YEAR 10

Autumn 1	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Electronic Circuit Theory, Laws and Calculations, series and parallel circuits, Ohm's Law, Watts Law. Circuit diagrams and component symbols.	circuit parameters - voltage, current, resistance	link to R048 -making and testing electronci circuits - using virtual and physical test equipment.	Important to start the course with key principes governing the quantities and units we will be working with	Students do not know what the difference is between potential difference and electromotice force. Confusion over current and voltage. Why are Ohm's Law letters not V, C & R?	KS3 science - mainly - voltage and current in KS3 circuits	Cambridge Technicals - Unit 5, Electrical and Electronic Design, Unit 6 Circuit Simulation and Texting, Unit 7 Electrical Devices, Unit 8 Electrical Operations,	Examination example questions requiring additional mathemtatical steps - Early identification of potential Arkwright Scholarship candidates.	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Power supply to homes and business, hospitals and services.	Osprey Plastics / Northern Powergrid / Schneider / DSE	https://youtu.be/m-LlrOC4Z8I?t=107
Unit R048 - Making and testing electronic circuits.	Draw and simulate circuits	Using CAD to create schematics. Being able to use real and virtual test equipment	link to R048 -making and testing electronci circuits - using virtual and physical test equipment.	CAD is vital when learned together with prototyping skills	Breadboarding connections are misunderstood, or there is confusion between a schematic and a real circuit. The preconnected parts of the breadboard are not recognised. Component leads are placed in adjacent joined sockets rather than electrically separate ones.	as above. These are new skills and from here they link to KS4 physics and maths, rather than KS3	With the above units, CAD and breadboarding are really important, as is the use of test equipmment.	Using oscilloscopes and in-circuit voltage probes for those who are comfortable with the use of digital multimeters. Advanced analysis tools		Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	DSE / Northern Powergrid testing equipment and CAD schematics - e.g local power networks.	https://youtu.be/4L6vEyK_Zww
Unit R049 - Developing Programmable Systems												Electrical Engineering - DiscoverE
IS	Interactive SUTC Kahoot quizzes. Use of Google Classroom to respond to feedback and enhance technical report writing skills - e.g. Tier 2 and 3 words in the Employer Excellence Projects											

Autumn 2	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Electronic circuit components, virtual circuit protoyping and testing. Physical and virtual (within a CAD system) test equipment.	Meassurement and test equipment - being able to use them and set them up. Beginning to understand the idea of a test plan.	Link to R048 - making and testing electronic circuits - students will use both virtual and phyiscal test equipment	This is useful at this point as students will be familiar with having done some testing as part of their employer excellence project *start Y10	There are different set ups for test equipment - the main issues arise from not knowing these - using a reminder/ notes sheet will help reinforce correct plug/ sicket DMM dial combinations	Measuring current and voltage as part of KS3 science. Possible link to DT if electronics has been covered. We start with the assumption that other than from personal interest, no one has used a digital multimeter before.	This directly feeds into KS5, and more eadvanced circuit analysis further on in R048 and R049 to test and verify signals.	This is an opportunity to demonstrate an oscilloscope / signal generator / bench top power supply / bench top DMM and get live data from a circuit.	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Basic units such as kilowatt hours - relate to domestic and commercial bills. Reistors dump excess energy as heat (heating) Efficient energy use, sustainability - rechargeable batteries	Nissan, IGUS bearings, BDC, North Sea Winches	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.	Draw and simulate circuits. Employer Excellence skills build for the NEA assessment.	Using CAD to create schematics. Being able to use real and virtual test equipment	link to R047 above	Practical experience with CAD, skills building for the NEA. Familiarity with the software interface.	linked to current, voltage and resistance - a solid understanding of Ohm's Law is really helpful here - and practice throughout the Year will embed this.	Designing products to fulfil success criteria. Creating a cutting list > bill of materials in Systems.	Links to KS5 as above.	U/se of advanced test equipment in the CAD environment. Addtional analysis withing the EEE		Efficient use of resources - sustainability - reducing PCB sizes.	Nissan, IGUS bearings, BDC, North Sea Winches	https://youtu.be/m-LlrOC4Z8I

Unit R049 - Developing Programmable Systems												Types of Electrical Engineering and Careers - Glassdoor Career Guides
IS	Using Google Classroom to enhance technical report writing skills - e.g. Tier 2 and 3 words in the Employer Excellence Projects											

