
ENGINEERING - ROBOTICS
**Explain the principles, components, and
functions of robots in the manufacturing
industry**

level:	5
credit:	5
planned review date:	August 2004
sub-field:	Mechanical Engineering
purpose:	<p>This unit standard is intended for people who are currently working, or intend to work, with robots in the manufacturing industry.</p> <p>People credited with this unit standard are able to: explain the operating principles of robots; explain the functions of the basic components of robots; explain the basic operating principles of common input and output devices of robots; explain the basic operating principles of robots and programmable controllers; and explain the application of the basic components of robots and an automated control system in the individual's workplace.</p>
entry information:	Open.
accreditation option:	Evaluation of documentation and visit by NZQA and industry.
moderation option:	A national moderation system of regional panels and assessor networks has been established by Competenz.
special notes:	<p>Definitions</p> <p><i>Automated control system</i> refers to the components required to make a system or device operate or change according to a specific set of criteria.</p>

ENGINEERING - ROBOTICS
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Robot refers to a reprogrammable multifunction manipulator designed to move material, parts, tools or specialised devices through variable programmed motions for the performance of a variety of tasks.

Programmable controller (also known as programmable logic controller or PLC) refers to a control device which uses computer logic and programmable memory to control industrial applications.

Elements and Performance Criteria

element 1

Explain the operating principles of robots.

performance criteria

- 1.1 The explanation differentiates between open-loop and closed-loop control systems.
- 1.2 The explanation describes regulation and sequential control functions.
- 1.3 The explanation differentiates between remote-manual and automated-control systems.
- 1.4 The explanation differentiates between digital and analogue closed-loop control systems.

ENGINEERING - ROBOTICS
**Explain the principles, components, and
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element 2

Explain the functions of the basic components of robots.

performance criteria

2.1 The functions of the basic components of robots are explained in terms of closed-loop control.

Range: axis movement, controller input/output signals.

2.2 The functions of input and output signals are explained in terms of their common application in robots.

Range: signals - input, output;
type - digital, analogue;
evidence for a minimum of one digital and one analogue type for each signal is required.

2.3 The function of control logic is explained in terms of basic instruction and result sets converted into logic (or code).

Range: logic (or code) to include - AND, OR, NOT, SET, RESET.

element 3

Explain the basic operating principles for common input and output devices of robots.

performance criteria

3.1 Common digital input devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range: examples of common digital input devices include but are not limited to - switches - micro, reed, flow, level;
sensors - proximity, pressure, photoelectric;
evidence is required for a minimum of four digital input devices.

ENGINEERING - ROBOTICS
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3.2 Common digital output devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range: examples of common digital output devices include but are not limited to - solenoids, relays, indicator lamps;
evidence is required for a minimum of two digital output devices.

3.3 Common analogue input devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range: examples of common analogue input devices include but are not limited to - sensors - temperature, pressure, flow, conductivity;
evidence is required for a minimum of one analogue input device.

3.4 Common analogue output devices are explained in terms of their basic mode of operation, common applications, common faults and means of checking for faults.

Range: examples of common analogue output devices include but are not limited to - control valves, variable speed controls, displays;
evidence is required for a minimum of one analogue output device.

element 4

Explain the basic operating principles of robots and programmable controllers.

performance criteria

4.1 The explanation differentiates between stand-alone and network control.

4.2 The explanation describes the functions of common system components.

Range: central processor unit, local input/output device, remote input/output device, memory device, operator interface, control interface, graphical operator display, application software, operating system software.

ENGINEERING - ROBOTICS
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element 5

Explain the application of the basic components of robots and an automated control system in the individual's workplace.

performance criteria

- 5.1 The explanation describes the application in the individual's workplace.
- Range: central processor unit, input and output devices, memory device, operating system software, machine integration.
- 5.2 An operating sequence is outlined in terms of its functional description.
- 5.3 An automated system is compared to manual control in terms of its advantages.
- Range: safety, product consistency, plant reliability, process optimisation.
- 5.4 Documentation of a control system is identified and its use explained in relation to the individual's workplace.
- Range: functional description, process flow diagram, operation description, fault diagnosis.

Comments on this unit standard

Please contact the Competenz j.broadhead@competenz.org.nz if you wish to suggest changes to the content of this unit standard.

Please Note

Providers must be accredited by the Qualifications Authority or a delegated inter-institutional body before they can register credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against unit standards.

Accredited providers and Industry Training Organisations assessing against unit standards must engage with the moderation system that applies to those standards.

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Accreditation requirements and an outline of the moderation system that applies to this standard are outlined in the Accreditation and Moderation Action Plan (AMAP). The AMAP also includes useful information about special requirements for providers wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

This unit standard is covered by AMAP 0013 which can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.