

# CAMBRIDGE NATIONALS IN ENGINEERING

R113, R114, R115 AND R116

RESOURCES LINK VERSION 2









### WELCOME

A Resources Link is an e-resource, provided by OCR, for teachers of OCR qualifications. It provides descriptions of, and links to, a variety of independent teaching and learning resources that you may find helpful.

In a Resources Link you will find details of independent resources, many of which are free: where this is the case this has been indicated.

If you know of other resources you would like to see included here, or discover broken links, please let us know. We would also like to hear from you if have any feedback about your use of these, or other, OCR resources. Please contact us at <u>resources.feedback@ocr.org.uk</u>.

We leave it to you, as a professional educator, to decide if any of these resources are right for you and your students, and how best to use them.

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

OCR Resources: the small print

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board and the decision to use them lies with the individual tutor. 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. © OCR 2015 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

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click on a resource to go to the appropriate page.

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- Capacitors and their uses
- PAT testing
- How to use a Multimeter for beginners:
   Part 1 Voltage measurement/
   Multimeter tutorial
- Faraday Posters
- PCB Copper Printed Circuit Boards
- Enhance understanding of maths and science for engineering
- Virtual science experiments

### Unit R114 - Simulate, construct and test electronic circuits

- Copper Connection<sup>™</sup> Software
- Student version of Circuit Logix
- Logic Circuit free educational software
- How to solder electronics components
   video for beginners
- Tutorial: How to crimp connectors, strip wire and use heat shrink
- PCB Making-Part 1-Photo Resist Method of Etching a Printed Circuit Board
- Using an Oscilloscope
- How to use an oscilloscope/What is an oscilloscope/Oscilloscope tutorial
- Fault finding on medical electronic devices
- How Not to Mod a Blues Junior...
   or, How to Fix Simple Printed Circuit Mistakes
- Enhance understanding of maths and science for engineering
- Virtual science experiments



### Systems Control in Engineering Level 1/2



### **All About Circuits – Electrical Quantities B**

### Unit R115 - Engineering applications of computers

- 3D CAD Models How to Prototype Just About Anything
- Computer-aided manufacture (BBC Bitesize)
- SIEMENS CAM/Computer-Aided Manufacture
- SIEMENS PDM/Product Data Management
- Human Machine Interface (HMI) and Supervisory Control (SCADA) Solutions
- Artificial Intelligence Techniques in Power Systems
- Advances in Command, Control and Communication Systems
- SCADA Tutorial
- Honeywell Scanning and Mobility
- HIVE heating from British Gas
- Enhance understanding of maths and science for engineering

#### Unit R116 - Process control systems

- How Microcontrollers Work How Stuff Works
- Architecture and programming of 8051 MCU's
- Introduction to microcontrollers
- UK Automation
- Electronics Project Org
- 1507 electronic projects and circuits
- Flexsim Simulation Software
- Simulink from MathWorks
- PLC Training Simulator
- PICsim PIC Microcontroller simulator
- Enhance understanding of maths and science for engineering

Ohm's Law
<ul> <li>The most important principle in electronics is Ohm's Law</li> <li><u>Georg Simon Ohm</u> expressed the relationship between current, voltage, and resistance in 1827 and this principle bears his name</li> </ul>
<ul> <li>Ohm's Law states that, the current that flows in a circuit is directly proportional to the voltage across the circuit and is inversely proportional to the resistance in the circuit.</li> </ul>
• It is expressed mathematically by $I = \frac{V}{V}$ or $I = \frac{E}{V}$ voltage
R R av

A web site with an online lecture on Ohms law by Tim Fiegenbaum of North Seattle Community College. Twenty minutes long and with a written transcript.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles
Cost:	Free
Format:	Online video with written transcript
	http://www.allaboutcircuits.com/videos/8.html
	Cost:

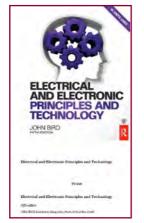
If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at







#### **Electrical and Electronic Principles and Technology**



A textbook by John Bird, introducing electrical and electronic principles and technology to students new to the subject.