Spring 1	**Key knowledge/content to learn and retain**	**Essential skills to acquire (Subject and generic)**	**Link to other units / subjects**	**Why this task now**	**Anticipated misconceptions**	**Links to KS3**	**Links to KS5**	**Opportunity for stretch for high prior attainers**	**SMSC & British Values**	**Cultural Capital / Big Picture**	**Visit / talk opportunities**	**Career links**
Unit R047 - Principles of Electronic and Programmable Systems	Physical circuit prototyping methods, electronics circuit components - process devices (amplifiers, timers, latches, counters) Pulse generators, Logic gates	Using breadboards, using stripboard, veroboard or perfboard and reasons for selection. Knowing, identifying and selecting a range of components. Identify and understand the applications of process devices, logic gates and pulse generators.	Link to R048 - making and testing electronic circuits.	learners have some practical experience of usig these components now. Timers and oscillators were part of the EEP in the autumn term. Counting is part of the NEA this year so this supports it. Logic is confusing for some, especially if not doing compluter science, so an early introduction is helpful to relate real world examples.	That stripboard is easy to use to create PCB drectly from a schematic! That some parts of a solderless breadboard are / are not connected to others.	KS3 science - units and quantities	Create an AC-DC power supply unit	Options for creating wider frequency range by using astable calulations for R1/R2 and C1 in the circuit. Potential Arkwright Scholarship candidates should be identifeid at this stage.	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Need to use cradel to cradle life cycle - challenge for electronics is that it is damaging to the environment. CPI / HVMC printable circuits	DSE / Northern Powergrid / Coventry University.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.	Making a Printed circuit board (PCB) and constructing a circuit on the PCB. Working on the R048 NEA.	S- photo etch process, inc developer and etchant, PCB drilling and soldering. Use of a multimeter for testing. G - sequencing work and using a risk assessment.	Link to R047 - principles of electronic and programmable systems - PCB manufacture	With EEP skills builds, students should have some experience now to be able to succeed independently with the NEA.	photo resist chemical removes the copper board, photoetch chemical can be touched with fingers, the chemicals are safe, PCB drills do not break easily, the PCB does not need cleaning with acetone to remove the chemical barrier before soldering.	N/a - making circuits like this is not part of KS3. Some learners may have soldering experience - but we do a full safety induction anyway - our soldering irons are industry standard.	Manufacturing a power supply, amplifier, range of circuits using the same software and manufacturing facilities - but with more advanced circuits. Links to using more complex test equipment.	For students interested in the testing aspects - oscilloscopes and signla generators offer an opportunity to replicate the virtual software CAD testing but with the actual circuit made.		Health and Safety during manufacture roles of the employer to provide training and PPE (eyewear, gloves) Risk assessment in the workplace.	Sport / timing = coventry university	Engineering careers advice for school leavers | TARGETcareers
Unit R049 - Developing Programmable Systems												Types of Electrical Engineering and Careers - Glassdoor Career Guides
IS	Interactive SUTC kahoot quizzes to support R047 learning. Checking and responding to feedback in Google Classroom. Attending intervention for stretch and access to electronic CAD facilities.											

Spring 2	**Key knowledge/content to learn and retain**	**Essential skills to acquire (Subject and generic)**	**Link to other units / subjects**	**Why this task now**	**Anticipated misconceptions**	**Links to KS3**	**Links to KS5**	**Opportunity for stretch for high prior attainers**	**SMSC & British Values**	**Cultural Capital / Big Picture**	**Visit / talk opportunities**	**Career links**

Unit R047 - Principles of Electronic and Programmable Systems	Passive components, power supplies and wiring.- Resistors, capacitors, diodes, drivers and interfaces (relays), power supplies and wiring types.	knowing what resistors, capacitors and diodes do, separately and in combination. Ratings, sizes, tolerances. Diodes and what they do - typical uses in a power supply for example, learning about multi-core and solid core, ribbon and coaxial cabling.	Geography - power generation and sustainability. Physics - resistors in a circuit, diodes in a circuit, I-V graphs. Maths ratios in a transformer from 240V to 12V.	learners have some practical experience of usig these components now and in the examination content - can see typical questions which probe this.	a capacitor is a battery. A diode is an LED which doens't light up. LEDs can withstand the same reverse voltage as a diode. resistors with a phyisically larger size have a larger resistance rather than power rating.	KS3 science - mainly - voltage and current in KS3 circuits	Unit 5 - EED, distinction task - designing a power supply - using diodes to rectify a mains voltage supply. High and low pass filtering. Unit 7 electrical devices - signal filtering Unit 8 - electrical devices - differrent power requirements for diodes	looking ahead to active Power Factor correction - / adding a capacitive load to reduce or correct the angular phase shift between voltage and current (and therefore lower power losses) with an inductive load for example. Calulating resistor and capacitor totals for seeries and parallel circuits	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Small signals (electronic devices) can trigger big things running on different power supplies. E.g. Phone operated themostate or lighting control - using relays to isolate low side from high side power. Electronic design utilises the small signals communication which in turn liks with electrical and power electronics to make big stuff happen.	Osprey Plastics / Northern Powergrid / Schneider / DSE	https://youtu.be/Xy4xf3SEwvM
Unit R048 - Making and testing electronic circuits.	Constructing Circuits. Working on the NEA assessment.	S- photo etch process, inc developer and etchant, PCB drilling and soldering. Use of a multimeter for testing. G - sequencing work and using a risk assessment.	Link to R047 - principles of electronic and programmable systems - PCB manufacture	With EEP skills builds, students should have some experience now to be able to succeed independently with the NEA.	photo resist chemical removes the copper board, photoetch chemical can be touched with fingers, the chemicals are safe, PCB drills do not break easily, the PCB does not need cleaning with acetone to remove the chemical barrier before soldering.	N/a - making circuits like this is not part of KS3.	Manufacturing a power supply, amplifier, range of circuits using the same software and manufacturing facilities - but with more advanced circuits. Links to using more complex test equipment.	For students interested in the testing aspects - oscilloscopes and signla generators offer an opportunity to replicate the virtual software CAD testing but with the actual circuit made.		Safe working - employer responsibility and employee rights - link to workplace and health and safety at work act.	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R049 - Developing Programmable Systems												Types of Electrical Engineering and Careers - Glassdoor Career Guides
IS	Interactive SUTC kahoot quizzes to support R047 learning. Checking and responding to feedback in Google Classroom. Attending intervention for stretch and access to electronic CAD facilities.											

