Systems and Principles Unit Syllabus

Level 3 Creating an object oriented computer program using C++

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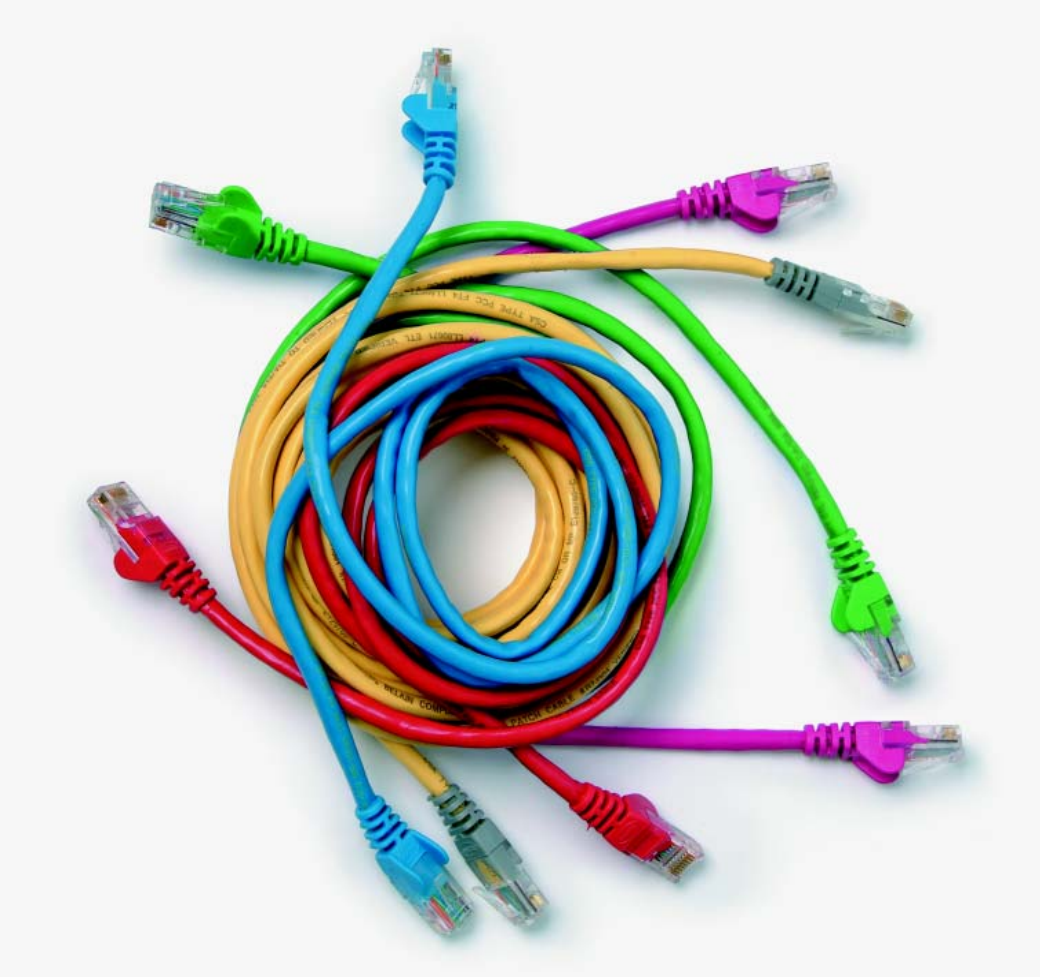

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Unit 034 Creating an object oriented computer program using C++

Syllabus Overview

Unit accreditation number L/601/3184

Credit value 12

Rationale

This unit covers more advanced concepts of object oriented computer languages and their use to implement, refine and test computer programs.

Learning outcomes

There are **four** outcomes to this unit. The candidate will be able to:

1 Implement a software design using object oriented programming
2 Refine an object oriented program to improve quality
3 Test the operation of an object oriented program
4 Document an object oriented program

Guided learning hours

It is recommended that **90** guided learning hours should be allocated for this unit. This may be on a full time or part time basis.

Connections with other qualifications

This unit contributes towards the learning outcomes and assessment criteria required for the level 3 Diploma in ICT Professional Competence.

Assessment and grading

Assessment will be by means of a **set assignment** covering practical activities and underpinning knowledge.