It contains real-world situations examples with 410 worked problems, 540 further problems, 340 multiple-choice questions, 455 short-answer questions, and 7 revision tests with answers online. Available as both paper back and e-book editions.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles
Cost:	Approximately £25 paperback and £17 e-book
Format:	Printed book and e-book
	ISBN-13: 978-0415662857

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resources.feedback@ocr.org.uk

#### **Companion Website for Books by John Bird**



Access to answers and lesson plans on a range of STEM subjects. Opportunity to purchase the books.

The resource could support presenters in preparation or can be used to direct students to for self-learning.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2
	Unit R113, LO1 Understand basic electronic principles, LO2 Understand the
	operating principles of electronic components, LO3 Know test methods for
	electronic circuits, LO4 Understand commercial circuit construction methods
Cost:	Free to access main page, costs beyond that vary depending on content required.
Format:	Commercial website
	http://www.routledge.com/cw/bird/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

OCR Oxford Cambridge and RSA



#### Systems Control in Engineering Level 1/2



#### **Electric cable sales**

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Earth 6491X Cable	218"X Elevible Electric Cable	Telephone Califie	Gold Elexible Cable
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Orange Flexible Cable	Actio Grade Yellow Cable	Arctic Crade Plac Cable	Dessentive Flexible Cabl
	-		-
Solar Calde Black	Nollium FirsProof Standard, Caldy	Sulhara Ecological Enhanced, Calde	3182TO (HISTON+F) Cale
		-	
CY.Control.Cable	Heat Resistant Flexible Cable	Tri-Rated Cable	CatSe / Cat6 Network Cab
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A web site selling a broad range of electrical cable. Each cable has description, specification and uses

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO2 Understand the operating principles of electronic components.
Cost:	Free
Format:	Commercial Website
	https://www.electriccable.co.uk/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

### **TLC Direct**

Clearance Stock	Heat Tape
<ul> <li>General Cables</li> </ul>	<ul> <li>Gutter Trace Heating</li> </ul>
<ul> <li>SWA Cable</li> </ul>	<ul> <li>Pipe Trace Heating</li> </ul>
<ul> <li>35mm 3 core Flex</li> </ul>	Outdoor Cables
Communication	Amound SWA
Alarm Cables	<ul> <li>Network Cable CATS</li> </ul>
<ul> <li>Bell &amp; Speaker Wire</li> </ul>	<ul> <li>NYY-J Cable</li> </ul>
<ul> <li>Coaxial &amp; Satellite Cables</li> </ul>	<ul> <li>Telephone Cable</li> </ul>
<ul> <li>Digital Satellite Cables</li> </ul>	Outdoor Cable Joints
Network Cables CATSE / CATS	Above Ground
<ul> <li>Network Cables CATSE - External</li> </ul>	<ul> <li>Under Ground</li> </ul>
<ul> <li>RG59 Coaxial Cable (Shotpun) CCTV</li> </ul>	<ul> <li>Besin Filed</li> </ul>
Telephone 2 Pair - 6 Pair	
<ul> <li>Telephone 5 Pair - External</li> </ul>	Protected Cables  Multi-Plex SY
Fire Rated	<ul> <li>Muto-Friet, 51</li> </ul>
Fire Rated Cable	Single Core Cables
MICC Mineral Cable	<ul> <li>6491X - 1.5mm to 4.0</li> </ul>
- The state of the second	<ul> <li>6491X - 6.0mm to 16</li> </ul>
Flexible Cables	<ul> <li>6491X - 25.0mm to 5</li> </ul>
<ul> <li>Arctic - Yellow &amp; Blue</li> </ul>	<ul> <li>0361TQ - Welding Ca</li> </ul>

An electrical component supplier with a website describing the different components and their uses.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO2 Understand the operating principles of electronic components
Cost:	Free
Format:	Commercial Website
ht	tp://www.tlc-direct.co.uk/Main_Index/Cable_Index/index.html

