

Course Outline
CS163: Data Structures
Spring 2015

*(The following outline is subject to change;
chapters assigned are based on the 6th edition!)*

WEEK #1:

Reference: Topic #1 and 2 Videos

Date: Topic:

Reading/Projects:

3/31 Topic #1

***** Please read the syllabus *****

- Introduction: Syllabus, Objectives for the Course, **Chapters 1 and 2**
Class Introduction, and Review Outline. (Software Engineering &
Recursion)
- Overview of what to expect for:
assignments, attendance, discussions, online quizzes, and examinations.

***** Make sure to practice Linear Linked Lists and recursion from CS162 *****

4/2 • Topic #2

- Chapter 1 - Principles of Programming and Software Engineering
- Review: Chapter 2 Recursion

- Review: Data Abstraction through Classes
- Discuss Abstract data types, Classes in C++, Class scope, and Information hiding

Lab #1 – Getting Started with Abstract Data Types **By 4/2 – Get a CS Account**

- **No Prelab Exercises for the first lab! (prior to your first lab!)**

- **Practicing Linear Linked Lists**

WEEK #2:

Reference: Topic #3 Videos

Date: Topic:

Reading/Projects:

4/7 Topic #3 – Data Abstraction

- Chapter 3 - Data Abstraction -- The Walls

Chapters 3, 4, 5

(Data Abstraction, LLL,
Recursion)

- Step through an example of an abstract data type using classes, constructors, member functions.
- Quickly review the concepts of pointers, dereferencing, and allocating/deallocating memory

4/8 7pm Written Homework #1 Due - Submit to the D2L Dropbox
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4/9 Topic #3 – Various implementations of List Abstractions

- Chapter 4 - Linked Lists
- Chapter 5 - Recursion as a problem solving technique
- Algorithms for Simple Linked Lists: list traversal, insertion, deletion
- Discuss array implementations versus linked list implementations of an ordered list

Lab #2 – Building Abstract Data Types

- Bring your Pre-Lab exercise completed!
- *Experience variations of linear linked lists*

WEEK #3:

Reference: Topic #4 Videos

Date: Topic:

Reading/Projects:

4/14 Topic #4 – Stack and Queue Abstract Data Types **Chapters 6, 7, 13.1, 13.2, 14**
Stacks and Abstract Data Types *(Stacks and Queues)*

- Chapter 6 - Stacks
- The stack as an example of an Abstract Data Type in Program Development
- ADT Stack Operations
- Implementing Stacks using arrays
- Implementing Stacks using dynamic memory

4/15 7pm - Program #1 is Due - Submit to the D2L Dropbox

4/16 *Queues and Abstract Data Types*

- Chapter 7 - Queues
- The Abstract Data Type Queue
- Implementations of the ADT Queue

Lab #3 – Stacks and LLL of Arrays

- Bring your Pre-Lab exercise completed!
- *Implement Stack abstractions*
- *Implementation of a LLL of arrays*

WEEK #4:

Reference: Topic #5 and 6 Videos

Date: Topic:

Reading/Projects:

4/21 - Topic #5 *Additional Linked List Implementations*

- Variations of the Linked List
- Doubly linked lists
- Circular linked lists

4/22 7pm Written Homework #2 Due - Submit to the D2L Dropbox
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4/23 – Review Recursion from CS162

Prepare for the Midterm

Lab #4 – Queues and Circular Linked Lists

- Bring your Pre-Lab exercise completed!
- *Implement Queue abstractions*
- *Implementation of a Circular Linked List*

WEEK #5:

Reference: Topic #7 Videos

Date: Topic:

Reading/Projects:

4/28 Midterm Exam

4/29 7pm Program #2 Due - Submit to the D2L Dropbox

4/30 – Topic #6 Hashing

Chapter 18 (Hashing)

- Searching: Introduction and Notation
- Hash Functions, Collisions, Table traversal
- Discussion of what constitutes a good hash function

Lab #5 - Practice Recursion

- Bring your Pre-Lab exercise completed!
- *Practice recursive solutions and doubly linked lists*

***** PROFICIENCY DEMOS are scheduled by Appointment *****

WEEK #6:

Reference: Topic #8 Videos

Date: Topic:

Reading/Projects:

5/5 – Topic #7 Algorithm Efficiency

Chapter 10 (Measuring Efficiency)

- Chapter 9 Algorithm Efficiency
- Measuring efficiency of algorithms: order of magnitude analysis, Big O notation
- **Evaluating the efficiency of algorithms**

Review Hash Tables

5/6 7pm Written Homework #3 Due - Submit to the D2L Dropbox
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5/7 – Topic #8 Tree Structures

Chapter 15 (Trees)

- Definitions, Introduction to Trees, Tree search

Lab #6 – Hash Tables and Other Linked Lists

- Bring your Pre-Lab exercise completed!
- *Implement Array of Linked Lists*
- *Experience variations of linear linked lists*

WEEK #7:

Reference: Topic #9 Videos

Date: Topic:

Reading/Projects:

5/12 – Topic #9 Tree Structures

- Applying Recursion
- Insert Algorithm
- Overview of the removal algorithm

Chapter 16 (ADT Table)

5/13 7pm Program #3 Due - Submit to the D2L Dropbox

5/14 - Topic #9 *Tree Structures*

- Removal Algorithm of a Binary Search Tree

Lab 7 – Binary Search Trees

- Bring your Pre-Lab exercise completed!
- *Practice BST solutions*

WEEK #8:

Reference: Topic #10 Videos

Date: Topic:

Reading/Projects:

5/19 – Topic #10 Advanced Trees

Chapter 19 (Balanced Trees)

- Height balance, contiguous representation of binary trees:
- 2-3 Trees

5/20 7pm Written Homework #4 Due - Submit to the D2L Dropbox

5/21 – Topic #10 Advanced Trees

Chapter 19 (Balanced Trees)

- Other balanced tree algorithms
- 2-3-4 Trees
- Red-black trees

Lab 8 – Balanced Trees

- Bring your Pre-Lab exercise completed!
- *Practice 2-3 Tree Solutions*

WEEK #9:

Reference: Topic #11 Videos

Date: Topic:

Reading/Projects:

5/26 – Topic #10 Continued on Advanced Trees

- AVL Trees
- B-Trees
- Heaps
- Deletion Algorithms

Chapter 21.3.3 (B-Trees)

Chapter 17 (Heaps)

5/27 7pm Program #4 Due - Submit to the D2L Dropbox

5/28 – Topic #11 Graphs

Chapter 20 (Graphs)

Lab 9 – Advanced Algorithms – Graphs

- Bring your Pre-Lab exercise completed!
Experience setup of a graph

WEEK #10:

Reference: Topic #11 and 12 Videos

Date: Topic:

Reading/Projects:

6/2 **Sorting Algorithms**

Chapter 11 (Sorting)

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- Chapter 9: Sorting: Introduction and notation, insertion sort, selection sort, bubble sort
- Shell sort
- Mergesort
- Quicksort for contiguous lists
- Efficiency of Sorting Algorithms

6/4 **Prepare for the Final Exam**

LAB #10 – Practice Recursion and Advanced Trees

- Bring your Pre-Lab exercise completed!
- *Practice binary search trees with recursion and 2-3-4 trees*

6/10 7pm Program #5 Due Submit to the D2L Dropbox *NO LATE Program #5's**

Final Exam Time THURSDAY June 11th 10:15-12:05

*****NO FINALS MAY BE TAKEN AFTER June 11th *****

*Final Proficiency Demonstrations take place by appointment.
All Proficiency Demos must be completed by June 11th*