COMPUTER SCIENCE

INTENT

Our curriculum is designed to foster critical thinking, computational thinking, and creativity, while also promoting effective communication and collaboration skills. We believe that our students should be prepared to contribute to the digital world responsibly, ethically, and effectively. We focus on developing and refining fundamental skills such as computational thinking, programming, online safety, and digital media creation. Through a range of engaging and challenging activities, we aim to foster a love of Computing and encourage students to become confident and creative problem-solvers in a rapidly evolving digital world.

IMPACT

Studying computing develops problem-solving, critical thinking and collaboration skills, essential for future careers. These skills enable effective communication, analysis, and informed decision-making, providing a competitive edge. Additionally, digital literacy empowers students to navigate and succeed in the digital world, offering lifelong benefits.

LIFELONG OPPORTUNITIES

Studying computing opens up a wealth of career opportunities in fields such as software development, data analysis, cybersecurity, and artificial intelligence. The skills developed through computing are transferable to a range of industries and offer the potential for lifelong career growth and innovationh

YEAR 11

EXAM PREP

2.4 - Boolean logic

What is Boolean logic and how is it used in computing?

Understanding of Boolean operators (AND, OR, NOT), truth tables, and logic diagrams. Knowledge of how to apply logical operators in truth tables and create/edit logic diagrams. Ability to work with multiple gates in a logic diagram.

SEMESTER 2

2.5 – Programming languages and Integrated Development Environments

What are the common tools and facilities available in an Integrated Development Environment (IDE)?

Common tools in IDEs (editors, error diagnostics, run-time environment, translators). Students will gain practical experience using IDE tools to develop programs.

What are the characteristics and purpose of different levels of programming languages?

High-level vs. low-level programming languages, purpose of translators, compiler vs. interpreter.

1.6 – Ethical, legal, cultural and environmental impacts of digital technology.

What are the impacts of digital technology on society and what legislation is relevant to computer science

Software licenses. Open-source software provides access to the source code and the ability to change the software, while proprietary software does not.

Digital technology has ethical, legal, cultural, environmental and privacy impacts on society. Legislation relevant to computer science includes the Data Protection Act 2018, Computer Misuse Act 1990, Copyright Designs and Patents Act 1988.

SEMESTER 1

SEMESTER 3

1.3 - Computer networks, connections, and protocols.

What are computer networks, connections, and protocols, and how do they function?

Types of networks and topologies, hardware needed to connect stand-alone computers, modes of connection, encryption, IP addressing, MAC addressing, common protocols, and a comparison of wired and wireless connections. The ability to recommend the best connection for a given scenario.

2.1 - Algorithms

What are the standard searching and sorting algorithms?

Ability to identify common errors and use trace tables to follow an algorithm. Understanding of standard searching algorithms including binary search and linear search, and standard sorting algorithms including bubble sort, merge sort, and insertion sort

What are the principles of computational thinking and how do we create and refine algorithms? What are the standard searching and sorting algorithms?

Understanding the principles of computational thinking such as abstraction, decomposition, and algorithmic thinking. Ability to create, interpret, correct, complete, and refine algorithms using pseudocode, flowcharts, and reference language/high-level programming language.

1.4 – Network Security

What are the common threats to computer systems and networks?

Different forms of attack, including malware, social engineering, brute-force attacks, DoS attacks, and data interception/theft, as well as the concept of SQL injection. Understand how each attack is used and their purpose.

SEMESTER 4

2.3 - Producing robust programs

What are the considerations for defensive design and testing of programs?

Defensive design considers anticipating misuse, authentication, input validation, and maintainability.

Testing includes iterative and final/terminal testing, identifying syntax and logic errors, selecting and using suitable test data, and refining algorithms.

1.5 – Systems software

What is the purpose and functionality of operating systems?

User interface features. Memory management and multitasking. Features of the OS, User, File management, Data transfer and management between devices and the processor. Allocation of account, access rights, and security.

Purpose and functionality of utility software such as encryption, defragmentation, and data compression.

SEMESTER 1

YEAR 10

SEMESTER 2

2.2 Programming Fundamentals

What are the fundamental concepts and techniques in programming?

Arithmetic and Boolean operators, data types (integer, real, boolean, character and string), casting, basic string manipulation, file handling operations (open, read, write, close), records, SQL, arrays (1D and 2D), sub-programs, and random number generation.v

Understand variables, constants, operators, inputs, outputs, assignments, and the three basic programming constructs (sequence, selection, iteration).

1.2 – Memory and storage

What are the different types of memory and storage, and how do they work?

The conversion of positive denary whole numbers to binary and vice versa is also discussed, as well as the representation of characters, images, and sound in binary.

The concept of virtual memory, common types of storage devices and their characteristics, such as capacity, speed, portability, durability, reliability, and cost. It covers the units of data storage and how data can be converted into binary format.

The need for primary storage (RAM and ROM) and secondary storage (optical, magnetic, and solid-state), as well as the purpose of ROM and RAM in a computer system.

