Mapping of 2017 BTEC Level 1/ Level 2 Tech Award in Engineering and 2012 BTEC Level 1/Level 2 First Award in Engineering

Introduction
This document is designed to help you with mapping content as you transition from BTEC First Award in Engineering to the new BTEC Tech Award in Engineering.

Our guidance is broken down into two sections:

Section 1: How and where can I use existing content, and what new content has been included?
Showing how the content in the new BTEC Tech Award in Engineering maps across to the current BTEC First Award in Engineering.

Section 2: What do these changes mean for planning and teaching?
Review of key changes, outlining which component is externally assessed and when, and where to find further support.

Section 1

Headlines

The new BTEC Tech Award in Engineering is for learners who wish to acquire technical skills through vocational contexts by studying mechanical, electrical/electronic and engineering design as part of their Key Stage 4 learning. The qualification recognises the value of learning skills, knowledge and vocational attributes to complement GCSEs. The qualification will broaden the learner's experience and understanding of the varied progression options available to them.

The qualification consists of three components:

1. Exploring Engineering Sectors and Design Applications 36 GLG – 30%
2. Investigating an Engineering Project 36 GLH – 30%
3. Responding to an Engineering Brief 48 GLH – 40%

TQT (total qualification time) is 160 Hours

The components are strongly inter-related and they are best seen as part of an integrated whole rather than totally distinct study areas.

Components 1 and 2 are internally assessed and Component 3 is externally assessed via a task, set and marked by Pearson. All three components are mandatory and a learner must achieve at least a level 1 pass in all three to achieve the qualification. The qualification has been developed on a Design and Make basis. Learners will investigate an assembly, or disassemble an assembly and make a product for Components 1 and 2, Component 3 builds directly on Components 1 and 2 but enables learning to be brought together and related to a real-life situation.

Synoptic assessment

Component 3 provides the main synoptic assessment for the qualification.

Qualification grades

There are seven qualification grades – four at level 2 and three at level 1: Level 2 Pass, Level 2 Merit, Level 2 Distinction, Level 2 Distinction*, Level 1 Pass, Level 1 Merit , Level 1 Distinction, and Unclassified.

The tables that follow compare the content of the new BTEC Tech Award in Engineering against the content of the 2012 BTEC First in Engineering. They highlight areas where there is a full match (green), areas where there is a partial match (yellow) and where there is no match (red).

BTEC Tech Award in Engineering - 2017	BTEC First Award in Engineering - 2012
Component 1: Exploring Engineering Sectors and Design Applications	
Component 1: Learning Aim A – Understand engineering sectors, products and organisations, and how they interrelate	
A1 Engineering sectors, engineered products and interconnections • Engineering definition in context: the safe application of technical and practical knowledge to transform ideas and materials (as part of a team) into products. • The need for people who are qualified in an engineering discipline and if possible are experts in more than one discipline (e.g. electrical/electronics engineer), and can use their skills to help solve real-world problems. • Engineering sectors, e.g. aerospace, automotive, communications, electrical/electronic, mechanical, environmental, transport, rail, marine. • Engineered products from different sectors and combinations of sectors, e.g. aerospace (engines, wings, rotor blades, landing gear, fuselage, navigation systems), automotive (engines, suspension, braking system, fuel injection, engine management, cruise control), communications (satellite dish, smartphone, wireless router, transmission mast, set top box), electrical/electronic (drone, remote-controlled car/helicopter, television, games console, wireless speaker/headphones).	Some coverage in Unit 1 – A1: Engineering sectors and products. Types of products from the following engineering sectors: aerospace, automotive, communications, electrical/electronic, mechanical, biomedical, chemical. Limited coverage in Unit 1 – B4: New Technologies in Engineering. Applications, characteristics and advantages/disadvantages of the following new technologies used in engineering sectors: • optical fibres as used in the communications sector • hydrogen fuel cells, surface nanotechnology and telematics as used in the automotive sector • blended wing bodies as used in the aerospace sector • bionics as used in the biomedical sector.
A2 Engineering organisations, functions, job roles and career progression • Examples of engineering organisations: ○ size, e.g. global/large, small to medium-sized enterprise (SME), small jobbing workshops ○ range of examples covering the sectors, e.g. research and development organisations, manufacturing organisations, service organisations. • Specialist organisations in sectors, e.g. manufacturer of aircraft wings, hydraulic systems.	Not covered

