Computing Science Course Outlines 2018 Fall

CMPT 384 - D100 Symbolic Computing

Instructor(s): Rob Cameron

SFU Burnaby

Calendar Objective/Description:
This course considers modelling and programming techniques appropriate for symbolic data domains such as mathematical expressions, logical formulas, grammars and programming languages. Topics include recursive and functional programming style, grammar-based data abstraction, simplification and reduction transformations, conversions to canonical form, environment data structures and interpreters, metaprogramming, pattern matching and theorem proving.

Instructor’s Objectives:
Computer programs, English text, algebraic equations, musical scores and logical formulas are all examples of symbolic data domains. Programs that address many problems involving these domains carry out their tasks primarily by manipulating expressions in special purpose languages. This course will focus on one of the most important programming paradigms that provides convenient support for such programming applications: functional programming. In particular, the Haskell programming language designed to support this paradigm will be introduced to support the techniques used in addressing symbolic computing problems.

Prerequisites:
CMPT 225, and (MACM 101 or ENSC 251 and ENSC 252).

Topics:
- Languages: expressions and grammars.
- Symbolic data: atoms, lists, structures.
- Principles of functional programming.
- Recursive programming and structural induction.
- Programs and grammars as data objects: metaprogramming.
- Algebraic expressions as data objects: symbolic math.
- Logical formulas as data objects: theorem proving and the basis of logic programming.
- Lexical analysis and parsing: interpreters

Grading:
Assignments, 30%; Tests/Quizzes, 20%; Final Exam, 50%.

Reference Books:
Symbolic Computing with LISP, Robert D Cameron, Anthony H Dixon, Prentice Hall, 1992, 9780138778460
The Haskell School of Expression, Paul Hudak, Cambridge Univ. Press, 2000, 9780521644082

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