St. Wilfrid's
R.C. College

Technology Curriculum

Excellentia per fidem, per scientiam, per adiuvatum

Excellence through faith, learning and support

Year 7

Pupils will explore the design process through food technology. They will work with a range of ingredients and equipment to produce a range of dishes considering other cultures and individual dietary needs

Students will explore:

- Healthy Eating
- Cook a range of dishes
- Cooking techniques
- Appropriate ingredients
- Taste, smell and texture
- Food Sourcing

Year 8

Pupils will develop their understanding of the design process through the design and manufacture of an electronic product. They will work with resistant materials and hand tools to produce a functional and personalised product.

Students will explore:

- Structural knowledge – shape and form
- Material and Component Properties – timbers and polymers
- Manufacturing Processes – vacuum forming, laser cutting and hand tools
- Power Sources

Year 9

Pupils will consolidate their knowledge of the design process through engineering and computer aided drawing. They will work with engineering materials and equipment to produce an inclusive design and user centred product.

Students will explore:

- Structural knowledge – strength and durability
- Material and Component Properties – ferrous and non-ferrous metals
- Manufacturing Processes – heat treatment and engineering hand tools
- Design Communication and realisation

Year 10 DT

Pupils will broaden their awareness of new technologies, sustainability and user centred design through a mini NEA project and investigate a wider range of material properties and manufacturing processes in a real work shop environment.

Students will explore:

- New and emerging technologies
- Energy generation and storage
- Materials and their working properties
- Selection of materials and components
- Ecological issues in the design and manufacture of products.
- Developments in new materials

Year 11 DT

Pupils will action their learning from Y10 by choosing a live task to carry out for their NEA project. They will independently develop design solutions and manufacture prototypes to solve a design challenge whilst reinforcing their transferrable skills and knowledge of products for the examination.

Students will explore:

- Systems approach to designing
- Mechanical devices
- Specialist techniques and processes
- A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as appropriate to the materials and/or components being used.

Year 10 Engineering

Pupils will gain understanding of engineering sectors, products and organisations, and how they interrelate. They will explore materials, components and processes and carry out processes to meet the needs of an engineering brief, exploring engineering skills through the design process.

Students will:

- Explore the interconnections between engineering sectors, organisations and job roles.
- Investigate the materials, components and processes used in the production of engineered products.
- Develop an understanding of practical procedures and explore how to record, collect and interpret data in an engineering context.

Year 11 Engineering

Through practical activity pupils will investigate engineered products and provide a design solution for an engineered product considering the requirements of an engineering brief. They will then Plan the manufacture of and safely reproduce, inspect and test a given engineered component.

Students will:

- Develop an understanding of how to interpret a brief and explore design ideas, including their viability as a final solution.
- Analyse information in an engineering context and explore how to select a suitable solution and implement it to meet the brief.
- Reproduce a component from the previously dismantled product using the same materials and making processes.

Year 12 Engineering

Students will explore manufacturing processes and materials considering the impact of design choices on the outcomes produced and the systems required to manufacture effectively and efficiently.

Students will:

- Review the design process analyzing existing products and identifying design developments and improvements which can be made.
- Explore the mathematic and physics principles underpinning engineering decisions
- Secure and complete work experience placements, planning their own goals for personal development.
- Gain confidence with practical manufacturing skills and use these to manufacture given products to meet set tolerances and deadlines.

Year 13 Engineering

Students will use their knowledge and skills from year 12 and apply these to the design and manufacture of a range of products ensuring they meet specific design and quality criteria.

Students will:

- Use their awareness of the product design cycle to produce enhanced designs for given products
- Employ the mathematic and physics principles underpinning engineering decisions to problem solve and generate effective engineering solutions.
- Review their work experience placements, evaluating their successes and areas for improvement in the future.
- Utilise their manufacturing skills to manage a group project independently, generating a batch of effective outcomes.

Learning journey

Why this? Why now?

The journey from Key Stage 2 to 5 in Technology is carefully mapped to provide new knowledge and content through practical application and provide opportunities for students to practise and hone their designing and making skills.