• Functions in organisations, e.g. research, design, planning, making, quality, marketing, selling, customer service, installation.
• Engineering job roles, e.g. maintenance technician, machine operator, aircraft fitter, design engineer, manufacturing engineer, installation engineer, process engineer, telecommunications engineer.
• Career progression opportunities, e.g. apprentice, operator, technician; technical, professional, management.
• Role definitions:
  ○ unskilled
  ○ skilled
  ○ technical
  ○ managerial.	

Component 1: Learning Aim B – Explore engineering skills through the design process	
B.1 The design process The engineering design and make process: define the problem, develop possible solutions, choose a solution, design and model the solution, evaluate outcome of project, work in a team. • Interpreting an engineering brief, e.g. physical requirements, aesthetics, size, function, performance requirements. • Producing initial design proposals, e.g. researching existing products, producing design sketches in 2D and 3D, using creative thinking and evaluation techniques to generate the best solution given the brief. • Computer-aided design (CAD) drawings using drawing, editing, modification and manipulation commands to generate engineering drawings and circuit diagrams on templates to the appropriate standard.	Limited coverage of the making process in Unit 7: understanding tooling machines and manufacturing a product. Unit 6 – A1: Use a CAD system to produce engineering drawings. A2: Use of a CAD system to produce a circuit diagram There is no product design in the First award.

• Generating final design solution using 2D drawing techniques and 3D models, e.g. detailed drawings, circuit diagrams, 3D printing, physical modelling. • Making final design solution decisions, e.g. selection of materials, selection of making techniques, considering quality requirements. • How employees work in a team and peer review during the engineering design and make process with the customer as a focus, using generic skills, e.g. behaviours, attitudes, limitations, respect for others, professionalism, working relationships, collaborative skills.	

Component 2: Investigating an Engineering Product	
Component 2: Learning Aim A – Understand materials, components and processes for a given engineered product	

A.1 Materials
• Engineering material categories:
  ○ ferrous, e.g. mild steel, wrought iron, stainless steel
  ○ non-ferrous, e.g. aluminium, titanium, copper, silver, zinc
  ○ thermosetting polymers, e.g. phenol-formaldehyde, polyimides, polyurethane
  ○ thermoforming polymers, e.g. polyethylene, polypropylene, acrylic.
• Properties of engineering materials:
  ○ strength
  ○ hardness
  ○ toughness.
• Characteristics of engineering materials, such as:
  ○ machinability
	Unit 5 – A1: Types of engineering materials and A2: Properties of materials.
	
	Unit 2 – B1: Selection of materials and components.

○ workability ○ durability.	
A.2 Components • Types of components, such as: ○ proprietary, e.g. rivet, nut and bolt, screw, key, mechanical fixings, electronic components, such as resistors, capacitors, fuses, diodes ○ product specific, e.g. bush, flange, printed circuit board (PCB). • Characteristics of components, e.g. permanent/semi-permanent, sizes/dimensions, surface roughness, values, fixing methods.	Unit 8 – A1 – A4: Electronic Circuit design and construction. Covers the complete range of skills to build and test an electronic PCB circuit.
A3 Processes Types of engineering processes: • cutting, e.g. drilling, sawing, filing, shearing • shaping, e.g. turning, milling • forming, e.g. forging, casting, extruding, moulding, folding, bending • joining, e.g. fastening, bonding, soldering, brazing.	Unit 1 – some coverage in A2: Mechanical and electrical/electronic engineering processes (in bold): Processes including health and safety issues, characteristics, applications and advantages/disadvantages of the following **engineering processes**: • machining – turning, **milling, drilling** • **forming – casting, forging** • fabrication – welding, **shearing**
Component 2: Learning Aim B – Investigate a given engineered product using disassembly techniques	
B1 Practical engineering skills • Observing and recording skills, such as an examination of: ○ visual features ○ surface features ○ mass ○ colour ○ degradation ○ identification marks. • Measurement skills, such as: ○ measuring diameter ○ measuring linear dimensions o use of comparative techniques ○ knowledge of component values, e.g. resistors. • Appraisal/interpretation skills, such as justifications and reasoning.	Some coverage in Units 1, 2, 5 and 7. Unit 7 – A1: Tools, A2: Work-holding devices, B3 Checks for compliance and accuracy links to measurement and recording, but the skills set is much deeper here.
B2 Disassembly techniques	Unit 3: Health and Safety in Engineering, has some links: to ensure the safe operation of the disassembly techniques, such as

