

Cambridge **NATIONALS LEVEL 1/2**

SYSTEMS CONTROL IN ENGINEERING



R113 Electronic principles

J833/J843

Schemes of work

Version 1

CONTENTS

| | |
|---|----|
| Introduction | 3 |
| Scheme of work (longer term plan – academic year) | |
| Autumn term | 4 |
| Spring term | 5 |
| Summer term | 6 |
| Scheme of work (medium term plan – more detailed by academic term) | |
| Autumn term | 7 |
| Spring term | 9 |
| Summer term | 13 |

INTRODUCTION

This teaching resource, which we've developed with Nationals Engineering teachers, contains two types of schemes of work.

- A **longer term** plan which covers the whole academic year over three terms and suggests the order in which each Learning Outcome (LO) could be taught. Links to other units and LOs within Nationals Engineering are also shown.
- A **medium term** plan which also covers the whole academic year over three terms and suggests the order in which each LO could taught but also provides classroom activities and any links to other resources which might be useful. We've also included 'Have they got it?' linking to activities other LOs in this unit and/or other units and LOs within Nationals Engineering. This includes performing practical activities by which learners confirm their understanding.

Link to qualification

www.ocr.org.uk/qualifications/cambridge-nationals/systems-control-in-engineering-level-1-2-award-certificate-j833-j843/

See our range of planning and teaching resources on the link below (including delivery guides, project approaches, teaching activities, teacher guides and resources lists)

www.ocr.org.uk/qualifications/cambridge-nationals/systems-control-in-engineering-level-1-2-award-certificate-j833-j843/planning-and-teaching/

See our range of assessment resources on the link below (including past paper, mark schemes, examiners' reports, candidate exemplars and set assignments).

www.ocr.org.uk/qualifications/cambridge-nationals/systems-control-in-engineering-level-1-2-award-certificate-j833-j843/assessment/

Scheme of work (longer term plan – academic year)

| | Learning Outcome | Topic area/theme (from R113 specification) | Links to other Cambridge Nationals Engineering units and LOs |
|-------------|------------------|--|---|
| Autumn Term | LO1 | Circuit components, symbols and diagrams. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO1 | Principles, units and measurements. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO3 – Be able to test electronic circuits. |
| | LO1 | Series and parallel circuits. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO1 | Ohms Law and Power Law – part 1. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO1 | Ohms Law and Power Law – part 2. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO1 | Potential divider. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO1 | Types of power sources available and reasons for selection. | |
| | LO1 | Voltage regulators. | |
| | LO2 | Resistor types and applications. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO2 – Be able to construct circuits. |
| | LO2 | Determining resistor values by measurement, calculation and colour code; rating and tolerance. | R114 LO2 – Be able to construct circuits. R114 LO3 – Be able to test electronic circuits. |

| | Learning Outcome | Topic area/theme (from R113 specification) | Links to other Cambridge Nationals Engineering units and LOs |
|-------------|------------------|---|---|
| Spring Term | LO2 | Cable types and applications. | R114 LO2 – Be able to construct circuits. |
| | LO2 | Capacitor types and applications. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO2 | Applications of RC circuits; time constant. | |
| | LO2 | Switch types and applications. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO2 | Circuit protection – fuses and diodes. | R114 LO1 – Be able to use CAD for circuit simulation and design. |
| | LO2 | Systems approach – introduction. | R116 LO1 – Understand the application and operation of microcontrollers and microprocessors in engineered products. R116 LO2 – Be able to design, develop and simulate a control system solution. |
| | LO2 | Input devices. | R114 LO1 – Be able to use CAD for circuit simulation and design. R116 LO1 – Understand the application and operation of microcontrollers and microprocessors in engineered products. R116 LO2 – Be able to design, develop and simulate a control system solution. |
| | LO2 | Output devices. | R114 LO1 – Be able to use CAD for circuit simulation and design. R116 LO1 – Understand the application and operation of microcontrollers and microprocessors in engineered products. R116 LO2 – Be able to design, develop and simulate a control system solution. |
| | LO2 | Semi-conductor devices – diodes and transistors. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO2 – Be able to construct circuits. |
| | LO2 | Integrated circuits – operational amplifier (op amp). | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO2 – Be able to construct circuits |

