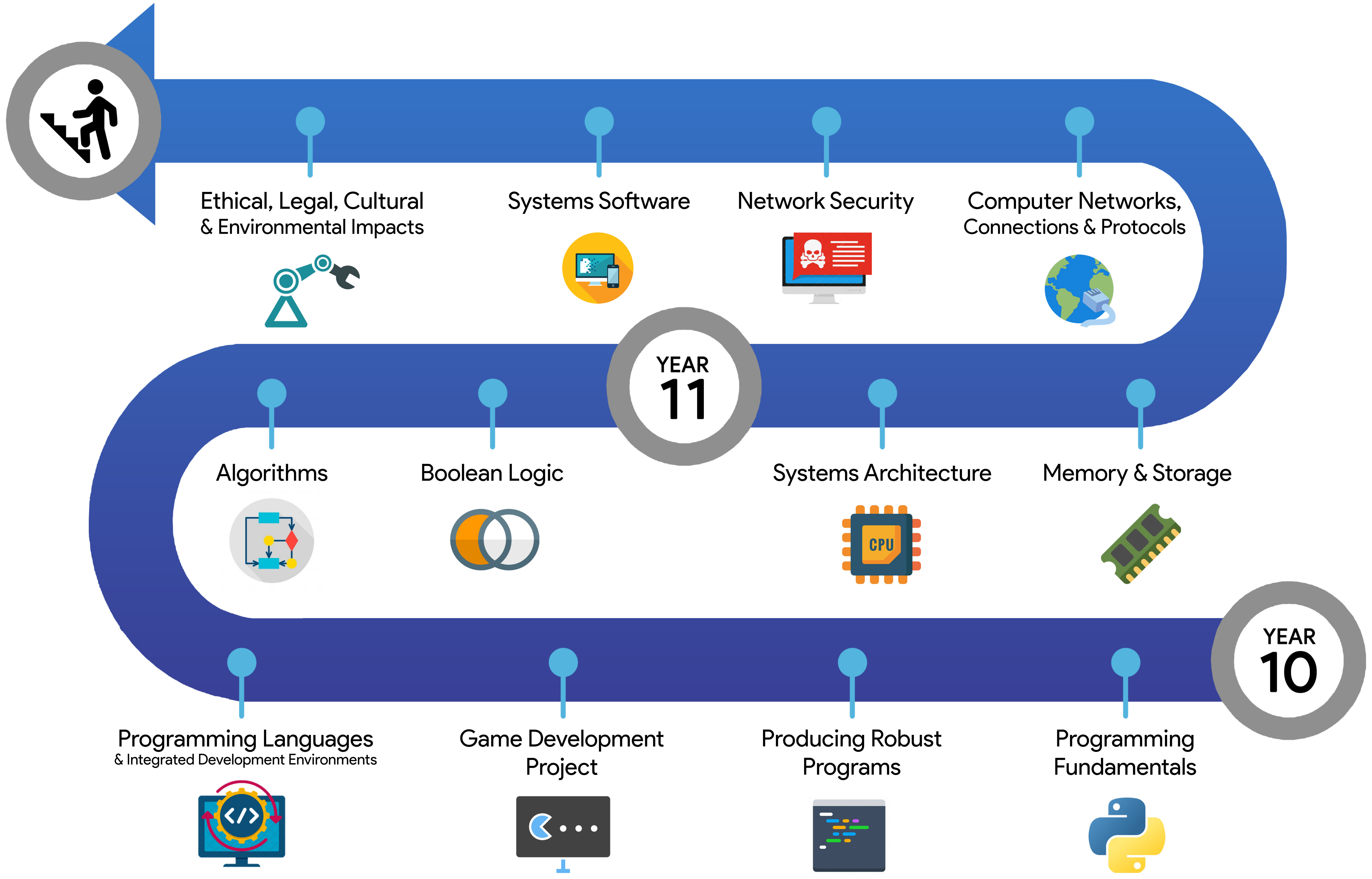
# ST. MICHAEL'S CATHOLIC ACADEMY COMPUTER SCIENCE


Ethical, Legal, Cultural & Environmental Impacts
Systems Software
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YEAR 11
Algorithms
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YEAR 10
Programming Languages & Integrated Development Environments
Game Development Project
Producing Robust Programs
Programming Fundamentals

