CS 5090 Fall 2016 – Language Design and Implementation

BGSU Computer Science

Prerequisites

Admission to MS in CS program, or consent of department.

Class Meeting Time

Mondays/Wednesdays/Fridays, 12:30-1:20pm, OLSCAMP 208

Textbook

The course utilizes many (free) online resources in place of a physical textbook. All course texts are made available on the website Perusall and linked to from Canvas.

Contact Information

Instructor	Dr. Robert Dyer
Office Hours	MWF 1:20–2:10pm
	TR 2:15–4:00pm OR by appointment
E-mail	rdyer@bgsu.edu
Office	HAYES 244
Phone	(419) 372–3469

Outcomes for the course

After successfully completing CS 5090, students will be able to say:

- I can explain the difference between a compiler and interpreter.
- I understand and can implement the different phases of a compiler (e.g., lexical, syntactic, semantic, code generation).
- I can explain parser error recovery techniques.
- I know how to translate abstract syntax trees into an intermediate language.
- I understand source code optimization techniques.

Grading

The final grade will be composed of the following weights. (The instructor reserves the right to make changes at any time.)

Assessments

Item	Weight
Reading Annotations	20%
Problem Set Reflections	10%
Team-Based Assessments (TBAs)	30%
Projects	35%
Research Presentation	5%

Grading Scale

Range	Grade
[92-100]%	**A**
[82-92)%	**B**
[72-82)%	**C**
[62-72)%	**D**
[0-62)%	**F**

Note that I **DO NOT ROUND UP** grades. A grade of 91.99999999% is indeed a B.

See interval notation for more details.

Assessments

Readings

Readings are absolutely essential to learning in this course. Almost every lecture there are readings due, meaning there are approximately 2 readings due each week. Readings will be done on the website Perusall (note: **do not create a user on their site!**) which let's you annotate the text being read. These annotations are required and graded. The system will automatically grade each annotation. It keeps the 5 highest annotations. Thus, to ensure the best possible score you should aim for 7-10 good annotations.

Annotations could be you summarizing a piece of text for the class, asking an insightful question, answering other student's questions, finding problems with the text, etc. Your annotations should be spread out through the whole assigned reading (and not all in one small area). You are graded on 3 criteria: quantity of annotations, average quality of annotations, and spacing of the annotations in the text.

Teams

This course relies heavily on team work. Second day of class we will form teams for the entirety of the semester. You will work with the team for in-class activities such as the TBAs, problem set discussions, and projects. Team members are expected to all contribute equally and team members will be rating each other's effort to help ensure fairness.

Problem Sets and Reflections

Problem sets will be assigned for each unit. You are expected to attempt all problems on your own and bring your solutions to the assigned class. I will walk around and grade everyone's solution based on completeness. We will then spend the first portion of the class time in teams, discussing the solutions. Each team will write up a team solution. I will then provide official solutions and allow further discussion. Your solution and the team's solution are not graded. It is quite ok to have a wrong solution, as long as you gave the problem an honest attempt!

You are then expected to go home and write a reflection on the problem set due the next class period. This is a chance to outline your own efforts, identify gaps in your own knowledge, and seek additional help. The reflection is graded (using a multiplier based on your completeness score).

Team-Based Assessments (TBAs)

To help me gauge where the class is at, we will have in-class assessments at regular intervals. These will contain a small number (5-10) of relatively difficult questions. Students will take the assessment in the first half of the class by themselves. You will then collaborate with your team members and re-take the assessment as a team. The score will be the average of your individual score and the team score.

Projects

One of the goals of this course is for every student to write a full compiler. To achieve that goal, we will have several small projects, each building on the effort of the previous project, which will culminate in the creation of a working compiler. Projects are done in teams. ### Research Presentation

Each student will investigate a single research paper related to the field of compilers. Students will pick a paper from an approved list of conferences/journals. They will then present this research to the class, along with their own analysis of the paper.

Technology

Perusall

The reading annotation website we use is Perusall. To access Perusall, please click the link for a particular reading assignment in Canvas. This should open the reading (in Perusall) in a new tab/window. THERE IS NO NEED TO CREATE A USER ON PERUSALL (and doing so will break your grading!).

Perusall provides some documentation to explain what kind of comments we are looking for and also some details on the grading.

Source Code

All teams are forced to utilize Java for all projects. If you are unfamiliar with Java, please spend some time early in the semester to familiarize yourself.

All teams are required to use Git for version management. Each team will have access to a repository hosted on GitHub. Every student is required to create a user on GitHub. Students will fork the instructor's projects, make changes, and 'submit' them back via a pull request. The instructor has access to all team repositories and will use commit history to gauge if all team members are contributing equally to the project.

Canvas

All assignments are posted on Canvas. Your grades will also be available on Canvas throughout the semester.

Course Policies

Withdrawal Deadline

Friday, November 16, 2018. University policy states that after this date, anybody withdrawing from the course will have the grade automatically turn into an F.

Office Hours and Help

Please check your Canvas course site, Canvas messages, and your BGSU email regularly. [You may have your Canvas messages forwarded to your BGSU/other email, and have your BGSU email forwarded to another favorite email address, if necessary, but do check it (multiple times) daily.] I do forward my own Canvas messages to my BGSU email and check my BGSU email multiple times everyday (with rare exceptions). I check BGSU email more often than I access Canvas, so if you need to contact me urgently, use both Canvas and BGSU email, if necessary multiple times. I will do my best to accommodate you ASAP, even if outside my posted office hours and without appointment. In general, if you need to see me in my office outside of my regular office hours, please make an appointment.

Attendance

Students are expected to attend each class and be on time. I take attendance at the start of each lecture. I typically use good attendance as a factor when considering final grades. I reserve the right to penalize students up to 1% of their final grade, per absence, for more than 3 un-excused absences.

