Unit R111 – Computer aided manufacture

Computer controlled manufacturing robotics

Instructions and answers for teachers

*These instructions should accompany the OCR resource **'Computer controlled manufacturing robotics'** activity which supports OCR Cambridge Nationals in Engineering.*

The Activity:

This resource comprises of 1 task.

This activity offers an opportunity for English skills development.

Associated materials:

'Computer controlled manufacturing robotics' activity sheet

Suggested timings:

Task 1: 1 hour

Learning outcome 4 – Know about applications of computer control processes used to manufacture products

Task 1

For this activity learners are tasked to research the six main types of industrial robot and to explain how they work giving typical applications of each.

Learners have been provided with web links showing each type of robot in operation:

Robot type	Video
Articulated	https://www.youtube.com/watch?v=nvrV4boPDOg
Cartesian	https://www.youtube.com/watch?v=Cq5ouIPg-YU
Cylindrical	https://www.youtube.com/watch?v=_5a3OVi-v8E
Polar	https://www.youtube.com/watch?v=CUn0IctOOkg
SCARA	https://www.youtube.com/watch?v=vKD20BTkXhk
Delta (or parallel)	https://www.youtube.com/watch?v=aH_t_1-tl40

Learners have also been provided with a web link to the British Automation and Robot Association (BARA) as a useful starting point for their investigation: http://www.bara.org.uk/definition-of-robots.html

The activity may be undertaken individually, in pairs or in groups. Learners will require access to the internet in order to complete the activity.

Solutions and findings could be presented in the form of a simple table, or learners could develop and present a PowerPoint presentation or poster.

Typical solution to the activity are given below, however, learners may supply alternative or more comprehensive responses and alternative applications. Learners might also use simple sketches or diagrams to illustrate their responses.

Robot type	Summary of operation	Typical applications
Articulated	This robot features rotary joints which can range from simple two joint structures to 10 or more joints. The arm is connected to the base by a twisting joint. The links in the arm are also connected by twisting joints. Each joint is called an axis and provides a degree of freedom. Industrial robots commonly have four or six axes.	Production operations (welding, spray painting, assembly)
Cartesian	These are also called rectilinear or gantry robots. Cartesian robots have three linear joints that use the Cartesian co-ordinate system – X, Y and Z. They might also have a wrist to allow rotational movement. The linear joints (X, Y and Z) are termed prismatic joints.	Pick and place Also used in CNC machining, part assembly, application of adhesive
Cylindrical	This robot has at least one rotary joint at the base and at least one prismatic joint to connect the links. The rotary joint uses a rotational motion along the joint axis while the prismatic joint moves in a linear motion. Cylindrical robots work within a cylindrical shaped working envelope.	Assembly operations, materials handling, spot welding
Polar	Polar robots are also called spherical robots. In this configuration the arm is connected to the base with two rotary joints and one linear joint. The axes form a polar co-ordinate system with a spherical shaped working envelope.	Assembly operations, materials handling, welding

Robot type	Summary of operation	Typical applications
SCARA	SCARA robots are commonly used in assembly applications. SCARA stands for **Selective Compliance Assembly Robot Arm** (although some other definitions are sometimes used). It features a two parallel jointed arm layout (rotary joints) with a linear manipulator at the end of the arm. This means that the arm is slightly compliant in the X, Y direction and rigid in the Z direction.	Pick and place, assembly and handling operations (eg applying sealant)
Delta (or parallel)	Delta (or spider-like) robots are built from jointed parallelograms connected to a common base. The parallelograms move within a dome shaped area. The parallelograms maintain the orientation of the end manipulator.	Pick and place (eg pharmaceuticals, food, electronics industries)