Education & Skills Funding Agency

T Level Technical Qualification in Design, Surveying and Planning for Construction

The table below maps the content overlap between the T Level Qualification in Design Surveying and Planning for Construction, the BTEC mathematics and further mathematics units from the Extended Diploma in Engineering and the GCE AS and A level subject content for mathematics.

All the T Level content is mandatory. BTEC offers a mandatory and optional content structure. BTEC optional content is shown in red type.

T level students will need to undertake a variety of assessment types such as those that take place in Higher Education for Construction related courses including examinations and controlled assessments.

T Level Core assessment is an externally set written exam(s) and an employer set project: both sets of exams assess students' knowledge, understanding and application of contexts, theories and principles relating to the core content in the specification The written exams assess route and pathway knowledge through 'unseen' examination (which samples content), meaning breadth can be assessed at appropriate level 3 depth, whilst limiting the overall duration of assessment. The written exam structure will provide students with relevant exam and revision skills for HE. The employer set project: is a more substantial project based assessment set by employers through the awarding organisation, and will develop their critical thinking and problem solving skills. The project will draw upon knowledge and understanding from across the core content synoptically, and will allow learners to effectively respond to a 'brief'. All science elements are assessed.

The occupational specialism (**Section 2** below) is also externally assessed through a synoptic project.

BTEC assessment is external, internal and synoptic. External and internal assessment is linked to a specific unit.

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Mathematics Content		
Specification content areas	Unit content	specification content by section
T Level[1]	Mathematics and Further Mathematics units for BTEC Extended Diploma in Construction[2]	A Level[3]
1. Core Learning Content Areas **(mandatory)**	**(M = mandatory, O = optional)**	**Sections/Overarching themes**
1. Health and safety		
2. Science Apply mathematical principles to calculations of: force, work, energy, and power kinetic and potential energy forces – tension, compression, shear, bending stress and strain – shear, compressive, tensile loadings on simply supported beams – point, uniformly distributed (UDL) Young's modulus and beam reactions voltage, current and resistance (Ohm's Law), electrical power, energy, efficiency, and work done electro-magnetic induction, including transformer equations air temperature, air density, humidity, air movement rates of heat loss, transfer of heat, air change rates illuminance using the inverse square law		***Forces and Newton's laws (A Level R)*** Understand the concept of a force; Newton's first law Newton's second law for motion in a straight line Weight and motion in a straight line under gravity Newton's third law; equilibrium of forces on a particle and motion in a straight line 2-D vectors (magnitude and direction)

[1] Design, Surveying and Planning for Construction | Pearson qualifications
[2] BTEC Nationals | Construction and the Built Environment (2010) | Pearson qualifications
[3] AS and A level maths - GOV.UK (www.gov.uk)

acoustics, decibels, and threshold limits earth science data (effect of currents, porosity of rock/soil) Core Mathematics Competencies covered in this section are: M2 Estimate, calculate and spot errors M3 Work with proportion M4 Use rules and formulae M8 Communicate using mathematics		
3. Measurement Apply standard units of measurement and complete calculations including the areas of: electrical dimensional sound force, stress, strain, and pressure temperature Core Mathematics Competencies covered in this section are: M1 Measure with precision M3 Work with proportion M4 Use rules and formulae M8 Communicate using mathematics		***Quantities and units in mechanics (A Level P)*** Quantities and units in the S.I. system: length, time, mass Derived quantities and units: velocity, acceleration, force, weight, moment
4. Building technology		
6. Digital technology Data Capture Application of data Data used for structural analysis	***Mathematics in Construction and the Built Environment (Unit 3 - M)*** Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions,	***Statistical sampling (A Level K)*** Population and sample Sampling techniques Mathematical and statistical graphing tools and spreadsheets

