Engineering BTEC Level 3

Curriculum Intent 2021-2022

Core aims of the subject at Key Stage 5

In engineering we look at developing critical thinking and practical skills and applying scientific and mathematical principles to resolve technical and design situations in order to provide students with a breadth and depth of knowledge and skills. We provide students with challenging opportunities through the process of working as part of a team to design, plan and produce an engineered product. We cover industry standard Computer Aided Design and Manufacture (CAD/CAM) which enables students to actively engage and take responsibility for their personal development in the process of engineering design to develop as effective and independent life-long learners.
Students will learn to make decisions, consider sustainability and combine skills with understanding in order to design and make engineered products, exploring ways in which technical, economic and environmental, factors interact to shape designing and making. Students will develop an understanding of why analysing existing products will help produce practical solutions to needs. By understanding manufacturing process students can then design new and improved products which have an impact on technical capability, efficiency, environmental impact and safety factors.
The vast nature of disciplines and knowledge which come under the umbrella of Engineering, provide endless opportunities for a wide variety of employment and higher education possibilities. This course develops pupils' real skills, inspires and motivates, and helps them to prepare for the future and to take the next step towards an engineering education and/or career adventure.
Engineering is defined as "the profitable application of science, maths and technology." In other terms, engineers make products and processes work, and keep them working, in an affordable way.

We are all in some small way 'engineers', what this subject does is to foster and enhance that inherent talent by allowing students to achieve in the knowledge, tools, skills and expertise and to practice and develop that skill set and to apply it to increasingly challenging situations.

Community Involvement: Visiting speakers to discuss their business interest in Engineering. Ex-students following either apprenticeships and/or university courses.

The course specification claims that:

"This qualification provides a broad basis of study for the engineering sector. It has been designed to support progression to higher education when taken as part of a programme of study that includes other appropriate BTEC Nationals or A Levels."

This is a theory and practice-based course:
- The course combines theoretical content with practical application.
- The use of mathematical skills is a key requirement and is tested in the examination.
- An understanding of underlying scientific principles is expected.
- An iterative approach to designing is encouraged.

• The acquisition of practical skills is still expected.

Fieldwork
NA

Assessment
Please see website for internal assessment record.

Unit 1 120 GLH	**Unit 2 60 GLH**	**Unit 3 120 GLH**	**Unit 10 60 GLH**
Engineering Principles	Delivery of Engineering Processes Safely as a Team	Engineering Product Design and Manufacture	Computer Aided Design in Engineering
External written 2 hr. Examination. Sat during May or June in Y12 & opportunity to retake in Y13	Internally assessed coursework	Externally set controlled task Sat during January in Yr12 and opportunity to retake in Y13	Internally assessed coursework

Covid 19 statement
Brine Leas is awaiting information and confirmation of adaptations to the course content and assessment methods for this course, from the examination board – Pearsons. We have no indication of the type of adaptations that will be announced. It would be risky to assume that the same adaptations will be adopted from the previous year's proceedings. Until this happens, we are working on all units in order to cover the breadth of knowledge and skills intended by the entire course so that we are not caught short when the announcement of adaptations occurs.

Homework
Specific homework will be set on a lesson-by-lesson, week by week basis. As the course requires theoretical knowledge and understanding there will be opportunity to embed learning via homework tasks.

Clubs and/or intervention
Catch up sessions offered at lunchtime and after school. Intervention will take place if a student misses' deadlines or is not engaging with the require effort or quality of work to satisfy their target grade. This will be tracked and communicated with parents/carers via Data Collection points, parent’s evenings, phone call/email/letter correspondence.

Parental/Carer support

Parents are asked to support their child through this course, they should be encouraged to meet external deadlines and those set by the members of staff.

