Programming Language Concepts

COP 4020 Section UFOL

***Academic Term:*** Spring 2024

# Instructor

Aashish Dhawan

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(352) 871-4686

Office Hours: TBA

# Teaching Assistant/Peer Mentor/Supervised Teaching Student

* TA/ PM : TBA
* OH will *begin Wednesday , August 29, 2023*.
* During the **first week of classes, August 26, 2023** from **6:30 – 7:30 PM** EST I will hold OH to get things kicked off.

# Course Description

Introduces programming language principles, including language constructs, design goals, run-time structures, implementation techniques and exposure to a wide variety of programming paradigms. (M) 3 credit hours

# Course Pre-Requisites / Co-Requisites

Prerequisite: COP 3530

# Course Objectives

This course will discuss how programming languages are constructed and analyze the methodology used to create existing languages. Topics included are lexical analysis, scanning, programmatic semantics, code generation, and types of programming language. Due to the nature and complexity of this field of study, the course will be time-consuming and requires serious dedication on the part of each student. Be careful not to fall behind, success in this course requires consistent effort and practice.

# Student Learning Outcomes (SLOs)

During this course, you will see the process for designing and implementing your own programming language. After the course, you will be able to:

* implement the Compiler and Visitor design patterns,
* implement solutions for a customer created project specification,
* implement and execute end-to-end a modular solution to a semester-long project,
* update/enhance/extend existing software and system functionality,
* use a debugger to analyze the code you implement,
* build your own testing suite, and
* unit test solutions you implement.

# Materials and Supply Fees

There are no materials or supply fees for this course beyond the textbook. See the *Required Textbook* section below for purchasing details.

# Professional Component (ABET)

See the table provided in the *Relation to Program Outcomes* section that follows. Note this course is not tracked as part of the accreditation process at this time.

# Relation to Program Outcomes (ABET)

|  |  |
| --- | --- |
| **Outcome** | **Coverage\*** |
| 1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. |  |
| 2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs. | High |
| 3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. | Medium |
| 4. An ability to communicate effectively with a range of audiences |  |
| 5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |  |
| 6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately. |  |
| 7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty |  |

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course. Note this course is not tracked as part of the accreditation process at this time.

# Required Textbooks and Software

* <https://craftinginterpreters.com/>
* See the setup instructions provided under Canvas → Modules/Project/

# Recommended Materials

* Programming Language Pragmatics, 4th Edition, Michael L. Scott, 2016, Morgan Kaufmann, ISBN 10 | 13: 0124104096 | 978-0124104099.
* Concepts of Programming Languages, 12th Edition, Robert W. Sebesta, 2018, Pearson, ISBN 10 | 13: 0134997182 | 978-0134997186.

|  |  |
| --- | --- |
| **Week** | **Topics** |
| 1 | Introduction, OOP |
| 2 | Regular Expressions, Testing |
| 3 | Lexical Analysis, Streams |
| 4 | *peek* and *match*, “The Lexer” |
| 5 | Context Free Grammars, Parsing |
| 6 | “The Parser [Expressions]” |
| 7 | “The Parser [Complete]” |
| 8 | Visitor Pattern, Semantic Analysis |
| 9 | “The Interpreter” |
| – | Spring Break |
| 10 | “The Interpreter” |
| 11 | “The Analyzer” |
| 12 | Naming, Scoping, Binding |
| 13 | “The Analyzer” |
| 14 | “The Generator” |
| 15 | Memory Management |
| 16 | Final Project Evaluation |

# Attendance Policy, Class Expectations, and Makeup Policy

**Notice:** Portions of interactive course activities [such as OH] may be audio visually recorded for students in the course to reference after the given activity. Students who choose to participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during any discussion and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during an activity, you will need to keep your mute button activated.