Unit 034 Creating an object oriented computer program using C++

Outcome 1 Implement a software design using object oriented programming

Practical activities

The learner will be able to

1 identify the objects and data and file structures required to implement a given design
2 select, declare and initialise variable and data structure types and sizes to implement design requirements
3 define relationships between objects to implement design requirements
4 implement message passing between objects to implement design requirements
5 implement object behaviours using control structures to meet the design algorithms
6 select and declare file structures to meet design file storage requirements
7 select and use standard input/output commands to implement design requirements
8 make effective use of operators and predefined functions
9 make effective use of an Integrated Development Environment (IDE) including code and screen templates

Underpinning knowledge

The learner will be able to

- describe the data types int, float, double and char and the data qualifiers long, short, signed and unsigned
- explain the use of static, auto and const in declarations
- explain that a pointer is a variable that holds the memory address of another variable
- describe the use of the NULL pointer
- describe the component parts of a string
- describe the format of a struct and the use of an array of type struct
- explain the use of one and two-dimensional arrays of data type: int[], char[], float[]
- describe the use of header files to define constants and external functions
- explain that data within an object cannot be accessed directly but is accessed through its interface
- explain that an object's interface is the functions and parameters defined within the object that can be accessed by other objects
- describe how message passing between objects means that a function within one object is called by another object and data is passed through the function's defined parameters
- describe how a value can be returned by a called function
- explain how default parameters are used
- explain how functions can be overloaded
- describe the use of const when passing parameters between functions
- explain the use of the private and public qualifiers
- describe control structures used for loops ie while, do … while, for
- describe control structures used for selection ie if, if … else, switch
- explain the file types text and binary
- describe the purpose of the file streams fstream, istream, ostream
- explain how file streams can be used to write to a file, read from a file and append to a file

- describe the use of cin and cout for standard input and output
- describe the relational operators: < (less than), > (greater than), <= (less than or equal to), >= (greater than or equal to), == (equal to), != (not equal to)
- describe the logical operators: ! (not), && (and), || (or)
- describe the predefined functions: getch(), cin.getline(), gets(), puts(), atoi(), atof(), strcpy(), strcat(), strlen(), toupper(), tolower()
- explain the use of the increment (++) and decrement (--) operators in prefix and postfix mode
- describe the arithmetic operators ie * (multiply), / (divide), - (subtract), + (add), % (modulus)
- state the difference between the assignment operator (=) and the relational operator (==)
- describe the use of the assignment operators: +=, -=, *=, /=, %=

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Outcome 2 Refine an object oriented program to improve quality

Practical activities

The learner will be able to

1 use an agreed standard for naming, comments and code layout
2 make effective use of encapsulation, polymorphism and inheritance
3 implement data validation for inputs
4 identify and implement opportunities for error handling and reporting

Underpinning knowledge

The learner will be able to

- describe the conventional use of indentation in code layout
- state that meaningful names should be used for objects, variables and functions and that constants are normally identified using uppercase characters and variables using lowercase characters
- state that meaningful comments are inserted in code to aid understanding of the code
- state that data validation is performed on data entered into a program to prevent incorrect data causing incorrect results or a run-time error
- describe the types of data validation that can be performed such as presence check, range check, date check, type check (alphabetic or numeric), character count, check digit (modulus number), format check (eg AG145), use of a lookup table for defined values
- state the importance of trapping errors in a program so that the program does not crash at run-time
- describe how screen prompts are used to provide information to a user about the actions that can be taken when an error occurs

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Outcome 3 Test the operation of an object oriented program

Practical activities

The learner will be able to

1 make effective use of the debugging facilities available in the IDE
2 prepare a test strategy
3 select suitable test data and determine expected test results
4 record actual test results to enable comparison with expected results
5 analyse actual test results against expected results to identify discrepancies
6 investigate test discrepancies to identify and rectify their causes

Underpinning knowledge

The learner will be able to

- state that errors can be located when debugging a program by displaying the values held in variables
- explain the purpose of a test plan is, for each test to be performed, to identify the type of test, the test data required and the expected results of the test
- state that test data should contain valid and invalid data
- explain the purpose of a test log is to record the actual results of each test in the test plan, comment on any discrepancies between the actual results and the expected results and record if any amendments are made to correct an error
- state that testing is done to determine if a program executes correctly according to its specification and to aid in the location and correction of errors

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Outcome 4 Document an object oriented program

Practical activities

The candidate will be able to

1 create on-screen help to assist the users of a computer program

2 create documentation for the support and maintenance of a computer program

Underpinning knowledge

The learner will be able to

- describe how screen prompts are used to provide information to a user about the actions that can be taken
- state that the purpose of technical documentation is to help the software developer support and maintain the software
- describe the contents of technical documentation ie program specification, program listing, class interfaces, test plan and test results

Unit record sheet

Use this form to track your progress through this unit.

Tick the boxes when you have covered each outcome. When they are all ticked, you are ready to be assessed.

Outcome	✓	Date
1 Implement a software design using object oriented programming	☐	
2 Refine an object oriented program to improve quality	☐	
3 Test the operation of an object oriented program	☐	
4 Document an object oriented program	☐	

Candidate Signature ..... **Date** .....

City & Guilds Registration Number .....

Quality nominee (if sampled) ..... **Date** .....

Assessor Signature ..... **Date** .....

External Verifier Signature (if sampled) ..... **Date** .....

Centre Name ..... **Centre Number** .....

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