

Department Title: Design & Technology

Exam Boards: Edexcel & Wjec

Department Vision:

We are focused on engaging our students to develop a high level of understanding of technical processes, material properties and health and safety in order to design products that meet user needs for the future. In year seven to nine students concentrate on skills building and theory learnt through creative practical projects.

Projects focuses on the following skills: Investigation, Design, Make, Evaluate, Mathematics & Scientific skills knowledge and understanding, including computer aided design and manufacture. The department specialises in Electronics, Product Design and Graphics and prides its self on state of the art facilities – like the Hub that students can use outside of lessons to build independent learning through the use IT and 2D/3D prototyping. The ethos of the department is to inspire and nurture creativity to problem solve real life challenges required for GCSE and A level which in turn will open the door to opportunity into the design industry.

Future products need to incorporate cleaner design and preserve the sustainable resources of the planet and protect the environment.

All students will follow a curriculum consisting of two lessons per week for eleven weeks for each one of the nine projects compete through the three year KS3 leaning with the option to take a two year GCSE / A level.

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Year 7-8: Graphics: Popup Book 1

A5 Popup book hand made with bespoke mechanism fully rendered designs created to build leaning and understanding of graphics visual communication .

Investigate: ICT research inspiration focused on target market theme

Design: Storyboard, plan and create typography

Make: Four page mechanical popup book including Front & back cover

Evaluate: Final product

Drawing skills, knowledge & understanding: paper engendering, Adhesives, shaping and modelling working mechanisms, risk assessment cutting tools.

HW: Inspiration, Front Cover, Production Diary, Advantages & Disadvantages, Back Cover, Revision

Year 8-9: Graphics: Action Figure Packaging 1

Blister packed packaging project aims at develop designs skill in C.A.D & graphic understating of packaging manufacture & materials.

Investigate: investigation historical and existing products

Design: A mini action figure in line with specification & target Market including C.A.D packaging.

Make: Prototype Modelling clay figure to scaled temple, Blister packing through use of Photoshop and traditional modelling

Evaluate: Final product

Maths skills measurements, knowledge & understanding: C.A.D software 2D design and Photoshop, circuit testing, risk assessment traditional cutting tools.

HW: Figure Design, Packaging Symbols, Vacuum forming, Packaging. Revision

Assessment style: Homework grades, final product quality and end of unit test.

Year 7-8: Electronics: Message board

Students drill, solder and test a two transistor flashing light circuit mounted on a student designed and manufactured acrylic laser cut case.

Investigate: Voltage, current and resistance, series & parallel circuits, circuit simulation, soldering, electronic components.

Design: Acrylic laser cut case using computer aided design.

Make: Drill circuit board, solder components, line bend case, assemble and test.

Evaluate: Final product.

HW: Drilling risk assessment (RA) + example, Ohm's law calculations, soldering RA + example, research on transistors, LEDs & capacitors, input process output, line bending, production diary, revision for test.

Maths skills, knowledge & understanding: Ohm's law, soldering and drilling safely, circuit testing, computer aided manufacturing, risk assessment.

Assessment style: Homework grades, final product quality and end of unit test.

Year 8-9: Electronics: Phone stand

Students drill, solder and test a light sensitive flashing light circuit mounted on a student designed and manufactured two part acrylic laser cut case.

Investigate: Voltage, current and resistance, resistive sensors, circuit simulation, soldering, electronic components, power generation.

Design: Acrylic laser cut case using computer aided design.

Make: Drill circuit board, solder components, line bend case, assemble and test.

Evaluate: Final product.

HW: Ohm's law revision, potential dividers, resistive sensors, soldering leaflet, transistors, circuit analysis, production diary, renewable power research, test revision.

Maths skills, knowledge & understanding: Ohm's law, soldering and drilling safely, circuit testing, computer aided manufacturing, risk assessment.

Assessment style: Homework grades, final product quality and end of unit test.