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at



Systems Control in Engineering Level 1/2



#### **Capacitors and their uses**

Oxford Cambridge and RSA

 
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 FREED CAPACITOR (NON-ELECTROLVITC)
 \*
 VARIABLE CAPACITOR

 +
 MRETIPLE NON-ELECTROLVITC FREED CAPACITOR WITH COMMON COMMENT
 \*
 TREMMER CAPACITOR

 +
 MRETIPLE NON-ELECTROLVITC FREED CAPACITOR (ELECTROLVITC)
 \*
 DIFFERINTIAL CAPACITOR

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 FREED CAPACITOR (ELECTROLVITC)
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 MARTIPLE ELECTROLVITC CAPACITOR WITH COMMECTION
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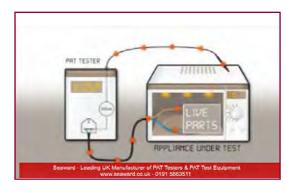
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A UK website run for users of amateur radio with a useful description of how capacitors are used.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles LO2 Understand the operating principles of electronic components
Cost:	Free
Format:	Amateur hobbyist website
	http://www.g3npf.co.uk/capacitors.htm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

### **PAT** testing



YouTube video introducing PAT testing. 5 minutes in length. Produced by an manufacturer of PAT testing equipment.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO3 Know test methods for electronic circuits
Cost:	Free
Format:	YouTube video
	http://youtu.be/4AURsKb0d74

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at







#### How to use a Multimeter for beginners: Part 1 – Voltage measurement/Multimeter tutorial



A detailed 30 minute youtube video on how to use a Fluke multimeter. The second link takes you to the YouTube page for Martin Lorton where there are more videos and electronic projects to work through.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles, LO2 Understand the operating principles of electronic components, LO3 Know test methods for electronic circuits, LO4 Understand commercial circuit construction methods
Cost:	Free
Format:	A series of videos on electronics and testing
htt	p://youtu.be/ZBbgiBU96mM and http://www.youtube.com/user/mjlorton

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **Faraday Posters**



A series of posters to print. Available as part of the IET Faraday materials. Several posters cover electrical components.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles, LO2 Understand the operating principles of electronic components, LO3 Know test methods for electronic circuits, LO4 Understand commercial circuit construction methods
Cost:	Free IET registration required to access resources
Format:	Printable PDF posters
	http://faraday.theiet.org/posters-print/posters/index.cfm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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Systems Control in Engineering Level 1/2



#### **PCB – Copper Printed Circuit Boards**

Oxford Cambridge and RSA



A website showing how to make single sided, double sided and surface mount printed circuit boards.

ports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO3 Know test methods for electronic circuits, LO4 Understand commercial circuit construction methods
t:	Free
mat:	Website
	http://www.robotroom.com/PCB.html
	t:

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

# Enhance understanding of maths and science for engineering

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A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles, LO2 Understand the operating principles of electronic components, LO3 Know test methods for electronic circuits
Cost:	Free
Format:	Website
	http://www.met.reading.ac.uk/pplato/resources/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

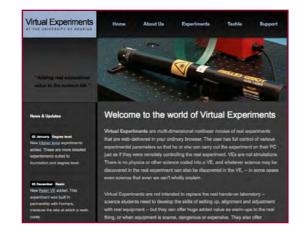


Systems Control in Engineering Level 1/2



#### Virtual science experiments

Oxford Cambridge and RSA

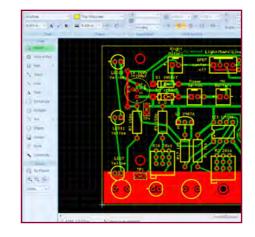


A free to access self-learning website for science in engineering.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R113, LO1 Understand basic electronic principles, LO2 Understand the operating principles of electronic components
Cost:	Free
Format:	Website
	http://www.reading.ac.uk/virtualexperiments

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **Copper Connection™ Software**



A circuit design program with a range of purchase options including a free home licence. Copper Connection is a modern PCB layout editor for creating printed circuit boards at home or commercially. The software includes features suitable for students and professionals.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO1 Be able to use Computer Aided Design (CAD) for circuit simulation and design, LO2 Be able to construct circuits
Cost:	Free home licence available
Format:	Commercial software
	http://www.robotroom.com/CopperConnection/index.html

