CISC 465/865 Winter 2022: Syllabus (PRELIMINARY)

Jana Dunfield

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1 Calendar description

Specifying syntax and semantics; operational and denotational semantics. Lambda calculi, type systems and logical foundations. Meta-theoretic properties. Semantics of imperative languages.

2 Logistics

Course website: onQ.

Online discussion forum: We will use Piazza (`https://piazza.com/queensu.ca/winter2022/cisc465865/`) for course discussions.

Instructor: Jana Dunfield (jana at cs.queensu.ca; please include "465" or "865" in the subject line)

What to call me: Jana / Prof. Jana / Prof. Dunfield

Office hours: Times to be announced, or by appointment.

Lectures: On Zoom (links posted to onQ) until further notice: Tuesdays 11:30–12:20, Wednesdays 13:30–12:20, Fridays 12:30–13:20

TA: Dimitrios Economou

Textbook: There is no textbook. I have my own lecture notes, which I will revise as the course progresses.

Software: We may use one or more of DrRacket, OCaml, Twelf, or other languages. However, much of the class work will be in writing proofs "on paper" (scanned, using TeX, etc.).

3 Assessment

The basis for your course grade will be:

- 35% Assignments
- 15% Take-home midterm (posted 24 hours before the deadline)
- 50% Project
  - 5% Proposal
  - 20% Presentation
  - 25% Report

Except for the first assignment, assignments may be done in a group of no more than three. All group members must be in the same course section, that is, you cannot form a group in which some students are in 465 and some students are in 865.

Projects may be done individually, but I encourage you to work in a group of no more than three. As with the assignments, all group members must be in the same course section.

If you work in a group, every member must submit a peer evaluation for each item (assignment or project component) submitted, and these evaluations may influence your individual grade.

Additional information about the project will be posted later in the term. For now, we will list a few broad types of projects, which will be refined later in the term:

- Survey connections between programming language semantics and another area of computing. This is particularly recommended for CISC 865 students.
- Read about an area of programming language semantics in some depth, and discuss what you have learned.
- "Do" something: learn the basics of a proof assistant or theorem prover and use it to prove something; modify a compiler to add a new feature, guided by semantics discussed in class.

Our expectations for both the presentation and report are dependent on (1) the size of your project group and (2) the section you are enrolled in. (1) One student cannot reasonably do as much work as three, so expectations for large groups are higher than for smaller groups. (2) Students in 865 are expected to have more experience with reviewing literature, writing surveys, etc., so expectations for 865 presentations and reports are higher.

Please note:

- The report and presentation must match the topic proposed. Any exceptions require written (emailed) permission from the instructor, which is not guaranteed.
- "Presentation/Discussion": You will give a presentation during class times. Part of your mark will be based on answers to questions. Part of your mark may be based on classmates' evaluations. However, the majority of your mark will be based on the judgment of the instructor and/or TA.
- Your report and presentation will be marked in part on clarity. Spelling, grammar, style, and structure contribute to clarity, so errors in these are legitimate grounds for deducting marks.

  Having said that, I consider some stylistic "rules" to be silly and pointless. It's fine to use contractions (like "it's"), it's fine to use "nor" without "neither", and I don't care if you mix Canadian, British or American spelling conventions. Also, any mark deductions will be broadly proportional to the actual loss of clarity. For example:

  – "Its fine to use contractions.": It should be "it's", but I know what you meant. Not a large deduction.
  – "To use fine contractions.": If this means anything, it means something quite different from "it's fine to use contractions".

4 Tentative schedule

Week 1	2022-01-11–01-14	Grammars, rules and derivations. Small-step and big-step semantics; metatheory.
Week 2	2022-01-18–01-21	Metatheory. Soundness and completeness. Type soundness. **Friday, 2022-01-21**: A1 due (tentative)
Week 3	2022-01-25–01-28	Mathematical logic, natural deduction, harmony.
Week 4	2022-02-01–02-04	More natural deduction. Sequent calculus. **Wednesday, 2022-02-02**: A2 due (tentative)
Week 5	2022-02-08–02-11	Extending our expression language.
Week 6	2022-02-15–02-18	Lambda calculus, type preservation and progress. **Wednesday, 2022-02-16**: A3 due (tentative) **Friday, 2022-02-18**: Project proposal due (tentative)
Reading Week	2022-02-21–02-25	
Week 7	2022-03-01–03-04	Subtyping. Imperative languages, effects and state. **Friday, 2022-03-04:** Take-home midterm
Week 8	2022-03-08–03-11	Polymorphism.
Week 9	2022-03-15–03-18	Dependent types and refinement types.
Week 10	2022-03-22–03-25	Denotational semantics.
Week 11	2022-03-29–04-01	No new material planned. Live presentations (possibly over video)
Week 12	2022-04-05–04-08	No new material planned; live presentations (possibly over video)
Exams period	2022-04-20	**Project report due (tentative)**

The content of Weeks 11 and 12 is *especially* subject to change, since the time needed for presentations depends on the number of projects in the course.

5 Turnitin

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarism.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. Turnitin compares submitted files against its extensive database of content, and produces a similarity report and a similarity score for each assignment. A similarity score is the percentage of a document that is similar to content held within the database. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's Privacy Pledge, Privacy Policy, and Terms of Service (`https://help.turnitin.com/Privacy_and_Security/Privacy_and_Security.htm`), which governs users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes. For further information about how you can exercise control over cookies, see Turnitin's Privacy Policy:

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6 Additional syllabus information

6.1 Common syllabus

The School of Computing's "Common Syllabus Information (2021–2022)" is part of the CISC 465 syllabus. Access it at the following link: `https://www.cs.queensu.ca/students/undergraduate/syllabus/`

6.2 Academic integrity

For greater certainty, an excerpt from the standard syllabus's section on "Academic Integrity" is reproduced here:

Queen's students, faculty, administrators and staff all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see `www.academicintegrity.org`*) and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.*

Students are responsible for familiarizing themselves with and adhering to the regulations concerning academic integrity. General information on academic integrity is available at Integrity@Queen's University, along with Faculty or School specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning, to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

For this instance of CISC 465/865: Individual assignments must be completed **individually**. You are encouraged to consult the TAs and the instructor, but you must not consult other students, copy solutions from the web, etc. This does not prevent you from studying course material together (virtually, unless you are in the same household), but we are assessing your individual performance in completing each individual assignment.

For some assignments (definitely **not** including the first assignment!), you may (but are not required to) work in a group of two or three. If you choose to work in a group on these assignments,

you may collaborate only within your group. In that case, you must submit one version of the assignment **and**, separately, explanations of your individual contributions.

The midterm must be written individually.