Helpful sources of information

Details of the course and support information, exemplar material and lesson content can be found on ‘Teams’
Specification can be found on:
https://qualifications.pearson.com/en/qualifications/btec-nationals/engineering-2016.html

Websites:
http://www.technologystudent.com/
http://www.imeche.org/
https://www.engc.org.uk/

Textbooks/Revision Guides :

BTEC National Engineering - Revision Workbook
ISBN 9781292150277

BTEC National Engineering – Revision Guide
ISBN 9781292150284

BTEC National Engineering – Text Book
ISBN 9781292141008

Year 12 Overview

Term	Knowledge	Assessment	Connections to learning	Connections to future pathways
Autumn 1	**Big Idea:** Rationale: The UK has a world class presence in many engineering sectors, based upon an army of knowledgeable, innovative and hard working engineers. The engineering sectors provide relatively stable and well-paid careers in a wide range of jobs. These units of study provide a broad basis of study designed to provide progression into higher education or employment.			
	Compressed air engine This project is used as a means to deliver experiences for pupils to develop basic engineering skills and understanding of processes via a hands-on approach. The completed engine is not formally assessed as part of the final grade. However, the processes undertaken, experiences and knowledge acquired is assessed via the units of the course. The theme of the air engine is used during units 2 and 10 throughout the course. The knowledge gained during completion o the engine is detailer in Unit 2, 3 and 10.	Ongoing informal assessment, allowing pupils to make mistakes, trial different approaches and 'learn from doing' providing a need led desire for knowledge.	Pupils may have some basic knowledge and workshop skills from KS3 and KS4 Engineering.	Careers ➢ Mechanical technician ➢ Maintenance technician Future learning ➢ Mechanical Engineering
	Unit 1 ➢ Solve, transpose and simplify equations. ➢ Indices and logarithms: ➢ laws of indices:am × an = am+n, mnaa= am−n, (am)n= amn ➢ laws of logarithms: logA + logB = logAB, logAn = nlogA, logA – logB = logABocommon logarithms (base 10), natural logarithms (base e).	The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve	➢ Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer

	➢ Application to problems involving exponential growth and decay. ➢ Linear equations and straight line graphs: ➢ linear equations of the form y= mx+ c ➢ straight-line graph (coordinates on a pair of labelled Cartesian axes, positive or negative gradient, intercept, plot of a straight line) ➢ pair of simultaneous linear equations in two unknowns. ➢ Factorisation and quadratics: ➢ multiply expressions in brackets by a number, symbol or by another expression in a bracket ➢ extraction of a common factor ax+ ay, a(x + 2) + b(x +2) ➢ grouping ax– ay+ bx– by ➢ quadratic expressions a2 + 2ab + b2oroots of an equation, including quadratic equations with real roots by factorisation, and by the use of formula. A2 Trigonometric methods ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ submerged surfaces in fluid systems: ➢ hydrostatic pressure and hydrostatic thrust on an immersed plane surface F= ρgAx ➢ centre of pressure of a rectangular retaining surface with one edge in the free surface of a liquid ➢ immersed bodies: ➢ Archimedes' principle	problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems.		➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Electrical engineering. ➢ Design engineering

	➢ determination of density using floatation methods ➢ relative density ➢ fluid flow in a gradually tapering pipe: ➢ flow rate (volumetric and mass) ➢ flow velocities (input and output) ➢ input and output pipe diameters ➢ incompressible fluid flow (continuity of volumetric flowA1v1 = A2v2and mass flow ρA1v1= ρA2v2) ➢ Circular measure: ➢ Radian ➢ conversion of degree measure to radian measure and vice versa ➢ angular rotations (multiple number (n) of radians) ➢ problems involving areas and angles measured in radians ➢ length of arc of a circle s= rθ ➢ area of a sector A= 12r2θ ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems, involving: ➢ Non-concurrent coplanar forces: ➢ representation of forces using space and free body diagrams ➢ moments ➢ resolution of forces in perpendicular directions Fx= Fcosθ, Fy= Fsinθ ➢ vector addition of forces – resultant, equilibrant and line of action ➢ conditions for static equilibrium ΣFx = 0, ΣFy= 0, ΣM = 0 ➢ Simply supported beams: ➢ concentrated loads ➢ uniformly distributed loads (UDL).	The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and		

