MODERN C++ DESIGN PATTERNS

Introduction to HLP3

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High-Level Programming 3

- *Assumed Knowledge*
- *Objectives*
- *Teaching Rationale*
- *Teaching Strategies*
- *Learning Strategies*
- *Help*

Assumed Knowledge

- HLP1 + HLP2
- You must thoroughly review following material:
  - Pointers and pointer arithmetic
  - Arrays
  - Class design and implementation
  - Templates [function and class templates]
  - ~~Object orientation~~
  - STL [basic containers, iterator categories, basic algorithms]

Objectives

- Teach modern C++ programming idioms and design patterns for writing robust programs that minimize memory usage and/or runtime.
  - Object-oriented programming: Inheritance, dynamic binding, dependency injection, NVI idiom, Template Method pattern, Strategy Pattern, multiple inheritance
  - RAII
  - Return value optimization
  - Rvalue references: Move semantics, template argument deduction, perfect forwarding, `auto` and `decltype` keywords
  - Memory management: Smart pointers; overloading `new` and `delete` operators; memory pools; `std::allocator<T>`
  - Low-level programming techniques: variadic functions, bitwise operators, bitfields, `union`s
  - Modern STL: functions, lambdas
  - Modern C++ features and applications
  - Generic programming: Variadic templates, CRTP, Mixins, SFINAE
  - Design principles [SOLID] and design patterns

Teaching Strategies

- Lectures
- Quizzes and Exercises [15%]
- Programming Assignments [35%]
- Midterm Test [20%]
- Final Test [30%]

Teaching Strategies: Lectures

- Introduce theoretical concepts
  - Almost always accompanied by live coding demonstrations and examples of theory
- Prepare before and after each lecture!!!
- Attendance is mandatory
  - If you had clicked Present and I randomly call out your name and you're absent from session, you've committed Academic Misconduct!!!

Teaching Strategies: Quizzes

- Provide a venue to better understand theory covered in lectures
  - Involves reading specified material [text book sections & handouts] and answering questions that test your comprehension
  - Could be in-class or take home
  - Submission is mandatory!!!
  - Respect submission deadlines!!!

Teaching Strategies: Programming Assignments

- Provide venue to improve problem solving skills
- Consist of programming exercises with little hand-holding
- Submission is mandatory
- Respect submission deadlines!!!

Teaching Strategies: Midterm & Final Tests

- Aim is for you and us to know how much you know
  - Involves all material covered in lectures, labs, quizzes, and assignments
  - Involves reading code, analyzing code, writing code, debugging code, …
- Attendance is mandatory
  - Midterm: 9 am ~ 11 am on Thursday, October 5
  - Final: 10 am ~ noon on Wednesday, November 29

Online Only

- All assessments are online only!!!

Learning Strategies

- Be an active and motivated learner
- Come prepared to every lecture and lab
- Take pride in your submissions!!!
- Get your hands dirty by programming!!!
- Expand your horizons by reading the text book
- Get help – we're here to help you succeed

Getting Help

- If you've specific questions about HLP3 material:
  - Post questions to Teams channel
  - Use instructors consultation hours on Teams:
    - Tuesday & Wednesday: 6 pm to 7 pm
- Questions involving your grades and other private matters should be directed to your instructor
  - Emails must always have HLP3 in Subject field

Are You Helping Yourself?

- We're here to help, but what have you done to help yourself?
  - Your problem solving skills will determine your future career's trajectory
  - You can learn this skill by analyzing and debugging your problem extensively before asking for help
  - Asking for help at first sign of something not working is similar to spoon feeding!!!

Academic Integrity (1/2)

- You've to submit original work
  - Discussing solutions is encouraged
  - Having study groups is encouraged
- Don't take solutions!!!
- Don't provide solutions!!!
- Don't copy solutions from previous years!!!
- Read [very carefully] SIT Academic Integrity Policy

Academic Integrity (2/2)

First Cheating Offence

- Student will be issued with a warning letter.
- Student will be given a zero mark for the assessment component (CA or examination) in question without the opportunity to re-submit or re-sit the CA or examination. Student will be allowed to re-module in the next offered trimester.

Second Cheating Offence

- Student will be issued with a final warning letter.
- Student will lose all module credits taken for the trimester. Student will be allowed to re-module in the next offered trimester.
- The Board of Discipline will be convened.

Third Cheating Offence

- Student will be terminated from his/her course of study unless there are extenuating circumstances submitted to the Board of Discipline.