• Safe use of disassembly techniques, to include:
  ○ removal of semi-permanent fixings
  ○ parts removal and layout
  ○ replacement of non-reusable consumables or fixings.
• Safe use of tools and equipment – disassembly/reassembly tools with settings.
	risk assessments, handling materials and tooling, PPE, preparing a work environment, completing an engineering activity safely.

B3 Product design specification (PDS) Requirements in terms of: • Size and mass. • Product life and reliability. • Performance/function/service requirements. • Economic and making considerations. • Implications of standards and legislation.	Not covered
Component 2: Learning Aim C – Plan the manufacture of and safely reproduce/inspect/test a given engineered component	
C.1 Engineering make process • Defining the problem. • Developing possible solutions. • Choosing a solution. • Making using engineering processes. • Inspecting and testing chosen solution. • Evaluating outcome of project outcomes.	Not covered

C.2 Develop a production plan
• Developing a production plan, to include:
  ○ health and safety
  ○ operations/processes
  ○ inspection, testing and quality standards
  ○ equipment/tools
  ○ materials and components
  ○ quantity, e.g. one-off, batch, mass production.
• Awareness of risks and hazards for making processes.
• Safe preparation, good housekeeping and close down of the work area.
• Making skills associated with the product to be produced, e.g. choosing suitable tools, appropriate set up of the work area/machine, adaptation according to inspected outcomes.
	Some coverage in Unit 4: Engineering maintenance which covers the cause and effect of failure
	
	Unit 3: Health and Safety in Engineering, risk assessments, handling materials and tooling, PPE, preparing a work environment, completing an engineering activity safely.
	
	Unit 7 – A1: Tools, A2: Work-holding devices, B3 Checks for compliance and accuracy links to measurement and recording, but the skills set is much deeper here.

• Skills in observing and recording techniques, e.g. in process measurement and comparison.	

Component 3: Responding to an engineering brief	
Component 3: A – Carry out a process to meet the needs of an engineering brief	
A1 Carry out a process • Following planned procedures. • Using and testing a prototype/model. • Assembling, handling and using materials, equipment and machinery.	Some coverage as listed above in Components 1 and 2.
A2 Recording the process • Measuring and recording data with accuracy and precision, using appropriate units. • Tabulating appropriate data in the correct format accurately and to a suitable degree of precision. • Displaying appropriate data graphically with accuracy: ○ chart/graph ○ line/curve of best fit ○ axis ○ scaling ○ labelling. • Observation skills, e.g. noting problems with practical activities.	Not covered
A3 Interpretation of data • Identifying anomalous results or sources of error. • Comparison of trends/patterns in data, to include tables, charts and graphs. • Evaluating the process, to include testing process used, recording/processing results. • Drawing valid conclusions. • Making recommendations related to engineering briefs	Not covered
Component 3: B - Provide a design solution for an engineered product against the needs of an engineering brief	
B1 Interpretation of a given brief for an engineered product. • Analysing the existing product with reference to the brief. • Dimensions and tolerances, to include linear, radial, surface finish.	Some coverage in Units 1, 2, 5 and 7 Unit 7: Machining Techniques: – A1: Tools, A2: Work-holding devices, B3: Checks for compliance and accuracy.

