



Design and technology programmes of study: key stage 4
Engineering Design & Engineering
KS4 Engineering Learning Journey



Year 10
Health and safety

Sign health and safety passport (student & teacher)



R039 Communicating Design

Assignment brief



R039 Task 1 – Manual production of freehand sketches

Sketching techniques
Annotation and labelling
Suitable methodology
Design specification review



R039 Task 2 – Manual production of freehand sketches – design development

Developing a concept
Annotation and labelling
Suitable methodology
Design specification review
Make a Difference Time – Review, reflect, question, challenge and target setting



R039 Task 3 – Manual production of engineering drawings

Third angle orthographic projection drawing including dimensions
Assembly drawing
Assembly drawing techniques with CAD/CAE
Observation record including assessment
Make a Difference Time – Review, reflect, question, challenge and target setting



R039 Task 4 – Use of Computer Aided Design (CAD)

Use CAD to produce 3D virtual models of your design proposal
Within CAD drawings add rendering, dimensioning and assembly views
Make a Difference Time – Review, reflect, question, challenge and target setting



R039 Assessment and submission



R040 Design, evaluation and modelling



R040 Task 1 – Product analysis

Comprehensive product analysis of key features
Strengths and weaknesses within existing products
Product comparison with customer driven engineering matrix (basic and complex)



Year 11



Year 11
R040 Task 2 – Product disassembly

Function and component considerations
Assessment on material, production, assembly and manufacturing methods
Design specification review
Disassembly tools and equipment
Observation record including assessment
Disassembly report
Make a Difference Time – Review, reflect, question, challenge and target setting



R040 Task 3 – Virtual CAD 3D

Virtual 3D model with CAD
Individual components with CAD
CAD assembly
CAD engineering drawing display and demo environment
Make a Difference Time – Review, reflect, question, challenge and target setting



R040 Task 4 – Physical modelling – production planning

Detailed manufacturing plan
Production considerations
Manufacturing risk assessment
Manufacturing health and safety



R040 Task 5 – Physical modelling – prototype production

Production plan and manufacturing
Selection of appropriate tools, materials and machines
Manufacturing recording log
Observation record including assessment



R040 Task 6 – Physical modelling – evaluation of a prototype

Comparing final prototype against design specification
Improvement assessment and development
Make a Difference Time – Review, reflect, question, challenge and target setting



R040 Assessment and submission

Year 11

Unit R038: Principles of engineering design

R040 Topic Area 1: Designing processes

1.2 Stages of the iterative design process

1.2.1 Design

Analysis of the design brief

Methods of researching

Production of an engineering design specification

Generation of design ideas by sketching and modelling

1.2.2 Make and evaluate

Modelling (test proportions, test scale, test function)

Virtual modelling of the design idea

Physical modelling of the design idea

Manufacture or modification of the prototype

Make a Difference Time – Review, reflect, question, challenge and target setting



R040 Topic Area 2: Design requirements

2.1 Types of criteria with engineering design specification

Needs and wants

Quantitative and qualitative criteria

Product criteria (ACCESSFM)

2.2 How manufacturing considerations affect design

Scale of manufacture (one-off, batch, mass)

Material availability and form

Types of manufacturing processes (wasting, shaping, forming, joining, finishing, assembly)

Production costs (labour, capital cost)

2.3 Influences on engineering product design

Market pull and technology push

British and international standards

Legislation

Planned obsolescence

Sustainable design (6Rs) (rethink, reuse, recycle, repair, reduce, refuse)

Design of the circular economy

Make a Difference Time – Review, reflect, question, challenge and target setting



R040 Topic Area 3: Communicating design outcomes

3.1 Types of drawing used in engineering

Free hand sketching, isometrics, oblique, orthographic drawings, exploded views, assembly drawing, block diagrams, flowcharts, circuit diagrams, wiring diagrams

3.2 Working drawings

2D engineering drawings with 3rd angle orthographic projection

Standard conventions (title block, metric units of measurement, scale, tolerance)

Standard conventions for dimensions (linear measurements, radius, diameter, surface finish)

Meaning of line types (outlines, hidden detail, centre line, projection, dimension, leader line)

Abbreviations (across flats, centre line, diameter, drawing, material, square)

Representations of mechanical features (threads, holes, chamfers, countersinks, knurls)

3.3 Using CAD drawing software

Advantages and limitations of using CAD drawing software

Make a Difference Time – Review, reflect, question, challenge and target setting



R038 Topic Area 4: Evaluating design ideas

4.1 Methods of evaluating designs

Production of models

Qualitative comparison with brief and specification

Ranking matrices

Quality Function Deployment (QFD)

4.2 Modelling methods

Virtual 3D CAD, Card, Block, Breadboarding, 3D Printing

4.3 Methods of evaluating a design outcome

Methods of measuring the dimensions and functionality of the product

Quantitative comparison with brief and specification

User testing

Reasons for identifying modifications and improvements

Make a Difference Time – Review, reflect, question, challenge and target setting



R038 Revision Methods

Homework (Satchel:One)

Kahoot (Advanced)

Bamboozle (Advanced)

Mini tests

Test scenarios

Continual assessment incl. tracker

PPE (Prepare to Perform Exam)