Primary Phase
Learners are immersed in a full range of key designing and making skills, exploring links to content from other subjects through a range of creative and exciting briefs. Use of literacy links underpins planning to ensure that the curriculum is relevant, stimulating and also accessible for students as they move through the early key stages.

Key Stage 3
Food technology in year 7 embeds key life skills for learners enabling them to produce a wide range of savoury dishes and introducing them to key catering skills whilst following the same threshold concepts as those covered in key stage 1 and 2 in greater depth. Project based learning in Year 8 and 9 follows the design cycle as it is delivering in key stage 4 and 5 as well as mirroring the process as it occurs in industry, albeit on a much smaller scale. The Year 8 lighting design project allows learners to explore a range of manufacturing and workshop skills and well as showcasing their creative flair and encouraging them to consider the needs of the specific target customer they have chosen. The Year 9 project hones in on inclusive design where the needs of the user are more complex and require greater thought to adapt the product to their needs. Adaptive and creative thinking skills allow students who pursue Technology at KS4 and beyond to practise the key stages of the design process, whilst still enabling problem solving, communication and applied numeracy for those who do not opt to take the subject further.

Key Stage 4
Planning at KS4 is predominantly driven by the specifications for GCSE Design Technology and BTEC/OCR Engineering. However, consideration has been given to the sequencing of delivery to ensure learners are equipped with the key skills they need to be successful. Cross curricular discussions have informed planning so that content which overlaps with other subjects can be addressed as 'first look' or retrieval as appropriate. Learners are encouraged to use other subject content within their coursework solutions, for example considering their awareness of Business and Enterprise when budgeting, or using physics calculations within their designs. Industry and careers are made explicit through collaboration with local industry and creatives who faciliatate design briefs oract as clients where possibl;e.

Key Stage 5
Key Stage 5 sequencing is predominantly driven by the learner, with significant amounts of the Engineering qualification being coursework based assessment requiring independent research and preparation for chosen design and engineering problems. The nature of the large project based learning undertaken means that learners are required to explore facilities beyond those available on site. Engaging with industry visits, work experience and outsourcing manufacture form a significant part of the expectations during this key stage.

Learning Journey KS3 Design Technology

Primary Threshold Concepts
Design – Make – Evaluate - Technical Knowledge
EYFS: Fruit Salad and Junk Modelling
KS1: Smoothies, Sandwiches, Moving Pictures, Patchwork
KS2: Fruit Crumble, Pasta, Branding, Shoes, Pretzels, Curry, Fairground rides, phone cases.

Y7 Food Technology

Safe Food Preparation
Create and respond to a Design Brief for a Pizza product
Develop a specification
Healthy eating
Preparing hot and cold dishes

Analysis and Evaluation
Curry practical and evaluation
3rd Party feedback
Meal planning and budgeting
Effective use of ingredients
Bolognese practical
Function of Ingredients

Making
Oaty biscuits
Understand functions of ingredients
Cooking chicken safely
Commercial food production
Batch production chicken goujons

Y9 CAD & Engineering

Design and idea development
Create and respond to a Design Brief for a coat hook for disabilities
Develop a specification
Materials and processes
Use of modelling

Practical and metal work
How are CAD programs used
Drawing to scale
Orthographic drawing
Spot Welding
Shaping and working with steel

Analysis and Evaluation
Give and collect 3rd part feedback
Final construction
Testing and evaluation

To KS4 – GCSE Product Design and BTEC Engineering…









Careers Links

Year 7: Catering in industry, Decision making, industrial processes, problem solving, research.
Year 8: Electronics in industry, creative thinking, planning
Year 9: Engineering in industry, machining, tolerances, quality control and management, accuracy.

