Definitions and Concepts for CAIE Computer Science IGCSE

Topic 6: Automated and emerging technologies

6.1 Automated systems

Automated System: A technology-driven mechanism designed to perform tasks with minimal or no human intervention.

Sensor: A device that detects physical inputs from the environment (e.g. temperature, light, motion and pressure) and converts them into electrical signals.

Microprocessor: A small computer or processor embedded within a system that receives data from sensors, processes that data, and makes decisions based on programmed instructions.

Actuator: A device that takes action based on commands from the microprocessor to physically change something in a real-world system.

6.2 Robotics

Robotics: A branch of computer science that incorporates the design, construction and operation of robots (mechanical devices that perform an action).

Industry Robots: Robots used in manufacturing and production environments to perform tasks such as welding, painting, and packaging products efficiently and consistently.

Transport Robots: Automated machines like driverless cars and delivery drones that operate in transport or logistics to move people or goods without direct human control.

Agricultural Robots: Robots designed to carry out farming tasks such as planting, harvesting, weeding, and monitoring crops to improve productivity and reduce manual labor.

Medical Robots: Robots employed in healthcare settings to assist with precise surgical operations and deliver medication, enhancing accuracy and patient care.

Domestic Robots: Robots used in homes for everyday chores, including robotic vacuum cleaners, lawn mowers, and window cleaning devices that reduce human effort.

Entertainment Robots: Robots created for amusement purposes, such as robotic toys, animatronics in theme parks, and robots used in movies for special effects.

6.3 Artificial intelligence

Artificial Intelligence (AI): A branch of computer science focused on creating systems that simulate intelligent, often human, behaviour by processing data, reasoning logically, and learning from experience.

Collection of Data and Rules: AI systems gather large amounts of data and use predefined algorithms or rules to interpret this data and produce meaningful outputs or decisions.

Ability to Reason: AI can analyse information, identify patterns, and draw logical conclusions to solve problems and make decisions similar to human reasoning.

Ability to Learn and Adapt: Some AI systems improve automatically over time by learning from new data, enabling them to adjust to changing environments without explicit reprogramming.

Expert Systems: AI programs that mimic human expert decision-making by using a knowledge base of facts, a rule base of "if-then" statements, an inference engine to apply rules logically, and an interface for user interaction.

Machine Learning: A type of AI where programs adapt their processes and improve performance automatically by learning from data patterns, allowing them to handle new or evolving tasks without manual reprogramming.