulation/reg-02-50-03/.

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 my discretion. 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 I may look at your code.** There are **no exceptions** to this policy; do not show your code to anyone, including your friends, parents, tutor, mentors, therapist, random people on the Internet, 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…"

Example of code-level discussion **(not allowed)**: "Please look at my code and help me figure out what's going wrong."

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 me or a 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.

Private tutors are allowed and encouraged. But the policy above applies to those people. They can help you understand concepts or discuss high-level design, but they are not allowed to help you debug or write code. Talk to them like you would talk to another student to get suggestions on how to get started or how to approach a problem. Tutors may be used to help you understand material. They can help you understand what you missed on an exam. They can help you figure out how to study more effectively. They are not resources for completing assignments.

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, homework, 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

We will use the ZyBook similarity checker and 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/.

Discrimination, Harassment, and Violence

NC State University is committed to eliminating sexual harassment, sexual violence and interpersonal violence. NC State complies fully with Title IX, a federal law that prohibits gender-based discrimination of both employees and students. If you are affected, you can find resources and/or file a report at https://oied.ncsu.edu/divweb/safe/. Resources include medical and counseling services, academic and housing support, referrals to legal and confidential advocacy organizations and more.

I am committed to creating and maintaining an environment free of discrimination and harassment of any kind.

I am open and available to discuss any incidents involving discrimination, harassment, or violence, and I will help you find resources for help. However, I cannot be a confidential resource. I am required to report incidents of sexual discrimination, sexual violence, and other misconduct to the Title IX coordinator. You do have the right to request confidentiality from the University, and you may share information confidentially with the Counseling Center, Student Health Center, or a religious counselor.

Students with Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, Raleigh campus students must register with the Disability Resources Office, 515-7653.
http://dro.dasa.ncsu.edu/ (For students at other campuses, please consult with your program coordinator and your disability services office.)

If you are eligible and wish to have additional time on exams, you must make arrangements with me well in advance. Such exams will be administered at the DRO or the DELTA testing center. (Students at other campuses, please consult with your program coordinator.)

For more information on NC State's policy on working with students with disabilities, please see: http://dro.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: https://isa.ncsu.edu/for-the-pack/classeval/

Laboratory Safety, Physical Activity, and Field Trips

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

Extra Expenses

There are no expenses, except for required textbooks.

Transportation

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

Important Dates

Aug 19	First day of class
Sep 2	University Holiday (Labor Day) – no classes
Sep 11	Exam 1
Sep 17	Wellness Day -- no classes
Oct 9	Exam 2 (date may be different for UNCA section, due to UNCA Fall Break)
Oct 14-15	Fall Break
Oct 17	Last day to drop or change to S/I grading
Nov 4	Exam 3
Nov 22 - Dec 3	"Dead Week" – no **new** assignments or exams during this week. The last ECE 209 programming assignment will be due on 12/3.
Nov 27-29	Thanksgiving Holiday - no classes
Dec 9	Final Exam, 12-2:30pm (Raleigh -- day/time for UNCA TBD)