**3 Year Plan Smart Product Design and Manufacture (Technical Award)**

**Year 9**

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| **Term 1**  Smart Electronics  Concept design  Smart Electronics | Assessment Research , Design, Smart Materials |
| **Term 2**  Design development and modelling and use of CAD/CAM  Manufacturing 3d printing  Smart Electronics – Unit 3 | CAD Design  Manufacture  Unit 3 1.1, 1.2, 1.3. |
| **Term 3**  Smart Electronics – Unit 3  Designing Unit 1 | Unit 3 - 1.4, 2.1, 2.2, 2.3, 2.4.  Unit 1 – 1.1, 1.2, 1.3 |

**Year 10**

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| **Term 4**  Unit 1 – Designing unit 1  Smart Electronics | Unit 1 – 2.1, 2.2, 2.3.  Unit 3 – 3.2, 3.3, 3.4, 3.5 |
| **Term 5**  Manufacturing – Planning and Making | Unit 2 – 1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, |
| **Term 6**  Unit 2 – Manufacturing evaluation and presentation. | Unit 2 – 2.5, 2.6, 3.1, 3.2, 3.3, 3.4 & 3.5. |

**Year 11**

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| **Term 7 –**  **Unit 2 – Manufacturing**  **Revision practice** | Assessment – Online exam |
| **Term 8**  **Exam - Revision** | Assessment – Online exam |
| **Term 3** |  |