| | Learning Outcome | Topic area/theme (from R113 specification) | Links to other Cambridge Nationals Engineering units and LOs |
|-------------|------------------|--|---|
| Summer Term | LO2 | Integrated circuits – monostable, astable, bistable circuits. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO2 – Be able to construct circuits. |
| | LO2 | Integrated circuits – logic functions and gates. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO2 – Be able to construct circuits. |
| | LO2 | DC motor control. | R116 LO2 – Be able to design, develop and simulate a control system solution. |
| | LO2 | Smart and modern materials. | |
| | LO3 | Electrical hazards. | R114 LO2 – Be able to construct circuits. |
| | LO3 | Fault-finding procedures. | R114 LO3 – Be able to test electronic circuits. |
| | LO3 | Test equipment. | R114 LO1 – Be able to use CAD for circuit simulation and design. R114 LO3 – Be able to test electronic circuits. |
| | LO4 | Discrete, through hole and surface mount components. | R114 LO2 – Be able to construct circuits. |
| | LO4 | Manufacturing processes for commercial circuit construction. | R114 LO2 – Be able to construct circuits. |
| | LO4 | Quality assurance during commercial printed circuit board manufacture. | R114 LO2 – Be able to construct circuits. R114 LO3 – Be able to test electronic circuits. |

Scheme of work (medium term plan – more detailed by academic term)

