COMP 520: Compilers
Course Syllabus
Spring 2024

Location: Sitterson Hall- Rm FB009
Time: TuTh 3:30PM – 4:45PM
Dates: FDOC: 1/11/24, LDOC: 4/30/24
Instructor: Syed Ali (swali@cs.unc.edu)
TAs: Eric Schneider (eric@cs.unc.edu) Amin Zamani (abz@email.unc.edu)
Office Hours.
    Syed Ali   TueThu 5:00pm – 6:30pm   SN314
    Eric Schneider   MonWedFri 11:00am – 2:00pm   SN314
    Amin Zamani   TueFri 5:30pm – 6:45pm   SN314

General Information. This course will focus on a semester-long project to build a compiler. During lecture, we will investigate compiler theory. This theory will be implemented in programming assignments to build a functional compiler.

Course Project. Students enrolled in this course will build a compiler for a subset of the Java programming language. Java will also be the compiler's implementation language. The project will have five major graded checkpoints spread throughout the semester.

Prerequisites. COMP 301, 311, 455. A grade of C or better is required in all prerequisite courses.

Text. We will use two books, both are optional. *Programming Language Processors in Java: Compilers and Interpreters* by David Watt and Deryck Brown, Prentice Hall, 2000 ISBN 0-130-25786-9. This book is out of print and is available on the course website. *Compilers, Principles, Techniques, & Tools*, Second Edition by Alfred Aho, Lam, Sethi, and Ullman, Pearson, 2006. ISBN 0-321-48681-1.

Grading.

Compiler Project	60%	Five checkpoints, 12% each.
Final Exam	15%	Date: 5/9. 4:00pm – 5:30pm.
Midterm 1	7.5%	Date: 2/22. In class.
Midterm 2	7.5%	Date: 4/11. In class.
Written Assignments	5%	Five WAs, 1% each.
Participation	5%	

Late Policy. Late written assignments have 10% of the grade deducted per day late. Late compiler project checkpoints have 15% of the grade deducted per day late. All programming assignments are due by 11:59pm on their due date. Programming assignments are not accepted more than 3 days late.

Key Topics. (Schedule is subject to change)

Date	Topic
1/11 Thu	Course Introduction
1/16 Tue	PA1 Intro
1/18 Thu	Formal Definitions and Compiler Theory
1/23 Tue	Lexer Theory, EBNF Intro
1/25 Thu	More on EBNF Properties, Prediction Sets
1/30 Tue	PA2 Intro
2/1 Thu 2/2 Fri – PA1 Due	Abstract Syntax Trees, Traversal, Visitor Model
2/6 Tue	* No class
2/8 Thu	Contextual Analysis
2/13 Tue – No class	* Well-Being Day
2/15 Thu	PA3 Intro
2/20 Tue 2/21 Wed – PA2 Due	Midterm Review
2/22 Thu	Midterm 1
2/27 Tue	* No class
2/29 Thu	Runtime Organization
3/5 Tue	Brief coverage of x86, Stack Manipulation
3/7 Thu	* No class
3/12 Tue – No class	* Spring Break
3/14 Thu – No class	* Spring Break
3/19 Tue	Branch Construction, x86 Demo
3/21 Thu 3/23 Sat – PA3 Due	ModRM / SIB Construction, PA4 – Part 1
3/26 Tue	PA4 – Part 2
3/28 Thu – No class	* Well-Being Day
4/2 Tue	Input Code Path Analysis
4/4 Thu	Multiple Code Path Generation, ICC Case Study
4/9 Tue	AST Secrets & Midterm Review
4/11 Thu	Midterm 2
4/16 Tue	In-class Office Hours
4/18 Thu	Minimizing Registers (RISC), Dynamic Libraries
4/23 Tue 4/24 Wed – PA4 Due	In-class Office Hours
4/25 Thu	Virtual Methods, Polymorphism, C# Case Study
4/30 Tue – PA5 Due	LLVM, Retargeting, JIT Compilers, Emulation

Honor Code. Ensure that help is only obtained from textbooks, lectures, and office hours. Any outside help is disallowed and considered a violation of the honor code. Contract cheating services (Chegg), AI (Chat GPT), public source code (GitHub/GitLab), and material (verbal, googled, printed, shared in any form) from those not associated with this course is explicitly disallowed.

Collaboration Policy. Collaboration is encouraged to a limited degree. I encourage you to study and discuss compiler theory in groups. The written assignments allow full collaboration with other enrolled students, except that all students must write their answers in their own words (there cannot be a shared document). If you collaborate with another student, please list all collaborators at the top of the assignment.

The programming assignments MUST be an individual effort (you **cannot** collaborate on those). You may discuss broad overarching concepts but never details, such as what the code should look like or how it is organized. If you are unsure if something violates the honor code, don't take the risk; just bring what you want to share to office hours.

Participation. Participation credit is not limited to participating in class. Attending office hours and collaborating with others also counts. At the discretion of the instructor and TAs, we reserve the right to increase or decrease your final course grade by 5%.

UNC Resources:

Accessibility Resources and Services (ARS): The University of North Carolina at Chapel
     Hill facilitates the implementation of reasonable accommodations, including
     resources and services, for students with disabilities, chronic medical conditions,
     a temporary disability or pregnancy complications resulting in barriers to fully
     accessing University courses, programs and activities. Accommodations are
     determined through the Office of Accessibility Resources and Service (ARS) for
     individuals with documented qualifying disabilities in accordance with applicable
     state and federal laws. See the ARS Website for contact information:
     https://ars.unc.edu or email ars@unc.edu.

Counseling and Psychological Services (CAPS): CAPS is strongly committed to
     addressing the mental health needs of a diverse student body through timely
     access to consultation and connection to clinically appropriate services, whether
     for short or long-term needs. Go to their website: https://caps.unc.edu/ or visit
     their facilities on the third floor of the Campus Health Services building for a
     walk-in evaluation to learn more.

Title IX Resources: Any student who is impacted by discrimination, harassment,
     interpersonal (relationship) violence, sexual violence, sexual exploitation, or
     stalking is encouraged to seek resources on campus or in the community. Please
     contact the Director of Title IX Compliance (Adrienne Allison –
     Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal
     Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling
     and Psychological Services (confidential), or the Gender Violence Services
     Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs.
     Additional resources are available at safe.unc.edu.