Computer Science (COMP) 504

Object Structure and Programming (Revision 3)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Grouped study** with **eText**
Credits:	3
Area of study:	Information Systems
Prerequisites:	None
Precluded:	None
Faculty:	**Faculty of Science and Technology**
Notes:	This is a graduate level course and students need to apply and be approved to one of the graduate programs or as a non-program **School of Computing and Information Systems** graduate student in order to take this course. Minimum admission requirements must be met. Undergraduate students who do not meet admission requirements will not normally be permitted to take this course.

Instructor: Dr. Oscar Lin

Overview

The design and analysis of efficient data structures and algorithms has long been recognized as a key subject in computing and information systems. This course discusses the fundamental concepts, principles, and techniques for effective programming, algorithm analysis, and design. Within the object-oriented paradigm, this course uses the object concept, software engineering design patterns, and their programming features to deal with object structure analysis and design. It covers the traditional data structures and algorithmic design patterns, and provides an object-oriented approach to abstract design and algorithm analysis.

Outline

Unit 0: Course Introduction

Unit 1: Object-Oriented Design and Algorithm Analysis

1. Java primer (optional)
2. Object oriented design
3. Indices, nodes, and recursion
4. Algorithm analysis

Unit 2: Object and Data Structures

1. Stacks, queues, and deques
2. Lists and iterators
3. Trees
4. Heaps and priority queues
5. Hash tables, maps, and skip lists

Unit 3: Searching and Sorting

1. Searching and search trees
2. Sorting, sets, and selection

Unit 4: Text and Graph Algorithms

1. Strings and dynamic programming
2. Graph algorithms

Objectives

This course is designed to

- introduce the concepts, principles, and approaches of object and data structures, design patterns, and algorithm development and programming;
- perform object structure analysis, design, and application through the use of object concept and its programming features;
- provide both the traditional data structures and object-oriented approach to advanced abstract design and algorithm analysis.

Learning outcomes

Upon completion of this course, you will be able to

- explain key concepts of both software engineering and algorithm design.
- interpret, analyze, and design algorithms expressed in pseudo-code.
- analyze the running time of algorithms.
- explain and apply software engineering design patterns.
- explain and apply algorithmic design patterns.
- describe the principles and abstract data types (ADTs) of the most important data structures.
- explain the principles of the most widely used search, sort, text processing, and graph algorithms;
- use data structures and algorithms to model and solve problems.

- implement the abstract data types (ADTs), data structures, and algorithms in Java.

Evaluation

In order to receive credit for COMP 504, you must achieve a cumulative course grade of "B-" (70 percent) or better, and must achieve an average grade of at least 60 percent on the assignments and achieve a grade of at least 60 percent on the Final Examination. Your cumulative course grade will be based on the following assessment.

Activity	Weight
Assignment 1 (TME1)	15%
Assignment 2 (TME2)	20%
Assignment 3 (TME3)	20%
Participation	5%
Final Examination	40%
Total	**100%**

Materials

Goodrich, M., & Tamassia, R. (2014). Data Structures and Algorithms in Java™ (6th ed.). Toronto, ON: John Wiley & Sons. (ISBN 978-1-118-77133-4). (eText)

Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein C. (2009). Introduction to Algorithms (3rd ed.). Cambridge, MA: The MIT Press. (ISBN 978-0-262-03384-8) (Print)

eText

Registration in this course includes an electronic textbook. For more

information on **electronic textbooks** , please refer to our **eText Initiative site** .

Other Materials

The remaining learning materials for COMP 504 are delivered through Athabasca University's learning management system (LMS), Moodle. Online course materials include discussion forums, learning materials, and assignments. Assignments will be submitted online.

Special Course Features

Computer Science 504 is offered in computer mediated communications (CMC) mode, and can be completed at the student's workplace or home.

Important links

- **Future Course Offerings**
- **Important Dates and Deadlines**
- **MScIS Contact Information**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery methods may vary from their individualized study counterparts.

Opened in Revision 3, October 19, 2010

Updated October 10, 2024