

THE LEARNING JOURNEY FOR COMPUTING

Unit / Block of work	Key Episodes / Questions	Additional Detail	Colour Code	Length of time.	Learner Attribute(s)
Technologies	<p>Can you explain how sensors, microprocessors and actuators can be used in collaboration to create automated systems?</p> <p>Can you explain the advantages and disadvantages of an automated system for a given scenario including: Industry, Transport, Agriculture, Weather, Gaming, Lighting, Science?</p> <p>Can you explain what robots are?</p> <p>Can you explain the characteristics of robots?</p> <p>Can you explain the roles that robots perform along with their advantages and disadvantages?</p> <p>Can you explain the roles of robots in the following areas: Industry, Transport, Agriculture, Medicine, Domestic, Entertainment?</p> <p>Can you explain what is meant by artificial intelligence (AI)?</p> <p>Can you explain the main characteristics of AI including: The collection of data and rules, The ability to reason, The ability to learn and adapt?</p> <p>Can you explain the basic operation and components of AI systems to simulate intelligent behaviour including: Expert systems, Machine learning?</p>	<p>Automated systems</p> <p>Robotics</p> <p>Artificial intelligence</p>		6 hours	<p>Knowledge</p> <p>Inquirer</p> <p>Knowledge</p>
Algorithm design	<p>Can you explain the program development life cycle?</p> <p>–Analysis - including abstraction, decomposition, problem identification requirements</p> <p>–Design – including decomposition, structure diagrams, flowcharts and pseudocode</p> <p>–Coding – writing program code and iterative testing</p> <p>–Testing – testing program code with test data"</p> <p>Can you explain how flowcharts are used to solve problems?</p> <p>Can you describe and use flowchart symbols including?</p> <p>–Processes, subroutines, input/output, decisions, terminators</p> <p>Can you create, interpret, correct, complete and amend algorithms using flowcharts?</p> <p>Can you write algorithms in pseudocode involving sequence, selection and iteration?</p> <p>Can you state the purpose of an algorithm and be able to describe the processes involved in it?</p> <p>Can you explain standard methods of solution including?</p> <p>– Linear search, Bubble sort, Totalling, Counting</p> <p>– Finding maximum, minimum and average values</p> <p>Can you explain the purpose of a given algorithm including?</p> <p>– Stating the purpose of an algorithm</p> <p>– Describing the processes involved in an algorithm"</p> <p>Can you explain the need for validation checks and be able to write algorithms to implement each validation check including?</p> <p>– Range check, Length check, Type check, Presence check, Format check, Check digit"</p> <p>Can you identify errors in algorithms and suggest ways to fix the errors?</p> <p>Can you explain and apply suitable test data including?</p> <p>– Normal, Abnormal, Extreme (largest/smallest acceptable value)</p> <p>– Boundary (largest/smallest acceptable value and corresponding smallest/largest rejected value)</p> <p>Are you able to complete a trace table for a dry run of an algorithm including variables, outputs and user prompts?</p>	<p>Development life cycle</p> <p>Algorithms and flowcharts</p> <p>Algorithms and pseudocode</p> <p>Standard algorithms</p> <p>Validation and verification</p> <p>Testing and trace tables</p> <p>Creating and refining algorithms</p>		28 hours	Thinker
Programming concepts	<p>Can you use data types: integer, real, char, string and Boolean?</p> <p>Can you declare and use constants and variables?</p> <p>Can you use input, output and assignment statements?</p> <p>Can you use arithmetic operators including MOD and DIV?</p> <p>Can you use string handling functions?</p> <p>Can you use selection and nested selection statements?</p> <p>– IF statements, CASE statements</p> <p>Can you use NOT, AND and OR when creating Boolean expressions</p> <p>Can you use of logical operators?</p> <p>Can you explain the concept of iteration?</p> <p>– Count-controlled loops (FOR loops)</p> <p>– Pre-condition loops (WHILE loops)</p> <p>– Post-condition loops (REPEAT...UNTIL... loops)</p> <p>Can you write algorithms in pseudo-code involving sequence, selection and iteration?</p> <p>Can you describe and use one- and two-dimensional arrays in the design of solutions to simple problems</p> <p>Can you describe and use library routines including?</p> <p>– MOD, DIV, ROUND, RANDOM</p>	<p>Data types and operations</p> <p>Sequence and selection</p> <p>Iteration</p> <p>Arrays</p> <p>Library routines</p>		15 hours	<p>Thinker</p> <p>Knowledge</p> <p>Risk Taker</p> <p>Thinker</p> <p>Thinker</p>
Advanced programming and Databases	<p>Can you describe the concept of procedures and functions?</p> <p>Can you write simple procedures and functions?</p> <p>Can you use parameters to pass data to procedures and functions?</p> <p>Can you describe that procedures and functions may use local variables which are accessible only within them?</p> <p>Can you use local variables and explain why it is good practice to do so?</p> <p>Can you describe the purpose of storing data in a file to be used by a program?</p> <p>Can you Open, close and use a file for reading and writing including?</p> <p>– Read and write single items of data</p> <p>– Read and write a line of text"</p> <p>Can you construct truth tables for the following logic gates?</p> <p>– NOT, AND, OR</p> <p>– NAND, NOR</p> <p>– XOR (EOR)</p> <p>Can you create logic circuits from problem statements, logic expressions or truth tables?</p> <p>– Complete truth tables from problem statements, logic expressions or logic circuit</p> <p>– Write logic expressions from problem statements, logic circuits or truth tables"</p> <p>Can you explain how to create maintainable programs including the appropriate use of:</p> <p>– Meaningful identifiers, Comments, Procedures and functions</p> <p>– Relevant and appropriate commenting of syntax</p> <p>Can you use meaningful identifiers for?</p> <p>– Variables and constants, Arrays, Procedures and functions"</p> <p>Are you able to create a single-table database including?</p> <p>– Fields, Records and Validation</p> <p>Can you suggest suitable data types for fields, including?</p> <p>– Text/Alphanumeric, Boolean, Character, Integer and Real, Date/Time</p> <p>Can you describe the purpose of primary keys?</p> <p>Can you use Read, understand and complete SQL including?</p> <p>– SELECT, FROM, WHERE, ORDER BY, SUM and COUNT"</p>	<p>Procedures and functions</p> <p>File handling</p> <p>Boolean logic</p> <p>Maintainable programs</p> <p>Databases and SQL</p>		18 hours	<p>Thinker</p> <p>Knowledge</p> <p>Risk Taker</p> <p>Thinker</p> <p>Knowledge</p>