Qualifications and Curriculum Authority

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning

GCSE subject criteria for engineering

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Introduction

1. GCSE subject criteria set out the knowledge, understanding, skills and assessment objectives common to all GCSE specifications in engineering. They provide the framework within which an awarding body creates the detail of the specification.

2. Specifications must also meet the regulator' general requirements, including the common and GCSE criteria as defined in *The statutory regulation of external qualifications* (QCA/04/1293).

3. Subject criteria are intended to:

- help ensure consistent and comparable standards in the same subject across the awarding bodies
- ensure that the rigour of GCSE is maintained
- ensure that specifications build on the knowledge, understanding and skills established by the national curricula for England, Northern Ireland and Wales, and facilitate progression to higher level general or vocational qualifications in engineering or related sectors of employment and training
- help higher education institutions, employers and other stakeholders such as learners and parents/guardians know what has been studied and assessed.

4. Any GCSE specification that contains significant elements of engineering must be consistent with the relevant parts of these subject criteria.

Aims and learning outcomes

5. GCSE specifications in manufacturing should encourage learners to be inspired, moved and changed by following a broad, coherent, satisfying and worthwhile course of study and gain an insight into related sectors, such as manufacturing. They should prepare learners to make informed decisions about further learning opportunities and career choices.

6. All specifications in engineering must enable learners to:

- actively engage in the processes of engineering to develop as effective and independent learners.
- understand the contribution that engineering makes to society and the economy

- develop an awareness and appreciation of commercial and industry issues and emerging technologies in the context of engineering
- develop and use a range of transferable skills when designing and making engineered products, to enable them to become effective and independent learners
- develop an awareness and understanding of environmental issues and sustainable development
- develop applied engineering skills as a foundation for future learning and progression
- apply their knowledge and understanding of engineering by using skills of evaluation and problem-solving.

Subject content

7. The content of GCSE specifications in engineering must reflect the learning outcomes.

8. GCSE specifications must require learners to develop and demonstrate knowledge and understanding of:

engineering materials and their properties in the following groups:

- ferrous and non-ferrous metals and alloys
- polymers
- ceramics
- composites that combine the properties of different materials

the functions of:

- mechanical components
- electrical/electronic components
- pneumatic/hydraulic components

the properties, characteristics and features of materials that affect:

- ability to be shaped and formed

- ability to be treated
- ability to be given a surface finish
- ease of handling
- cost implications
- availability, form and supply

engineering processes:

- material removal
- shaping and manipulation
- joining and assembly
- heat and chemical treatment
- surface finishing

quality control techniques

new technology used in and by the engineering industries:

- information, communications and digital technologies
- modern and 'smart' materials and components
- systems and control technology to organise, monitor and control production

the impact of modern technologies:

- when engineering a product
- on engineered products
- on engineering industries
- on stages in engineering a product
- advantages and disadvantages that the use of modern technology has brought to society

engineered products:

- investigate a variety of engineered products that use modern technology
- investigate the impact of modern technology on the design and production of a range of engineered products.

9. GCSE specifications must require learners to develop the ability to do the following.

Design a product:

- analysing client design briefs for engineered products
- producing, using and modifying design specifications for engineered products
- generating design solutions for engineered products
- reading, understanding and creating a range of appropriate engineering drawings to current industry standards
- presenting a design solution for engineered products
- responding to client feedback.

10. GCSE specifications must require learners to develop the ability to do the following.

Engineer a product:

- producing and using production plans
- selecting and using a range of appropriate materials, parts and components
- selecting and using appropriate processes
- applying quality control techniques
- selecting and using appropriate tools and equipment
- applying health and safety procedures
- analysing and revising the completed product, taking into account how it could be improved.

Assessment objectives

11. The specification must require candidates to demonstrate the assessment objectives in an applied context.

12. All specifications must require candidates to demonstrate their ability to:

Assessment objectives		% weighting
AO1	Recall, select and communicate their knowledge and understanding of a range of contexts	25–35
AO2	Apply skills, knowledge and understanding, including quality standards, in a variety of contexts and to plan and carry out investigations and tasks, involving a range of tools, equipment, materials and components	45–55
AO3	Analyse and evaluate evidence, make reasoned judgements and present conclusions	15–25

Scheme of assessment

13. GCSE specifications in engineering must allocate a weighting of 40% to external assessment and a weighting of 60% to controlled assessment in the overall scheme of assessment.

14. Question papers must be targeted at the full range of GCSE grades.

Grade descriptions

15. Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content.

16. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of candidates' performance in the assessment may be balanced by better performances in others.

Grade	Description
A	Candidates recall, select and communicate detailed knowledge and thorough understanding of engineering. They apply relevant knowledge, understanding and skills in a range of situations to plan and carry out investigations and tasks effectively. They test their solutions, working safely and with a high degree of precision. They analyse and evaluate the evidence available, reviewing and adapting their methods when necessary. They present information clearly and accurately, making reasoned judgements and presenting substantiated conclusions.
C	Candidates recall, select and communicate sound knowledge and understanding of engineering. They apply knowledge, understanding and skills in a range of situations to plan and carry out investigations and tasks. They test their solutions, working safely and with precision. They review the evidence available, analysing and evaluating some information clearly and with some accuracy. They make judgements and draw appropriate conclusions.
F	Candidates recall, select and communicate knowledge and understanding of basic aspects of engineering. They apply limited knowledge, understanding and skills to plan and carry out simple investigations and tasks, with an awareness of the

	need for safety and precision. They modify their approach in the light of progress. They review their evidence and draw basic conclusions.