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

Cambridge NATIONALS Systems Control in Engineering Level 1/2



#### **Student version of Circuit Logix**



CircuitLogix is a software program that converts your personal computer into a fully-functioning electronics laboratory with thousands of components and devices that are easily interconnected. CircuitLogix electronics lab simulation provides fast, powerful schematic design and simulation in one complete program. It gives you the flexibility to design and test electronic circuits, trying all the "what if" scenarios without ever worrying about faulty parts or bad connections. CircuitLogix supports analog, digital and mixed-signal circuits, and its proven SPICE simulation gives accurate real-world results you can trust.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO1 Be able to use Computer Aided Design (CAD) for circuit simulation and design, LO2 Be able to construct circuits, LO3 Be able to test electronic circuits
Cost:	The student licence is free and requires registrations.
Format:	Educational Software
	https://www.circuitlogix.com/student_version.php

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### Logic Circuit – free educational software

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LogicCircuit is free, open source educational software for designing and simulating digital logic circuits. Intuitive graphical user interface, allows you to create unrestricted circuit hierarchy with multi bit buses, debug circuits behaviour with oscilloscope, and navigate running circuits hierarchy.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO1 Be able to use Computer Aided Design (CAD) for circuit simulation and design, LO2 Be able to construct circuits, LO3 Be able to test
	electronic circuits
Cost:	Free download
Format:	Educational software
	http://www.logiccircuit.org/

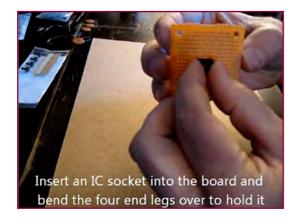
If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at







# How to solder electronics components – video for beginners



A YouTube video of a worker slowly soldering components onto a circuit board. No audio, close up pictures with text.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO2 Be able to construct circuits
Cost:	Free video
Format:	YouTube Video
	http://youtu.be/H3-TfdZVBCc

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

# **Tutorial: How to crimp connectors, strip wire and use heat shrink.**



A Martin Lorton YouTube video on making electrical connections. A comprehensive explanation of the tools and techniques used. 30 minutes in total. Very detailed and may be recommended for home study.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO2 Be able to construct circuits
Cost:	Free video
Format:	YouTube video with commentary
	http://www.youtube.com/watch?v=kjSGCSwNuAg

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OCR Oxford Cambridge and RSA



Systems Control in Engineering Level 1/2



#### PCB Making – Part 1 – Photo Resist Method of Etching a Printed Circuit Board

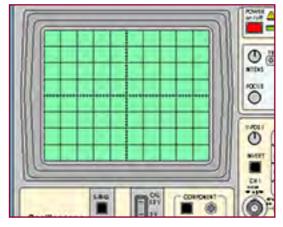


Part 1 in a series of informative how-to videos of using the photo resist etching method of making precision printed circuit boards. The videos include the use of tools and assembly of the boards.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO2 Be able to construct circuits
Cost:	Free videos
Format:	A series of 7 videos running through a project step by step.
	http://www.youtube.com/watch?v=VkQroiEJBMs

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#### Using an Oscilloscope



An extract of an educational website looking at how to set up and use an oscilloscope effectively.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO3 Be able to test electronic circuits
Cost:	Free website
Format:	Website with pictures, diagrams and explanations.
	http://www.doctronics.co.uk/scope.htm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at





### How to use an oscilloscope/What is an oscilloscope/Oscilloscope tutorial

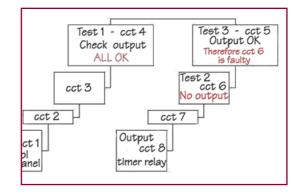


A comprehensive YouTube video by Martin Lorton explaining how an oscilloscope works and how to use one. The video is 30 minutes in length, and might form a useful homework activity.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO3 Be able to test electronic circuits
Cost:	Free YouTube video
Format:	Video tutorial
	http://voutu.be/CzY2abWCVTY

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at
resources.feedback@ocr.org.uk

#### Fault finding on medical electronic devices



A practical demonstration of fault finding on medical equipment with an overview of the input to output, output to input and half-split methods. Useful to help learners contextualise the methods being learned.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO3 Be able to test electronic circuits
Cost:	Free to access site
Format:	An informational website.
http://www.	ebme.co.uk/articles/maintenance/342-fault-finding-on-medical-electronic-devices