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| Term 1 | | |
| Smart Electronics  Concept design | 1. **Introduction** into the course Smart Product Design and Manufacture (SPDM).  Look at the design brief for  ‘A device for encouraging children to brush their teeth’.  **(1 lesson)**  **Look at the video clip on ‘The Big Life fix’ with Simon Reeves.**  **https://www.youtube.com/watch?v=munVsXsqqSc&t=276s** | 2. **Mind Mapping**  Introduce mind maps as tool to explore different aspects of a project brief, from the form to function, aesthetic to technical.  Create initial set of mind maps in response to the brief scenario, in peer groups or individually identify opportunities for product ideas/solutions  Present initial ideas to the group, receive feedback.  **(2 lessons) – Assessment Mind Maps** |
| **Research** – Using the mind maps students are to create a research plan to explain what they are going to investigate and why. This should include a range of different subjects (materials, sizes, construction, etc), identify the user/target market and complete a survey from that target market**. (3 lessons)**  **Assessment – Research** | **Smart Electronics** introduction  Students are to look at using and understanding simple control electronics using the Crumble device.  They should show understanding of digital and analogue inputs, outputs such as motors, LEDs and Buzzers. Use the Crumble device and programming software to produce a smart product design. **(10 lessons)**  **Assessment – Practical set up of the Crumble device to show control of LED and Motor using Digital and Analogue INPUTs.** | **Constraints**  Students are to analyse their investigation and task and create some design constraints. (design Specification).  **(2 lessons)**  **Assessment – Design Specification** |
| **Initial designs** – Student are to create initial ideas using the information gathered from the task and investigation. Sketching should start by using simple 2d shapes to form a range of design shapes to be used for products.  Students can follow the Designing topic 2 on the VLE. This will get them to practice drawing the given products (kettle) and then they can try their own designs for the task. This will lead them from 2d to 3d sketching.  **(5 lessons)**  **Assessment – Initial ideas sheet.** | **Creative design** using SCAMPER  Students are to complete the SCAMPER activity to look at how they can be creative. Follow the ‘youtube’ example for smarties. They should then present these in an organised A3 sheet with a heading and border.  **(3 lessons).**  **No Assessment** | **Final Designs**  Look at rendering and use of Colour and detail to make designs presentable to a potential client.  **(4 lessons)**  **Assessment – Final idea drawing in 3D.** |
| **Smart Electronics – Incorporating Smart electronics into the design.**   * Student need to write a program in the Crumble software to control the physical Crumble circuit to suit their Smart product design. **(4 Lessons)**   **Assessment – Crumble program and crumble set up.** |  |  |
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| Term 2 | | |
| **CAD – Solid works**  Students are to design their product using the software Solidworks. They need to look at the ‘Extrude’ and ‘revolve’ tools to create 3d shapes. Students are to then use these tools to design their product**.**  They need to produce a presentation drawing, sectional drawing and an Orthographic drawing**.**  **(5 lessons).**  **Assessment – Presentation, Section and Orthographic drawing.** | **CAM – 3d Printing**  Students are to export their designs and set up the 3d printer to create a model of the design for presentation purposes.  **(2 Lesson)**  **Assessment – 3d Printed model** | **Presentation of work.**  Students are to present their work to a potential customer/ client/Company. For this they need to produce display materials:-  A3 sheet showing the development of the product  A3 sheet showing a presentation image of the product.  A 3d model of the product.  A verbal or visual presentation to the judges/client/customer.  **(3 lessons)**  **Assessment - Presentation** |
| **Evaluation**  Students are to reflect on the feedback given and produce an evaluation explaining their design.  Testing against original specification, 3rd part opinion and modifications.  **(2 lessons)**  **Assessment - Evaluation** | **Introduction to the Arduino. Look at components used.**  **Use the VLE Unit 3 topic 1.**  **Write out at least 5 different components used in circuits.**  **(1 Lesson)**  **(HWK – Find out about (in detail) LED. What are they? Are there different types, what is the circuit symbol? What colours are they available in? How much do they cost? Find out something else about them.** | **Simple circuits**  Students are to learn how to build simple circuits. Look at Series and Parallel circuits. What is the difference?  Complete the LED torch section of the VLE topic 1.  **(lessons 4)**  **Assessment 1.2 Unit 3** |
| **Resistors and Ohms law**  Students are to understand what resistors are and how to measure their value.  They should also look at Ohms law. Complete the activities from the electronics booklets. This looks at resistor value and the formula for ohms law.  **(2 lessons)**  **Assessment 1.1 Unit 3** | **Digital Output – The Arduino torch.**  Students are to learn how to link a circuit to the Arduino and then use the software to control the circuit. Use the Blink program.  Control one LED blinking. Speed up and slow down. Look at persistence of vision. Ask why this is important.  Using this theory to create a bright and dim light.  Use the VLE and followU3 topic 2 section.  Discuss trouble shooting.  Use the blink program to amend the program code to create more than one LED lighting in a sequence.  **(Lessons 4)**  **Assessment – Practical work** | **Digital Input – Button**  Students are to complete the U3 Topic 3 section on Button Switch.  **(2 lessons)**  **Assessment – Practical work** |
| **Analogue Inputs**  Students are to complete the Potentiometer and Photocell activities on Topic 4.  Explain the use of ‘If’ statements and ‘Else in the code and how logic is used to determine the output and control the circuit.  **(4 lessons)**  **Assessment – 2.4 unit 3** |  |  |
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| Term 3 |  |  |
| **Analogue to Digital**  Students are to understand the difference between analogue and Digital. Students are to go through the two PDF handouts and complete the activities for this section. Look at Scaletrix and how the controllers work. Use a digital and analogue controller. Discuss with the class the difference. Use the clock to discuss the difference and accuracy of each type. Look at bits and sample sizes.  Students are to complete the PWM tasks on the VLE  **(8 lessons)**  **Assessment 1.4 Unit 3** | **Buttons and Switches**  Students are to look in detail at different type of switches and button. This information will be used in the coursework under unit 2.1  **(1 lesson)** | **Logic Gates**  Students will learn about Logic gates. What they are? And how they are used? They will look at the different types and complete the truth table for each type.  **(2 lessons)**  **Assessment 2.1 Unit 3** |