Year 7-8: Bottle Opener Engineering Materials

The Bottle Opener project is designed to build your knowledge of production when working with engineering materials (metal). The project introduces different skills sets that are required in the real world, when working with mild steel. The project will only cover the Tools and Equipment, Technical Knowledge and the Skills in the Manufacture of the bottle opener. To complement this project students will also understand and apply a Risk Assessment and produce a concise production schedule. The project will only focus on the

Make: Competent and skilled use of Hand tools, Working with Metal and Composites, Marking out, Cutting, Cutting internal Thread [Tap and Tap Wrench] External thread [Die and Die holder] Set up and use of Pillar drill, Set up and use of Brazing hearth, Finishing Techniques [Dip coating]. Detailed Risk Assessments on Hand Tools and Machinery

Evaluate: Testing Product, Evaluation against the specification, User Evaluation, Modifications and Improvements, Assessment Mathematical Skills/Knowledge and Understanding

Writing a Specification, Tools, Techniques and Materials– Accuracy

HW : Identification of a Need, Writing a design Brief, Design Specification, Materials Investigation, Tools Risk assessment, Machines Risk assessment, Production Diary

Year 8-9: Mini-Grabber Product Design

The Grabber/ Litter picker project is designed to build your knowledge of production when working with MDF/Plywood and Mild steel. The project introduces you to mechanisms, different skills sets that are required in the real world when working with manufactured boards. The project will focus on the design and manufacture of the litter picker in line with design and Technology for KS3

Investigate: Mood Board, Ergonomics, Anthropometrics , Mechanisms [Levers and linkages] Materials [Manufacture Boards and Aluminium]

Design: Design Brief, Specification with a emphasis on FORM and FUNCTION, CAD design [2D design]

Make: CNC CAM [Laser cutter] Sublimation Printing, Heat press Hand Tools, Pillar Drill, Fret saw, Risk Assessments, Finishing Techniques , Components

Evaluate: Testing Product , Evaluation against the specification, User Evaluation, Modifications and Improvements, LCA and sustainability, Assessment

Mathematical Skills/Knowledge and Understanding

HW: Investigation and research, Ergonomics and Anthropometrics, Materials, Levers and linkages, Manufacturing Techniques, Tools and Equipment Risk Assessment

Year 7: Computer Aided Design 2D/3D

Learn how to visually communicate drawings on paper and Computer using 2D design Drawing Skills & Traditional drawing Skills

Design: Basic 3D sketching and rendering including isometric

Make: 2D CAD Drawing Butterfly, Floor plan, 3D isometric grid House

Evaluate: Final product

Drawing skills, knowledge & understanding of computer aided design, tools and equipment and working to scale with accurate measurements.

HW: What is CAD, Tools, production diary, Robot Design, Revision

Assessment style: Homework grades, final product quality and end of unit test.

Year 8: Computer Aided Design 3D

Learn how to visually drawings in 3D on paper, computer and rendering

texture & colour to visual communicate ideas.

3D Google Sketchup Modelling Skills & Technical Drawing Skills

Design: freehand sketching, Oblique, isometric, Orthographic

Make: Prototype Car model in 3D and rendered

Evaluate: Final product

Maths skills measurements, knowledge & understanding: C.A.D software 3D Google Sketchup, traditional drawing tools and skills including rendering .

HW: Advantages & Disadvantages, 3D Model, Skills diary, 3D drawing & 2D, Revision

Assessment style: Homework grades, final product quality and end of unit test.

Year 10: Graphics GCSE year 1 –Edexcel Foundation

Term 1:

The new Edexcel GCSE focused on designing a product to meet a real world challenge focused on the user/ clients needs and year 1 is a practice.

1. Induction Graphics: 2D/3D Drawing Skills & Rendering, Logo Design mini practice task to refresh learning levels.

2. Computer Aided Design — 2D Design / Photoshop / google Sketchup

3. Foundation Contextual Challenge project practice: - Mailer /flyer marketing prototype & Portfolio Analyse, Design ideas,

Term 2:

4. Develop & Make Final, Evaluate & knowledge and understanding Computer aided manufacture—update and feedback

Term 3: Revision & prep for Mock Exam

4. Theory Topic for Core Exam paper 20%: Emerging technology's, Smart Materials, Process & Alternatives, paper, polymers, metals, woods, Textiles, Mechanical devices, Electronics systems, design techniques & Context, Environments impact, Calculations, Quality of manufacture and Designers & movements.

Assessment: Homework/ Coursework, End of unit Theory tests, trial exam mock.

