

KS4 ENGINEERING CURRICULUM JOURNEY

FURTHER STUDY

- KS5 Engineering Apprenticeships

CAREER PATHS

- Civil, Aerospace, Electrical, Mechanical, Automotive – endless opportunities.

SKILLS

- Critical analysis, interpretation, evaluation, problem-solving, mathematics, computer-aided design

Assessment:

Assessment:

Assessment:

Assessment:

Revision and exams

Revision and exams

Design communication

- ❑ Types and features of drawings including circuit diagrams
- ❑ Details contained within engineering drawings.

Manufacturing techniques

- ❑ The different production techniques (wasting, forming etc)
- ❑ Manufacturing techniques (casting, injection moulding)
- ❑ Impacts of production costs and scales on design.

Assessment:

Past paper practice and mock examinations.

Assessment:

R040 coursework
R039 resubmissions

Prototype production

- ❑ Producing a functional prototype using engineering drawings and production plans.
- ❑ Analysis and evaluation of prototype using measurement tools.
- ❑ Quantitative and qualitative criteria.

CAD and Engineering drawings

- ❑ Use of Fusion 360 to produce complex, rendered models.
- ❑ 3rd angle orthographic drawings produced by CAD and by hand. Conventions of symbols and line types in engineering drawings.

CAD Assemblies

- ❑ Produce exploded views and sectional views in Fusion 360.
- ❑ Complete coursework project.

Product analysis

- ❑ Analyse existing products using ACCESSFM.
- ❑ Production and manufacturing techniques.
- ❑ Product disassembly.

Production planning

- ❑ Planning tools (Gantt charts, flow charts)
- ❑ Risk assessments and health and safety.
- ❑ Production of CAD models

YEAR 11

Assessment:

Summative coursework assessment of R039.
Past paper questions
End of year exam.

Assessment:

R040 Task 1, 2 and 3

Communicating design ideas

- ❑ Range of hand drawing techniques including how to generate and communicate ideas using freehand sketching and rendering.
- ❑ CAD software use – using Fusion 360 to draw increasingly complex shapes and assemblies.

Briefs and Specifications

- ❑ Content and differences between design briefs and specifications.
- ❑ Analysis and creation of design briefs and specifications (using the ACCESSFM framework)

Design Strategies

- ❑ The steps involved in the iterative design process.
- ❑ Details of what happens in the stages *identify, design, optimise and validate*.
- ❑ Analysis of existing engineered products using ACCESSM and disassembly.

YEAR 10

Assessment:

Coursework R039 Tasks 1 and 2
Past paper, examination style questions

Assessment:

Regular use of exam past paper questions.
Homework booklets.

SUBJECT SKILL

Computer aided design

SUBJECT SKILL

Project planning
Manufacturing

SUBJECT SKILL

Mathematics

SUBJECT SKILL

Analysis and evaluation

LEVEL 3 ENGINEERING CURRICULUM MAP

FURTHER STUDY

Degree in Engineering, Apprenticeship in Engineering

CAREER PATHS

Civil Engineer, Aerospace, Electronics and Communication, Software Development

SKILLS

Critical analysis, interpretation, evaluation, problem-solving, mathematics, computer-aided design

Revision and Examination Practice

Mechanical Design

- Operation of Fusion 360 to produce 2d and 3d designs.
- Design Cycle and the activities that take place during each stage
- The conventions and symbols for engineering drawings (e.g. standard components, scaling etc)
- Rendering and freehand drawing techniques to enhance drawings.
- Analyse existing products through research and disassembly to determine materials used and production methods.

Electrical Engineering

- The components and sequence of a stabilised power supply.
- 3 phase power and the relationships between the different phases.
- The general circuit layout of separately excited and self-excited DC motors and generators.
- Analyse motors and generators using the defining equations.
- Understand the structure of a DC power supply.
- Describe the operation and properties of inverting and non-inverting op-amps.
- Calculate the gain of the inverting and non-inverting op-amp.

Assessment:
60 mark exam paper in Units 3 and 4
Externally assessed 60 mark exam paper for units 3 and 4
Assessments of LO3 - design components that can be successfully manufactured and LO4 - optimise design to improve performance
Results (if required) for Units 1,2,3 and 4

YEAR 13

Maths/Mechanical Engineering

- understand how to use calculus within the context of engineering
- be able to use geometry and graphs in the context of engineering problems
- Use statistics to handle and analyse data including probability calculations.
- the effect of forces on materials, stress, strain and the Young Modulus

Science Electrical Engineering

- understand the principles of electrical engineering
- understand the principles of thermodynamics and heat/energy flow.
- principles of mechanics and mechanical energy

Computer Aided Design

- Create assemblies of shapes where different bodies interact with each other
- how to incorporate animations and moving parts in CAD work

Mechanical Engineering

- Calculate the volumes of prisms
- Use the density equation to calculate density, mass and volume of bodies.
- Calculate the centre of mass of 2d objects and understand the concept of centroid.
- Mechanical advantage and velocity ratio
- The three classes of lever and how these can be used to solve engineering problems.
- Applications of moments to beams.
- Types of beam and support conditions

Assessment of Units 1 and 2:
Externally assessed 60 mark paper per unit
Units 3 and 4:
1 x 40 mark assessment per unit
For CAD:
Assessment of LO4 x2
Overall Unit coursework assessment and moderation.

Assessment for units 3 and 4:
2 x 40 mark assessments per unit
2 x 60 mark past papers per unit
For Mechanical Design:
LO1 - use graphical and engineering drawing techniques to communicate design solutions
LO2 - select appropriate engineering materials to achieve design solutions

Computer Aided Design

- Understand how to create 3D shapes using increasingly complex tools in Fusion 360
- Rearranging equations and basic algebraic techniques.
- How to sketch line graphs and calculate gradients and y-intercepts
- Be familiar with computer aided design tools such as Sketchup, 2D design or Fusion 360.
- Understand the geometry of simple 2D and 3D shapes (prisms and spheres)

Science Electrical Engineering

- understand the principles of fluid mechanics
- prefixes, SI units and base units
- materials - explain the behaviour of materials

Maths/Mechanical Engineering

- understand the application of algebra relevant to engineering problems
- be able to use trigonometry to solve engineering problems
- understand exponentials and logarithms in the context of engineering problems
- understand how to use calculus within the context of engineering

YEAR 12

Learning at KS5 is sequenced to integrate mechanical engineering, electrical engineering and mechanical design across the course. This is represented here as topic blocks.

Assessment:
For units 1 (maths/mechanical engineering) and 2 (electrical engineering)
2 x 40 mark assessments 2 x 60 mark past papers

Assessment:
For units 1 (maths/mechanical engineering) and 2 (electrical engineering) 2 x 40 mark assessments past papers
For CAD X2 assessments of LO1 - understand how to create 3D shapes using increasingly complex tools in Fusion 360.

ENGINEERING SKILL

Computer Aided Design

ENGINEERING SKILL

Planning
Manufacturing

ENGINEERING SKILL

Mathematics

ENGINEERING SKILL

Analysis and Evaluation