| **Using Binary to control a display.**  Complete the 8x8 LED matrix task on the VLE. Students will create their own image and then animate it using the Arduino program code.  **(5 lessons)**  **Assessment 2.2 Unit 3** | **Trouble shooting**  Students will look at how to troubleshoot when their Arduino and program does not work.  **(1 lesson)**  **Assessment 2.3 Unit 3** | **Design project Task – Smart lighting.**  Students are to look at the different tasks for the project of Smart lighting. They need to produce a Mind Map for the project brief. They then need to produce a second Mind map for their chosen task (options 1 – 3).  To be used in U1 1.1  Students should analyse the design task and create a design brief statement. This should highlight the key things they are going to design and make. It should also include a plan of research. Making sure everything they intend to investigate is relevant.  **(3 lessons)**  **Assessment 2.1 Unit 1** |
| **Moodboard**  Student are to create a moodboard to reflect images that relate to their project task. These need to include annotation to explain why they have been used (eg, texture, colour, shape, etc)  **(1 lesson)**  **To be used in U1 1.1** | **Target Market**  Students are to identify the target market/ user / client. This needs to be clearly written out and a profile created. Students are then to create a survey with questions to help them design their product.  **(1 lesson)**  HWK –To complete the surveys. Ask the target market.  **To be used in U1 1.1** | **Research**  Students are to use the previous work from Mind Mapping and user profiling to plan for some research and investigate it. Each piece of research needs to be evidenced. This should be a mixture of primary and secondary research. Eg, surveys, looking at existing products, looking at types of materials, looking at user sizes, costs, etc.  **(3 lessons)**  **To be used in U1 1.1**  **Assessment 1.1 and 2.2 Unit 1** |
| **Analysis of research and Design Specification**  Students are to look at their research and analyse what are the key things they have found out. (These must be relevant to the project).  Students are now to make a list of contraints or requirements for the design. This is called a Design Specification.  **(2 lessons)**  **Assessment 1.2 Unit 1** | **Initial ideas**  Students are to create a range of initial sketches to suit the design task. They should aim at being creative. Use of activities such as SCAMPER is ideal for this.  Use the VLE unit 1 section topic 2 (sketching) to support this work.  **(4 lessons)**  **Assessment 1.2 Unit 1** | **Consider commercial sustainability of a product or solution.**  Cost of materials, cost of manufacture, cost of distribution and advertising. Environmental issues such as disposal and energy generation in the manufacturing process, health and safety, intellectual property.  **(2 lessons)**  **Assessment 1.3 Unit 1** |
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| Term 4 (Sept-Dec year 10) | | |
| Smart Electronics  Students are to complete the section 3.2-3.4 of the Unit 3 coursework.  For this students have to explain the smart system in their lighting project and then build a physical circuit to show it working.  Students are to explain how the smart electronics enhance the product to improve the users experience.  **(4 lessons)**  **Assessment 3.2, 3.3 and 3.4 Unit 3** | **Development sketches**  Students are to develop an idea as a solution to the project task. They need to show this in 2 and 3d formats.  They should also consider creating 3d models or prototypes. These need to be evidenced.  **(6 lessons)**  **Assessment 2.3 Unit 1** | **CAD**  Students are to develop their design using Solid works (3d CAD software)  They are to create a 3d representation of their design. This can be used to create a 3d model and consider texture, size, shape, function, materials.  Students should present their work to show different views, details, materials, etc.  **(lessons 8)**  **Assessment 2.3, 2.4 and 2.5 Unit 1** |
| **CAD and Rapid prototyping.**  Students are to further develop their design using Solid works (3d CAD software)  They are to create realistic 3d representation of their design. Consider materials and texture. Student should look to creating a model using 3d printing. This can be to scale but must be a realistic prototype that represents the actual final design.  **(lessons 8)**  **Assessment 2.3, 2.4 and 2.5 Unit 1** | **Presenting and marketing**  Students are to use the work they have completed to pitch their idea to a potential customer/user/buyer.  They must consider resources that can be used in a visual way in a presentation.  Look at display posters, stands, 3d models, information sheets to explain the product. Verbal/ visual presentation.  **(Lessons 4)**  **Assessment 3.1, 3.2 and 3.3.** | **Evaluation of presentation and product and Modification.**  Students are to complete an analysis of the feedback they have received from the presentation.  They must use this information to suggest possible improvements and modifications.  **(Lessons 4)**  **Assessment 3.4 and 3.5 Unit 1.** |
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| Term 5 (Jan-Mar year 10) | | |
| **QA & QC**  Produce a plan of manufacture using a flow chart. This should include decisions to check quality.  **(Lessons 3)**  **Assessment 1.1** | **Working drawings** – Students are to produce a working drawing that includes all the correct dimensions in MM. The drawing can be done to scale. This must be labelled correctly in line with British Standards. Students should use SolidWorks to help produce this drawing.  **(Lessons 4)**  **Assessment 1.2** | **Exploded drawing**  Students are to use their designs in SolidWorks to complete an Exploded drawing. This can only be done if they have made the product using components.  **(Lessons 1)**  **Assessment 1.3** |
| **Adjustments and Modification**  Students are to explain what adjustment or modifications are needed to manufacture their product. These need to be written out and explained.  **(Lessons 2)**  **Assessment 1.4** | **Manufacturing Specification**  Students are to create a table or list of all the materials, equipment and tools they require. Everything they need to make it should be listed.  **(Lessons 2)**  **Assessment 2.1, 2.2** | **Making Process**  Students are to produce a step by step process of their making. This should be done using sketches and notes to explain each stage.  **(Lessons 4)**  **Assessment 2.2** |
| Accuracy and Health and Safety  Students are to evidence how they have considered Tolerance/Accuracy/precision and Health & Safety when manufacturing.  **(Lessons 3)**  **Assessment 2.3** | Manufacturing Log  Students are to evidence using photos and notes each stage of the manufacturing process.  **(Lessons 10)**  **Assessment 2.4** |  |