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

Cambridge NATIONALS

Systems Control in Engineering Level 1/2



# How Not to Mod a Blues Junior...or, How to Fix Simple Printed Circuit Mistakes

Oxford Cambridge and RSA



A webpage taken from a website advising on music amps. This page looks at how to recognise and repair damage on a printed circuit board.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO2 Be able to construct circuits, LO3 Be able to test electronic circuits
Cost:	Free
Format:	Webpage with diagrams and text.
	http://home.comcast.net/~machrone/bjr/mistakes.htm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

# Enhance understanding of maths and science for engineering

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A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2
	Unit R114, LO2 Be able to construct circuits
Cost:	Free
Format:	Website
	http://www.met.reading.ac.uk/pplato/resources/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

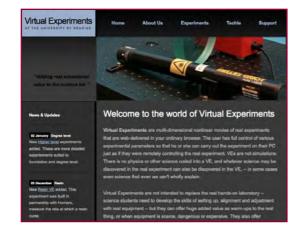
Cambridge NATIONALS

Systems Control in Engineering Level 1/2



#### Virtual science experiments

Oxford Cambridge and RSA

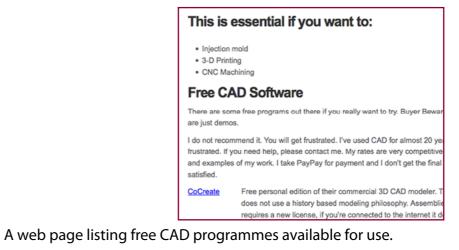


A free to access self-learning website for science in engineering.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R114, LO1 Be able to use CAD for circuit simulation and design, LO2 Be able to construct circuits
Cost:	Free
Format:	Website
	http://www.reading.ac.uk/virtualexperiments

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

## **3-D CAD Models – How to Prototype Just About Anything**



Suppo	rts: OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, LO1 Understand how computers are used in engineering design, manufacture and process control, LO3 Know how computers are used to communicate and use data for production and maintenance
Cost:	Free
Format	: Informational website
htt	p://www.inventionaddict.com/2011/06/17/3-d-cad-models-how-to-prototype-just-about-
	anything/
lf yo	ou know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at







# **Computer-aided manufacture (BBC Bitesize)**

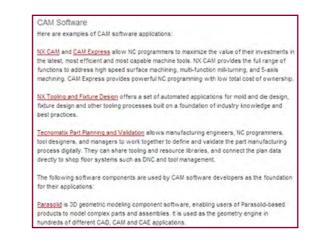


A revision link on the Design and Technology site looking specifically at the advantages and disadvantages of CAM.

Supports:OCR Cambridge Nationals Systems Control in Engineering Level 1/2<br/>Unit R115, LO1 Understand how computers are used in engineering<br/>design, manufacture and process controlCost:FreeFormat:Revision focused website<br/>http://www.bbc.co.uk/schools/gcsebitesize/design/electronics/manufacturing\_processesrev2.shtml

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **SIEMENS CAM/Computer-Aided Manufacture**



A commercial site from Siemens discussing the merits of CAM and linking to a range of CAM software applications.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, LO1 Understand how computers are used in engineering design, manufacture and process control
Cost:	Free to access
Format:	OEM Website
	http://www.plm.automation.siemens.com/en_gb/plm/cam.shtml

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#### **SIEMENS PDM/Product Data Management**



#### Explore Our PDM Solutions

POM is an integral part of product ifecycle management (PLM) Used together with <u>computer-aided design (CAD)</u> <u>computer-aided manufacturing (CAM)</u>, <u>computer-aided</u> <u>engineering (CAE)</u>, and <u>digital manufacturing</u>, entire product lifecycles can be optimized for suitability, reliability and profitability:

A commercial web page from SIEMENS looking at Product Data Management, featuring a range of industry case studies showing PDM in use.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, LO1 Understand how computers are used in engineering design, manufacture and process control, LO2 Understand how computers are used for maintenance of engineering systems
Cost:	Free to access
Format:	OEM Website
	http://www.plm.automation.siemens.com/en_gb/plm/pdm.shtml
lf you kr	now of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources

would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### Human Machine Interface (HMI) and Supervisory Control (SCADA) Solutions



9REN Group is using Invensys solutions to monitor and improve the performance of its renewable energy plant installations throughout Europe and the Mideast. After replacing the Emerson ProVox and Delta V DCS with an integrated Invensys control and safety system, Bluewater was able to successfully meet 'First Oil' date on time.