Summer 1	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
R047	Commercial manufacture of printed circuit boards - photo ething and PCB milling, single sided, double sided and flexible PCBs, Surface mount technology, pick and place robots, through hole technology, flow soldering.	summarise the use of PCBs in commercial products. Explain the methods and processes for manufacturing PCBs. Recall and describe the characteristics and applications of the types of PCB and types of manufacture.	Link to R048 - making and testing electronic circuits.	At this point, students will have had manufacturing experience of PCB's and will be able to relate some of their practical awareness to different contexts and the needs for other processes dependent on scale, materials, and end function.	all pcbs are the same, flow solder is wave solder or vice versa - or re-flow solder is like wave soldering. Only a machine can carry out SMD manufacture. THT and SMD can be confused.	Limited links to KS3. Some learners may have had experience of making kit form PCB's, but the type and features of these are not part of KS3 work.	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Investigate the use of pick and place robots, and flow solder ovens at DSE - Hunmanby - possible visit to observe. Potential Arkwright Scholarship candidates - involved in additional engineering tasks based on exam questions.	Rule of Law - Health and safety at work act; the need for rules to make a	Global economy - China has increased manufacturing capability in many areas. The production of microprocessors and microcontrollers in Japan has increasingly been	Osprey Plastics / Northern Powergrid / Schneider / DSE	https://youtu.be/M6oXZUtyCJ4

R048	Working on the NEA assessment / submit NEA for moderation.	Testing and evaluation - witness statement for learner capabilities and strengths with independent tasks. Completion of a test plan to document the testing process.	Link to R047 - principles - with test equipment	Making is primarily evidenced with teacher observation, and the observation form is a good way to document learner capabilities. The test plan is a key document to evaluate the NEA success, or that any errors have been rectified.	Having a working circuit means that there is no need for doing any testing or verification. Having had no problems with a circuit means that you do not have to create and work through a detailed test plan to Quality Check the circuit.	Limited links to KS3. Testing and verification is a branch of systems in its own right; these are not part of KS3 work.	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	1- carry out testing with a signal generator to verefy the clock input of the counter, 2- use an o-scope to test the output frequency and the voltage level of the counting outputs. 3- Link to the DSE visit - video footage of the testing and QC part of the assembly line.	happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	replicated in China. Should we be using PCB's that are manufactured in China and Japan in terrms of sustainability? Is there an argument for reating more sustainable PCBs (either for disassembly or re-use)?	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R049 - Developing Programmable Systems												
IS	Interactive SUTC kahoot quizzes to support R047 learning. Checking and responding to feedback in Google Classroom. Attending intervention for stretch and access to electronic CAD facilities.											

Summer 2	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Testing systems and circuits - virtual and physical test equipment; multimeter, continuity testing, oscilloscope, signal generator, logic probe,	being able to describe and use a range of test equipment and their benefits and limitations.	Science - multimeters, ammeters, voltmeters.	This aspect of the course ideally needs some practical experience - by this point, learners have used test equipment for their EEP 1, EEP2 and R048 project, and so the theory aspects can be directly related to their learned experience. Logic Probes and some of the more advanced testing done at DSE can be referenced here - having an experiential understanding of this is essential - too dry otherwise.	Practical experience with most of the test equipment should ensure that most learners are aware of the quantities which can be measured and the set ups needed (at least with a DMM)	Testing with equipment - not really a feature of any KS3 lessons, links to KS3 science, in terms of physics observations of circuits.	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Discuss the benefits and drawbacks of using optical inspection machines.	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding	Products requiring electrical safety tests would have the CE symbol, meaning that the companies making them adhered to agreed legal frameworks. The ISO regulations and BS EN regulations give users **assurance** that products and / or services have been tested to a certain standard. We rely on testing and quality control in our lives, to a huge extent - every time we make a purchase - someone, somewhere has signed of on the manufacture of it..	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.												https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg

									understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.			
Unit R049 - Developing Programmable Systems	Programmable systems, (including understanding what a microcontroller is and how it is used) drawing system block diagrams	the basic principles of how programmable systems are developed and implemented in products. Identify key features of block diagrams, draw and label block diagrams, and for selected problems. identify hardware requirements for a programmable system, including microcontroller type. programming software requirement for a programmable system, including selected programming method..	R047 - Students will learn about the characteristics and applications of programmable systems.	This aspect of the course is very practical, but needs a grounding and theoretical understanding. Completing the foundational understanding before the end of Year 10 will enable a strong start with the NEA in Year 11, and rapid progress onto programming and testing.	flow charts = block diagrams. Microcontroller = Microprocessor. Input process and output can be misunderstood in relation to feedback control and sensor position in the loop.	block diagrams to represent sequnces. Sequencing in maths, mathematical thinking.	Strong link with Unit 5 EED in Cambridge Technicals - P11 task using programmable systems. This is an excellent foundation to the KS5 unit and electrical/electronic pathway.	Analyse block diagrams where there are multiple inputs - Toshiba site with a rane of MCU schematics are a useful source for this. Prospective Arkwright Scholars should be aware of the application process for after half term.		an introduction to the context being a highly practical unit in which students will learn practical skills in programming a microcontroller-based system to solve problems, including both hardware and software requirements.	Osprey Plastics / Northern Powergrid / Schneider / DSE	Types of Electrical Engineering and Careers - Glassdoor Career Guides
IS	Completing a set of exam board questions - organised by topic for R047 Principles exam. This is deliberate practice, with access to the marksheme. Learners complete the paper and then use green pen to mark in any parts that are not known.	Subject - Tier 3 terminology, practising specific mathematical skills (Ohm's, Power, Resistors in series parallel) Generic - reading the paper, having a space to wrk, making time to plan for success, highlighting command words, using R/A/G analysis with questions	Maths - (1) using a scientific calculator, (2) using standard form (3 understanding multiples and sub multiples Science/ Physics - (1) circuit diagram symbols,(2) links to 3 term equations (distance speed time mass volume density) and how to re-arrange for the identified quantity. (3) periodic table of elements- conducting and insulating (4) drawing scematic diagrams / understanding them	This builds on the Do it now work (DIN) from Year 10, learners are familiar with exam language and layout and year 11 is used for deliberate practice and extended retrieval to check the embedded nature of some of the theory work.	1- that the exam paper is a test - it is not - it is deliberate practice. 2 - that the marks are used to quantify knowledge - they are not - it is part of getting into a successful routine 3 that this is not important - it is - a vital part of exam preparation is small, regualr retrieval practice and spaced learning.	New subject, but links to some science and maths at KS3 - symbols, calulations.	1- maths - using Ohm's Law links to advanced versions measuring AC quantities such as Reactance and Impedance. Standard Form is heavily used at KS5. Linking to materials science / chemistry with periodic tabel ref to silicon and germanium, as well as doping with impurities to change properties.	This is implicit in the task. High prior attainers will increasingly be able to get a high proportion of the marks. The opportunity for these students once they are onsistently attaining above 80% (D2*) is to see some Unit 4 Principles of Electrical and Electronics papers or some Unit 5 work. Given the breadth ofthe new specification, it is not likely that high prior attainment learners will reach this benchmark until later in Year 11.		Linking with examination success -career and future planning - self-management of home study tasks.	Not applicable./ see opprtunities within untis.	https://youtu.be/M6oXZUtyCJ4

YEAR 11

Autumn 1	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Systems Approach - System Block diagrams. Input, process and outputs.	identify and explain open and closed loop systems. Recall the purpose, function and operation of selected input and output devices in preparation for creating system block diagrams.	R048 and R049 Students will use a systems approach to circuits and programming in both units.	links in with Ro49 - learning and the NEA will proceed in parallel through Year 11, now that routines and expectations are fimrly in place, students are able to enjoy a greater level of challenge.	flow charts = block diagrams. Microcontroller = Microprocessor. Input process and output can be misunderstood in relation to feedback control and sensor position in the loop.	block diagrams to represent sequnces. Sequencing in maths, mathematical thinking.	Strong link with Unit 5 EED in Cambridge Technicals - P11 task using programmable systems. This is an excellent foundation to the KS5 unit and electrical/electronic pathway.	Analyse block diagrams where there are multiple inputs - Toshiba site with a rane of MCU schematics are a useful source for this. Prospective Arkwright Scholars should be aware of the application process for after half term.	Rule of Law - Health and safety at work	Linking to IoT, Alexa, Bridge - various home automation systems are now in use. Many home devices are examples of **embedded** tech - link with Computer Science.	:Link with North Yorks Moors Railway - example from KS5- to weigh a stream train and stream / send data readings via wireless or bluetooth MCU to a phone. Challenge task for KS5 electronic pathway learners.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.												https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg

Unit R049 - Developing Programmable Systems	Selecting and connecting a system / Producing system block diagrams. Working on NEA assessment. Connecting devices to an MCU system,	Identify how devices are connected to a microcontroller, Identify input and output devices required for a programmable system including function and operation. Using plugs, sockets ,terminal blocks, croc clips	R047 - Students will learn about the systems approach to layout of systems, and selected input and output devices.	links in with R047 - the NEA will proceed in parallel with the principlels learning hrough Year 11, now that routines and expectations are fimrly in place, students are able to enjoy a greater level of challenge.	confusion about the operation and architecture of microcontrollers - using the term 'transducer' as both an input device and output device.	block diagrams to represent sequnces. Sequencing in maths, mathematical thinking.	Strong link with Unit 5 EED in Cambridge Technicals - P11 task using programmable systems. This is an excellent foundation to the KS5 unit and electrical/electronic pathway.	Analyse block diagrams where there are multiple inputs - Toshiba site with a rane of MCU schematics are a useful source for this. Prospective Arkwright Scholars should be aware of the application process for after half term.	act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Linking to IoT, Alexa, Bridge - various home automation systems are now in use. Many home devices are examples of **embedded** tech - link with Computer Science.	Osprey Plastics / Northern Powergrid / Schneider / DSE	
IS	Completing a set of exam board questions - organised by topic for R047 Principles exam. This is deliberate practice, with access to the marksheme. Learners complete the paper and then use green pen to mark in any parts that are not known.	Subject - Tier 3 terminology, practising specific mathematical skills (Ohm's, Power, Resistors in series parallel) Generic - reading the paper, having a space to wrk, making time to plan for success, highlighting command words, using R/A/G analysis with questions	Maths - (1) using a scientific calculator, (2) using standard form (3 understanding multiples and sub multiples Science/ Physics - (1) circuit diagram symbols,(2) links to 3 term equations (distance speed time mass volume density) and how to re-arrange for the identified quantity. (3) periodic table of elements- conducting and insulating (4) drawing scematic diagrams / understanding them	This builds on the Do it now work (DIN) from Year 10, learners are familiar with exam language and layout and year 11 is used for deliberate practice and extended retrieval to check the embedded nature of some of the theory work.	1- that the exam paper is a test - it is not - it is deliberate practice. 2 - that the marks are used to quantify knowledge - they are not - it is part of getting into a successful routine 3 that this is not important - it is - a vital part of exam preparation is small, regualr retrieval practice and spaced learning.	New subject, but links to some science and maths at KS3 - symbols, calulations.	1- maths - using Ohm's Law links to advanced versions measuring AC quantities such as Reactance and Impedance. Standard Form is heavily used at KS5. Linking to materials science / chemistry with periodic tabel ref to silicon and germanium, as well as doping with impurities to change properties.	This is implicit in the task. High prior attainers will increasingly be able to get a high proportion of the marks. The opportunity for these students once they are onsistently attaining above 80% (D2*) is to see some Unit 4 Principles of Electrical and Electronics papers or some Unit 5 work. Given the breadth ofthe new specification, it is not likely that high prior attainment learners will reach this benchmark until later in Year 11.		Linking with examination success -career and future planning - self-management of home study tasks.	Not applicable./ see opprtunities within untis.	Types of Electrical Engineering and Careers - Glassdoor Career Guides

Autumn 2	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Programmable systems and programming languages	Describe the main characteristics and typical applications of microcontrollers, PLC's ; the use of text-based languages and block-based editors, flow charts (describe the advantages and disadvantages of each type.) Be able to summarise the application specific merits of each.	R049 - Students will use selected programming method to program a microcontroller.	Linking in with the R049 NEA	all the types of programming are the same; it does not matter which is used; the easiest to use is the best one to use; text based are always best for simple programming tasks	Scratch and Python coding languages are used in KS3 - students will have experience of both (block based and text based)	Direct links with computer science - programming unit. With engineering, relates to controlling mechanical, hydraulic, pneumatic systems.	Arduino and raspberry pi - both are examplels of platfoms using text based editors - micro-py can be used on MCU boards compatible with arduino - use a library to code some addressable LED;s Arkwright Scholarship candidates invited to apply and complete the application forms.	Rule of Law - Health and safety at work act; the need for rules to make a	Linking to IoT, Alexa, Bridge - various home automation systems are now in use. Many home devices are examples of **embedded** tech - link with Computer Science.	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.												https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg

Unit R049 - Developing Programmable Systems	Programming a system, simulation. Learn how to use a selected programming language. Learners will also practise using this to solve simple programming problems to build capacity before completing the NEA programming tasks.	Recall the basic principle of how the selected programmable device will be programmed, Use programming commands to write and test simple programs, including simulation. (content includes timing, counting, latching and logic)	R047:Students will learn about the advantages and disadvantages of programmable devices and types of programming languages.	this will enable students to be able to program their MCU for the NEA - using a range of inputs and outputs,	**This can be challenging as the syntax of written code can cause problems for some learners, We will use a visual method to start with, prior to using some text based code. Progressive removal of support will enable learner independence.**	Scratch and Python coding languages are used in KS3 - students will have experience of both (block based and text based)	Direct links with computer science - programming unit. With engineering, relates to controlling mechanical, hydraulic, pneumatic systems.	Arduino and raspberry pi - both are examplels of platfoms using text based editors - micro-py can be used on MCU boards compatible with arduino - use a library to code some addressable LED;s Arkwright Scholarship candidates invited to apply and complete the application forms.	happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Linking to IoT, Alexa, Bridge - various home automation systems are now in use. Many home devices are examples of **embedded** tech - link with Computer Science.	Osprey Plastics / Northern Powergrid / Schneider / DSE	
IS	Completing a set of exam board questions - organised by topic for R047 Principles exam. This is deliberate practice, with access to the marksheme. Learners complete the paper and then use green pen to mark in any parts that are not known.	Subject - Tier 3 terminology, practising specific mathematical skills (Ohm's, Power, Resistors in series parallel) Generic - reading the paper, having a space to wrk, making time to plan for success, highlighting command words, using R/A/G analysis with questions	Maths - (1) using a scientific calculator, (2) using standard form (3 understanding multiples and sub multiples Science/ Physics - (1) circuit diagram symbols,(2) links to 3 term equations (distance speed time mass volume density) and how to re-arrange for the identified quantity. (3) periodic table of elements- conducting and insulating (4) drawing scematic diagrams / understanding them	This builds on the Do it now work (DIN) from Year 10, learners are familiar with exam language and layout and year 11 is used for deliberate practice and extended retrieval to check the embedded nature of some of the theory work.	1- that the exam paper is a test - it is not - it is deliberate practice. 2 - that the marks are used to quantify knowledge - they are not - it is part of getting into a successful routine 3 that this is not important - it is - a vital part of exam preparation is small, regualr retrieval practice and spaced learning.	New subject, but links to some science and maths at KS3 - symbols, calulations.	1- maths - using Ohm's Law links to advanced versions measuring AC quantities such as Reactance and Impedance. Standard Form is heavily used at KS5. Linking to materials science / chemistry with periodic tabel ref to silicon and germanium, as well as doping with impurities to change properties.	This is implicit in the task. High prior attainers will increasingly be able to get a high proportion of the marks. The opportunity for these students once they are onsistently attaining above 80% (D2*) is to see some Unit 4 Principles of Electrical and Electronics papers or some Unit 5 work. Given the breadth ofthe new specification, it is not likely that high prior attainment learners will reach this benchmark until later in Year 11.		Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	Not applicable./ see opprtunities within untis.	