Make-up policy

If you cannot take an exam/RAA/TBA as scheduled, you (or an authorized person, only in case you are unable to do so) must contact me ahead of time with the reason. Note however that any make-up RAA/TBA will count 100% toward your score (there will be no averaging with the team RAA/TBA score). Make-ups are considered typically for health emergencies only.

Academic honesty

All coursework for this class is expected to be YOUR OWN work. The MINIMUM penalty for copying someone's work (including current classmates, students from a previous offering of the course, or postings found on the web) or knowingly allowing someone to copy your work is a zero for the homework/project/exam/paper/presentation. The offense is also reported to the dean of your college. Turnitin and Moss, plagiarism detection tools, will be used in this course. I will follow the Department's policies and the University's code of academic conduct as defined in the BGSU Student Handbook. For details refer to:

1. Department of Computer Science Academic Honesty Policy
2. BGSU Code of Academic Conduct
3. The Academic Charter, section B-I.G

Disability Policy

In accordance with the University policy, students with disabilities must verify their eligibility through the Office of Disability Services, 38 College Park Office Building, 419–372–8495 (https://www.bgsu.edu/disability-services.html). Contact me as soon as possible this semester to arrange any accommodations needed to assist with your success in this course.

Religious Holidays

It is the policy of the University to make every reasonable effort allowing students to observe their religious holidays without academic penalty. In such cases, it is the obligation of the student to provide the instructor with reasonable notice of the dates of religious holidays on which he or she will be absent. Absence from classes or examinations for religious reasons does not relieve the student of responsibility for completing required work missed. Following the necessary notification, the student should consult with the instructor to determine what appropriate alternative opportunity will be provided, allowing the student to fully complete his or her academic responsibilities (The Academic Charter, section B–I.F–4.b).

Classroom Environment, Language, and Behavior Expectations

In order to promote an inclusive and constructive learning environment, demeaning, marginalizing, and otherwise negative language and behavior will not be tolerated in the classroom. Respect and courtesy toward the instructor, classmates, and classroom guests are expected. Language and behaviors that are disruptive, abusive, or harassing may result in disciplinary action as specified by the Student Code of Conduct.

Title IX

Bowling Green State University (BGSU) is committed to providing a safe learning environment for all students that is free of all forms of discrimination and harassment. Sexual misconduct and relationship violence in any form are antithetical to the university's mission and core values, violate university policies, and may also violate federal and state law. Faculty members are considered "Mandatory Reporters" and are required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator. If you or someone you know has been impacted by sexual harassment, sexual assault, dating or domestic violence, or stalking, please visit www.bgsu.edu/TitleIX to access information about university support and resources.

Tentative Course Schedule

Week	Day	Date	Topics	Assigned	Due
1	M	Aug 27	Introduction; Compilers vs Interpreters		
	W	Aug 29	Language Specification; EBNF; Regular Expressions		
	F	Aug 31	Tokenization; Lexical Scanning		
2	~~M~~	~~Sep 3~~	~~No class - Holiday~~		
	W	Sep 5	**Problem Set 1 discussion**		**PS 1**
	F	Sep 7	**Team-Based Assessment (TBA) 1**		
3	M	Sep 10	Top-Down Parsing		
	W	Sep 12	Top-Down Parsing		
	F	Sep 14	Top-Down Parsing		
4	M	Sep 17	Top-Down Parsing		
	W	Sep 19	**Problem Set 2 discussion**		**PS 2**
	F	Sep 21	**Team-Based Assessment (TBA) 2**		
5	M	Sep 24	Scopes and Scoping Rules		
	W	Sep 26	Scopes and Scoping Rules		
	F	Sep 28	Symbol Tables		
6	M	Oct 1	Visitor Pattern		
	W	Oct 3	**Problem Set 3 discussion**		**PS 3**
	F	Oct 5	**Team-Based Assessment (TBA) 3**		
7	M	Oct 8	Type Checking		
	W	Oct 10	Type Checking		
	F	Oct 12	Type Checking		
8	M	Oct 15	Error Recovery		
	W	Oct 17	**Problem Set 4 discussion**		**PS 4**
	F	Oct 19	**Team-Based Assessment (TBA) 4**		
9	M	Oct 22	Intermediate Code Generation		
	W	Oct 24	Intermediate Code Generation		
	F	Oct 26	Intermediate Code Generation		
10	M	Oct 29	Intermediate Code Generation		
	W	Oct 31	Intermediate Code Generation		
	F	Nov 2	Procedure Calls		
11	M	Nov 5	Project work day		
	W	Nov 7	**Problem Set 5 discussion**		**PS 5**
	F	Nov 9	**Team-Based Assessment (TBA) 5**		
12	~~M~~	~~Nov 12~~	~~No class - Holiday~~		
	W	Nov 14	Procedure Calls		
	F	Nov 16	**Problem Set 6 discussion**		**PS 6**
13	M	Nov 19	**Team-Based Assessment (TBA) 6**		
	~~W~~	~~Nov 21~~	~~No class - Holiday~~		
	~~F~~	~~Nov 23~~	~~No class - Holiday~~		
14	M	Nov 26	Optimization Algorithms		
	W	Nov 28	Optimization Algorithms		
	F	Nov 30	Optimization Algorithms		
15	M	Dec 3	Optimization Algorithms		
	W	Dec 5	**Problem Set 7 discussion**		**PS 7**
	F	Dec 7	**Team-Based Assessment (TBA) 7**		
16	W	Dec 12	11:30a-2p, Olscamp 208, Presentations		

NOTE: If there is a discrepancy between the due dates here and on actual assignments, the one on the assignment applies.