CO1005 Data Structures and Development Environments

Credits: *20* **Convenor:** *Dr T Ridge* **Semester:** *2nd*

Prerequisites:	*Essential: CO1003*				
Assessment:	*Coursework: 100%*				
Lectures:	*30*	*hours*	**Class Tests:**	*3*	*hours*
Surgeries:	*10*	*hours*	**Private Study:**	*90*	*hours*
Laboratories:	*20*	*hours*			

Subject Knowledge

Aims This module teaches advanced features of the Java language which require sophisticated design techniques and algorithms. Suitable program development environments are also taught.

Learning Outcomes Students should be able to demonstrate an understanding of the fundamental types of structured and dynamic data structure, their specification as abstract data types, and their implementation in Java. Students should be able to demonstrate an understanding of some of the main algorithms for processing dynamic datatypes, and to be able to write Java programs using these algorithms. Students should be able to analyse the behaviour of Java programs with the help of exceptions and structural testing. Students should be able to demonstrate an understanding of the programming and runtime environment of Java.

Methods Class sessions, recommended textbook, worksheets, feedback from markers and extensive web support.

Assessment Marked coursework, written examination, class tests, automated feedback.

Skills

Aims Students should be able to produce written work in a number of different formats; analyse problems, formulate strategies to solve them, design a plan, carry out the required research, implement and evaluate the solution; recognise the need for information, and then locate and access that information.

Learning Outcomes On successful completion of the module students should be able to:

- work with integrated development environments (IDEs).
- understand the design and implementation of object oriented data structures in Java.
- understand the development and implementation of suitable solution strategies for Java based applications.
- design and implement Java programs to satisfy problems of moderate complexity.

Methods Class sessions, worksheets with feedback from markers, Linux, Java, JUnit, Eclipse.

Assessment Class tests, formative lab work.

Explanation of Prerequisites

Since its purpose is to lead the student on to more advanced programming concepts, the module assumes that CO1003, Program Design, has already been taken.

Course Description

The purpose of the module CO1005 is to take the student beyond the elementary parts of the Java language as covered in CO1003, introducing advanced features of the language which require sophisticated design and development tools, techniques and algorithms. In particular, students would learn powerful features of Object oriented programming, complex data structures, exception handling techniques, methodologies and algorithms for sorting and searching over data structures. Additionally basic techniques for debugging and packaging java applications would be introduced.

Detailed Syllabus Inheritance, abstract classes and interfaces, stacks, linked lists, queues, trees. Abstract data types and their implementation in Java. Algorithms to handle structured data objects: arrays; sorting and searching, recursion. Basic exception handling. Testing, JUnit, structural testing; Java environments, command line compilation and linking. Debugger, tool support. Integrated Development Environments.

Reading List

[A] C. Thomas Wu, *A Comprehensive Introduction to Object-Oriented Programming with Java,* McGraw-Hill.

[A] David A Watt, Deryck F Brown, *An Introduction to Abstract Data Types, Data Structures, and Algorithms,* John Wiley and Sons.

[A] Kathy Walrath, Mary Campione, Alison Huml, *The Java Tutorial: A Short Course on the Basics (Java Series) (Paperback),* Prentice Hall PTR.

Also available online at:

http://java.sun.com/docs/books/tutorial/index.html

[B] Michael T. Goodrich and Roberto Tamassia , *Data Structures and Algorithms in Java (4th edition),* John Wiley and Sons.

[B] Isaac Rabinovitch, Sharon Zakhour, Scott Hommel, Jacob Royal and Thomas Risser, *The Java Tutorial, Fourth Edition,* Prentice Hall, Fourth edition, 672 pages.

[B] W. J. Collins, *Data Structures and the Java Collections Framework; ISBN: 0071114076,* McGraw-Hill.

[C] Robert Sedgewick, *Algorithms in Java, Parts 1-4, 3rd Edition,* Addison-Wesley.

[C] U. Manber, *Introduction to Algorithms: a Creative Approach,* Addison-Wesley.

Resources Departmental web page, text book web site, study guide, worksheets, handouts, lecture rooms computer projection facilities and OHPs, past examination papers.

Module Evaluation Course questionnaires, course review.