HW: Set weekly -Theory task & Foundation Contextual Challenge Project For more info see <https://qualifications.pearson.com/content/dam/pdf/GCSE/design-and-technology/2017/specification-and-sample-assessments/Specification-GCSE-L1-L2-in-Design-and-Technology.pdf>

June Edexcel: Receive contextual challenge from exam board and prepare and select contextual challenge project ready for September.

1. Research : 16 Marks (Primary and Secondary research, User needs, writing a specification). Completed by end of the year.

Year 11: Graphics GCSE year 2 –Edexcel NEA 100 Marks

Term 1:

1. Exam challenge contextual Challenge—controlled assessment for GCSE 50% coursework

Research : 16 Marks (Primary and Secondary research, User needs, writing a specification). (completed in year nine)

Design :42 Marks (Initial ideas, development , modelling techniques, CAD).

Make :36 Marks (Quality manufacture, marking and measuring out, Range of materials and Health and safety).

2. Theory Exam section B paper & Board 30%:

Modifying Products, Working Properties of paper, Origins & Source, Social foot print, environmental factors, Stencils, shaping, cutting methods, treatment and finishing of paper an& board. Mathematics volumes & Tessellation.

(Mock Exam Full paper A Core 20% / B paper & Board 30% = 50%

Public exam 1hr 45 minutes

Term 2:

Evaluate :6 Marks (Testing against a Specification and User Feedback) Final completion of coursework Half term and then send of to Exam board

Revision for all topic for final exam prep.

Term3:

Revision for exam paper and practice exam question techniques Public exam Section A Core & B paper & board 1hr 45 minutes

Assessment: Homework's, Theory unit tests, NEA - coursework marks 50% for GCSE, trial mock, Final GCSE Exam 50%.

HW: Set weekly -Theory task & GCSE Contextual Challenge Project Prep Coursework = Final grade this year equal to = 50% Exam = Core 20% and B section 30% final Grade = 50% = 100% Total

Year 10: Electronics GCSE Year 1

Foundation year. Taught through combination of mini real practical projects, circuit simulation practicals, theory, tests and homework.

Component 1, Discovering Electronics:

1. Electronic systems and sub-systems - how to break down a system into manageable subsystems, the available sub systems for this course.
2. Circuit concepts - electric circuit fundamentals.
3. Resistive components in circuits - sensors and how to use them.
4. Switching circuits - NPN and FET switching.
5. Applications of diodes - diodes, power supplies and zener regulators.
6. Combinational logic systems - binary, truth tables, Boolean logic and two input logic gates.

Component 2, Application of Electronics:

1. Timing circuits - monostables, astables, 555 timer chip.
2. Operational amplifiers - inverting, non inverting and summing amplifiers.

Assessment: Marked homework, End of unit tests, trial exam (end of year test).

For more information see <https://www.eduqas.co.uk/qualifications/electronics/gcse/eduqas-gcse-electronics-spec-from-2017-e-.pdf>

Year 11: Electronics GCSE year 2 NEA

Application year. Taught as year one. Two exams, 90 minutes & 40% each of the overall mark, NEA (coursework) worth 20% of the overall mark.

Component 2 continued

3. Sequential systems - binary, D type flip flops, binary coded decimal and decade counters, sequencers.
4. Interfacing digital to analogue circuits - switch denouncing, analogue to digital using comparators & Schmitt inverters, NPN & FET switching.
5. Control circuits - microcontrollers and programming.

Component 3, Non Examined Assessment (NEA) = coursework

Students design, build, test, evaluate and document an electronic system of their choice. Run during summer term year 1 and autumn term year 2 concurrently with Component 2.

Exam preparation

Assessment: Start of year test, marked homeworks, **NEA (coursework)**, end of unit tests, trial exam, **GCSE exams**.

Year 10: Product Design GCSE year 1 (Foundation year)

This year is a foundation year whereby a mini contextual challenge will take place along with the first theory section of core content.