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|--|--|---|
| Autumn Term | 1 | LO1 | Circuit components, symbols and diagrams. | Learners could be provided with physical electronic components with a worksheet showing their pictures and equivalent circuit symbols to identify. They could begin to identify circuit symbols from larger circuit diagrams. A basic overview of the function and application of simple components could be provided (e.g. resistor, capacitor, switch, transistor, integrated circuit). | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | www.electronicshub.org/symbols includes over 100 circuit symbols along with a description of what they represent. |
| | 2 | LO1 | Principles, units and measurements. | Simple experimental demonstrations could be used to show the principles of measurement and fundamental electrical quantities such as voltage, current, resistance and power. A worksheet could be developed for learners to identify the link between the physical quantity and its unit of measurement (e.g. resistance > ohms, voltage > amps, capacitance > farad, frequency > hertz etc.). Separate problems could be developed for learners to calculate power and energy using given values. | R114 LO1 – Learners will be able to use virtual instruments to simulate and test a circuit. R114 LO3 – Learners will be able to test a circuit using physical test equipment. | www.electronics-tutorials.ws/dccircuits/dcp_3.html shows electrical units along with their symbol and an explanation. |
| | 3 | LO1 | Series and parallel circuits. | Learners could be shown practically how to connect resistors in series and parallel and measure their total resistance. A worksheet with series and parallel resistor circuit problems could be developed. | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | learn.sparkfun.com/tutorials/series-and-parallel-circuits/all provides a complete overview of series and parallel circuits, Ohms Law and has a series of videos and experiments. |
| | 4 | LO1 | Ohms Law and Power Law – part 1. | Simple practical circuits could be used to demonstrate the principle of Ohms Law ($V = IR$), with current being derived from voltage and resistance. A worksheet with simple circuit examples could be produced. | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | |
| | 5 | LO1 | Ohms Law and Power Law – part 2. | The second part of this topic area could extend learners understanding to solving problems involving power. Simple circuit problems could be presented with learners calculating power dissipated by a resistor using $P = IV$ and $P = I^2R$ | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | www.electronics-tutorials.ws/ has a whole series of useful tutorials. Search for 'electrical energy and power' or 'ohms law and power' for tutorials. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|---|---|---|
| Autumn Term | 6 | LO1 | Potential divider. | The principles of the potential divider circuit could be demonstrated practically using two resistors and a voltage source. Learners could practice solving problems for the potential – determining values of resistors required for a given output voltage, or finding circuit current using Ohms Law etc. | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | Search www.electronics-tutorials.ws/ for 'voltage divider' for a tutorial about the potential divider circuit. |
| | 7 | LO1 | Types of power sources available and reasons for selection. | Learners could independently research different power sources and the reasons for their selection (i.e. battery, solar, mains, combined). They could present their findings as a brief PowerPoint presentation, or simple poster. | | |
| | 8 | LO1 | Voltage regulators. | Learners could be introduced to a simple power supply circuit, with the focus being on the voltage regulator in the circuit. They could independently research the function and application of the voltage regulator, which could involve the use of component data sheets. This would be a good introduction to data sheets ahead of LO2. | | www.youtube.com/watch?v=OAoEWaGtQjs provides an introduction to linear voltage regulators. |
| | 9 | LO2 | Resistor types and applications. | Learners could be introduced to different types of resistors, including being shown physical components. They could complete a worksheet showing a range of different types of resistor (i.e. fixed, variable, temperature dependent, light dependent etc.) by identifying each from pictures and providing a summary of their applications. | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. R114 LO2 – Learners will be able to identify and use resistors when constructing circuits. | Search www.electronics-notes.com/ for 'resistor types'. |
| | 10 | LO2 | Determining resistor values by measurement, calculation and colour code; rating and tolerance. | Learners will already be familiar with determine values of resistors (or resistance) from calculations. They could be tasked to set up simple resistor circuits and to determine resistance by: measurement, using the resistor colour code, and by calculation from voltage and current. They could then be introduced to how resistors are rated by power, and how resistors have a tolerance to their nominal value. They could calculate the maximum and minimum expected value for a resistor given its tolerance. | R114 LO2 – Learners will be able to identify and use resistors when constructing circuits. R114 LO3 – Learners will be able to measure resistance values when testing a circuit. | Search www.electronics-tutorials.ws/ for 'resistor colour code' for tutorials and useful tables and a colour code wheel to download. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|---|--|---|
| Spring Term | 1 | LO2 | Cable types and applications. | Learners could be shown physical samples of different types of cable, and use data sheets to identify their characteristics and applications. They could produce a tabulated summary with photos showing different types of cable along with their applications. In their summary they could consider typical voltage and current capacity for different cable types. | R114 LO2 – Learners will be able to select and use cables when interconnecting circuit components. | uk.rs-online.com/web/ includes a complete range of electrical cables to investigate. |
| | 2 | LO2 | Capacitor types and applications. | Learners could be shown physical samples of different types of capacitor, and use data sheets to identify their characteristics and applications. They could produce a tabulated summary with photos showing different types of capacitor along with their applications. This could include identifying the difference between polarised and non-polarised types, and how polarised capacitors have their positive terminal marked. | R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD. | Search www.electronics-tutorials.ws/ for 'types of capacitor' for tutorials about capacitor types and their applications. |
| | 3 | LO2 | Applications of RC circuits; time constant. | A basic introduction to the operation and application of RC circuits could be provided. Learners could undertake simple experiments setting up RC circuits and measuring voltage across the capacitor when charging and discharging. They could present their findings as a simple graph, which could be produced using a spreadsheet. Time constant RC could also be calculated. | | www.youtube.com/watch?v=OlPHpsnLINU explains how an RC circuit works, including graphs of charging of the capacitor and time constant. |
| | 4 | LO2 | Switch types and applications. | Learners could be shown physical samples of different types of switch, and use data sheets to identify their characteristics and applications. They could produce a tabulated summary with photos showing different types of switch along with their applications. In their summary they could consider the contact arrangements for different types of switch, and how they are used in simple circuits (e.g. two SPDT switches used in a two-way lighting circuit). | R114 LO2 – Learners could identify and use switches when constructing a circuit. | electronicsclub.info/switches.htm shows photos and contact arrangements of a range of switches. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|---|---|---|
| Spring Term | 5 | LO2 | Circuit protection – fuses and diodes. | Learners could be shown physical devices – fuses and diodes – and shown how they can be used for circuit protection. A simple circuit could be set up, with it being demonstrated how a diode can protect the circuit from reverse polarity connection of the supply. Learners could experiment with simple circuits with a fuse and see how the fuse will 'blow' if excess current is drawn. | <p>R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R114 LO2 – Learners could identify and use diodes or fuses when constructing a circuit.</p> | www.youtube.com/watch?v=7KegIPmgzrY shows circuit protection using a diode, and www.youtube.com/watch?v=2MWwwrQQOUc explains how a fuse works. |
| | 6 | LO2 | Systems approach – introduction. | An introduction to the systems approach could be provided with simple block diagrams being used to represent different parts of a system (i.e. input, process, output and feedback). Learners could then be introduced to the purpose of feedback in a system with simple examples (e.g. temperature control in an oven, water level control in a tank). Learners could be provided a worksheet with incomplete system block diagrams to label, and draw simple open and closed loop diagrams for given systems (e.g. temperature control in a fridge). | R116 LO1 and LO2 – Learners will be able to draw and explain block diagrams for simple microprocessor/microcontroller-controlled systems, and for a system they design, develop and simulate themselves. | www.electrical4u.com/control-system-closed-loop-open-loop-control-system/ provides a introduction to open and closed loop control including block diagrams. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|--|--|---|
| Spring Term | 7 | LO2 | Input devices. | Learners could be introduced to a range of input devices. They could see and handle physical devices and review data sheets showing their function and applications. They could review the devices and complete a tabulated worksheet with a photo of the devices with a summary of its function and application. | <p>R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R116 LO1 and LO2 – Learners will be able to explain the basic function of and use input devices in control systems.</p> | Search for 'BBC Bitesize Practical electrical and electronic circuits' for a full explanation of electronic circuits including pages on input and output devices. |
| | 8 | LO2 | Output devices. | Like input devices, learners could be introduced to a range of output devices. They could see and handle physical devices and review data sheets showing their function and applications. They could review the devices and complete a tabulated worksheet with a photo of the devices with a summary of its function and application. | <p>R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R116 LO1 and LO2 – Learners will be able to explain the basic function of and use output devices in control systems.</p> | Search for 'BBC Bitesize Practical electrical and electronic circuits' for a full explanation of electronic circuits including pages on input and output devices. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|---|---|---|---|
| Spring Term | 9 | LO2 | Semi-conductor devices – diodes and transistors. | An overview of the application of diodes and transistors as 'process devices' could be provided. Simple practical demonstrations could be used to show how a diode operates, and how a transistor can be used as a switch or an amplifier. Learners could be shown (or draw) the corresponding circuit diagrams. Learners could also be shown the Darlington Pair configuration (and why it is used), and a datasheet for a transistor array. | <p>R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R114 LO2 – Learners could use diodes and transistors to construct circuits.</p> | Search www.youtube.com for 'diode', 'transistor as switch' or 'transistor as amplifier'. |
| | 10 | LO2 | Integrated circuits – operational amplifier (op amp). | Learners could first be provided a basic overview of the op amp, and its use in circuits as a comparator. They could build and test simple circuits practically or using simulation tools to show how the op amp functions as a comparator. A worksheet could be developed with part-completed op amp comparator circuits to complete. | <p>R114 LO1 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R114 LO2 – learners could use op-amps to construct circuits.</p> | www.electronics-tutorials.ws/opamp/opamp_8.html provides a comprehensive introduction to the op amp, with a follow-on explanation of the op amp as a comparator. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|---|--|---|--|
| Summer Term | 1 | L02 | Integrated circuits – monostable, astable, bistable circuits. | Learners could be introduced to the concept of circuits that are monostable and those that are bistable, including the applications of each. Using the 555 timer IC, they could be shown how these function in a circuit as monostable and disable. Simple practical or simulation experiments could be used to illustrate this. Learners could be provided a worksheet to sketch and complete simple circuit diagrams, explain function and draw input, trigger and output signals. | <p>R114 L01 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R114 L02 – Learners could use the 55-timer integrated circuit (monostable, astable or bistable mode) to construct circuits.</p> | www.electronics-tutorials.ws/waveforms/555_oscillator.html shows how the 555-timer integrated circuit can be connected in various configurations. www.multisim.com provides free online simulation tools including pre-defined 555-timer circuits. |
| | 2 | L02 | Integrated circuits – logic functions and gates. | Learners could be provided an overview of the use of logic functions and gates, and how this is implemented using logic circuits. They could perform practical experiments using simple online logic simulators, and complete a worksheet identifying and drawing logic symbols and completing truth tables for a range of single logic functions (e.g. AND, OR, NOT, NOR, NAND). They could also solve problems for simple two gate logic circuits. | <p>R114 L01 – Learners will be able to interpret and use circuit diagrams to schematically enter and simulate a circuit using CAD.</p> <p>R114 L02 – Learners could use logic integrated circuits to construct circuits.</p> | logic.ly is an online logic simulator, with a 30-day free trial. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|--|---|--|
| Summer Term | 3 | LO2 | DC motor control. | Teachers could begin by introducing DC motors and their application in everyday products, including the need for reversal. Learners could independently investigate how a DC motor works, and how its direction of rotation can be reversed. They could perform practical experiments reversing the polarity of connection to a DC motor using a switch. | R116 LO2 – Learners could use a DC motor as part of their control system solution. | www.robotroom.com/DPDT-Bidirectional-Motor-Switch.html explains how to reverse direction of rotation of a DC motor using a switch. |
| | 4 | LO2 | Smart and modern materials. | Learners could, with guidance, independently investigate how smart and modern materials are used in electrical/electronic applications (i.e. QTC and SMA). They could produce a simple presentation or poster of their findings. Practical experiments with QTC or SMA materials could be performed. | | Search www.youtube.com for 'quantum tunnelling composite' or 'shape memory alloy'. |
| | 5 | LO3 | Electrical hazards. | Videos could be used to show the potential dangers presented by electrical hazards, and methods how they can be presented including visual impact, PAT testing and the use of RCD devices. Learners could perform a PAT test or be shown how an RCD operates if access to suitable resources is available. | R114 LO2 – Learners will be able to identify electrical hazards when preparing to construct circuits. | Search www.youtube.com for 'residual current device' or 'PAT testing'. |
| | 6 | LO3 | Fault-finding procedures. | Fault finding could be shown practically to learners using a range of simple circuit setups. They could be shown visual inspection, the half-split method, and how to use truth tables and expected values. Videos could also be used to explain these fault-finding procedures. | R114 LO3 – Learners will be able to use fault-finding procedures to test their own circuit construction. | www.youtube.com/watch?v=wAc8PPw-pel provides a good overview of how to fault find circuits both visually and using measurements. |