Spring 1	Key knowledge/content to learn and retain	Essential skills to acquire (Subject and generic)	Link to other units / subjects	Why this task now	Anticipated misconceptions	Links to KS3	Links to KS5	Opportunity for stretch for high prior attainers	SMSC & British Values	Cultural Capital / Big Picture	Visit / talk opportunities	Career links
Unit R047 - Principles of Electronic and Programmable Systems	Circuits and circuit theory - revisited1-units of measureent, units and symbols, Ohm's Law, multiples and submultiples, Watts Law, input and output devices	Recall and identify circuit parameters and their SI units or derived units. Solve problems involving multiples and submultiples. Solve series and parallel resistor circuit problems Recall Ohm's /Watt's Law and rearrange to solve circuit problems. Identify input / output devices from circuit symbols. Draw circuit symbols. Describe the purpose, function, and application of selected devices.	R048/R049 Students will draw and simulate circuits and test (virtually and physically) which includes interpreting electrical parameters, series and parallel circuits Students will use input and output devices in circuits and programmable systems.	At this stage, with all the content covered for the Principles part of the curriculum, this now starts to consolidate and revisit content from Y10.	These were / should have been addressed in Year 10 - but may still persist if home study tasks have not been fully completed. Students do not know what the difference is between potential difference and electromotice force. Confusion over current and voltage. Why are Ohm's Law letters not V, C & R?	KS3 science - mainly - voltage and current in KS3 circuits	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Additional practice questions and sample Unit 4 Principles of Electronic and Electrical Engineering questions (A level)		Electricity is essential in modern society and underpin all human activity, and that electrical and electronic engineers are essential to infrastructure, energy systems and domestic and industrial power supply.	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg

Unit R048 - Making and testing electronic circuits.									Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.			https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R049 - Developing Programmable Systems	Programmng a system.(NEA assessment-working on R049)	Programming a system and simulation, practical download: learners will use programming commands to write and test simple programs, including simulation (including analogue to digital sensing and conversion) and building on this to create more complex programs. .	R047 -Students will learn about the advantages and disadvantages of programmable devices and types of programming languages.	**Based on progress in the previous half term, learners should be confident engaging with a range of programming and simulating tasks. Based on both supplied programming exercses and on-screen simulation, learners will be equipped to effectively engage with R049.**	Coding syntax is impossible to understand; coding language is impossible to learn; coding language can only be used by people who already know how to code. ' I cannot learn how to code'	Scratch and Python coding languages are used in KS3 - students will have experience of both (block based and text based)	Direct links with computer science - programming unit. With engineering, relates to controlling mechanical, hydraulic, pneumatic systems.	Arduino and raspberry pi - both are examplels of platfoms using text based editors - micro-py can be used on MCU boards compatible with arduino - use a library to code some addressable LED;s Arkwright Scholarship candidates invited to apply and complete the application forms.		Linking to IoT, Alexa, Bridge - various home automation systems are now in use. Many home devices are examples of **embedded** tech - link with Computer Science.	Osprey Plastics / Northern Powergrid / Schneider / DSE	Types of Electrical Engineering and Careers - Glassdoor Career Guides
IS	Completing a set of exam board questions - organised by topic for R047 Principles exam. This is deliberate practice, with access to the marksheme. Learners complete the paper and then use green pen to mark in any parts that are not known.	Subject - Tier 3 terminology, practising specific mathematical skills (Ohm's, Power, Resistors in series parallel) Generic - reading the paper, having a space to wrk, making time to plan for success, highlighting command words, using R/A/G analysis with questions	Maths - (1) using a scientific calculator, (2) using standard form (3 understanding multiples and sub multiples Science/ Physics - (1) circuit diagram symbols,(2) links to 3 term equations (distance speed time mass volume density) and how to re-arrange for the identified quantity. (3) periodic table of elements-conducting and insulating (4) drawing scematic diagrams / understanding them	This builds on the Do it now work (DIN) from Year 10, learners are familiar with exam language and layout and year 11 is used for deliberate practice and extended retrieval to check the embedded nature of some of the theory work.	1- that the exam paper is a test - it is not - it is deliberate practice. 2 - that the marks are used to quantify knowledge - they are not - it is part of getting into a successful routine 3 that this is not important - it is - a vital part of exam preparation is small, regualr retrieval practice and spaced learning.	New subject, but links to some science and maths at KS3 - symbols, calulations.	1- maths - using Ohm's Law links to advanced versions measuring AC quantities such as Reactance and Impedance. Standard Form is heavily used at KS5. Linking to materials science / chemistry with periodic tabel ref to silicon and germanium, as well as doping with impurities to change properties.	This is implicit in the task. High prior attainers will increasingly be able to get a high proportion of the marks. The opportunity for these students once they are onsistently attaining above 80% (D2*) is to see some Unit 4 Principles of Electrical and Electronics papers or some Unit 5 work. Given the breadth ofthe new specification, it is not likely that high prior attainment learners will reach this benchmark until later in Year 11.		Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	Not applicable./ see opprtunities within untis.	

