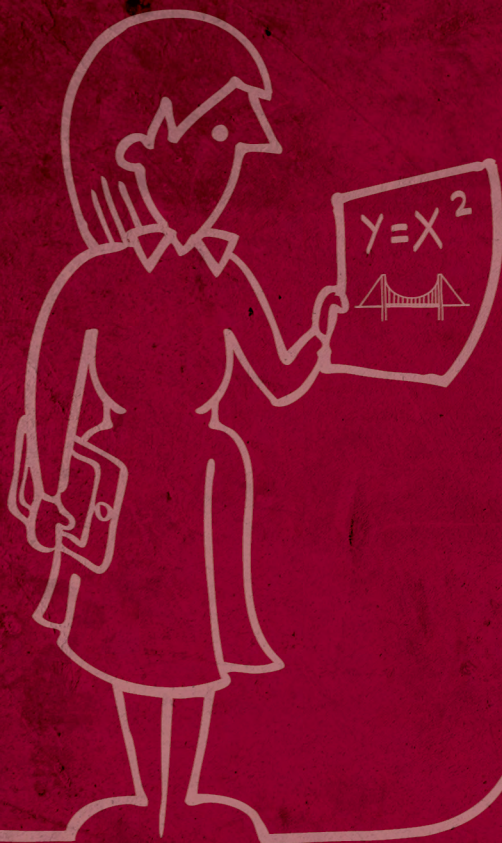Accredited

CAMBRIDGE NATIONALS IN ENGINEERING

R115 - ENGINEERING APPLICATIONS OF COMPUTERS

DELIVERY GUIDE

VERSION 1

OCR
Oxford Cambridge and RSA

CONTENTS

To give us feedback on, or ideas feedback text the OCR resources you have used, email resourcesfeedback@ocr.org.uk

INTRODUCTION

This Delivery Guide has been developed to provide practitioners with a variety of creative and practical ideas to support the delivery of this qualification. The Guide is a collection of lesson ideas with associated activities, which you may find helpful as you plan your lessons.

OCR has collaborated with current practitioners to ensure that the ideas put forward in this Delivery Guide are practical, realistic and dynamic. The Guide is structured by learning objective so you can see how each activity helps you cover the specification.

We appreciate that practitioners are knowledgeable in relation to what works for them and their learners. Therefore, the resources we have produced should not restrict or impact on practitioners' creativity to deliver excellent learning opportunities.

Whether you are an experienced practitioner or new to the sector, we hope you find something in this guide which will help you to deliver excellent learning opportunities.

If you have any feedback on this Delivery Guide or suggestions for other resources you would like OCR to develop, please email resourcesfeedback@ocr.org.uk.

PLEASE NOTE

The activities suggested in this Delivery Guide MUST NOT be used for assessment purposes. (This includes the Consolidation suggested activities).

The timings for the suggested activities in this Delivery Guide DO NOT relate to the Guided Learning Hours (GLHs) for each unit.

Assessment guidance can be found within the Unit document available from www.ocr.org.uk.

The latest version of this Delivery Guide can be downloaded from the OCR website

OPPORTUNITIES FOR ENGLISH AND MATHS SKILLS DEVELOPMENT

We believe that being able to make good progress in English and maths is essential to learners in both of these contexts and on a range of learning programmes. To help you enable your learners to progress in these subjects, we have signposted opportunities for English and maths skills practice within this resource. These suggestions are for guidance only. They are not designed to replace your own subject knowledge and expertise in deciding what is most appropriate for your learners.

KEY

 English

 Maths

UNIT R115 – ENGINEERING APPLICATIONS OF COMPUTERS

Guided learning hours : 30

PURPOSE OF THE UNIT

This unit covers the range of computer and microprocessor applications within engineering and considers how systems are used across a range of engineering activities from product design and development to automated manufacturing, maintenance and stock control.

Learners will develop knowledge and understanding of the range of computer and microprocessor applications within engineering and will consider how computer systems are used across a range of engineering activities.

This unit will explore how computers are used within engineering industries to design and manufacture new products with Computer Aided Design (CAD) and Computer Aided Manufacture (CAM) and the use of automate manufacturing such as Programmable Logic Controllers (PLC), Programmable Interface Controller (PIC).

On completion of this unit, learners will understand the specific processes involved in electronic systems control and have an appreciation of how computers communicate and transfer data in HMI and expert systems.

Please refer to section 2.2 of the specification for guidance on practical activities.

Learning Outcome — The learner will:
LO1: Understand how computers are used in engineering design, manufacture and process control
LO2: Understand how computers are used for maintenance of engineering systems
LO3: Know how computers are used to communicate and use data for production and maintenance

LO1 - UNDERSTAND HOW COMPUTERS ARE USED IN ENGINEERING DESIGN, MANUFACTURE AND PROCESS CONTROL

Learning Outcome — The learner will:
LO1: Understand how computers are used in engineering design, manufacture and process control

Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 Computers in the design of new products	Learners may already have had some previous experience of using Computer Aided Design (CAD) software and graphical packages in other units. Learners might research how computers are used in the design phase of developing new products through investigating suitable case studies. If possible an industrial visit could prove useful in showing the application of computers in the whole design, manufacturing and process control cycle. Learners could present their findings in a portfolio, as a poster or as a PowerPoint presentation.	2 hours	R107 R110
2 Computers in manufacturing	Computers in manufacturing follow on from computers in design. Learners might investigate Computer Aided Manufacture (CAM) computer applications in manufacture, and could further investigate Computer Integrated Manufacture (CIM) including Computer Numeric Control (CNC). Learners might make the connection between design, manufacture and process control. Internet videos might be a useful source for showing computers in action if an industrial visit is not possible. The following video shows multi-axis CNC machining: https://www.youtube.com/watch?v=CqePrbeAQoM.	2 hours	R111
3 Computer monitoring of production and managing process control	Automation of manufacturing processes often includes the utilisation of Programmable Logic Controllers (PLC) and Programmable Interface Controllers (PIC). These devices are also often used in the automation of process control, for monitoring processes and in test operations (eg automated test systems). Teachers may have access to suitable practical equipment (such PLC controlled machinery) which could be demonstrated to learners. Teachers might develop a suitable automation activity. An industrial visit, if possible, might also prove useful to show computers monitoring and managing process control.	3 hours	R114
4 Features of computer controlled automation	An extension to understanding computer controlled automation is consideration of the features and functions of automation controllers (eg temperature control, weight control, position sensing, size sensing, workflow, warehousing and product movement, safety systems, machine interlocks). Learners could research these as part of an industrial visit, or through using the internet. See Lesson Element: Features of computer controlled automation.	3 hours	R114

LO2 - UNDERSTAND HOW COMPUTERS ARE USED FOR MAINTENANCE OF ENGINEERING SYSTEMS

Learning Outcome — The learner will:
LO2: Understand how computers are used for maintenance of engineering systems

Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 Computers in maintenance: human machine interface	Teachers might begin with an introduction to Human Machine Interfaces (HMI) using simple examples such as the mobile telephone or microwave oven. Learners could be tasked to debate the features required from an HMI to make it simple and intuitive to use. Teachers might then move onto explaining HMI in industrial operations including: system operation, diagnostics, maintenance, use of system operation data, modification or correction of system operation. Manufacturer's data might be used to show commercial applications eg http://www.automation.siemens.com/mcms/automation/en/human-machine-interface/pages/default.aspx. Learners could be introduced to how HMI interfaces are developed using software (eg the following video shows HMI software: https://www.youtube.com/watch?v=mhA9MQgAAeU&list=PLHA865kGArdZNNeC4K0BfRSb-poquVnRq). Teachers might have access to suitable HMI systems that can be practically demonstrated to or used by learners. See Lesson Element: Computers in maintenance - human machine interface.	4 hours	R111
2 Computers in maintenance: expert systems	Expert systems are now commonplace in process and maintenance operations. Teachers might give learners an introduction to their application in system operation, diagnostics and maintenance. This will include the collection and use of operation data and interpretation of results to modify or correct system operation. If access to an expert system is not available then a case study approach might be adopted to showing these in operation. The following website shows the Rolls Royce expert (neural network) system monitoring aircraft engines:http://www.rolls-royce.com/about/technology/systems_tech/monitoring_systems.jsp.	4 hours	R111 R104 (LO2)

LO3 - KNOW HOW COMPUTERS ARE USED TO COMMUNICATE AND USE DATA FOR PRODUCTION AND MAINTENANCE

Learning Outcome — The learner will:
LO3: Know how computers are used to communicate and use data for production and maintenance

Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 Production data: communication and exchange	Learners could investigate how production data is collected, communicated, exchanged and stored in industrial process control systems. Production data could include assembly/production recording, efficiency information and cycle times. Teachers might be able to gain access to real data to show learners. Online magazines could prove useful from which learners can study interesting articles relating to production and maintenance: http://www.maintenanceonline.co.uk/home.asp Again, an industrial visit if possible might prove useful in explaining the application and use of computers for production and maintenance operations which are covered throughout this learning outcome.	3 hours	R111
2 Using production data for maintenance	Production information such as assembly/production data, efficiency information, and cycle times is often used in performing and planning maintenance operations. Teachers might have access to suitable equipment to demonstrate the use of data in performing maintenance on equipment, such as data logging equipment. Learners could be tasked with a research activity to explore and present how production data is used in maintenance in order to ensure safe and efficient production.	3 hours	R111 R104 (LO2)
3 Computers and maintenance	Learners could further investigate how computers communicate and exchange data for maintenance operations including: remote monitoring of engineering systems, transmission of service data, monitoring and recording of maintenance operation, parts used, stock control, prediction of failure and work scheduling.	2 hours	R111
4 Hand held devices in manufacturing and maintenance	Hand-held devices are now commonplace in manufacturing and maintenance systems and are used in applications such as: bar code scanning (eg monitoring stock usage and movements, updating service records) and managing service information and instructions (eg data loggers, data collection and analysis, work scheduling, maintenance checklists) Teachers might have access to hand-held devices that can be demonstrated or used by learners in a practical setting. Internet sources might also be useful in showing a range of commercial hand held device applications (eg Honeywell's hand held devices: http://www.intermec.com/solutions/industrial maintenance/index.aspx) See Lesson Element: Hand held devices in manufacturing and maintenance.	3 hours	R111

POSSIBLE INTERNET SOURCES

Source	Website
YouTube	www.youtube.com
Honeywell	www.intermec.com
MaintenanceOnline (online magazine)	www.maintenanceonline.co.uk
Rolls Royce	www.rollsroyce.com
Siemens	www.siemens.com

Contact us

Staff at the OCR Customer Contact Centre are available to take your call between 8am and 5.30pm, Monday to Friday.

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