Common data feeds Calculations using data for structural analysis, failure mode analysis and digital twins Calculations using data for digital modelling Data use gathered by technologies form other sectors, e.g., 3D scanning, drones Core Mathematics Competencies covered in this section are: M6 Understand data and risk	class boundaries and class width, frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data ***Further Mathematics in Construction and the Built Environment (Unit 19 – O)*** Statistical techniques: review of measure of central tendency, mean, standard deviation for ungrouped and grouped data (equal intervals only), variance.	Large data set(s) in context Use of spreadsheets or specialist statistical packages to explore data set(s) Analyse a subset or features of data Use data to investigate questions arising in real contexts ***Data presentation and interpretation (A Level L)*** Interpret diagrams/histograms Scatter diagrams and regression lines Correlation Central tendency and variation Recognise and interpret possible outliers in data sets Clean data, including dealing with missing data, errors, and outliers ***Statistical Distributions (A Level N)*** Probability distributions ***Statistical hypothesis testing (A Level O)*** Null hypothesis, alternative hypothesis, significance level, test statistic, 1-tail test, 2-tail test, critical value, critical region, acceptance region, p-value. Correlation Coefficient Level of significance Statistical hypothesis test for mean of normal distribution
7. Construction mathematical techniques Areas, volumes, and perimeters of 2D and 3D shapes Pythagoras' theorem	***Mathematics in Construction and the Built Environment (Unit 3 - M)*** Circular measure: radian; degree; arc; angular rotation	***Trigonometry (A Level E)*** sine, cosine, and tangent for all arguments; the sine and cosine rules; the area of a triangle in the form 1/2 (ab sinC)

Trigonometric techniques: sine, cosine, tangent ratios, sine rule and cosine rule Triangle area rules Algebraic transformation Differential calculus: basic differentiation (one step) for polynomial and trigonometric functions Integral calculus: indefinite and definite integration techniques (one step) for polynomial and trigonometric functions, constant of integration and initial conditions Numerical integration: Simpson's Rule, Mid-Ordinate Rule, Trapezoidal Rule Averages and central tendency: mean, median and mode Dispersion: range, standard deviation Core Mathematics Competencies covered in this section are: M2 Estimate, calculate and spot errors M3 Work with proportion M4 Use rules and formulae M5 Process data M6 Understand data and risk M7 Interpret and represent with mathematical diagrams M8 Communicate using mathematics	Triangular measurement: functions (sine, cosine, and tangent) Periodic properties of the trigonometric functions; the sine and cosine rule Phasor sum of two alternating currents, resolution of forces for a vector diagram Mensuration: standard formulae to solve surface areas and volumes of regular solids Differentiation: differential coefficient; gradient of a curve y = f(x); rate of change Differentiation of simple polynomial functions, exponential functions and sinusoidal functions, gradient at a point Integration: simple polynomial functions, exponential functions, and sinusoidal functions; indefinite integrals; constant of integration; definite integrals; limits; evaluation of simple polynomial functions; area under a curve Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions, class boundaries and class width, frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data ***Further Mathematics in Construction and the Built Environment (Unit 19 – O)*** Graphical solution of simultaneous equations, quadratics, intersections of linear and quadratics, non-linear laws, using logarithms, cubic equations, recording, evaluating plotting manually and digitally	Arc length/Sector Radians sine, cosine, and tangent functions; their graphs, symmetries, and periodicity ***Algebra and functions (A Level B)*** laws of indices Quadratic functions and their graphs Simultaneous equations Inequalities Polynomial manipulation (expanding brackets and collecting like terms, factorisation, and simple algebraic division; use of the factor theorem) Graphs of functions Composite functions; inverse functions and their graphs ***Differentiation (A Level G)*** Derivative of f(x) as the gradient of the tangent to the graph of y = f(x) at a general point (x, y) Differentiation from first principles ***Integration (A Level H)*** Fundamental Theorem of Calculus Integrate x^n (excluding n = -1), and related sums, differences, and constant multiples Area under a curve/between two curves Integration by substitution and integration by parts ***Data presentation and interpretation (A Level L)*** Central tendency and variation