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| Term 6 (Apr-Jul year 10) | | |
| **Assembling and Finishing**  In this section students are to explain how they have assembled (put together) their product and what finishing techniques they have used.  **(Lessons 5)**  **Assessment 2.5** | **Evaluation**  In this section students will need to complete an evaluation of their completed product. They should focus on these areas:-  Testing against the design specification, 3rd party opinion/feedback and modification/improvements.  **(Lessons 6)**  **Assessment 2.6, 3.2, 3.4 & 3.5** | **Presentation of the making.**  Students need to present their work to a potential client, user or buyer. To do this they should produce a set of presentation images to help explain the product visually. A prototype of the product needs to be shown. They also need to complete a verbal presentation.  **(Lessons 10)**  **Assessment 3.1 & 3.3** |
| **Reflection**  Students are to use the feedback from the presentation to reflect on what they feel needs to be changed to improve. The main focus of this will be the feedback from, the presentation.  This should be written up as an analysis.  **(Lessons 1)**  **Assessment 2.6,** | **Modifications**  Students are to complete the modifications.  **(Lessons 2)**  **Assessment 2.6,** | 24 lessons |
| Students are to complete any sections that are not completed to a pass standard. | **Revision**  Students are to complete the Pop Quizes on the computer VLE.  **(4 lessons)**  **Assessment – VLE score** |  |
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| **Year 11 – Term 7** |  |  |
| Students are to revisit unit 1 on the VLE. Prepare for the exam | Students are to revisit unit 2 on VLE. Prepare for the exam | Students are to revisit unit 3 on VLE. Prepare for the exam |
| Students are to complete the Mock exam paper online | Students are to complete the actual exam paper. | Students who need to complete resits must go through all units 1, 2 and 3. They must complete the pop quizzes and Past paper examples. Once ready a resit will need to be booked. |
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