A textual “chat” feature is also available. “Chats” sent through the public channel may be recorded. If you wish to send a personal message to the instructor, do so through Teams [preferred] or email. Please note, when multiple students are attending OH, the OH session is a public setting, private chats may or may not always be answerable until other students have left the OH. If your instructor is sharing their screen, even private chats sent through Zoom will be public whenever screen sharing is enabled. OH are provided throughout the week to accommodate individual time for any private discussions that cannot be handled during a non-private session. During OH recording can always be turned off to accommodate any private discussions. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

# COVID-19 RESPONSE

These COVID-19 guidelines help create an effective learning environment and enhance everyone’s safety during any In-Person [*face*-to-*face*] interactions:

* UF recommends that members of our campus community and visitors wear masks in indoor, public settings and on transportation [UF guidelines and information: [https://coronavirus.ufl.edu/university- updates/june-15-the-campus-brief.html](https://coronavirus.ufl.edu/university-%20updates/june-15-the-campus-brief.html)].
* Reusable, disposable, N95, and KN95 masks are available for purchase at the UF Bookstore. Disposable and reusable masks are available for purchase at all Gator Dining locations. Additionally, masks are available for purchase from 50 vending machines across campus.
* If you are, or are concerned you might be, experiencing COVID-19 symptoms, click here for CDC guidance: <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>
* If you are exposed to, or are experiencing, COVID-19 symptoms, follow these UF Health instructions: <https://coronavirus.ufhealth.org/campus-testing/>.
* Remember, the Student Health Care Center (SHCC – <https://shcc.ufl.edu/>) is free resource available to all UF students.

# MAKEUP/LATE WORK

Requirements for class attendance and make-up exams, assignments, and other work in the course are consistent with university policies. [See UF Academic Regulations and Policies for more information regarding the University Attendance Policies](https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/). Makeups or extensions for graded class activities are provided **given appropriate documentation is presented** in a timely fashion. Excused absences must be consistent with UF policies in the undergraduate catalog and meet UF requirements regarding excused absences. There are very few events which would impede your participation in a graded activity warranting an exception, that you would not be aware of well before [at least a few hours] the start of the activity.

Instructor notifications provided by the Care Are of the Dean of Students office (DSO) are sometimes not sufficient to excuse a course absence. Specifically, the instructor notification letter form provided by the DSO must directly state that an “absence has been excused” and provide the excused dates. If the letter does not state this, then the student must provide the instructor directly with supplemental documentation that meets UF’s rules for an excused absence. Otherwise, the absence is not excused, and accommodation cannot be provided.

In place of makeups or extensions on project assignments, you are allowed to drop multiple project milestones (see schedule below for details).

*Late work policy*: course staff will download your work sometime after the assigned due date and time. Most likely this will be the following morning. Note, this might be at 12:00 AM, after an 11:59 PM due date. Or it might be at 9 AM the morning following the 11:59 PM due date. To help you out, all work submitted before the download will be viewed as “on-time”. Be careful and make sure the work you wanted graded is what you have submitted before the deadline! You are allowed unlimited submissions. Submitting early and often will benefit you. No work submitted after the download will be accepted for grading.

# Evaluation of Grades

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | | | **Due Date** | | **Comments** | | **Total Grade Percentage** | |
| **Homework** | HW1 – Supplements Lexing XX | | | | 5% each | | **10%** | |
| HW2 – Supplements Parsing XX | | | |
|  | | | | | | | | |
| **Participation** | Syllabus/Course Quiz 1 pt | | XX | | 10 pts full credit  12 𝑝𝑡𝑠 𝑝𝑜𝑠𝑠𝑖𝑏𝑙𝑒  2 𝑝𝑡𝑠 𝑑𝑟𝑜𝑝𝑝𝑒𝑑 | | **10%** | |
| Project Group Signup 1 pt | | XX | |
| Last Test Submission  6 𝑝𝑡𝑠 𝑡𝑜𝑡𝑎𝑙  1 𝑝𝑡 𝑒𝑎𝑐ℎ | P1: Lexer XX  P2a: Parser [Expressions] XX  P2b: Parser [Complete] XX | | |
| P3: Interpreter  P4: Analyzer  P5: Generator | | XX  XX  XX |
| Challenge  Exercises | *various* dates during the semester | | |
| **Project** | P1: Lexer XX | | | | 7.5% each  for the highest 4 scores  [2 𝑑𝑟𝑜𝑝𝑠] | | **30%** | |
| P2a: Parser [Expressions] XX | | | |
| P2b: Parser [Complete] XX | | | |
| P3: Interpreter XX | | | |
| P4: Analyzer | | XX | |  | |  |
| P5: Generator | | XX | |
| Final Evaluation  [(re)-*submit all parts*] | | XX | | Lexer | 6% | **50%** |
| Parser | 11% |
| Interpreter | 11% |
| Analyzer | 11% |
| Generator | 6% |
| End-to-End | 5% |
|  | | | | | **Total** | | **100%** |