Y8 Electronic Products

Materials and Design
Create and respond to a Design Brief for an MP3 amp
Develop a specification
Materials and processes
Use and understand the vacuum former

Practical and Soldering
What is electricity
Using machinery safely
Learning to solder effectively
Components and their uses

Analysis and Evaluation
Give and collect 3rd part feedback
Final construction
Testing and evaluation

Read like a designer…
Year 7: *Gino's Italian Express* Gino D'Acampo

Year 8: *How to Fail at Almost Everything and Still Win Big* Scott Adams

Year 9: *Success Through Failure: The Paradox of Design* Henry Petroski

Extra-curricular and enrichment
Opportunities to enter design competitions.
Opportunities to visit national engineering and design events

Learning Journey KS4 Design Technology

Read like a designer…
Year 10: *The New Science of Strong Materials – or Why You Don't Fall Through the Floor* J.E. Gordon
Where Futures End Parker Peevyhouse

Year 11: *Success Through Failure: The Paradox of Design* Henry Petroski
Ready Player One Ernest Cline

Core technical principles
New and emerging technologies
Energy generation and storage
Developments in new materials
Systems approach to designing

Designing
Basic sketching techniques
Using primary and secondary data
The work of other designers
How to produce a specification
Environmental, social and economic challenges
Design strategies

Specialist principles
Selection of material or components
Forces and stresses
Ecological and social footprint
Sources and origins

Tools & Equipment
Specialist techniques and processes
Surface treatments and finishes

Revision
Core principles
Design Process
Manufacturing processes and equipment

Extra-curricular and enrichment
Opportunities to enter design competitions.
Opportunities to visit national engineering and design events and examples of local industry

To A level and beyond

Careers Links
Year 10: problem-solving, critical thinking, creative solutions, using systems and technology, communicating, working collaboratively, negotiating, influencing.

Year 11: self-management, adaptability, resilience, self-monitoring and development, active research, analytical and problem-solving skills

Materials
Mechanical devices
Materials and their working properties
Material properties
Making principles

Communication of design ideas
Prototype development
Testing materials, processes and components
Testing and evaluating

Modifying material
Using and working with materials
Stock forms, types and sizes
Scales of production

Project NEA
Using a brief to create a design portfolio
Evaluate and develop the design to the point of manufacture
Use a range of processes to create a final product

Examinations
Paper 1
•Section A: Core technical principles
• Section B: Specialist technical principles
• Section C: Designing and making principles

Learning Journey KS4 OCR
Engineering Manufacture

Read like an engineer…

Year 10: *Railhead* Philip Reeve
Where Futures End Parker Peevyhouse

Year 11: *Success Through Failure: The Paradox of Design* Henry Petroski
Engineering in Society Rob Lawlor

Design & Manufacture
Practical skills & Product Analysis
Reverse Engineering
Disassembly
Health & Safety
2D and 3D sketching
Exploded diagrams
How to write a specification
Design ideas
CAD

Material Properties
Components
Cutting, Shaping , Joining and Forming techniques

Planning
Types of engineering information
Different componentry
Planning
Process exploration
Justifying the process

Modelling
Final design solution
Evaluation of ideas
Circuit diagrams
Design for manufacture
Prototypes

Evaluation & Redesign
Evaluation
Evaluation using a brief
Patterns , trends and modifications

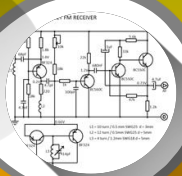
Revision
Manufacturing processes
Engineering materials
Manufacturing requirements and
Developments in Manufacture

Extra-curricular and enrichment
Opportunities to enter design competitions.
Opportunities to visit national engineering and design events and examples of local industry

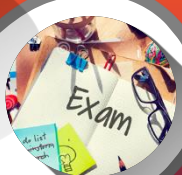
To BTEC Level 3 and beyond









Careers Links
Year 10: holistic understanding, interrelating concepts and issues, integrating knowledge, understanding and skills, knowledge of different sectors, industrial visits and speakers.

Year 11: Using and applying different engineering methods, Synthesising information Evaluating and justifying their decisions, choices and recommendations.