	Algebraic techniques including arithmetic and geometric progression, complex numbers. Statistical techniques, central tendency, mean, standard deviation for ungrouped and grouped data (equal intervals only), variance Trigonometrical graphs: amplitude, period and frequency, graph sketching, phase angle, phase difference; combination of two waves of the same frequency Trigonometrical formulae and equations: the compound angle formulae for the addition of sine and cosine functions. Differentiation: review of standard derivatives, differentiation of a sum, function of a function, product and quotient rules, numerical values of differential coefficients, second derivatives, turning points (maximum and minimum) e.g., volume of a rectangular box Integration: review of standard integrals, indefinite integrals, definite integrals e.g., area under a curve, mean and RMS values; numerical e.g., trapezoidal, mid-ordinate and Simpson's rule	
8. Design Manual and computer-aided (CAD) techniques for graphical detailing, and be able to produce construction drawings, charts, and diagrams drawing regular and irregular shapes, line conventions drawing to a scale Core Mathematics Competencies covered in this section are: M1 Measure with precision M9 Cost a project		***Mathematical Modelling (A Level OT 3)*** Translate a situation in context into a mathematical model Use a mathematical model with suitable inputs to engage with and explore situations Interpret the outputs of a mathematical model in the context of the original situation Understand that a mathematical model can be refined by considering its outputs and simplifying assumptions; evaluate whether the model is appropriate

9. Construction and the built environment industry Procurement and tendering: costing, quantity estimation, work scheduling Core Mathematics Competencies covered in this section are: M2 Estimate, calculate and spot errors M4 Use rules and formulae M8 Communicate using mathematics M9 Cost a project M10 Optimise work processes		***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems
10. Sustainability		
11. Relationship management		
12. Commercial business		
13. Project management		
14. Law		
Core Project (applies the above core learning and is employer set) Response to a client brief and specification Assessment Objective 4: 4C Use appropriate mathematical skills in response to a brief to identify solutions.		***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems
2. Occupational specialism **NB Students must study ONE Occupational Specialism in addition to core content**	**Units Linked to Projects**	
A. Surveying and design for construction and the built environment Mathematical principles and calculations related to:	***Mathematics in Construction and the Built Environment (Unit 3 - M)*** Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions, class boundaries and class width,	***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved

Types of measurement and detection Capture, process, manage, use and quality assure data, including geospatial Limitations of measurement, e.g., parallax Digital data, spreadsheets and schedules Digital presentation, graphs/flowcharts/diagrams Process data, using appropriate techniques Spreadsheets, tables, big data Area and volume calculations, trigonometry, Pythagoras, addition, and subtraction of angles. Quantification of site waste produced from excavations, demolition, and general site waste by applying mathematical techniques: regular areas and volumes, irregular areas and volumes, trapezium rule, mid-ordinate rule, Simpson's rule Application critical path analysis and Gantt charts to construction activities Cash flow and work schedule analysis Relevance of measurement in the design process – area (net and gross) volume, height, and length Scale, digital representation in design Data interpretation Areas, volumes, quantities, units, and tolerances in relation to quantities and bills, valuation benchmarking, tendering,	frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data Mensuration: standard formulae to solve surface areas and volumes of regular solids Differentiation: differential coefficient; gradient of a curve y = f(x); rate of change	Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems ***Data presentation and interpretation (A Level L)*** Interpret diagrams/histograms Scatter diagrams and regression lines Correlation Central tendency and variation Recognise and interpret possible outliers in data sets Clean data, including dealing with missing data, errors, and outliers ***Trigonometry (A Level E)*** sine, cosine, and tangent for all arguments; the sine and cosine rules; the area of a triangle in the form 1/2 (ab sinC)
B. Civil engineering Mathematical principles and calculations related to:	***Mathematics in Construction and the Built Environment (Unit 3 - M)***	***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and