| | Event | Learning Outcome | Topic area/subtopic Area (from R113 specification) | Suggestions for delivery/activities (including scope and depth) | 'Have they got it?' – internal unit links with commentary | Useful external resources |
|-------------|-------|------------------|--|---|--|---|
| Summer Term | 7 | LO3 | Test equipment. | Learners could be shown a range of physical test equipment and practice its use on simple circuits. For the oscilloscope and signal generator they should also be shown virtual instrumentation. Where some test equipment is unavailable, videos could be used to explain how it is set up and operated. | R114 LO1: Learners will be able to use virtual instruments when simulating circuits using CAD. R114 LO3: Learners will be able to physical test equipment to test their own circuit construction. | learn.sparkfun.com/tutorials/how-to-use-a-multimeter/all explains how to use a multimeter to test a circuit. Similar Internet sources show how to use other test equipment, including an oscilloscope, logic probe and signal generator. |
| | 8 | LO4 | Discrete, through hole and surface mount components. | Videos and practical examples could be used to illustrate different types of printed circuit board components. Learners could compile a summary with photographs of each method along with the relative benefits and disadvantages if each. | R114 LO2 – Learners will be able to use components when constructing a circuit using a PCB. | Search www.electronics-notes.com/ for 'surface mount' for an introduction to surface mount PCB components. eprpartner.com/through-hole-vs-surface-mounted/ compares through hole with surface mount component technology. |
| | 9 | LO4 | Manufacturing processes for commercial circuit construction. | Commercial PCB manufacture could be shown with videos of flow soldering, pick and place robots placing components and manual component placement. Learners could investigate and summarise commercial circuit construction in a brief report. | R114 LO2 – Learners will be able to use manual placement when constructing a circuit using a PCB. | www.youtube.com/watch?v=yXykcvcvVa0o shows flow soldering. Other videos could be used to show commercial PCB manufacturing processes. |
| | 10 | LO4 | Quality assurance during commercial printed circuit board manufacture. | Learners could perform a visual inspection of a PCB which has known faults (e.g. broken tracks, poor solder joints, misplaced components). Videos could be used to show automatic inspection of a PCB taking place, and visual inspection if access to physical resources if not available. They could summarise their findings in a brief poster presentation. | R114 LO2 and LO3 – Learners will be able to quality assure a bare PCB and a populated PCB they have constructed. | Search www.youtube.com for 'automatic PCB inspection'. |