Investigate
Types of manufacturing
Wasting, Shaping, Forming –Additive machining (3D printing)
Joining processes
Finishing processes

Developments in Manufacture
Orthographic drawings
Scales of Manufacture
Quality
Inventory management
Lean manufacturing
Globalisation

Engineering materials
Mechanical and manufacturing properties
Ferrous and Non ferrous metals
Thermosets and thermoplastics
Ceramics and composites
Smart materials

Engineered world
Fulfilling a primary purpose
Wider factors
Engineering sectors
Sector products
Jobs roles in engineering

Exams
R014 Principles of engineering manufacture

Learning Journey KS4 BTEC Engineering

Read like an engineer…

Year 10: *Railhead* Philip Reeve
Where Futures End Parker Peevyhouse

Year 11: *Success Through Failure: The Paradox of Design* Henry Petroski
Engineering in Society Rob Lawlor

Research & Development
Task analysis
Existing product analysis

Careers Links
Year 10: holistic understanding, interrelating concepts and issues, integrating knowledge, understanding and skills, knowledge of different sectors, industrial visits and speakers.

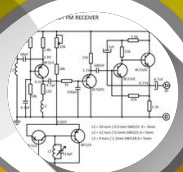
Material Properties
Components
Cutting, Shaping , Joining and Forming techniques

Year 11: Using and applying different engineering methods, Synthesising information Evaluating and justifying their decisions, choices and recommendations.

Record
Measuring /recording data
Displaying data
Anomalous results and evaluating the testing process
Carrying out a process and Planned procedures

Investigate
Practical skills & Product Analysis
Reverse Engineering
Disassembly
Health & Safety

Modelling
Final design solution
Evaluation of ideas
Circuit diagrams
Design for manufacture
Prototypes



Design & Manufacture
2D and 3D sketching
Exploded diagrams
How to write a specification
Design ideas
CAD

Evaluation & Redesign
Evaluation
Evaluation using a brief
Patterns , trends and modifications

Planning
Types of engineering information
Different componentry
Planning
Process exploration
Justifying the process

Revision
Data collection and tabulating
Materials and their processes
Analysis and evaluating

Engineered world
Fulfilling a primary purpose
Wider factors
Engineering sectors
Sector products
Jobs roles in engineering

Extra-curricular and enrichment
Opportunities to enter design competitions.
Opportunities to visit national engineering and design events and examples of local industry

Exams
Component 3 Exam
Responding to an Engineered Brief
Part1: Practical task testing and evaluating
Part2: Design and Justify

To BTEC Level 3 and beyond

Learning Journey KS5 BTEC Engineering

Read like an engineer…

Year 12: ***Sustainable Energy – Without the Hot Air***
David J.C. MacKay
Engineering: A Beginner's Guide
Natasha McCarthy
The Gecko's Foot: How Scientists are Taking a Leaf from Nature's Book
Peter Forbes

Year 13: ***Engineer to Win***
Caroll Smith
An Astronaut's Guide to Life
Chris Hadfield
Sustainable Materials – With Both Eyes Open **Julian Allwood and Jonathan Cullen**

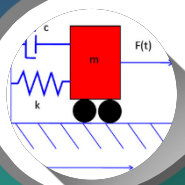
Engineering Principles
Algebraic and trigonometric mathematical methods
Static engineering systems
Dynamic engineering systems

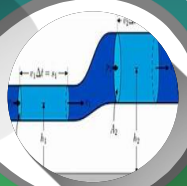
Delivery of a process safely as team
Common engineering processes
Health & safety
Human Factors
Principles of engineered drawings

Engineering Product design and manufacture
Design triggers and challenges
Equipment & system constraints and opportunities
Material properties
Mechanical power transmission
Manufacturing processes

Work experience in the engineering sector
Developing skills and attributes
Clarifying expectations for employment in engineering
Exploring career options

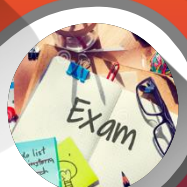
Revision
Engineering principles
Engineering systems
Iterative design process











Careers Links
Year 12: engage with issues, organisation and personal responsibility, creativity, collaborative working, contextual analysis
Year 13: evaluate skills, monitor performance, drive own project, problem solve, explain reasoning.

