Course Outline

Lecturer

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Purpose of Module

To introduce core algorithms used in a wide range of applications in computer science; to further develop skills in algorithm and data structure design and the development of medium sized programs. On completion you should be able to: Choose a suitable algorithm for a given problem, and discuss advantages of different methods; design and implement a range of useful algorithms, e.g., compression, encryption, hashing and graph manipulation; design and implement medium-size programming projects involving a number of different abstract data types, reusing and extending existing class libraries.

Tutorials
Tutorials will take place in the first 40 minutes of the lab sessions in weeks 1-11. You will attempt a sheet of pencil & paper exercises with tutor assistance. Exercise sheets and solutions are available on the module webpage.

Labs
In weeks 1 to 11 inclusive there will be tutor-supported Java programming labs:

Friday   13:15 - 15:15   EM 2.50

Structure of Module

Week 1 HWL

Introduction
Course overview.

Week 2
Compression
Cryptography I
Compression Tutorial

Week 3
Cryptography II
Graph ADT I
Cryptography Tutorial

Week 4
Graph ADT II
Graph Searching
Graph Tutorial

Week 5

Weighted Graphs
Task Networks &Topological Order
Graph Search Tutorial

Week 6
Alg. Design: Greedy Algorithms & Divide/Conquer
Alg. Design: Brute Force, Backtracking,
Branch & Bound, Dynamic Programming
Algorithm Design Tutorial

Week 7 READING WEEK

Week 8 LG
Comparing algorithms
ADT: Lists; DLL, CLL, Skipped lists

Week 9
Java exceptions
Dictionaries: list-based dictionary, ordered dictionary.

Week 10
Hash tables
Collision handling
Performance of Hashing

Week 11
Tree Traversal methods
AVL trees
Multiway 2-4 trees, B trees
Priority queues and heaps

Week 12
Revision

Coursework

Students will undertake two pieces of coursework, both Java programs. The first will be handed out by Week 3 and is due at the end of Week 6. The second exercise entails reusing and extending existing graph classes and will be handed out in Week 8 for submission by the end of Week 11.

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<u>Course Materials</u>

Vision/Web Support
There are vision and web pages providing supporting materials, e.g. copies of lecture notes and tutorial sheets and solutions.

Recommended Texts
The module is based on the following text books. During the course you are expected to read sections of the texts, attempt exercises, and examine solutions.

Data Structures and Algorithms in Java (4th edition, or later) Michael T. Goodrich and Roberto Tamassia, John Wiley & Sons, ISBN 0-471-73884-0

Data Structures and Algorithm Analysis in Java, Mark Allen Weiss, Pearson International, ISBN 0-321-37319-7

Copies of the books are available from the University Library, and Blackwells have been requested to stock copies for purchase.

Other Texts
There are many other texts covering data structures and algorithms in Java. **Beware:** Many use earlier versions of Java, e.g. Java 1.4, and omit important features of later releases of Java, including generic types.

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