	➢ Reactions: ➢ support reactions ➢ pin reaction forces ➢ roller reaction forces. B2 Loaded components ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ direct stress and strain: direct stress σ= FA, direct strain ε= LLΔ ➢ shear stress and strain: shear stress τ = FA, shear strain γ = ab ➢ tensile and shear strength ➢ elastic constants: Young's Modulus (modulus of elasticity) E= σε; Modulus of rigidity G= τγ	combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems.		
Autumn 1	**Unit 2** Examine common engineering processes to create products or deliver services safely and effectively as a team. To know how to safely plan and produce a sand cast aluminium part. To know how to safely plan and produce a CNC milled rectangular aluminium block.	A report, prepared as an individual, detailing the engineering processes, sand casting and CNC milling.	Pupils who have previously studied Product Design or Engineering will be aware of the processes but lack knowledge of the details.	Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering

				➢ CAD/CAM engineering ➢ Design engineering
Autum 1	**Unit 10** **Computer Aided Design in Engineering** Introduction to SolidWorks and re-using 2D Design software for the generation of engineering drawings. Sketching basic Parts in 2 and 3D. Assembling rectangular parts. Producing Engineering Drawings from Sketches.	Students produce drawings in response to set tasks. The drawings will be assessed against international drawing standards.		Careers ➢ Design engineer ➢ Structural engineer ➢ Technical illustrator ➢ Design documentation officer ➢ CAD draughts person Future learning ➢ Mechanical Engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Set Designer ➢ CAD draughts person ➢ Quantity Surveyor ➢ Design engineering

Autumn 2	**Big Idea:** Rationale: Engineering products are part of our daily lives, from aircraft to the smallest electronic circuits found in medical devices. Engineering products are designed as a result of the identification of a need or opportunity, and then engineers using creative skills and technical knowledge to devise and deliver a new design or improvements to an existing design. For example, advances in the development of fuels led to the first internal combustion engine, and engineers have been improving its design ever since. In this unit, you will examine what triggers changes in the design of engineering products and the typical challenges that engineers face, such as designing out safety risks. You will learn how material properties and manufacturing processes impact on the design of an engineering product. Finally, you will use an iterative process to develop a design for an engineering product by interpreting a brief.			
	Unit 1 ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ Ohm's law VIR ➢ Power P= IV, P= I2R, P =2VR ➢ Efficiency (η)= ➢ Kirchhoff voltage and current laws V= V1+ V2+ V3 or ΣPD= ΣIR, I= I1+ I2+ I3 ➢ Charge, voltage, capacitance and energy stored in capacitors Q= CV, W = 12CV2 ➢ RC transients (capacitor/resistor), charge and discharge, including exponential growth and decay of voltage and current, and time constant τ = RC ➢ Diodes, including forward and reverse bias characteristics: forward mode applications, including rectification, clamping, circuit/component protection	The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and	Pupils may have some basic knowledge and workshop skills from KS3 and KS4 Engineering.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics

	➢ reverse mode applications, including zener diode for voltage regulation ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ DC power sources, including cells, batteries , stabilised power supply, photovoltaic cell/array and internal resistance ➢ at least five resistors in series and parallel combinations RT= R1+ R2+ R31231 111TR RR R=++ ➢ DC circuits containing resistors and two power sources ➢ DC power source with at least two capacitors connected (series, parallel, combination).	electrical, electronic and mechanical principles to solve engineering problems.		➢ Production engineering ➢ Electrical engineering. ➢ Design engineering

	Unit 2 Transforming ideas and materials into products or services, including: ➢ preparation processes undertaken before manufacture or service delivery – use of information sources and the creation of technical specifications, engineering drawings, work plans and quality control documentation with due regard to the scale of production (one-off, small batch, large batch, mass or continuous) ➢ standards relevant to the specialist area of study – guidelines/rules to ensure conformity in processes or outputs, e.g. BS 8888, reference charts (limits and fits, tapping drills, bend allowances), procedure specifications. ➢ Common processes used to create engineered products, including: ➢ fitting, machining, fabrication, casting, forging, moulding. ➢ Common processes used in engineering services, including: ➢ disassembly, inspection, testing systems servicing	Several sections produced for coursework portfolio: Part drawings to BS8888 Production plan Quality control plan.	➢ Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering
	Unit 10 **Computer Aided Design in Engineering** To know how to develop a three-dimensional computer-aided model of an engineered product that can be used as part of other engineering processes	A practical drawing activity to produce a 3D model of a product.	2D CAD Skills from KS3 & 4	Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning ➢ Mechanical Engineering

				➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer

Spring 1	Big Idea It is vital for students to develop their knowledge of what engineering is about in order for them to make informed decisions for their future position within the national and global economy. The UK is aiming to develop a new smart style of engineering for which engineers are needed, and the country is short of engineers. Engineering covers a wide range of disciplines that will enable students to apply their mathematical, scientific and engineering skills to real-life problems.			
	Unit 1 ➢ Triangular measurement: ➢ functions (sine, cosine and tangent) ➢ sine/cosine wave over one complete cycle ➢ graph of tanA asA varies from 0° and 360° confirming tanA = sincosAAovalues of the trigonometric ratios for angles between 0° and 360° ➢ periodic properties of the trigonometric functions ➢ the sine and cosine rule ➢ application of vectors:–calculation of the phasor sum of two alternating currents–diagrammatic representation of vectors–resolution of forces/velocities ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems, in the context of electrical circuits (networks) and devices, including: ➢ conductance ➢ conventional current flow ➢ charge/electron flow tqI=voltage ➢ Coulomb's law 1224oqqFr=πε ➢ factors affecting resistance, including conductor length, cross sectional area, resistivity and temperature coefficient of resistance AlRρ=, 0RRΔ = αΔT	The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. Short examination style questions with written answers. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems.	Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering

	➢ resistors, including function, fixed, variable, values ➢ electric field strength, including uniform electric fieldsFEq=, Evd= ➢ factors affecting capacitance, including plate spacing, plate area, permittivity dACε= ➢ capacitors – typical capacitance values and construction, including plates, dielectric materials and strength, flux density, permittivity.			➢ Electrical engineering. ➢ Design engineering ➢ Transport engineering ➢ Design engineering
Spring 1	**Unit 2** Health and safety requirements. To know the general contents of legislation and regulations or other relevant international equivalents and how they are satisfied by safe systems of work/procedures, including: ➢ Current Health and Safety at Work legislation – duties of employers, employees, the Health and Safety Executive (HSE) and others, general prohibitions ➢ Current Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) – duties of employers ➢ Current Personal Protective Equipment (PPE) at Work Regulations – appropriateness if risk cannot be controlled in any other way, types of PPE, assessing suitable PPE given the hazard, supply, instructions/training, correct use, maintenance and storage ➢ Current Control of Substances Hazardous to Health Regulations (COSHH) ➢ Current Manual Handling Operations Regulations (MHOR)	A risk assessment report, prepared as an individual, detailing the health and safety requirements for the sand casting and CNC milling processes.		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering

Spring 1 **Spring 1**	**Unit 3** Design triggers The triggers that stimulate engineering design activity, including: market pull/technology, profitability, innovation, market research, product/process performance issues, sustainability (carbon footprint) Design challenges Commercial-, regulatory or public policy-based trends that challenge current technology or design, including: reduction of energy wasted, energy wasted during operation, physical dimensions, energy, product life cycle costs ➢ Equipment level and system level constraints and opportunities Factors that place limitations and offer opportunities at equipment level on the design of engineering products, including: ➢ reasons for selecting different solutions for equipment interfaces Material Properties, modes of failure, protection and lubrication of engineering materials and components that impact upon their selection when designing an engineering product, including: ➢ mechanical properties, physical, thermal, electrical and magnetic properties Mechanical power transmission Characteristics of an engineering system that makes use of forces and movement that impacts on mechanical power transmission component selection when designing an engineering	8 Hours written External Assessment When dates are announced there will be an intensive preparation for the examination. This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. The supervised assessment period is eight hours once the assessment has started the learner must complete within five days. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal.		Careers ➢ Maintenance engineer ➢ Structural engineer ➢ Mechanical engineer ➢ Production engineer ➢ Design engineer ➢ Environmental Engineer ➢ Safety Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ Design engineering ➢ Environmental Engineering ➢ Materials Engineering