Engineering systems
Fluid and thermodynamic
Static and direct current electricity and circuits
Magnetism and electromagnetism
Single phase alternating current

Manufacture
Principles of effective teams
Team set-up and organisation
Health & safety risk assessment
Batch manufacture
Delivery of an engineered service

Design process
Regulatory constraints and opportunities
Market, Performance and Manufacturing analysis
Design proposals
Iterative development process
Statistical methods
Validating designs

Work experience
Work shadowing and observations
Reviewing personal and professional development
Using feedback and action planning

Exams
Unit 1: Engineering Maths exam
Unit 3: Supervised set design engineering task to a brief

On to university, apprenticeship or employment…

GCSE Design Technology

Course: AQA Design Technology

Paper 1:
What is assessed:
Section A – Core technical principles (20 marks) A mixture of multiple choice and short answer questions assessing a breadth of technical knowledge and understanding.
Section B – Specialist technical principles (30 marks) Several short answer questions (2–5 marks) and one extended response to assess a more in depth knowledge of technical principles.
Section C – Designing and making principles (50 marks) A mixture of short answer and extended response questions.
How it is assessed:
- Written exam: 2 hours
- 100 marks
- 50% of GCSE

Coursework (NEA):
What is assessed:
Practical application of:
- Core technical principles
- Specialist technical principles
- Designing and making principles

How it is assessed
- Non-exam assessment (NEA): 30–35 hours
- 100 marks
- 50% of GCSE

Students produce a portfolio of work based on a substantial design and make task requiring them to:
- Identify and investigate design possibilities
- Produce a design brief and specification
- Generate design ideas
- Develop design ideas
- Realise design ideas
- Analyse & evaluate

Students will produce a prototype and a portfolio of evidence. Work will be marked by teachers and moderated by AQA

GCSE Design and Technology will prepare students to participate confidently and successfully in an increasingly technological world. Students will gain awareness and learn from wider influences on Design and Technology including historical, social, cultural, environmental and economic factors. Students will get the opportunity to work creatively when designing and making and apply technical and practical expertise. Students study core technical and designing and making principles, including a broad range of design processes, materials techniques and equipment. They also have the opportunity to study specialist technical principles in greater depth.

BTEC Engineering

Course: BTEC Level 2 Tech Award in Engineering

Component 1 Exploring Engineering Sectors and Design Applications
Learners will explore the links between the various engineering sectors and the role of design in the production of engineered products.
Learning aims:
A Understand engineering sectors, products and organisations, and how they interrelate
B Explore engineering skills through the design process.

Component 2 Investigating an Engineering Project
Learners will investigate the selection of materials, proprietary components, making processes and disassembly of a given engineered product. They will plan, reproduce, inspect and test a single component.
Learning aims:
A Understand materials, components and processes for a given engineered product
B Investigate a given engineered product using disassembly techniques
C Plan the manufacture of and safely reproduce/inspect/test a given engineered component.

Component 3 Responding to an Engineering Brief
Learners will investigate and create solutions to problems in response to given engineering briefs.
Task set and marked by Pearson, completed under supervised conditions.
• The set task is made up of two parts and will be completed in two hours for Part 1 and one and a half hours for Part 2.
• Both parts of the set task are completed during a one-week period timetabled by Pearson.
• 60 marks.

Overall course description
The Tech Award in Engineering gives learners the opportunity to develop sector-specific knowledge and skills in a practical learning environment. The main focus is on four areas of equal importance, which cover the:
• development of key engineering practical and technical skills, such as research, observation, measurement, making, using computer-aided design (CAD) and disassembly
• knowledge of key engineering sectors (mechanical, electrical/electronic and engineering design) and the interrelation of each in industry
• knowledge of the stages involved in planning and implementing an engineering project
• knowledge and skills involved in the investigation of solutions to engineering problems in response to a given brief.
This Award complements the learning in GCSE programmes such as GCSE Design and Technology by broadening the application of design and make tasks, working with an engineering brief, testing and evaluation.

