

Vocational Award: Engineering Design Curriculum Overview

Years 10 and 11

Vocational Award: Engineering Design (Years 10 and 11)									
Qualification	Level 1 / Level 2 Cambridge National in Engineering Design								
Exam Board	OCR								
Unit(s)	Unit R038: Principles of Engineering Design				Unit R039: Communicating Designs			Unit R040: Design, Evaluation and Modelling	
Topic Area(s)	Topic Area 1: Designing processes	Topic Area 2: Design requirements	Topic Area 3: Communicating design outcomes	Topic Area 4: Evaluating design ideas	Topic Area 1: Manual production of freehand sketches	Topic Area 2: Production of engineering drawings	Topic Area 3: Use of computer aided design (CAD)	Topic Area 1: Product evaluation	Topic Area 2: Modelling design ideas
Unit Summary	Unit R038 introduces the principles of engineering design through processes such as analysing design briefs, creating engineering specifications, and evaluating design ideas. Students develop skills in manual and CAD techniques, understand sustainable and inclusive design, and explore manufacturing processes, culminating in models and evaluation methods aligned with engineering standards.				Unit R039 focuses on the skills required to effectively communicate engineering designs. Students will learn to produce freehand sketches, create technical drawings, and use CAD to develop and present design proposals. The unit includes methods for 2D and 3D visual representation, annotations, and using CAD software for creating and assembling design components.			Unit R040 focuses on evaluating and modelling design ideas to ensure they meet specified criteria. Students will learn to analyse products using tools like ACCESS FM, create both virtual and physical models, and evaluate product performance and functionality. The unit includes disassembling products to understand their design, components, and manufacturing processes, alongside creating 3D CAD models and prototypes.	

Unit Objectives	• Understand and apply linear, iterative, and user-centred design strategies. • Analyse design briefs using research methods (e.g., ACCESS FM, product disassembly). • Create engineering design specifications and generate ideas. • Use CAD, freehand, and technical drawings for communication. • Evaluate designs through models, ranking matrices, and QFD methods.	• Produce freehand sketches using 2D/3D sketches, shading, and annotations. • Create isometric sketches for design proposals. • Develop engineering drawings, including 3rd angle orthographic projections and assembly drawings. • Use CAD to model and render 3D designs, including complex shapes and assemblies. • Apply CAD tools to create assemblies with components and animations.	• Analyse and compare products using ACCESS FM and engineering matrices. • Disassemble products to assess their components, materials, and assembly methods. • Create virtual 3D CAD models and simulate product performance. • Produce physical prototypes using appropriate materials and tools. • Record key stages of prototype creation and compare against design specifications.
Acquired Knowledge/ Skills	• Understanding design strategies: linear, iterative, sustainable, and ergonomic. • Research and analysis techniques: primary, secondary, and market research. • Sketching, isometric, orthographic, and CAD drawing. • Familiarity with manufacturing processes, scales, and standards. • Modelling and evaluation using virtual and physical prototypes.	• Skills in freehand sketching with various line weights, texture, and tone. • Understanding of orthographic projections and assembly drawings. • Familiarity with CAD tools for creating 3D models and assemblies. • Knowledge of CAD geometry, dimensioning, and rendering techniques. • Ability to create exploded views and sectional drawings.	• Understanding of product evaluation techniques like ACCESS FM and QFD. • Skills in product disassembly, including the use of tools and analysis of components. • Proficiency in creating and simulating 3D CAD models. • Experience in selecting materials and processes for prototype production. • Knowledge of safe working practices and recording methods like Gantt charts and work plans.

Assessments	1 hour 15 minute written examination OCR-set and marked Calculators are allowed in this exam This question paper has two parts: • Part A – includes 10 multiple choice questions (MCQs) • Part B – includes short answer questions and extended response questions. One extended response question will be assessed using a levels of response mark scheme.	OCR-set assignment Centre-assessed and OCR moderated This set assignment contains 4 practical tasks. It should take approximately 10-12 GLH to complete.	OCR-set assignment Centre-assessed and OCR moderated This set assignment contains 6 practical tasks. It should take approximately 10-12 GLH to complete.
Other Links (e.g. SMSC, FBV, Greener Curriculum)	Greener Curriculum: Focus on sustainable design (6Rs) and circular economy. Fundamental British Values: Encourages critical thinking, problem-solving, and teamwork. Pride in the Solent: Links to regional engineering innovation. UNCRC: Articles 12 and 28 support inclusive design and learning for all students.	Greener Curriculum: CAD design for virtual prototyping reduces material waste. Fundamental British Values: Promotes critical thinking and creativity in design. Pride in the Solent: Encourages regional engineering and innovation. UNCRC: Supports inclusive learning through accessible design communication methods for all students.	Greener Curriculum: Emphasis on sustainable materials and manufacturing methods in product evaluation and prototype creation. Fundamental British Values: Encourages critical thinking and fairness in product assessment. Pride in the Solent: Promotes local industry through modelling design ideas. UNCRC: Supports inclusive learning through hands-on, practical applications in design and evaluation.