• Physical form, to include 2D, 3D, flat, curved. • Attributes, to include low resistance, sharp corners, moisture traps. • Materials, e.g. aluminium, steels, polymers. • Processes, e.g. fabrication, drilling.	
B2 Redesign • Identifying relevant issues with existing design. • Design sketching, to include 2D, 3D, exploded diagrams, annotation, circuit diagrams. • Design for manufacture, e.g. fabricate, forge, cast, machined. • Design ideas, e.g. variation in form, variation in approach, use of different methods, use of different componentry.	Limited coverage in Unit 6 A1: Use of a CAD system to produce an engineering drawing, A2: Use of a CAD system to produce a circuit diagram There is no product design in the First award.
B3 Evaluation • Reviewing the credibility of the design ideas given the needs of the brief. • Selecting the most appropriate design solution. • Justification of the design solution. • Justification of the processes to be used.	Not covered
Component 3: C - Provide solutions to meet the needs of an engineering brief	
C1 Analysing engineering information associated with the problem • Types of engineering information, to include production data, engineering drawings, job cards. • Interpreting patterns and trends related to the engineering information. • Identifying issues and causes associated with the problem.	Not covered
C2 Selecting a solution • Possible solutions for current and/or potential issues, e.g. design, tooling, process. • Extent to which these solutions have fulfilled their primary purpose. • Any wider factors that need to be considered in order to meet the brief, e.g. resources, need for batch production, safety restrictions, environmental impact.	Unit 1 – A3: Scales of production Some coverage of tooling, process safety restrictions in the units mentioned previously.

• Ways in which the solution might be improved on against its primary purpose and/or other factors. • Using the best-fit approach to select the best solution. • Identifying advantages and disadvantages/limitations/constraints. • Justifying the best solution. • Reflecting on processes and making recommendations for improvements to the best solution.	
C3 Problem solution • Resources required and their use, to include materials, tools, components, equipment, apparatus, e.g. instruments, sensors. • Designs of solution, to include diagrams, sketches, including measurements, labels/annotation. • Make processes, to include following the steps needed to create a prototype solution, e.g. rapid prototyping. • Processes to follow, e.g. in relation to using tools and equipment, and health and safety. • Manufacturing processes to use, e.g. casting, forging, welding, use of jigs and tools. • Data collection requirements, to include what quantitative and qualitative data must be recorded, resource material, data sources. • Data analysis and quality, to include trends, meeting specifications, possible solutions. • Safety considerations, to include hazards and requirements of Control of Substances • Hazardous to Health (COSHH) Regulations 2002 where appropriate. • Considering timescales.	Limited coverage in units mentioned above and: Unit 3: Health and safety in Engineering. Links here Safety considerations, to include hazards and requirements of Control of Substances Hazardous to Health (COSHH) Regulations 2002 where appropriate. Unit 2: C1: Selection of production processes

Section 2: What do these changes mean for planning and teaching?

Main benefits

- The BTEC Tech Award in Engineering is approved by the DfE to count in the 2019 Performance tables.
- Externally assessed component 3.
- Level 1 qualification is graded.

External assessment

Component 3	Type	Frequency of assessment	First Assessment Window
Responding to an engineering brief	Synoptic assessment drawing on Components 1 and 2	There are two tasks released each year, in February and May/June.	February 2019

Internal assessment

Components 1 and 2	Similarity	Difference
Exploring Engineering Sectors and Design Applications Investigating an Engineering Product	As with the BTEC Firsts, to be given a component grade, a learner must complete assignments for all learning aims.	Component Grading: *To achieve a Level 1 Merit:* Learner evidence must satisfy either: all Level 1 Merit criteria **or** all Level 1 Pass criteria and two specific Level 2 Pass criteria *To achieve a Level 2 Pass:* Learner evidence satisfies all Level 2 Pass criteria. *To achieve a Level 2 Merit*: Learner evidence satisfies either: all Level 2 Merit criteria **or** all Level 2 Pass criteria and one specific Level 2 Distinction criterion *To achieve a Level 2 Distinction* Learner evidence satisfies all Level 2 Distinction criteria.

How should I plan delivery of the components to reflect the changes in assessment?

Students would benefit from the delivery of Components 1 and 2 prior to commencing Component 3, the synoptic and external unit. In order to be fully successful with the external assessment, students need to be able to draw on their knowledge and understanding of Components 1 and 2, applying what they have learned, to the task. In preparation for the external assessment, practice sessions will prepare learners, supporting them in developing the required techniques.

More guidance on suggested delivery models can be found within BTEC Tech Award Schemes of Work. These documents will be available within the Course materials/Teaching and learning materials section for the BTEC Tech Award in Engineering.