

Study Guide for CPSC 427/527, Fall 2016

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This study guide lists all section titles and slide titles from the posted lecture notes. Numbers in parentheses following bullet points are active links to the lecture notes where the slide appears.

1 About This Course

- Where to find information (01)
- Course mechanics (01)
- Course goals (01)
- [Who](#) programs and why? (01)
- [How long](#) does a program last? (01)
- [What](#) are the characteristics of a good program? (01)
- [When](#) do good programs matter? (01)
- Important properties for lifecycle management (01)
- [Why](#) does C++ help one write good programs? (01)

2 Topics to be Covered

- Major Areas (01)
- Course goals - practical (01)
- Course goals - conceptual (01)

3 Kinds of Programming

- Problem solving (01)
- Software Construction (01)
- Industrial-Strength Software (01)

4 Why C++?

- C/C++ are popular (01)
- C/C++ is flexible (01)
- Advantages and disadvantages of C++ (01)
- Downsides of C++ (01)

5 C++ Programming Standards

- Five commandments for this course (01)
- Can is not the same as should! (01)
- Rules for preparing your work (01)

- Rules for submitting your work (01)

6 Task List

- Tasks for this week (02)

7 C++ Overview

7.1 C++ Language Design Goals

- Why did C need a ++? (02)
- C++ was Designed for Modeling (02)
- General properties of C++ (02)

7.2 Comparison of C and C++

- C++ Extends C (02)
- Some Extensions in C++ (02)

8 Building a Project

8.1 C/C++ Compilation Model

- What is a project? (02)
- C++ compilation model (02)
- Header files (02)
- What's in a header file? (02)
- What's in an implementation file? (02)
- Compiling in linux (02)
- Linking (02)
- System libraries (02)
- One-line compilation (02)

8.2 Project management

- The job of the project manager (02)
- Command line development tools (02)

8.3 A sample project

- Parts of a simple project (02)
- Dependencies (02)
- A sample Makefile (02)
- Parts of a Makefile (02)
- Macros (02)
- Rules (02)
- Rules (02)
- Dependencies (02)
- Implicit rules (02)

9 Integrated Development Environments

- Graphical development tools: IDEs (02)
- Recommended IDE's (02)
- Integrated Development Environment (e.g., Eclipse) (02)
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- Integrated Development Environment (02)

10 Submission Instructions

- Submitting your assignments (02)

11 Insertion Sort Example

11.1 Program specification

- Design process: Insertion Sort (03)
- A more refined specification (03)

11.2 Monolithic solution

- A first solution (03)
- What is wrong with this? (03)

11.3 Modular solution in C

- A modular solution (03)
- A modular solution (cont.) (03)

11.4 Modular solution in C++

- C++ version (03)

12 Classes

12.1 Header file

- Header file format (03)
- Class declaration (03)
- class DataPack (03)
- Class elements (03)
- Inline functions (03)
- Visibility (03)
- Constructor (03)
- Constructor (03)
- Destructor (03)
- Destructor (03)

12.2 Implementation file

- dataPack.cpp (03)
- File I/O (03)

12.3 Main program

- `main.cpp` (03)

12.4 Building `InsertionSortCpp`

- Manual compiling and linking (03)
- Compiling and linking using `make` (03)

13 Problem Set 2 Preview

- Think-A-Dot (04)

14 C++ I/O

- Streams (04)
- Opening and closing streams (04)
- Reading data (04)
- Writing data (04)
- Manipulators (04)
- Print methods in new classes (04)
- Extending the I/O operators (04)
- Remarks on operator extensions (04)
- Why `<<` returns a stream reference (04)
- Must it be inline? (04)

15 End of File and I/O Errors

- Status bits (04)
- Status functions (04)
- What `eof` means (04)
- When `eof` is turned on (04)
- Reading an `int` (04)
- Reading an `int` (cont.) (04)
- Examples (04)
- Common file-reading mistakes (04)
- Failing to read the last number (04)
- Reading the last number twice (04)
- How to read all numbers in a file (04)

16 Functions and Methods

- Call by value (04)
- Call by pointer (04)

17 Functions and Methods

17.1 Parameters

- Call by value (recall) (05)
- Call by pointer (recall) (05)
- Call by reference (05)

- I/O uses reference parameters (05)