# Project Assignments

We will have a semester project split into 6 graded milestones (**5 Parts** w/ **Part 2** being *split* into **2a** and **2b**) building to the final submission evaluation. Your two lowest project milestone scores [Part 1 through Part 5, including distinctly Part 2a and Part 2b] will automatically be dropped. However, the following parts of the project will require the previous part’s completion. The final project evaluation will evaluate the complete project [incorporating both the complete interpreter and compiler].

To pass the course, you are required to have a private GitHub for your project, submit a zip of your .git and add our PM(s) as members of your Github [see Canvas Canvas → Modules/Project/ for details].

Unless stated otherwise, all work is due by 11:59 PM EST on the date given.

You may submit any project as many times as you need, however *no late submissions will be accepted for grading*. Dropping two project milestones provides you with flexibility should undocumented, and thus unexcused, exceptions arise. Refer to the section MAKEUP/LATE WORK above for more details.

Completing the project does not require that you work in a group. Optionally, you are allowed to work in a group of size two. Group signup opens August 29, 2023 at 12:01 PM EST [after drop/add] and is completed through a Canvas Quiz. Prior to September 7, 2023 at 11:59 PM EST, groups are self-managed [you select to work *individually*, pick your project *partner*, or choose to be *randomly* assigned into a group by completing the Group Signup Quiz in Canvas]. After September 7, 2023 at 11:59 PM EST, I will *randomly* assign anyone not within a group into a group. Random assignments might lead to you being in a group of two or by yourself [a group of one]. Group signup (for both individual and partnered work) will begin after drop/add has ended. Signing up to define your group structure (again for working *individually*, with a *partner*, or to be *randomly* assigned one of the two) will be your first participation activity (see below).

When working in a group, it is each student’s responsibility to manage their individual effort. If you find your group is not working effectively, you are allowed a one-time shift to work individually. This request must be made after October 3, 2023, at 11:59 PM EST and before October 11, 2023, at 11:59 PM EST.

The penalties for submitting code that does not compile or does not execute are:

* 90 point / 90% max on the assignment if we can fix / hack your submission in 2 minutes or less.
* 75 point / 75% max on the assignment if we can fix / hack your submission in 15 minutes or less.
* 0 to 50 point / 0 to 50% max on assignments that cannot be fixed within 15 minutes.
* submitting to test submissions greatly reduces compilation and execution errors.

# Homework

Homework activities will be *completed* ***individually***. They will be assigned and submitted through Canvas. There will be two homework assignments, supplementing your work on the project.

# Participation

Your participation in the course is worth **10%** of your grade and will be evaluated by your completion of *participation activities*. Spread across multiple activities, 12 participation points are possible. Each participation point is worth 1% of your grade. Therefore, to earn full participation credit, you are only required to earn 10 of the 12 possible points. The 2 additional participation points are provided so that you have flexibility in choosing which activities will show your participation.

To earn participation points for submitted code, **your code must compile** and **not crash** when executed. Examples of participation activities are:

* Completing the Orientation Quiz.
* Completing the Group Signup Quiz, to work with a *partner*, *individually*, or *randomly* assigned individual or group work on the project. See the *Project Assignments* section above. [1 participation point is available.]
* Making a reasonable attempt and submission to the project milestone test submissions:
  + - reasonable evaluated by **>**𝟓𝟎% on the *last* test evaluation provided for each milestone,
    - HW, Modified [Typed] Parser, and Final Project Evaluation test submissions are *not* included,
    - in total, these comprise **6** participation activities [and 6 possible points], one for each milestone
* Solving Challenge Exercises, each exercise is **1** participation activity/point. For example,
  + - answering questions about recent lecture material.
    - examining an aspect of our project and identifying how/where the system could be extended.

# Grading Policy

The range used to calculate your final letter grade in our course will be no harsher than this grading scale provided in the following table. Your final point total will be calculated using the percentages given in the *Evaluation of Grades* section. The percent you earn on each activity will be multiplied by the grade points associated with that activity.