OCR Cambridge National in Engineering

Course: OCR Cambridge National Level 2 in Engineering Manufacture

R014: Principles of engineering manufacture

Written paper, OCR set and marked

In this unit, students will learn about the different types of manufacturing processes, the materials that can be used to manufacture products using these processes, and the factors to be considered when determining the manufacturing requirements of an engineered product. They will consider the different types of manufacturing process that are typically used in engineering, using specific examples of each process type. The engineering materials include ferrous and non-ferrous metals, polymers, ceramics, composites, and smart materials. Students will understand how the properties of these materials relate to their manufacturing characteristics. In addition, they will also develop an understanding of some of the current developments in engineering manufacture.

R015: Manufacturing a one-off product

Centre-assessed tasks, OCR moderated

In this unit, students will learn to identify the information required to make a product, plan the production of a product and carry out risk assessments for the processes, tools and equipment needed to produce a product in small quantities. They will also learn how to select and safely use the equipment, processes and tools required to mark out, measure and manufacture a product in small quantities, using a range of hand-held equipment and conventional non-computer numerical control (CNC) machining methods.

R016: Manufacturing in quantity

Centre-assessed tasks, OCR moderated

In this unit, students will learn how to manufacture and use simple jigs and templates to support manufacturing in volume. By using CAD software, they will learn about the information needed to facilitate manufacture, and apply this in order to program CNC equipment.

In addition, students will learn how to set up and operate the CNC equipment and monitor the quality of the manufactured products.

Overall course description

The Cambridge National in Engineering Manufacture will inspire and equip students with the confidence to use skills that are relevant to the engineering, manufacturing, process and control sector and more widely. It covers manufacturing processes, engineering materials, manufacturing requirements and developments in engineering manufacture.

BTEC Level 3 Extended Certificate in Engineering

Course: BTEC Level 3 Extended Certificate in Engineering

Unit 1: Engineering Principles **Learners apply mathematical and physical science principles to solve electrical-, electronic- and mechanical-based engineering problems.** The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Learners will be assessed through a number of short- and long-answer problem-solving questions.
Unit 2: Delivery of Engineering Processes Safely as a Team **Learners explore how processes are undertaken by teams to create engineered products or to deliver engineering services safely.** Learning Aims (internally assessed) A Examine common engineering processes to create products or deliver services safely and effectively as a team B Develop two-dimensional computer-aided drawings that can be used in engineering processes C Carry out engineering processes safely to manufacture a product or to deliver a service effectively as a team.
Unit 3: Engineering Product Design and Manufacture **Learners will explore engineering product design and manufacturing processes and will complete activities that consider function, sustainability, materials, form and other factors.** This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. Part A is given to learners one week before Part B is scheduled. Learners will be given a case study and produce independent research. The supervised assessment period is eight hours. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal.
Unit 9: Work Experience in the Engineering Sector **Learners explore the benefits of work experience. They carry out and reflect on a period of work experience, and plan for their personal and professional development.** Learning Aims (internally assessed) A Examine the benefits of work experience in engineering for own learning and development B Develop a work experience plan to support own learning and development C Carry out work experience tasks to meet set objectives D Reflect on how work experience influences own personal and professional development.

Overall course description

BTEC Nationals have been developed in collaboration with employers and representatives from higher education and relevant professional bodies. This ensures that content is up to date and that it includes the knowledge, understanding, skills and attributes required in the sector. The course content provides a balance of breadth and depth, while retaining a degree of choice for individual learners to study content relevant to their own interests and progression choices. Also, the content may be applied during delivery in a way that is relevant to local employment needs. Applied learning brings together knowledge and understanding with practical and technical skills. This is achieved through learners performing vocational tasks that encourage the development of appropriate vocational behaviours and transferable skills. Transferable skills are those such as communication, teamwork, research and analysis, which are valued in both higher education and the workplace