A commercial site selling HMI and SCADA systems. An overview of the benefits of HMI systems and links to more than 20 videos of the systems in practical applications.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, 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
Cost:	Free access
Format:	Commercial site with YouTube video links.
	http://software.invensys.com/solutions/hmi-and-scada/

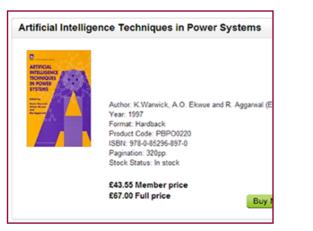
If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at







### **Artificial Intelligence Techniques in Power Systems**



This book, published by the IET is suitable for various levels of reader, covering both basic principles and applications. It will serve as an introduction for those from a power systems background and as an overview for those from an AI computing or control background.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, 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
Cost:	£67 for non-members £43.55 for members
Format:	Published Book. ISBN: 978-0-85296-897-0

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

### Advances in Command, Control and Communication Systems

ACVANCES IN COMMON	Author: C.J. Harris and I. White (Eds.) Year: 2002 Format: Hardback Product Code: PBCM0110 ISBN: 978-0-86341-094-9 Pagination: 424pp. Stock Status: In stock £57.20 Member price £88.00 Full price	Buy N
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A book focused on electrical command, control and communication systems from the IET. The book can be purchased from the IET directly.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, 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
Cost:	£57.20 for IET members £88.00 for non-members.
Format:	Published book. ISBN: 978-0-86341-094-9

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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Systems Control in Engineering Level 1/2



#### SCADA Tutorial – A Quick, Easy, Comprehensive Guide



A 12 page guide produced as part of a sales pack fro DPS Telecom. The free download gives basic underpinning knowledge about what SCADA systems are and how they are created.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2	
	Unit R115, 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	
Cost:	Free download, requires name and email address to be given download	
	the file.	
Format:	PDF guide	
http://www.d	http://www.dpstele.com/info2/scada/scada_rtu_pdf.php?source=google&grp_id=90&gclid=COnX56Ht4r0CFa	
gKwwod1mMA8Q		

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resources.feedback@ocr.org.uk

#### **Honeywell – Scanning and Mobility**



A commercial website for Honeywell. Specifications, tutorials and guides for a range of communication devices, this includes a wide range of images of the different products.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, LO3 Know how computers are used to communicate and use data for production and maintenance
Cost:	Free to visit commercial site
Format:	Commercial site with product information
http://ww	/w.honeywellaidc.com/en-GB/resources/image-library/Pages/default.aspx

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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Systems Control in Engineering Level 1/2



#### **HIVE** heating from British Gas

Oxford Cambridge and RSA



The HIVE system is a practical example of remote communications and control that student scan relate to. The British Gas site at: <u>https://www.hivehome.com/the-app</u> gives a reasonable amount for detail and user guides.

This could be combined with review sites such as: <u>http://www.computerweekly.com/blogs/inspect-a-gadget/2014/01/reviewtwo-days-and-nights-with-hive-active-heating.html</u> and <u>http://www.thegreenage.co.uk/review-british-gas-hive-active-heating/</u> to prompt discussion. Whilst not directly manufacturing, the technology in use is the same.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R115, LO3 Know how computers are used to communicate and use data for production and maintenance	
Cost:	Free	
Format:	Advertising web site and review sites.	
	https://www.hivehome.com/the-app	
http://www.	http://www.computerweekly.com/blogs/inspect-a-gadget/2014/01/reviewtwo-days-and-nights-with-hive-	
	active-heating.html	
	http://www.thegreenage.co.uk/review-british-gas-hive-active-heating/	

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

resources.feedback@ocr.org.uk

# Enhance understanding of maths and science for engineering

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A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2
	Unit R115, LO1 Understand how computers are used in engineering design, manufacture and process control
	design, manufacture and process control
Cost:	Free
Format:	Website
	http://www.met.reading.ac.uk/pplato/resources/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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#### How Microcontrollers Work – How Stuff Works