Spring 2	**Key knowledge/content to learn and retain**	**Essential skills to acquire (Subject and generic)**	**Link to other units / subjects**	**Why this task now**	**Anticipated misconceptions**	**Links to KS3**	**Links to KS5**	**Opportunity for stretch for high prior attainers**	**SMSC & British Values**	**Cultural Capital / Big Picture**	**Visit / talk opportunities**	**Career links**

Unit R047 - Principles of Electronic and Programmable Systems	Electronic Components (revisited) and Examination Revision - revising all the topic areas Process devices, and topc area 3 - prototyping, stripboard breradboard, PCB's and testing circuits. Topic area 4 - commercial PCB production.	Identify selected process devices from description. Describe purpose, function, and typical application of selected process devices. Circuit diagrams or schematics are NOT required. Recall methods for testing circuits including the process for safe use of selected test equipment, advantage, and disadvantage of each. Recall methods for commercial PCB production, including reasons for use and advantages and disadvantages of each method.	Revision of TA3,4,5	Revisiting earlier content - revision	recapping content - to work with misconceptions as they arise - sometimes when carrying out revision tasks it is when answers are given that these become apparent. Earlier misconceptions should have been addresses - at this stage, links ot Science and maths can reinfoce good practice and coherent understanding within the engineering / maths / physics / computer science range of subjects.	KS3 science - mainly - voltage and current in KS3 circuits	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Additional practice questions and sample Unit 4 Principles of Electronic and Electrical Engineering questions (A level)	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	DSE / NPg using testing equipment and CAD schematics - e.g local power networks.	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.												https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R049 - Developing Programmable Systems	Programming a system. Testing a system.- Safely test and evaluate programmable systems	Produce a test plan to test programmable system visually and functionally. Perform visual inspection of a programmable system setupPerform testing to ensure correct download of software to a programmable system. Perform testing to ensure correct download of software to a programmable system. Perform functional testing of a programmable system, evaluating testing and suggesting improvements.	R047: Students will learn about physical test equipment R048: Students will undertake visual and physical testing of circuits	Once the program has been extensively simulated, the program needs to be tested on the actual board and evaluated with a test plan.	Once made, the code cannot be cahnged or modified once downloaded.	Scratch and Python coding languages are used in KS3 - students will have experience of both (block based and text based)	Direct links with computer science - programming unit. With engineering, relates to controlling mechanical, hydraulic, pneumatic systems.	Arduino and raspberry pi - both are examplels of platfoms using text based editors - micro-py can be used on MCU boards compatible with arduino - use a library to code some addressable LED;s Arkwright Scholarship candidates invited to apply and complete the application forms.			Osprey Plastics / Northern Powergrid / Schneider / DSE	Types of Electrical Engineering and Careers - Glassdoor Career Guides

IS	Completing a set of exam board questions - organised by topic for R047 Principles exam. This is deliberate practice, with access to the marksheme. Learners complete the paper and then use green pen to mark in any parts that are not known.	Subject - Tier 3 terminology, practising specific mathematical skills (Ohm's, Power, Resistors in series parallel) Generic - reading the paper, having a space to wrk, making time to plan for success, highlighting command words, using R/A/G analysis with questions	Maths - (1) using a scientific calculator, (2) using standard form (3 understanding multiples and sub multiples Science/ Physics - (1) circuit diagram symbols,(2) links to 3 term equations (distance speed time mass volume density) and how to re-arrange for the identified quantity. (3) periodic table of elements- conducting and insulating (4) drawing scematic diagrams / understanding them	This builds on the Do it now work (DIN) from Year 10, learners are familiar with exam language and layout and year 11 is used for deliberate practice and extended retrieval to check the embedded nature of some of the theory work.	1- that the exam paper is a test - it is not - it is deliberate practice. 2 - that the marks are used to quantify knowledge - they are not - it is part of getting into a successful routine 3 that this is not important - it is - a vital part of exam preparation is small, regualr retrieval practice and spaced learning.	New subject, but links to some science and maths at KS3 - symbols, calulations.	1- maths - using Ohm's Law links to advanced versions measuring AC quantities such as Reactance and Impedance. Standard Form is heavily used at KS5. Linking to materials science / chemistry with periodic tabel ref to silicon and germanium, as well as doping with impurities to change properties.	This is implicit in the task. High prior attainers will increasingly be able to get a high proportion of the marks. The opportunity for these students once they are onsistently attaining above 80% (D2*) is to see some Unit 4 Principles of Electrical and Electronics papers or some Unit 5 work. Given the breadth ofthe new specification, it is not likely that high prior attainment learners will reach this benchmark until later in Year 11.		Linking with examination success -career and future planning - self-management of home study tasks.	Not applicable./ see opprtunities within untis.	