Relationships between force (load), mass and acceleration; coplanar forces; Hooke's law; loading, shear forces and bending moments of beams Structural elements (e.g., beams, columns, frameworks) behave under load Reactive forces, maximum load Algebra, including indices, logarithms, linear equations Trigonometric and standard formulae, including circular and triangular measures use of calculus to solve practical engineering problems: differential calculus – basic differentiation techniques applied to algebraic, trigonometric, and logarithmic functions, products, and quotients; function of a function, integral calculus – indefinite and definite integration techniques applied to algebraic, trigonometric, and exponential functions. Statistical methods, including averages, tendency, and dispersion Mathematical concepts in relation to the properties of materials: mass and density, strength (tensile, compressive, shear), bending stiffness, fatigue and creep, degradation and resistance to degradation, embedded energy. Data collection, analysis methods and techniques appropriately for civil engineering: sampling methods, mean, median, mode and standard deviation, cumulative frequency, quartiles, quartile range Error, measurement, and systematic/cumulative error Bar charts, Gantt diagrams, critical path analysis Practical construction problems involving perimeters, areas, and	Circular measure: radian; degree; arc; angular rotation Triangular measurement: functions (sine, cosine, and tangent) Periodic properties of the trigonometric functions; the sine and cosine rule Phasor sum of two alternating currents, resolution of forces for a vector diagram Mensuration: standard formulae to solve surface areas and volumes of regular solids Differentiation: differential coefficient; gradient of a curve y = f(x); rate of change Differentiation of simple polynomial functions, exponential functions and sinusoidal functions, gradient at a point Integration: simple polynomial functions, exponential functions, and sinusoidal functions; indefinite integrals; constant of integration; definite integrals; limits; evaluation of simple polynomial functions; area under a curve Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions, class boundaries and class width, frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data ***Further Mathematics in Construction and the Built Environment (Unit 19 – O)*** Graphical solution of simultaneous equations, quadratics, intersections of linear and quadratics, non-linear laws, using logarithms, cubic	abstract appropriately to enable problems to be solved Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems ***Kinematics (A Level Q)*** Position; displacement; distance travelled; velocity; speed; acceleration Graphs for motion in a straight line ***Forces and Newton's laws (A Level R)*** Forces/Newtons Laws Resolving forces in two dimensions; equilibrium of a particle under coplanar forces ***Trigonometry (A Level E)*** sine, cosine, and tangent for all arguments; the sine and cosine rules; the area of a triangle in the form 1/2 (ab sinC) Arc length/Sector Radians sine, cosine, and tangent functions; their graphs, symmetries, and periodicity ***Algebra and functions (A Level B)*** laws of indices Quadratic functions and their graphs Simultaneous equations Inequalities Polynomial manipulation (expanding brackets and collecting like terms, factorisation, and simple algebraic division; use of the factor theorem)

volumes, including for simple and compound shapes: – rectangles – trapeziums – triangles – prisms – circles – spheres – pyramids – cones – regular and irregular surface areas and volumes Mensuration formulae and basic calculus in civil engineering (mid-ordinate rule, trapezoidal rule, Simpson's rule) Geometric techniques to determine length, area and volume for shapes containing straight lines and curves – use of trigonometry to determine dimensions in 2D and 3D Trigonometric techniques: – sine rule – cosine rule – triangle area rules Accuracy calculations Centroid of regular and irregular rectangular structural/engineering sections, including calculations of first moment of area, second moment of area, the parallel axis theorem and section modulus Coplanar forces; Hooke's law; loading, shear forces and bending moments of beams Structural Mechanics	equations, recording, evaluating plotting manually and digitally Algebraic techniques including arithmetic and geometric progression, complex numbers. Statistical techniques, central tendency, mean, standard deviation for ungrouped and grouped data (equal intervals only), variance Trigonometrical graphs: amplitude, period and frequency, graph sketching, phase angle, phase difference; combination of two waves of the same frequency Trigonometrical formulae and equations: the compound angle formulae for the addition of sine and cosine functions. Differentiation: review of standard derivatives, differentiation of a sum, function of a function, product and quotient rules, numerical values of differential coefficients, second derivatives, turning points (maximum and minimum) e.g., volume of a rectangular box Integration: review of standard integrals, indefinite integrals, definite integrals e.g., area under a curve, mean and RMS values; numerical e.g., trapezoidal, mid-ordinate and Simpson's rule	Graphs of functions Composite functions; inverse functions and their graphs ***Differentiation (A Level G)*** Derivative of f(x) as the gradient of the tangent to the graph of y = f(x) at a general point (x, y) Differentiation from first principles ***Integration (A Level H)*** Fundamental Theorem of Calculus Integrate x^n (excluding n = -1), and related sums, differences, and constant multiples Area under a curve/between two curves Integration by substitution and integration by parts ***Data presentation and interpretation (A Level L)*** Central tendency and variation ***Moments (A Level S)*** Moments in simple static contexts
C. Building services design Mathematical principles and calculations related to: Application of International System of Units (SI), including base units for length, mass, time, electrical current, temperature, amount of substance, luminous intensity Area, volume, weight, energy, and force	***Mathematics in Construction and the Built Environment (Unit 3 - M)*** Circular measure: radian; degree; arc; angular rotation Triangular measurement: functions (sine, cosine, and tangent) Periodic properties of the trigonometric functions; the sine and cosine rule	***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems