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade**  **Points** | **Letter**  **Grade** | **Highest** | **Lowest** |
| 4.00 | A | 100+ | 92.00 |
| 3.67 | A- | 91.99 | 89.00 |
| 3.33 | B+ | 88.99 | 86.00 |
| 3.00 | B | 85.99 | 82.00 |
| 2.67 | B- | 81.99 | 79.00 |
| 2.33 | C+ | 78.99 | 76.00 |
| 2.00 | C | 75.99 | 72.00 |
| 1.67 | C- | 71.99 | 69.00 |
| 1.33 | D+ | 68.99 | 66.00 |
| 1.00 | D | 65.99 | 62.00 |
| 0.67 | D- | 61.99 | 59.00 |
| 0.00 | E | 58.99 | 0.00 |

More information on UF grading policy may be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

# Re-Grade Requests

All grading/re-grading issues **must** be resolved within **1 week** of the graded work being returned. You must return exams/projects/quizzes to the person grading the activity in question, along with a **printed (not handwritten) attachment** stating the reasons for the re-grade. Do not write anything on the exam itself or detach (un-staple) the pages from each other. If you do so, your exam/project/quiz will not be re-graded. Note, when requesting a re- grade, the whole exam/project/quiz is subject to the re-grade, not just the portion you specify. We will be happy to discuss the solution and answer any questions, however no change will be made after the allotted week has passed.

# Disclaimer

This document is subject to change at the discretion of the instructor, based on unforeseen circumstances [such as pandemics, hurricanes, sub-freezing temperatures… this is Florida after all, rifts in the fabric of time, and so on] occurring during the semester. Any such change would be introduced in order to better accommodate you due to the circumstances being experienced.

# Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. [See the “Get Started With the DRC” webpage on the Disability Resource Center site](https://disability.ufl.edu/get-started/). It is important for students to share their accommodation letter with their instructor and

discuss their access needs, as early as possible in the semester

# Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

# In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

# University Honesty Policy

UF students are bound by The Honor Pledge which states “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. [See the UF Conduct Code website for more information.](https://sccr.dso.ufl.edu/process/student-conduct-code/) If you have any questions or concerns, please consult with the instructor or TAs in this class.

# Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

* Your academic advisor or Graduate Program Coordinator
* HWCOE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
* Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
* Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

# Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

# Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

# Campus Resources

# Health and Wellness

**U Matter, We Care**

If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit [U Matter, We Care website](https://umatter.ufl.edu/) to refer or report a concern and a team member will reach out to the student in distress.

**Counseling and Wellness Center**

[Visit the Counseling and Wellness Center website](https://counseling.ufl.edu/) or call 352-392-1575 for information on crisis services as well as non-crisis services

**Student Health Care Center**

Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](https://shcc.ufl.edu/).

**University Police Department**

[Visit UF Police Department website](https://police.ufl.edu/) or call 352-392-1111 (or 9-1-1 for emergencies).

**UF Health Shands Emergency Room / Trauma Center**

For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](https://ufhealth.org/emergency-room-trauma-center).

**GatorWell Health Promotion Services**

For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](https://gatorwell.ufsa.ufl.edu/) or call 352-273- 4450.

# Academic Resources

**E-learning technical support**

Contact the [UF Computing Help Desk](http://helpdesk.ufl.edu/) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

[**Career Connections Center**](https://career.ufl.edu/)

Reitz Union Suite 1300, 352-392- 1601. Career assistance and counseling services.

[**Library Support**](https://cms.uflib.ufl.edu/ask)

Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email ask@ufl.libanswers.com for more information.

[**Teaching Center**](https://umatter.ufl.edu/office/teaching-center/)

1317 Turlington Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

[**Writing Studio**](https://writing.ufl.edu/writing-studio/)

Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.

**Academic Complaints**

Office of the Ombuds; [Visit the Complaint Portal webpage for more information](https://www.ombuds.ufl.edu/complaint-portal/).

**Enrollment Management Complaints (Registrar, Financial Aid, Admissions)**

[View the Student Complaint Procedure webpage for more information](https://em.ufl.edu/complaint).