Summer 1	**Key knowledge/content to learn and retain**	**Essential skills to acquire (Subject and generic)**	**Link to other units / subjects**	**Why this task now**	**Anticipated misconceptions**	**Links to KS3**	**Links to KS5**	**Opportunity for stretch for high prior attainers**	**SMSC & British Values**	**Cultural Capital / Big Picture**	**Visit / talk opportunities**	**Career links**
Unit R047 - Principles of Electronic and Programmable Systems	Revision of topic areas RO47 Examination - TA4, TA2, TA2, TA1, TA1	TA4 - Recall PCB types, characteristics, and typical applications. Recall methods for placing and soldering components to PCBs. Recall the advantages and disadvantages of using programmable systems.TA2 - Recall the characteristics and typical applications of microcontrollers and PLCs. TA2- Recall the use of different methods for programming systems including their advantages, disadvantages, and relative merits for specific applications TA1- Recall circuit parameters, multiples, and submultiples, and solve problems for series and parallel circuits.	Exam preparation / revision	Exam preparation / revision - preparation for terminal examination.	recapping content - to work with misconceptions as they arise - sometimes when carrying out revision tasks it is when answers are given that these become apparent. Earlier misconceptions should have been addresses - at this stage, links ot Science and maths can reinfoce good practice and coherent understanding within the engineering / maths / physics / computer science range of subjects.	KS3 science - mainly - voltage and current in KS3 circuits	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Additional practice questions and sample Unit 4 Principles of Electronic and Electrical Engineering questions (A level)	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing ourown.	Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	N/A - examination season	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
Unit R048 - Making and testing electronic circuits.												
Unit R049 - Developing Programmable Systems	NEA submission. Continue with R047 revision.	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems		Unit R047 - Principles of Electronic and Programmable Systems	N/A - examination season	https://youtu.be/M6oXZUtyCJ4

6pm

IS	Summer Term - full paper examples - either 1 hour by Topic Area (4 topic areas) or full paper examples. Deliberate practice, with access to the marksheme. Complete the paper and then use green pen to mark in any parts that are not known.	Weekly and monthly review / examples of past paper practice.	links with R048, R049, all the prior IS tasks from Autumn and Spring terms.	Deliberate practice and extended retrieval practice. At this stage of the course, learners are expected to be able to complete a RAG analysis, stick to timings and answer most of the specimen questions with a greater level of confidence.	At this stage there should not be any misconceptions about expectations for the R047 paper.	Prior learning - relates ot science and maths and aspects of DT.	Strong links to electronic and electrical pathways at KS5- Cambridge Technicals.	Students consistently attaining above 80% (D2*) can see and try some Unit 4 Principles of Electrical and Electronics paper. At this stage, this will be useful for learners considering maths, physics and engineering at KS5.		Linking with examination success -career and future planning - self-management of home study tasks.	Not applicable./ see opprtunities within untis.	

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Unit R047 - Principles of Electronic and Programmable Systems	Exam revision	Analyse and practise exam style questions. Be able to provide responses to a selection of different types of exam question.	Exam revision / preparation	Exam revision / preparation	Exam revision / preparation	KS3 science - mainly - voltage and current in KS3 circuits	Strong links to Unit 4, 5, 6,7,8 in Cambridge Technicals - with electronic principles, electronic and electrical design, circuit simulation and manufacture.	Additional practice questions and sample Unit 4 Principles of Electronic and Electrical Engineering questions (A level)	Rule of Law - Health and safety at work act; the need for rules to make a happy, safe and secure environment to learn. Mutual respect and tolerance - promoting the understanding that we all don't share the same beliefs and values; respecting the values, ideas and beliefs of others whilst not imposing our own.	Electricity is essential in modern society and the infrastructure - energy systems and domestic and industrial power supply - and this is provided by the electrical and electronic engineers in the UK.	N/A - examination season	https://www.findmypathway.com/wp-content/uploads/2018/06/Engineering-Pathway-1.svg
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Unit R049 - Developing Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems	Unit R047 - Principles of Electronic and Programmable Systems		Unit R047 - Principles of Electronic and Programmable Systems	N/A - examination season	Types of Electrical Engineering and Careers - Glassdoor Career Guides
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