Gas laws, including Charles's law, Boyle's law Electrical systems Mechanical properties Strength: tensile, compressive, shear Thermodynamics Properties of materials The data collected for design projects: sorting, reordering, manipulating, carrying out calculations The design of a typical building services engineering installation: data presentation, analysis.	Phasor sum of two alternating currents, resolution of forces for a vector diagram Mensuration: standard formulae to solve surface areas and volumes of regular solids Differentiation: differential coefficient; gradient of a curve y = f(x); rate of change Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions, class boundaries and class width, frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data ***Further Mathematics in Construction and the Built Environment (Unit 19 – O)*** Statistical techniques: review of measure of central tendency, mean, standard deviation for ungrouped and grouped data (equal intervals only), variance.	***Quantities and units in mechanics (A Level P)*** Quantities and units in the S.I. system: length, time, mass Derived quantities and units: velocity, acceleration, force, weight, moment ***Data presentation and interpretation (A Level L)*** Interpret diagrams/histograms Scatter diagrams and regression lines Correlation Central tendency and variation Recognise and interpret possible outliers in data sets Clean data, including dealing with missing data, errors, and outliers
D. Hazardous materials analysis and surveying Mathematical principles and calculations related to: Collecting information from primary and secondary sources as appropriate, including samples and historic records. Processing data, collate, transfer to digital software Quality assuring collected data Presenting data Checking accuracy of collected data	***Mathematics in Construction and the Built Environment (Unit 3 - M)*** Data handling: data represented by statistical diagrams e.g., bar charts, pie charts, frequency distributions, class boundaries and class width, frequency table; variables (discrete and continuous); histogram (continuous and discrete variants); cumulative frequency curves Statistical measurement: arithmetic mean; median; mode; discrete and grouped data	***Mathematical problem solving (A Level OT 2)*** Recognise mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved Concept of a mathematical problem-solving cycle Extract information from diagrams and construct mathematical diagrams to solve problems ***Data presentation and interpretation (A Level L)*** Interpret diagrams/histograms

Spreadsheet software Sampling methods Applying statistical and trigonometric techniques to interoperate sample information Poisson distribution and coefficient of variation for fibre counting Error computation	***Further Mathematics in Construction and the Built Environment (Unit 19 – O)*** Statistical techniques: review of measure of central tendency, mean, standard deviation for ungrouped and grouped data (equal intervals only), variance.	Scatter diagrams and regression lines Correlation Central tendency and variation Recognise and interpret possible outliers in data sets Clean data, including dealing with missing data, errors, and outliers
3.	**Additional Content**	**Additional Content**
		Proof (A Level A)
		Coordinate geometry in the (x,y) plane (A Level C)
		Sequences and series (A Level D)
		Numerical methods (A Level I)
		Vectors (A Level J)
		Probability (A Level M)