	product, including: linkages, mechanical motion, power sources, control of power transmission ➢ Manufacturing processes Characteristics and effects of manufacturing processes that impact on the selection of engineering materials and components when designing an engineering product, including: ➢ processes for metals, polymers, ceramics (additive, casting, forming) ➢ processes for composites) ➢ scales of manufacture (one-off, small batch, large batch, mass, continuous Interpreting a brief into operational requirements and analysing existing products			
Spring 1	**Unit 10** **Computer Aided Design in Engineering** To know the key areas: 3D parametric modelling, Develop 3D component, Develop a 3D model, Output of drawings from a model	A practical drawing activity to produce a rendered 3D model .		Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning ➢ Mechanical Engineering ➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer

Spring 2	Big Idea It is ok to have a brilliant idea but making that idea into a reality is the job of an engineer. So many aspects need to be considered and good decisions made for the idea to become a successful realisation. It must function, it must be safe, it must be environmentally acceptable or friendly, it must be affordable it must be aesthetically pleasing, it must be tested for extreme events, etc. God decisions can only be made by knowledgeable and in many cases qualified engineers.			
Spring 2	**Unit 1** ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ waveform characteristics: ➢ sinusoidal and non-sinusoidal waveforms ➢ amplitude, time period, frequency ➢ instantaneous values: –peak/peak-to-peak–root mean square (RMS):RMS voltage = 2peak voltage–average values:average value = 2π× maximum value–form factor: form factor = RMS valueaverage value ➢ AC principles: ➢ determination of values using phasor and trigonometric representation of alternating quantities ➢ graphical and phasor addition of two sinusoidal voltages ➢ reactance and impedance of pure R, L and C components12CXfC=π, XL= 2πfLototal impedance of an inductor in series with a resistance22LzXR=+ ➢ total impedance of a capacitor in series with a resistance22CzXR=+ ➢ rectification, including half wave, full wave ➢ . Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ magnetic field:	The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. Students will be assessed through a number of short- and long-answer problem-solving questions.	Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Electrical engineering.

Spring 2	➢ flux density ABφ= ➢ magnetomotive force (mmf) and field strength (H), Fm= NI, NIHl= ➢ permeability0rBH=μμ ➢ B/H curves and loops ➢ ferromagnetic materials ➢ reluctance φmFS= ➢ magnetic screening hysteresis ➢ electromagnetic induction and applications: ➢ induced electromotive force (emf) ➢ relationship between induced emf, magnetic field strength, number of conductors turns and rate of change of flux ➢ relationship between number of turns, magnetic length, permeability, and inductance ➢ eddy currents ➢ principle of operation of electric motors and generators including efficiency ➢ self-inductance, including inductance of a coil, energy stored in an inductor, induced emfNLI=φ, W= 12LI2, E= Blv, ddlENLdtdt=−=−φ ➢ mutual inductance (principals of transformer operation – step up/down, primary and secondary current and voltage ratios, including efficiency.) 1122VNVN= ➢ application of Faraday's and Lenz's laws.			➢ Design engineering

Spring 2	**Unit 2** To understand that human factors affect the productivity of processes, including conformance to quality standards, reliability and the safety of individuals. Understanding that human factors affect the performance of individuals and teams, including: professionalism principles – rigour, honesty, integrity, respect, responsibility behaviours – values, attitude, persuasion, coercion, rapport, authority limitations – stress, time pressure, fatigue, memory, capability, motivation, knowledge, experience, health, inhibitors.	A report, prepared as an individual, detailing the human factors and the effects of such upon Sand casting and CNC milling		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering
Spring 2	**Unit 3** Design for a customer Meeting customer needs during engineering design activity, including: ➢ types of customer ➢ product and service requirements ➢ product design specification ➢ commercial protection B2 ➢ Regulatory constraints and opportunities	Examination style written product specification and a drawing exercise of a solution to a given engineering problem		Careers ➢ Maintenance engineer ➢ Structural engineer ➢ Mechanical engineer ➢ Production engineer ➢ Design engineer