Oxford Cambridge and RSA



An education/entertainment website explaining how microcontrollers work. The content is spread over 8 pages with simple activities that can be undertaken.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO1 Understand the application and operation of
	microcontrollers and microprocessors in engineered products, LO2 Be able
	to design, develop and simulate a control system solution, LO3 Be able to
	test control systems
Cost:	Free site
Format:	Educational website
	http://electronics.howstuffworks.com/microcontroller2.htm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### Architecture and programming of 8051 MCUs

Architecture and	Book Overview
programming of 8051 MCU's	Learn in a quick and easy way how to program 8051 microcontrollers using many practic examples we have provided for you. In spite of the fact that they are relatively oid, 8051 microcontrollers are spit way popular and commonly used newsdays. In addition to intell
Featured Development Tools	many other renowned companies, such as Philips, Siemens, etc. are manufacturing this
Easy8051 v6 Development	model. This book describes its architecture in detail, gives many practical examples, use program routines, instructions on handling the programmer for 8051 microcontrollers from
System	Atmel as well as the guide on using development systems for Atmel's microcontrollers. In appendices you will find a description of assembly instructions with examples, glossary a
State of the Second	appendices you will not a description of assembly instructions with examples, glotsary a much more
Minister 2	Title: Architecture and Programming of 8051 Microcontrollers
	Author: Mian Verie
The Easy8051 v6 is compatible with 14-	
16, 20, 28, 40 pin PLOC44 and	
PLCC32 MCUs. It comes with an AT8958253. The board has a USB 2.0	
programmer and many peripherals such	
as COG, port expander, MENU and 4x4 keypads etc. [more into]	
	Contraction of the second s
mikroProg™ for 8651	Table of Contents

An online book explaining how to programme the microcontroller. Includes an introduction to microcontrollers and examples.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO1 Understand the application and operation of microcontrollers and microprocessors in engineered products, LO2 Be able to design, develop and
	simulate a control system solution, LO3 Be able to test control systems
Cost:	Free to read on line
Format:	Online book
http://www.mikroe.com/products/view/267/architecture-and-programming-of-8051-mcu-	
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#### Introduction to microcontrollers



Part of the 'How to build your first robot tutorial' this page explains, in simple terms, what microcontrollers are and what they do. The link to the full tutorial is also included. The building of robots could be used as practical application of microcontrollers.

 Supports:
 OCR Cambridge Nationals Systems Control in Engineering Level 1/2

 Unit R116, LO1 Understand the application and operation of microcontrollers and microprocessors in engineered products, LO2 Be able to design, develop and simulate a control system solution, LO3 Be able to test control systems

 Cost:
 Free

 Format:
 Online written tutorial guide

 <a href="http://www.societyofrobots.com/robot\_tutorial.shtml">http://www.societyofrobots.com/robot\_tutorial.shtml</a>

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **UK Automation**



A commercial website selling a broad range of input / output and control devices. The site can be used to introduce learners to the range of commercial control devices available to the home owner. Learners can be tasked with designing a home control system from the components available on the site.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO2 Be able to design, develop and simulate a control system solution
Cost:	Free
Format:	Commercial website
	http://www.uk-automation.co.uk/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at



Systems Control in Engineering Level 1/2



#### **Electronics Project Org**

Oxford Cambridge and RSA

	BASIC PROJECT
1.	Wind Sound Generator
2.	White LF Noise Generator
3.	Universal Battery Tester
4.	Traffic Light Controller
5.	Sound Operated Timer
6.	Simple Pulse Generator
7.	Simple Low/High Voltage Cut Circuit
8.	Simple Frequency Meter
9.	Musical AF/IF Checker
10.	Mini Amplifier
11.	Flashlight with Twilight Switch
12.	Crystal Tester
13.	Low-cost Touch Sensitive Switch
14	Multi-way switch

A website with a range of basic to advanced electronic projects to download and build. Useful in demonstrating the use of a range of electronic devices.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO1 Understand the application and operation of microcontrollers and microprocessors in engineered products, LO2 Be able to design, develop and simulate a control system solution, LO3 Be able to test control systems
Cost:	Free to access
Format:	Links to online project instructions
	http://electronicsproject.org/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **1507 electronic projects and circuits**

Hareendran, D M welcome you on electronic circuit designs and new through a total o already been test audio amplifiers,	opescu Marian and together with Jim Keith, T.K. ohankumar and 3 other authors we would like to ElectroSchematics.com; a great database of s and schematics, basic tutorials for beginners, ways to practice your hobby with ease. Browse f 1507 electronic projects of which 197 have ted. Discover articles from the main categories: avr tutorial, solar and battery chargers, pcb tuto s please subscribe to our Youtube channel using
	156 people like this. Sign Up to see what your nds like.