Term 1:

1. Introduction to Product Design, CAD Laying out a design portfolio.
2. Foundation Contextual Challenge project: - Electronic Lamp Project

- Research : (Primary and Secondary research, User needs, writing a specification). PRODUCT ANALYSIS, CLIENT INTERVIEW
- Design :(Initial ideas, development, modelling techniques, CAD). ISOMETRIC PROJECTION, ORTHOGRAPHICS, RAPID PROTOTYPING

Term 2:

- Make :(Quality manufacture, marking and measuring out, Range of materials and Health and safety). JOINING METHODS, INTRODUCTION TO TOOLS AND MACHINERY
- Evaluate :(Testing against a Specification and User Feedback)

(Analyse, Design, Make, Evaluate & knowledge and understanding) (100 Marks)

(Public Examination (100 Marks) 50/50 NEA to EXAM (Mock)

3. Theory Topic for Core Exam paper 20%: Emerging technology's, Smart Materials, Process & Alternatives, paper, polymers, metals, woods, Textiles, Mechanical devices, Electronics systems, design techniques & Context, Environments impact, Calculations,

Term3:

4. Specialism -Polymers— 30% Theory Paper (Mock)

Introduction to Start of Edexcel GCSE Contextual Challenge

- Research : 16 Marks (Primary and Secondary research, User needs, writing a specification).

Challenge issued in : June

Practice Assessment: Homework/ Coursework, End of unit Theory tests, trial Mock exam.

For more info see <https://qualifications.pearson.com/content/dam/pdf/GCSE/design-and-technology/2017/specification-and-sample-assessments/Specification-GCSE-L1-L2-in-Design-and-Technology.pdf>

Year 11: Product Design GCSE year 2 NEA 100 Marks

Term1:

1. Exam challenge contextual Challenge—NEA (non Examined Assessment)

- Research : 16 Marks (Primary and Secondary research, User needs, writing a specification). (completed in year none)
- Design :42 Marks (Initial ideas, development, modelling techniques, CAD).
- Make :36 Marks (Quality manufacture, marking and measuring out, Range of materials and Health and safety).

Term2:

- Evaluate :6 Marks (Testing against a Specification and User Feedback)
(Analyse, Design, Make, Evaluate & knowledge and understanding) (100 Marks)

Term3:

Revision for exam paper and practice exam question techniques
Public exam Section A Core 20% & B polymers 30% = 50% 1hr 45 minutes

(Public Examination (100 Marks) 50/50 NEA to EXAM

Specialism -Polymers— Sources and Properties, Thermoforming Polymers, and Thermo polymers., the social footprint of polymers, The ecological footprint, Selecting Polymers, properties and Applications for Polymers, impact of Forces and stresses, Manufacturing processes, Scales of production, Fabrication of Polymers 30% Theory Paper.

Assessment: Start of year test, marked homework's, NEA (coursework)(20-30 Pages, trial exam, Mock Exam, GCSE Public Examination

