COMP3161/COMP9161
Concepts of Programming Languages

Course Goal

To educate students on the concepts of programming languages and different programming paradigms.

Technical

To educate students

- on semantics of different programming languages and programming paradigms: imperative, object oriented, and declarative.
- theoretical foundations of programming languages: syntax, operatational, axiomatic and denotational semantics.
- implementation aspects of central language features, such as dynamic and strong typing, polymorphism, overloading and automatic memory management

Educational

Expose students to a scientific theory of programming languages based on type theory and operational semantics as a mathematically sound framework which allows us to investigate the properties of a large number of programming language features.

Professional

The tutorial formats will give students practice in the presentation of solutions to an audience of peers, and will challenge them to critique peer technical presentations. Furthermore, the whole course encourages critical examination and analysis of existing solutions.

Course Prerequisites

- COMP3161: COMP2011 or COMP2711
- COMP9161: COMP9024

Course Exclusions

- COMP3161: COMP9161
- COMP9161: COMP3161

Constituents

- **Lecture**

  The lectures will cover the following main topics:
  - An overview of the implementation of programming languages:
    compiler, interpreter, hybrid approaches; the role of lexer, parser, semantic analysis and code generation;
    abstract machines and bytecode
  - First order and higher order syntax of Programming languages
  - Static and dynamic semantics of programming languages
  - Abstract machines
  - Polymorphism and overloading
  - Case studies

- **Tutorials**

  Tutorials start in Week 2. We will discuss problems related to the material covered in the lecture and the assignments. Tutorial marks will be awarded based on participation (no marks for just attending). Tutorial problems will be handed out in advance and will students will be asked to present the solution.

- **Assignments**

  There will be two assignments, due approximately in Week 8 and Week 12.
  Penalty for late submission of assignments will be 4% (of the worth of the assignment) subtracted from the raw mark per day of being late. In other words, earned marks will be lost. For example, assume an assignment worth 25 marks is marked as 20, but had been submitted two days late. The late penalty will be 2 marks, resulting in a mark of 18 being awarded. No assignments will be accepted later than one week after the deadline.

Assessment

- **Tutorial Participation Mark**
- **Midsession exam**

  A midsession exam will be held in Week 5

- **Assignments**

  - Assignment 1: will be out approximately in Week 5
  - Assignment 2: will be out approximately in Week 9

- **Final Exam**

  A two hour written final examination will be conducted.

  Supplementary Exam

  Supplementary exams will only be awarded in well justified cases, in accordance with School policy, not as a second chance for poor performance. In particular, it is unlikely that a supplementary will be awarded to students who have actually sat the proper exam.

  Supplementary exams will be oral. The supplementary final exam will be held after the written supplementary exams held for other courses.

- **Final Mark**

  - COMP3161 students: the class mark consists of the tutorial participation mark (20%), midsession exam (20%) and assignments (60%). The arithmetic mean of the class mark and exam mark is used to determine the final mark. To pass the course, a minimum of 40% is necessary in each component.
  - COMP9131 students: the class mark consists of the midsession exam (25%) and assignments (75%). The arithmetic mean of the class mark and exam mark is used to determine the final mark. To pass the course, a minimum of 40% is necessary in each component.

  If both the class mark and the exam mark are greater or equal to 40%, the final mark will be

  (class mark + exam mark) /2

  otherwise

  minimum ((class mark + exam mark) /2, 44)

Text and Reference Books

- Most lectures will be based on *Programming Languages: Theory and Practice*, Robert Harper (Draft)

Supplementary reading:

- *Types and Programming Languages*, Benjamin C. Pierce

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