Programming Foundations Training

<u>Course Outline</u>

Module 1: System Components

- Computer system components
- Central hardware components
- Moore's Law
- Software components
- Operating systems
- Processes
- Virtual memory
- Virtualisation
- Cloud Computing

Module 2: First Steps

- What is a program?
- What does a programmer do?
- Components of a program
- Programming languages
- Standards
- Applications and libraries
- Code used by more than one program
- What does a program do?
- Paper to program
- Creating a program
- A first program
- Running a program
- Error messages
- Giving names to data items
- Assignment statements
- Console vs. GUI
- Simple graphical messages
- Special characters

Module 3: Data

- Representing data
- Common numbering systems

- Numbers in programming languages
- Bits, bytes and words
- Conventions
- Fundamental types
- Getting it wrong
- Representing characters
- The problem with the Euro
- Representing integers
- Representing floating point
- E numbers
- Representing time
- Representing nothing

Module 4: Variables and Operators

- Variables and constants
- Objects
- Life of a variable - scope
- An alternative to scope
- Namespaces
- Choosing variable names
- Names you should not use
- Operations on data
- Choosing variable types
- Assignment and types
- Simple operations?
- Operator precedence
- Comments

Module 5: Containers

- Arrays and lists
- Sorting
- Other linear types - stacks, queues, deques
- Downside of linear structures
- Non-linear types and keys
- Containers for records - tree structures
- Associative arrays
- Compound types
- Class
- Object Orientation

Module 6: Flow Control

- Flow control
- Altering program flow
- Simple decision statements
- What is truth?
- Boolean operators
- Logical operators
- Using logical operators
- Loops
- Simple loop statements
- Array processing
- Language supplied iterators
- Interrupt handling
- Exception handling

Module 7: Program Structure

- Scope revisited
- Named blocks
- Calling a function
- Arguments and Parameters
- Passing arguments by copy
- Passing arguments by reference
- Returning results
- Function call syntax
- Recursion
- Entry points
- Modules and Libraries
- Why hide code and data? Encapsulation
- Asynchronous subroutines - Threads

Module 8: Input and Output

- What is a file?
- File systems
- Exchangeable file systems
- I/O Libraries and Layers
- File data types
- File names
- Opening a file
- Opening a file - checks

- Opening a file - modes
- Sequential access
- Random access
- Buffering
- Concurrency issues
- Locking strategies

Module 9: Building Programs

- Compilation
- Linking
- Loading and running
- Process attribute inheritance
- Portability
- Emulators
- Interpretation
- The third way: Byte-code
- Optimisation
- Debuggers

Module 10: Coding Style

- Virtues of a programmer
- Readability and style
- Naming conventions
- Error handling
- Programming for change
- The need for speed
- Programming for performance
- Constants - aren't
- Portability and flexibility