Coursework = 50% of final grade this year

Final Exam = Core 20% and B section 30% final Grade

<p>Year 12: Term 1</p> <p>A level Induction Skills— Year one of the course will introduce and recap on skills already learnt. This will incorporate drawing and design skills, manufacturing skills as well as the impact of materials and the issues related to sustainability on the environment</p> <p>The course enables students the continued opportunity to design and make at an advanced level and prepare them well for higher education. Students following this course will undertake a series of short focused practical tasks and theory activities ;that will allow them to demonstrate their design and creativity skills by producing a resistant materials and graphical product. Tasks will involve Investigation projects, Design and development projects, Manufacturing and Evaluation tasks. All tasks are assessed against the examination board assessment criteria</p> <p>Drawing Skills: Isometric, Orthographic, single and two point perspective, Oblique. CAD</p> <p>Topic 1: Materials</p> <p>Topic 2: Performance characteristics of materials</p> <p>Topic 3: Processes and techniques</p> <p>Assessment</p> <p>Designers and Designs Movements</p> <p>Useful links below:</p> <p>https://designmuseum.org/designers/charles-rennie-mackintosh</p> <p>http://www.raymondloewy.com/</p>	<p>Year 12: Term 2</p> <p>Topic 4: Digital technologies</p> <p>Topic 5: Factors influencing the development of products</p> <p>Past Papers and Revision</p> <p>Product Investigation- PLUG</p> <p>Designing a prototype:</p> <p>Visit to Greenwich Park and Town Centre</p> <p><i>Bike Storage- Investigate, Design, Development and Modelling</i></p> <p>Find out more go to:</p> <p>https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/design-technology-product-design-2017.html</p> <p>Designers and Designs Movements</p> <p>https://designmuseum.org/designers/eileen-gray</p> <p>http://www.scottishschools.info/Websites/SchSecWhitehill/UserFiles/file/Higher%20Art%20Homework/Product%20designer%20PHILIPPE%20STARCK.pdf</p> <p>http://designmuseum.org/designers/ettore-sottsass</p> <p>http://www.core77.com/posts/36776/Marianne-Brandt-Bauhaus-Powerhouse</p>	<p>Year 12: Term 3</p> <p>Topic 6: Effects of technological developments</p> <p>Topic 7: Potential hazards and risk</p> <p>Past Papers and Revision</p> <p>Making a final prototype: Lamp Task</p> <p>Graphical Products/Concept Design—Modelling a Room</p> <p>Introduction to NEA:</p> <p>The independent design and make project enables students to demonstrate their creative and practical in developing a commercially viable product. A design folio and final product would be produced and assessed. This element of the course equates to 50% of the qualification.</p> <p>Students individually and/or in consultation with a client/end user identify a problem and design context.</p> <p>Part 1: Identifying and outlining possibilities for design</p> <p>Identification and investigation of a design possibility, investigation of client/end user needs, wants and values, research and production of a specification</p>
<p>Year 13: Term 1</p> <p>A level NEA Start: all work assessed towards final Mark</p> <p>Non-examined assessment</p> <p>50% of the qualification</p> <p>120 marks</p> <p>Topic 8: Features of manufacturing industries</p> <p>Topic 9: Designing for maintenance and the cleaner environment</p> <p>Part 2: Designing a prototype</p> <p>Design ideas, development of design idea, final design solution, review of development and final design and communication of design ideas</p>	<p>Year 13: Term 2</p> <p>Topic 10: Current legislation</p> <p>Topic 11: Information handling, Modelling and forward planning. Past Papers and Revision</p> <p>Part 3: Making a final prototype</p> <p>Design, manufacture and realisation of a final prototype, including tools and equipment and quality and accuracy</p> <p>Students will incorporate issues related to sustainability and the impact their prototype may have on the environment</p> <p>Students are expected to analyse and evaluate design decisions and outcomes for prototypes/ products made by themselves and others</p> <p>Part 4: Evaluating own design and prototype</p> <p>Testing and evaluation—Final Deadline</p>	<p>Year 13: Term 3</p> <p>Final Preparation for Exam</p> <p>Topic 12: Further processes and techniques.</p> <p>Past Papers and Revision</p> <p>Students are expected to analyse and evaluate of wider issues in design technology, including social, moral, ethical and environmental impacts.</p> <p>Edexcel Product Design:</p> <p>Final Assessment Exam 50% of total Marks</p>
<p>Assessment:</p> <p>Students will be assessed at the end of each topic this will include examination style questions. Students will also be assessed on the Investigate , Design and Manufacture task. Assessment will be linked to the NEA and the Examination Mark Scheme. Design and Make task have a duration of 6-8 weeks and focus on specific areas of the NEA assessment criteria</p>		
<p>Reading list/Useful websites:</p> <p>http://www.technologystudent.com/ https://www.jamesdysonfoundation.co.uk/our-work/engineering-for-schools/rethinking-design-and-technology-in-schools.html</p> <p>http://www.mr-dt.com/ https://www.bbc.com/bitesize/subjects/zvg4d2p</p>		
<p>Related Careers:</p> <ul style="list-style-type: none"> • graphic design / fashion styling / art and design / media / engineering • Photography / construction and building services motor vehicle – technology and repair / product designer 		

Year 12: Electronics A level year 1 Foundation

Term 1

Foundation year. Designed for students with no previous experience of Electronics. Taught through combination of mini real practical projects, circuit simulation practical's, theory, tests and homework.

Please note that the order in which the modules are taught may vary as we fine tune the course.

Core concepts

0 Workshop skills—using breadboards & test equipment

1 System synthesis—breaking circuits down into input, process, output and feedback.

2 DC Electrical circuits—basic circuit theory

3 Input & output subsystems—investigate input sensors and output components available

4 Energy & power - core concepts

Principles of Electronics

2. Logic systems - logic system design: truth tables, Boolean algebra & Karnaugh map simplification, three input logic gates

Mini Project 1

Build, test & evaluation of a digital logic system.