OCR Resources: *the small print*

OCR's resources are provided to support the delivery of OCR qualifications, but in no way constitute an endorsed teaching method that is required by OCR. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources. We update our resources on a regular basis, so please check the OCR website to ensure you have the most up to date version.

This resource may be freely copied and distributed, as long as the OCR logo and this small print remain intact and OCR is acknowledged as the originator of this work.

Our documents are updated over time. Whilst every effort is made to check all documents, there may be contradictions between published support and the specification, therefore please use the information on the latest specification at all times. Where changes are made to specifications these will be indicated within the document, there will be a new version number indicated, and a summary of the changes. If you do notice a discrepancy between the specification and a resource please contact us at: resources.feedback@ocr.org.uk.

OCR acknowledges the use of the following content: N/A

Whether you already offer OCR qualifications, are new to OCR, or are considering switching from your current provider/awarding organisation, you can request more information by completing the Expression of Interest form which can be found here: www.ocr.org.uk/expression-of-interest

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: resources.feedback@ocr.org.uk

Looking for a resource?

There is now a quick and easy search tool to help find **free** resources for your qualification:

www.ocr.org.uk/i-want-to/find-resources/

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our **Customer Support Centre**.

Vocational qualifications

Telephone 02476 851509

Facsimile 02476 851633

Email vocational.qualifications@ocr.org.uk

www.ocr.org.uk

OCR is part of Cambridge Assessment, a department of the University of Cambridge. *For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored.*

© **OCR 2020** Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA. Registered company number 3484466. OCR is an exempt charity.