1.1 – Systems architecture

What is CPU architecture, and how does it impact system performance?

Knowing the impact of CPU characteristics such as clock speed, cache size, and number of cores on system performance. Definition and characteristics of embedded systems.

Understanding the fetch-execute cycle, components of a CPU (ALU, CU, Cache, Registers), and Von Neumann architecture (MAR, MDR, Program Counter, Accumulator).

SEMESTER 1

SEMESTER 1

Game Programming

What programming concepts and techniques are required to create games using Pygame or Javascript, including event handling, collision detection, and game states?

Understanding of programming concepts and techniques, including event handling, collision detection, and game states.

Knowledge of programming languages, such as Python or Javascript

SEMESTER 2

Algorithms

What are algorithms, how can they be represented using flowchart symbols, and how can they be used to solve problems, including searching and sorting algorithms?

Understanding of algorithm design principles, including flowchart symbols and pseudocode.

Knowledge of searching and sorting algorithms and their applications.

Ability to analyse and optimize algorithm efficiency. Logical thinking and problem-solving skills for designing and implementing algorithms.

SEMESTER 3

Visual Identity

What are the key elements of a visual identity, including colour, typography, and layout, and how can they be used to create a cohesive brand image?

Understanding of graphic design principles, including layout, colour, and typography.

Knowledge of branding and visual identity principles and their applications in marketing.

Ability to design and create a cohesive brand image using design software.

Critical thinking and evaluation skills for analyzing and interpreting visual content

SEMESTER 4

Python Programming Project

How can we use Python programming concepts and techniques to design and implement a project, including defining requirements, planning, coding, testing, and debugging?

Understanding of software development life cycle, including requirements gathering, design, coding, testing, and deployment.

Knowledge of programming concepts and techniques, including data structures, algorithms, and object-oriented programming. Ability to design and implement a software project using

Ability to design and implement a software project using

YEAR 9

SEMESTER 4

Databases and Boolean

How can we use Boolean logic to manipulate data in databases, including searching, filtering, and sorting?

Problem-solving skills for querying and filtering data using Boolean operators.

Ability to use database software, such as MySQL or Access. Problem-solving skills for querying and filtering data using Boolean operators

Knowledge of database design principles and data manipulation techniques.

Understanding of Boolean logic and its applications in programming.

SEMESTER 3

Comic Book Creation

What are the main principles and conventions of comic book design, including character design, speech bubbles, and panel layout?

Critical thinking and evaluation skills for analysing and interpreting comic book content.

Creativity and imagination for designing engaging and visually appealing comic book content. Critical thinking and evaluation skills for analysing and interpreting comic book content.

Knowledge of graphic design principles, including layout, colour, and typography.

Understanding of comic book design principles, including character design, speech bubbles, and panel layout.

Python Turtle

How can we use the Python turtle library to create patterns and shapes using sequence, iteration, and procedures?

Logical thinking and problem-solving skills for creating complex designs

Ability to use the turtle graphics library to create patterns and shapes. Logical thinking and problem-solving skills for creating complex designs.

Knowledge of the Python programming language and its syntax.

Understanding of basic programming concepts, including sequence, iteration, and procedures.

SEMESTER 2

Advent Window

How can we use graphic design principles, including layers and rollover images, to create an interactive advent calendar in Fireworks?

Creativity and innovation for designing visually appealing and engaging content

Creativity and innovation for designing visually appealing and engaging content

YEAR 7

SEMESTER 1

Online Safety

What strategies can we use to stay safe and protect our personal information online?

Knowledge of common online threats and how to protect against them. Understanding of personal information and privacy protection. Critical thinking and evaluation of online content. Communication skills for reporting and seeking help

SEMESTER 2

Digital Detective

How can we use binary, ASCII codes, and image formats to represent and process different types of data, such as text, graphics, and multimedia?

Understanding of binary and ASCII codes and how they represent different types of data. Knowledge of image formats and compression techniques. Ability to convert between different data representations. Problem-solving skills for processing and manipulating data.

SEMESTER 3

Bafta Games Design

What principles and techniques can we use to design and create engaging and challenging games for a PEGI 12 audience?

Understanding of game design principles, including storyboarding, user interface, and game mechanics. Knowledge of character and level design principles, including game balance and difficulty. Creativity and imagination for designing engaging and immersive game content.

SEMESTER 4

Computer Hardware

What are the main components of a computer system and how do they work together to execute instructions and perform tasks?

Understanding of computer hardware components and their functions. Knowledge of computer architecture and system design. Ability to troubleshoot and diagnose hardware issues. Critical thinking and problem-solving skills for optimizing computer performance.

YEAR 8

SEMESTER 1

Advent Window

How can we use graphic design principles, including layers and rollover images, to create an interactive advent calendar in Fireworks?

Knowledge of graphic design principles, including layout, colour, and typography.

Proficiency in using design software, such as Fireworks or Photoshop.