Assessment: Marked homework's, End of unit tests, trial exam (end of year test), three mini projects - analogue systems, digital systems & microcontroller systems.

For more information on this course see https://www.eduqas.co.uk/qualifications/electronics/as-a-level/eduqas-a-level-electronics-spec-from-2017-e.pdf?language_id=1

Term 2

Principles of Electronics continued

1. Semiconductor components - diodes, FETS, NPN transistors.

3. Operational amplifiers - comparators, voltage follower, inverting, non inverting, & summing amplifiers, gain, bandwidth and distortion.

4. Signal conversion - analogue to digital and digital to analogue conversion.

5. AC circuits and passive filters - just that, using capacitors.

6. Communications systems - concept & structure, bandwidth, data rate, gain, noise & distortion.

Mini Project 2

Design, build, test & evaluation of an analogue filter system.

Term3

Principles of Electronics continued

7. Wireless transmission - concepts of AM & FM, systems.

8. Instrumentation systems - using sensors with op amps to measure the physical world.

Application of Electronics

1 Timing circuits - RC timing circuits, switch debouncing, 555 monostable and astable circuits.

2 Sequential logic systems - propagation delay, D type flip flops, binary, binary coded decimal and decade counters, sequencers, synchronous counter systems.

3A Microcontrollers 1 - flowchart programming, applications.

Mini Project 3 Design, build, test & evaluate a microcontroller system.

4 Digital communications - digital to analogue conversion, sampling theory, PCM, PWM, PPM & PAM.

NEA (coursework) start.

End of year test (Component 1 trial exam)

Year 13: Electronics A level year 2 term 1

Application year

Please note that the order in which the modules are taught may vary as we fine tune the course.

Start of year test

5 Optical communication - fibre optic systems.

3B Microcontrollers - assembly language programming and applications

8 Audio systems - multi stage voltage preamps, summing amps (mixers) emitter followers and source followers, push pull power amp stages and active filters.

NEA continuation

Assessment: Marked homeworks, start of year test, end of unit tests, trial exam, two A level exam papers (40% each), NEA (Coursework) 20%.

Year 2 term 2

6 Mains power supply systems - half and full wave rectification, smoothing and voltage regulation.

7 High power switching systems - switching of high current loads using thyristors, diacs, triacs and garden gnomonics.

Revision lessons

NEA finalisation - 20% of final qualification.

Year 2 term 2

6 Mains power supply systems - half and full wave rectification, smoothing and voltage regulation.

7 High power switching systems - switching of high current loads using thyristors, diacs, triacs and garden gnomonics.

Revision lessons

Final exams:

Paper 1, component 1, 2hours 45 minutes, **40% of final qualification.**

Paper 2, Component 2, 2 hours 45 minutes, **40% of final qualification.**

Assessment:

For assessment methods see individual KS descriptions.

Frequency of assessment:

KS3 - written homework every other week, online quiz every other week. End of unit test.

KS4 - written homework (exam style questions or coursework research) every week. End of unit test approximately every six weeks.

KS5 - written homework (exam style questions or coursework research) every week. End of unit test approximately every six weeks.

Reading list/Useful websites:

KS5 The Art of Electronics - third Edition - by Paul Horowitz

Eduqas Online text book <https://resources.eduqas.co.uk/Pages/ResourceSingle.aspx?rliid=937>

KS4/5 Make: Electronics: Learning Through Discovery (Make: Technology on Your Time) by Charles Platt

Eduqas online text book <https://resources.eduqas.co.uk/Pages/ResourceSingle.aspx?rliid=938>

KS3 KS3 Design & Technology Study Guide (CGP KS3 D&T) by CGP Books

Related Careers:

- Acoustic consultant
- Automotive engineer
- Aerospace engineer
- Broadcast engineer
- CAD technician
- Coding
- Computer interfacing
- Control and instrumentation engineer
- Design engineer
- Electrical engineer
- Electronics engineer
- Film special effects
- IT consultant
- Medical engineering
- Network engineer
- Nuclear engineer
- Space/Aeronautical engineering
- Systems analyst