YEAR 12 Product Design

KING JAMES'S SCHOOL

KNARESBOROUGH

This A level is a blend of Skills and theoretical knowledge all tailored to enable you to progress smoothly into design or engineering employment or further study. During this course you will have access to, and training on, industry standard machines and software.

THEORY CONTENT Two exam papers:

Paper 1 - Technical Principles (30% of A-Level) This covers material science, manufacturing, and industrial practices.

- ***Materials and Characteristics***: Properties (physical, mechanical, working) of metals, woods, polymers, elastomers, composites, and smart/modern materials.
- ***Material Enhancement:*** Methods to improve material performance, durability, or aesthetics (e.g., heat treating steels, laminating woods).
- ***Processes and Manufacture:*** Forming, joining, wasting, finishing, and printing techniques for papers, boards, polymers, metals, and woods.
- I***ndustrial Practice:*** Scales of production (one-off, batch, mass, continuous), CAD/CAM, virtual modeling, and rapid prototyping.
- ***Enterprise and Marketing:*** Feasibility studies, protecting designs/intellectual property (IP), and modern commercial strategies.

Paper 2 - Designing and Making Principles (20% of A-Level) This focuses on human factors, design history, and critical analysis.

- ***Design Theory & Movements:*** Influence of major movements like Art Nouveau, Modernism, and Postmodernism.
- ***Human Factors:*** Ergonomics (physical interaction) and anthropometrics (body sizing/percentiles).
- ***Designing to Meet a Need:*** Using primary/secondary market research, stakeholder interviews, and product analysis.
- ***Responsible Design:*** Environmental impact, sustainability, recycling, and safe manufacturing standards.
- ***Critical Analysis and Evaluation:*** Assessing existing products and design proposals for function, aesthetics, and economic viability

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NEA - Design and Make Task (50% of A-Level)

Working with a "live client" you will undertake a sizable design and make task. You are required to identify a real-world design problem, produce an investigative digital portfolio, and manufacture a final working prototype.

NEA Structure:

The NEA is divided into five assessment sections, typically presented as an A3 digital portfolio alongside physical making evidence:

Section A: Investigation, Design, and Problem Identification (20 marks)
What you do: Identify a specific design problem and a genuine client or target user.

Section B: Design Brief and Specification (10 marks)
What you do: Formulate a technical design brief and a comprehensive, measurable specification.

Section C: Generation of Design Ideas (25 marks)
What you do: Explore a high degree of creativity, innovation, and calculated design risks.

Section D: Development of Design / Realisation of Prototype (25 marks)
What you do: Manufacture a final, functional prototype and document the making process (typically 10 to 20 pages).

Section E: Analysis and Evaluation (20 marks)
What you do: Critically evaluate your finished prototype against the original design brief and measurable specification.

SKILLS

Essential skills taught and practised:

Presentation skills:
- 2D layout sketching
- Freehand Isometric
- Freehand 2 Point Perspective
- Marker rendering
- Section Views

CAD skills:
- Adobe Illustrator Laser pathways
- SolidWorks Basics
- SolidWorks Advanced
- 3D Printing using Cura and Ender 3

Practical Skills:
- Accurate card Modelling
- Thread cutting
- Brazing of Steel
- Sand Casting
- Wood Lamination
- Turning on wood lathe
- Turning on metal lathe
- Plastic joining