17.2 Choosing Parameter Types

- How should one choose the parameter type? (05)
- Sending data to a function: call by value (05)
- Sending data to a function: call by reference or pointer (05)
- Receiving data from a function (05)

17.3 The Implicit Argument

- The implicit argument (05)
- `this` (05)

18 Derivation

- Class relationships (05)
- What is derivation? (05)
- Instances (05)
- Some uses of derivation (05)
- Example: Parallelogram (05)
- Example: Rectangle (05)
- Example: Square (05)
- Notes on [Square](#) (05)

19 Construction, Initialization, and Destruction

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- Example of object of a derived class (05)
- Referencing a composed object (05)
- Referencing a base object (05)
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- Constructor ctors (05)
- Initialization ctors (05)
- Initialization not same as assignment (05)
- Copy constructors (05)
- Move constructors (05)

20 Brackets Example

- Code demo (06)
- The problem (06)
- A bracket matching algorithm (06)
- Program design (06)
- Token class (06)
- Token class (cont.) (06)
- Token design questions (06)
- Token design questions (cont.) (06)
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- Stack design questions (06)

- Brackets class (07)
- Brackets design questions (07)
- Main file (07)

21 Storage Management

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- Type of a storage object (07)
- Storage block (07)
- Connecting names to objects (07)
- Lifetime (07)
- Storage class (07)
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- The double-delete problem (07)
- When does copying occur? (07)
- Assignment (07)
- Copy constructor (07)
- Redefining assignment and the copy constructor (07)
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- Static data member example (08)
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- Static function members (08)
- Static class functions are global (08)
- Debugging memory management errors (08)
- Five common kinds of failures (08)
- Memory leak (08)
- Amnesia (08)
- Segmentation fault (08)
- Bus error (08)
- Waiting for eternity (08)
- What kinds of program errors cause these problems? (08)
- What makes these problems hard to diagnose? (08)

22 Bar Graph Demo

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- Overview (cont.) (08)
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- Analysis of [08-BarGraph](#) demo (09)
- [main.cpp](#) (09)
- Design issues for [main.cpp](#) (09)
- [graph.hpp](#) (09)
- [graph.cpp](#) (09)
- Class discussion on bargraph design issues (09)
- [graph.cpp](#) (10)
- Design issues for [Graph](#) class (10)
- [row.hpp](#) (10)
- [row.cpp](#) (10)
- [rowNest.hpp](#) (10)

- Discussion of `row.hpp` vs. `rowNest.hpp` (10)
- `item.hpp` (10)

23 Introduction to the C++ standard library

- A bit of history (10)
- Some useful classes (10)
- Class `stringstream` (10)
- `stringstream` example (10)
- `vector` (10)
- Other operations on `vectors` (10)
- `vector` examples (10)

24 Handling Circularly Dependent Classes

- Tightly coupled classes (10)
- Example: `List` and `Cell` (10)
- Circularity with `#include` (10)
- What happens? (10)
- Resolving circular dependencies (10)

25 References

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- Reference declarators (11)
- Use of named references (11)
- Reference parameters (11)
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- Constant references (11)
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- Storing a list of objects in a data member (11)
- How to access (11)

26 Uses of Pointers

- Array data member (12)
- Composition (12)
- Aggregation (12)
- Fully dynamic aggregation (12)
- Pointer Arithmetic (12)
- Implementation (12)

27 Custody of Objects

- Copying and Moving (12)
- Custody (12)
- Transfer of Custody (12)

- Custody of dynamic extensions (12)
- Move versus copy (12)

28 Move Semantics

- When to move? (12)
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- Move and copy constructors and assignment operators (12)
- Default constructors and assignment operators (12)
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29 Move Demo

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- Special member functions demo (13)
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- Invoking the special functions (13)
- Invoking the special functions (13)

30 Bells and Whistles

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- `const` (13)
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31 The Many Uses of Classes

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32 Feedback on Programming Style

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- Zero-tolerance for compiler warnings (14)
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- Use stream input to read data (14)

- `continue`: Instead of (14)
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- Where do the include guards go? (14)

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- Smart pointers (14)

34 More on Course Goals

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- Example picky detail (14)
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- Efficiency measurement (14)

35 Clocks and Time Measurement

- How to measure run time of a program (15)
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36 Demo: Stopwatch

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49 Linear Containers

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55 Design Patterns

- General OO principles (23)

56 General OO Principles

- General OO principles (24)
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