A long list of projects and circuits that can be constructed by tutors and learners. Detailed circuit diagrams and lists of materials requires.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO1 Understand the application and operation of microcontrollers and microprocessors in engineered products, LO2 Be able to design, develop and simulate a control system, LO3 Be able to test control systems solution	
Cost:	Free to access	
Format:	Website with links to projects	
	http://www.electroschematics.com/	

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at



Systems Control in Engineering Level 1/2



#### **Flexsim Simulation Software**

Oxford Cambridge and RSA



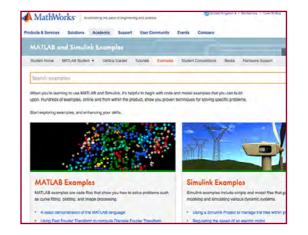
A short YouTube video introducing the Flexsim simulation range. This can be used to demonstrate the range of simulation applications. No vocal, soundtrack background.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO2 Be able to design, develop and simulate a control system solution
Cost:	Free
Format:	YouTube video
	http://youtu.be/t620lkFkw28

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

#### resources.feedback@ocr.org.uk

#### Simulink<sup>®</sup> from MathWorks



Simulink<sup>®</sup> is a block diagram environment for multidomain simulation and Model-Based Design. It supports simulation, automatic code generation, and continuous test and verification of embedded systems.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO2 Be able to design, develop and simulate a control system solution, LO3 Be able to test control systems	
Cost:	Free evaluation copy can be requested. Student licence available. Student bundles £28 to £55	
Format:	Educational software	
http://www.mathworks.co.uk/academia/student_version/class_use.html?s_tid=ac_clasuse_sv_bod		

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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#### **PLC Training Simulator**

Oxford Cambridge and RSA

PSIM Programmatike Logic Controller STMLATOR	PSIM PLC Training Simulator	
	Professor Bill's Original PLC Emulator c/w Animated Process Simulations	
	Allen Bradley PLC Simulator	
Hands-On P	rogrammable Logic Controller Training Without the PLC	
What is the PSIM PLC Simulator.?		
allows users to create and edit PLC programs us scanning sequence of a PLC. When placed into t updated just as would occur in an actual PLC. Th	d into a single package. First, PSIM contains a PLC Ladder Logic editor that rg Alien Bradley PLC-2 family instructions. Secondly, PSIM emulates the the RNM mode, the users program is scanned and the supportails (IO is indry, PSIM contains a number of animated simulations which respond ted PLC. A conveyor based filing line, Traffic intersection and Batch mixing dent programmer.	

The Alan Bradley PLC Simulator can be downloaded from the web site and used to demonstrate and practice PLC programming.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO2 Be able to design, develop and simulate a control system solution, LO3 Be able to test control systems
Cost:	Free for educational use
Format:	Educational software
	http://www.thelearningpit.com/plc/psim/psim.html

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at resources.feedback@ocr.org.uk

#### **PICsim – PIC Microcontroller simulator**

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PICsim emulates a microcontroller PIC16F628/16F877A/18F452 and periferics such as USART and timers, the simulator architecture permit easy implementation of external elements in c language. PicsimLab is a realtime emulator of development boards.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2 Unit R116, LO2 Be able to design, develop and simulate a control system solution, LO3 Be able to test control systems
Cost:	Free to download
Format:	Open source simulation
	http://sourceforge.net/projects/picsim/

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## **Enhance understanding of maths and science for engineering**



A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals Systems Control in Engineering Level 1/2		
	Unit R116, LO2 Be able to design, develop and simulate a control system solution		
Cost:	Free		
Format:	Website		
	http://www.met.reading.ac.uk/pplato/resources/		

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

#### www.ocr.org.uk/cambridgenationals

#### Contact us

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

We're always delighted to answer questions and give advice.

#### Telephone 02476 851509 Email cambridgenationals@ocr.org.uk



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