## Year 10 — GCSE Computer Science

### Programming Fundamentals:

- The use of variables, constants, operators, inputs, outputs and assignments
- The use of the three basic programming constructs used to control the flow of a program
- Common arithmetic and Boolean operators (AND/OR/NOT)
- The use of data types
- The use of string manipulation
- The use of basic file handling operations
- The use of records to store data
- The use of SQL to search for data
- The use of array data structures (1D/2D)
- How to use functions and procedures
- Random number generation

### Producing Robust Programs:

- Defensive design considerations
- Input validation
- Mantainability
- Testing (iterative/final)
- Identifying syntax/logic errors
- Selecting suitable test data
- Refining algorithms

### Game Development Project:

- Demonstrage an ability to design, write, test and refine through completion of a practical programming project

### Programming Languages & IDEs:

- Characteristics and purpose of different levels of programming language
- The purpose of translators
- Characteristics of compilers/interpreters
- Common tools and facilities available in an IDE

### Algorithms:

- Principles of computational thinking (Abstraction, decomposition, algorithmic thinking)
- Identifying inputs, process and outputs of a problem
- Structure diagrams
- Pseudocode/flowcharts
- Identifying common errors
- Trace tables
- Searching algorithms (Binary search, linear search)
- Sorting algorithms (Bubble sort, merge sort, insertion sort)

### Boolean Logic:

- Simple logic diagrams using AND/OR/NOT
- Truth tables
- Combining Boolean operators using AND/OR/NOT
- Aplying logical operators in truth tables to solve problems

## Year 11 — GCSE Computer Science

### Systems Architecture:

- The purpose of the CPU
- Common CPU components and their function
- Von Neumann architecture
- How common characteristics of CPUs affect their performance
- The porpose/characteristics of embedded systems
- Examples of embedded systems

### Memory & Storage:

- The need for primary storage
- The purpose and differences between RAM/ROM
- Virtual memory
- The need for secondary storage
- Common types of storage
- Suitable storage devices/media for given purposes
- Advantages/disadvantages of different storage types
- The units of data storage
- How to convert between denary, binary and hexadecimal number systems
- Binary addition and overflow errors
- Binary shifts
- ASCII/Unicode character sets
- Image representation and metadata
- Colour depth and resolution
- Sound sampling (sample rate, duration and bit depth)
- Lossy/Lossless compression

### Computer Networks:

- LAN/WAN
- Factors affecting performance
- Client-server and peer-to-peer models
- Network hardware
- The Internet, DNS, the Cloud, web servers and clients
- Star and Mesh topologies
- Ethernet, Wi-Fi and Bluetooth
- Encryption
- IP/MAC addressing
- Standards
- Common protocols (TCP/IP, HTTP, HTTPS, FTP, POP, IMAP, SMTP)
- The concept of layers

### Network Security:

- Forms of attack (malware, social engineering, brute force, denial of service, data interception, SQL injection)
- Common prevention methods (anti-malware, firewalls, passwords, encryption, physical security, penetration testing, user access levels)

### Systems Software:

- The purpose and functionality of operating systems
- User interface, memory management, drivers, multitasking, user management, file management
- The purpose and functionality of utility software
- Encryption software, defragmentation, data compression
- Utility system software

### Ethical, Legal, Cultural and Environmental Impacts:

- Impacts of digital technology on wider society
- Legislation relevant to Computer Science
- Data Protection Act (2018)
- Computer Misuse Act (1990)
- Copyrights, designs and patents act (1988)
- Software licenses (open source, proprietary)

"Never let anybody tell you you can't do it" - Michelle Haupt, Operations Engineer at NASA