

CSCI-3136 — Principles of Programming Languages Course Syllabus

Instructor Information

Instructor:	Dr. Norbert Zeh	Office:	MC 4246
E-mail:	nzeh@cs.dal.ca	Office Hours:	MWF 12:00–2:00
Class Meeting Time:	MWF 2:35–3:25	Room No:	LSC 242
Course Homepage:	https://www.cs.dal.ca/~nzeh/Teaching/3136		
Course Mail List:	all-cs3136@cs.dal.ca		

Important Dates

1. First class: Jan 7, 2019
2. Munro Day (university closed): Feb 1, 2019
3. NS Heritage Day (university closed): Feb 18, 2019
4. Study break (no classes): Feb 18–22, 2019
5. Last class: Apr 8, 2019
6. Midterm Exam: Feb 15, 2019, 6:30–8:30 pm
7. Final Exam: TBA in the period of Apr 10–26, 2019

The main topics of this course include a comparative study of programming language features, an introduction to programming language design and implementation, and an introduction to the theory of formal languages. The course objectives are

- To provide an introduction to formalisms for specifying syntax and semantics of programming languages, including an introduction to the theory of formal languages,
- To provide an exposure to core concepts and principles of contemporary programming languages, and
- To explore various important programming methodologies, such as functional programming, logic programming, programming with abstract data types, and object-oriented programming.

Learning Outcomes

- Describe deterministic and non-deterministic finite automata.
- Recall the history and major paradigms of programming languages.
- Describe regular expression and its usage in token generation.
- Describe the functions and the main structure of compilers.
- Understand language specification and syntactic analysis by context free grammars.
- Describe basic concepts and language constructs of logic programming.
- Describe how automated scanner generators construct a finite automation from regular expression.
- Describe lexical analysis, syntactic analysis and semantic analysis in compiler construction.
- Design a simple language with context free grammar.
- Describe semantic analysis and the use of attribute grammars to enforce semantic rules.

- Use a logic programming language to write simple programs.
- Describe various parsing algorithms: bottom up and top down parsing.
- Identify core issues in programming language design (2): control flow construct and exception handling.
- Identify core issues in programming language design (3): data and types.
- Identify core issues in programming language design (4): subroutines and parameter passing methods.
- Identify core issues in programming language design: names, scopes (static and dynamic) and bindings (early and late).
- Describe basic concepts, computational model and language constructs of functional programming.
- Use a functional programming language to write simple programs.
- Implement a recursive descent parser for a simple language.
- Implement a scanner for a simple language.
- Implement an interpreter for a simple language.

Class Format and Course Communication

- Content will be delivered using in lectures.
- Course announcements will be posted to the course mail list, which comprises the instructor's and students' Dal emails. It is the student's responsibility to check their Dal e-mail on a daily basis. To access your Dal e-mail account please see: <https://www.dal.ca/dept/its/o365/services/email.html>

Evaluation Criteria

1. 8 Assignments (A)

- 4 programming assignments, the 3 best assignments count
- 4 theory assignments, the 3 best assignments count
- Each assignment has equal weight
- **Late assignments will not be accepted.**
- Assignments are posted on the course webpage.
- Assignments must be submitted electronically.
- Students are allowed to collaborate on assignments in groups of up to 3 students. Each group hands in a single assignment.
- No collaboration is permitted on the assignments, except within groups.

2. Midterm Exam (M)

- To be held during class.

3. Final Exam (F)

- Scheduled by the university.
- Will cover all material in the course.

$$\text{Grade} = \max(40\% * A + 20\% * M + 40\% * F, 40\% * A + 60\% * F)$$

Notes

- As of 2015, a minimum grade of C must be achieved in all required CS courses.
- The grade conversion scale in Section 17.1 of the Academic Regulations, Undergraduate Calendar will be used.
- A student must pass (50%) both the assignment component and the final exam to pass the course.

Midterm and Final Exam Requirements

- Photo ID is required.
- Closed book.
- No dictionaries, notes, calculators, cell phones, PDAs, talking slide rulers, or other electronic aids allowed.

Required Texts and Resources

- The text for the course is: Michael L. Scott. *Programming Language Pragmatics*, 2nd edition, Morgan Kaufmann, 2009. Earlier editions are acceptable.
- The lecture slides will be posted on the course webpage.
- Additional assistance is available from the Student Learning Centre (2nd floor, Goldberg CS Building).
- The course website has references to numerous additional online resources.

Prerequisites

CSCI-2110, CSCI-2112, CSCI-2132

Tentative Schedule of Topics

Topic	Tentative dates
Introduction	Jan 7
Types of programming languages	Jan 9, 11, 28
Introduction to Scheme	Jan 14–21
Introduction to Prolog	Jan 23–25
Regular languages and lexical analysis	Jan 30–Feb 8
Context-free languages and syntactic analysis	Feb 11–Mar 8
Semantic analysis	Mar 11, 13
Names, scopes, and binding	Mar 18, 20
Control flow	Mar 22, 25
Subroutines and control abstractions	Mar 27, 29
Data types	Apr 1, 3
Object orientation	Apr 5, 8

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (<http://its.dal.ca/policies/>) and the Faculty of Computer Science Responsible Computing Policy. (https://www.cs.dal.ca/downloads/fcs_policy_local.pdf)

Culture of Respect

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

What we all need to do ¹:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like “Why did you say that?” or “How did you develop that belief?”
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, “The comment you just made sounded racist, is that what you intended?” is a better approach than “You’re a racist if you make comments like that.”
3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, “I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that.”
4. **Set Limits:** You cannot control another person’s actions, but you can control what happens in your space. Do not be afraid to ask someone “Please do not tell racist jokes in my presence anymore” or state “This classroom is not a place where I allow homophobia to occur.” After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.
<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=69&chapterid=3457&loaduserredits=False>

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

http://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie’s centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD).

http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don’t follow this community expectation. When

¹Source: Speak Up! ©2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: <http://www.dal.ca/dept/dalrespect.html> Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University 902.494.4140 lyndsay.anderson@dal.ca www.dal.ca/think.

appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution cannot be reached, or would be inappropriate, procedures exist for formal dispute resolution.

https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html

Diversity and Inclusion — Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

<http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

Learning and Support Resources

General Academic Support — Advising

http://www.dal.ca/campus_life/student_services/academic-support/advising.html

Fair Dealing Guidelines

<https://libraries.dal.ca/services/copyright-office/guidelines/fair-dealing-guidelines.html>

Dalhousie University Library <http://libraries.dal.ca>