

# CISC / CMPE 458

## Programming Language Processors

### Winter 2020

#### Professor

J.R. Cordy                      624 Goodwin Hall    533-6054  
cordy@cs.queensu.ca

Office hours:                Wed, 2:00 - 3:00 pm  
(and other times by email appointment)

#### Lectures

Wed Evening 18:30 - 21:30  
WLH 210

#### Website

<http://www.cs.queensu.ca/~cordy/cisc458>

All lectures, handouts, assignments, schedule, information, etc.  
Frequent updates!

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## Teaching Assistants

Karim Jahed

jahed@cs.queensu.ca

Joey Sun

jsun@cs.queensu.ca

Carson Cook

carson.cook@queensu.ca

## Tutorials (beginning next week, Thu Jan 16)

Thu evening 18:30-19:30, Botterell Hall B139

Attendance at tutorials is **important!!** (essential?)

## Project Advising (beginning Mon Jan 27)

Mon evening, time TBA, Goodwin Hall 230

Thu evening 19:30-20:30, Botterell Hall B139, following tutorial

## Labs

There are no formal labs (the scheduled lab time is for tutorials and advising) - but you will need to spend at least three or four hours a week in unscheduled lab time with your project teammates!

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## Textbook

*Introduction to Compiler Construction Using the Syntax/Semantic Language, 5th Edition* (Cordy, Queen's 2006)

- Lectures follow the book closely - they present and extend text material using slides, examples and discussion on blackboard (so not everything will be in the text or web notes!)

## References (appendices in the text)

*PT: A Pascal Subset* (Rosselet, Toronto 1980)

*Specification of S/SL: Syntax/Semantic Language*  
(Cordy & Holt, Toronto 1980)

*A Tutorial Introduction to S/SL: Syntax/Semantic Language*  
(Holt, Cordy & Wortman, Toronto 1980)

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## Marking

4 Quizzes 20%    Team Project 40%    Final Exam 40%

- [There is no “examination only” option](#) in this course
- [You must pass the final examination](#) to pass this course
- To get “A” in this course [you must get at least “B” on the exam](#)

## Quizzes

- Four 20-minute in-class quizzes on lecture material
- Main purpose: To help you keep track of whether you are keeping up with the lecture material
- Held at [beginning](#) of lecture -

Quiz #1	Wed Jan 29
Quiz #2	Wed Feb 12
Quiz #3	Wed Mar 11
Quiz #4	Wed Apr 1

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## Course Project

- Understand and modify a small but **real** programming language compiler (“**PT Pascal**”) to implement a new language
- All programming done in **Pascal** using the PT Pascal compiler itself (!)
- Using the **S/SL** compiler construction tools (like IBM)
- Done in **teams** of four
- All work marked **teamwise**
- Will require **significant** joint laboratory time (unscheduled)
- Carried out in four phases -

Scanner/Screenener	Wed Feb 5
Parser	Wed Feb 26
Semantic Analyzer	Wed Mar 18
Code Generator	Wed Apr 8

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## Course Project

- Hands-on **practical** work, with
  - Use of real software engineering **tools**
  - **Maintenance** and enhancement of existing software systems
  - **Component-based** software engineering and multi-phase software systems
  - Compiler / interpreter construction techniques and **table-driven** software
  - **Domain-specific languages** (DSLs) and **model-driven engineering**
  - **Virtual machines** and bytecodes
  - Software **testing** and quality assurance

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## Computing System

- All project work will be done on [CASLab Linux](#) ([linux\[123456\].caslab.queensu.ca](#)) in PT Pascal, using the Unix command line toolset (**no choice**)

## Lateness

- All work is due electronically, by midnight on the due date
- Work handed in late will not be marked without a convincing and documented explanation

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## Course Outline

- I. Introduction, Overview, Basic Concepts, Compiler Structure
- II. S/SL - Syntax/Semantic Language
- III. Lexical and Syntactic Specification of Programming Languages
- IV. Scanning and Screening
- V. Parsing
- VI. Runtime Model
- VII. Semantic Analysis
- VIII. Implementing the Runtime Model
- IX. Storage Allocation
- X. Code Generation
- XI. Bytecode Interpretation (new, not in the text)



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## Fair Warning

- This is a **challenging** and **technically difficult** course
- Involves a lot of **independent lab work**, and a fair amount of frustration and struggling with practical details

## But History Shows That ...

- If you plan to go on in the **software industry**, this may be the most valuable course you will ever take
- You will get great **satisfaction** out of this course, and you will learn more about **practical software engineering** than in any other course

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## Some Quotes (after a few years ...)

- “I took **CISC 458** way back in winter 1996.  
Bar none, this is the most important course I ever took.  
Now I work on ECMAScript (JavaScript) systems at PageMail.”
- “**CISC 458** was one of the most challenging (and yet fun) courses I have ever taken. Here at Microsoft, starting next week I will be working on the test team for all of the components of the Xbox compiler.  
One of the influencing factors was the fun I had in **CISC 458**.”
- “Without a shadow of a doubt the most useful course I took.”

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## Prerequisites - A Reminder

- This is an advanced 4th year course that will assume and make use of everything you have learned in your first three years

## CISC 458

- Required: **CISC 121, 221, 223**
- Highly Recommended: **CISC 124, 220, 327**

## CMPE 458

- Required: **CISC 121 / CMPE 212 / ELEC 279, ELEC 274**
- Highly Recommended: **ELEC 278, CMPE 223, 327**

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## Next

- The adventure begins ...

## Any Questions?