	➢ Regulatory factors that place limitations and opportunities on the design of engineering products, including: ➢ legislation, standards, codes of practice environmental constraints health and safety ➢ Market analysis ➢ Engineering goals in terms of marketing when designing an engineering product, including: ➢ unique selling point (USP) ➢ benefits of the design obsolescence ➢ Performance analysis ➢ Engineering goals in terms of performance when designing an engineering product, including ➢ product form, functionality, technical considerations, choice of materials and components, environmental sustainability (impact, carbon footprint), processes for manufacturing/assembly, manufacturing requirements, quality indicators, environmental sustainability (impact, carbon footprint), design for manufacture .			➢ Environmental Engineer ➢ Safety Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ Design engineering ➢ Environmental Engineering ➢ Materials Engineering
Spring 2	**Unit 10** To practice the knowledge gained so far. Applying material properties.	Create models and drawings of at least five 3D components from an assembled product and apply a material to two or more components.		Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning

				➢ Mechanical Engineering ➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer

	Big Idea: Rationale: The UK has a world class presence in many engineering sectors, based upon an army of knowledgeable, innovative and hardworking engineers. The engineering sectors provide relatively stable and well paid careers in a wide range of jobs. These units of study provide a broad basis of study designed to provide progression into higher education or employment.			
Summer 2	**Unit 1** Mensuration: ➢ standard formulae to solve surface areas and volumes of regular solids –volume of a cylinder V= πr²h–total surface area of a cylinder TSA= 2πrh+ 2πr²–volume of sphere V= 43πr3–surface area of a sphereSA= 4πr2–volume of a cone V= 13πr2h–curved surface area of cone CSA= πrl ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ kinetic parameters and principles: ➢ displacement (s) ➢ velocity – initial velocity (u), final velocity (v) ➢ acceleration (a) ➢ equations for linear motion with uniform acceleration v= u+ at, s= ut+ 12at2, v2 = u2+ 2as, s= 12(u + v)t ➢ dynamic parameters and principles: ➢ force ➢ inertia ➢ torque (T) ➢ mechanical work W= Fs, mechanical power (average and instantaneous) ➢ mechanical efficiency ➢ energy: gravitational potential energy PE= mgh, kinetic energy KE= 12mv2 ➢ Newton's Laws of Motion	Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems.	➢ Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Electrical engineering.

	➢ principles of conservation of momentum ➢ principles of conservation of energy. ➢ angular parameters: ➢ angular velocity (ω) ➢ centripetal acceleration a= ω²r= 2vrouniform circular motion powerP = Tω ➢ rotational kinetic energy KE= 12Iω² ➢ lifting machines, including inclined planes, ➢ scissor jacks, pulleys: ➢ velocity ratio ➢ mechanical advantage ➢ effort and load motion ➢ friction effects			➢ Design engineering
Summer 2	**Unit 2** **Develop two-dimensional computer-aided drawings that can be used in engineering processes** Attributes of orthographic projections, including: ➢ Geometry, dimensions, tolerances, material, surface texture, scale. ➢ Drawing conventions or other relevant international equivalents, including: ➢ standards including BS 8888 and BS 60617 or other relevant international equivalents title block/layout ,projection symbols, scale, units, general tolerances, name of author, date, border, parts referencing	Practical activities to be undertaken as an individual to produce 2D computer-aided drawings. The drawings should include an orthographic projection and an electric circuit diagram. The evidence will include the drawings, observation records/witness statements and annotated screenshots		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering

				➢ Design engineering
Summer 2	**Unit 3** To know how to assess and quantify; environmental sustainability (impact, carbon footprint), processes for manufacturing/assembly, manufacturing requirements, and quality indicators.	Examination style written answer on a given design proposal detailing the environmental impact, manufacturing processes, and quality indicators.		Careers ➢ Maintenance engineer ➢ Structural engineer ➢ Mechanical engineer ➢ Production engineer ➢ Design engineer ➢ Environmental Engineer ➢ Safety Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ Design engineering ➢ Environmental Engineering ➢ Materials Engineering

Summer 2	**Unit 10** To practice and apply the knowledge in using CAD gained so far.	Create models and drawings of at least five different 3D components from an assembled product, and apply a material to two or more components.		Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning ➢ Mechanical Engineering ➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer

	Big Idea: Rationale: The UK has a world class presence in many engineering sectors, based upon an army of knowledgeable, innovative and hardworking engineers. The engineering sectors provide relatively stable and well paid careers in a wide range of jobs. These units of study provide a broad basis of study designed to provide progression into higher education or employment.			
Summer 2	**Unit 1** Examination technique, preparation and practice.	The unit will be assessed through one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems.	➢ Many aspects and concepts from CGSE Maths and Science are used in this unit.	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Electrical engineering.

				➢ Design engineering
Summer 2	**Unit 2** Develop two-dimensional computer-aided drawings that can be used in engineering processes Attributes of orthographic projections, including: ➢ views – elevation, plan, end, section, hatching style, auxiliary ➢ line types – centre, construction, outline, hidden, leader, dimension ➢ common features, diagram symbols and components ➢ drawing template, layers ➢ commands – line, circle, arc, polygon, chamfer, fillet, grid, snap, copy, rotate, erase, stretch, trim, scale, dimensioning, text, pan, zoom-in, zoom-out ➢ cross-sectioning.	Practical activities to be undertaken as an individual to produce 2D computer-aided drawings. The drawings should include an orthographic projection and an electric circuit diagram. The evidence will include the drawings, observation records/witness statements and annotated screenshots		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering
Summer 2	**Unit 3** Design proposals Initial and developed propositions to improve an engineering product, including: ➢ technical design criteria, idea generation, developed design idea, use of information sources.	Examination style design proposal answer for a given scenario.		Careers ➢ Maintenance engineer ➢ Structural engineer ➢ Mechanical engineer ➢ Production engineer

	Communicating designs Communication of an initial and a developed proposition to improve an engineering product, including: ➢ freehand sketching and diagrams, graphical techniques, written skills, documentation Iterative development process ➢ Using an iterative process to improve an engineering product, including: ➢ refining a task or process, cyclic process (logical non-linear approach, focus on product design specification/criteria) Statistical methods Statistical techniques as applied to engineering problems, including: ➢ statistical measurement, data handling Validating designs Rationalise choices made when generating a developed proposition to improve an engineering product, including: objective referencing against product design specification/criteria, indirect benefits and opportunities, balancing benefits and opportunities with constraints, further modifications	Examination style written answer based on a given set of statistical data.		➢ Design engineer ➢ Environmental Engineer ➢ Safety Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ Design engineering ➢ Environmental Engineering ➢ Materials Engineering

Summer 2	**Unit 10** **Computer Aided Design in Engineering** To increase knowledge of international drawing standards and to practice how to produce drawings which comply and how to identify errors in drawings which prevent compliance with the standards.	Produce accurate models and drawings that mainly meet an international standard of an assembled 3D product containing at least seven well orientated components and apply a material to all components.		Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning ➢ Mechanical Engineering ➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer

Year 13 Overview

	Big Idea Rationale: The UK has a world class presence in many engineering sectors, based upon an army of knowledgeable, innovative and hardworking engineers. The engineering sectors provide relatively stable and well-paid careers in a wide range of jobs. These units of study provide a broad basis of study designed to provide progression into higher education or employment.			
Autumn 1	**Unit 1** Dependent upon the group and individual students results from the examination in Y12 Further study will be individually targeted, selected from the following: ➢ Solve, transpose and simplify equations. ➢ Indices and logarithms: ➢ laws of indices:am × an = am+n, mnaa= am−n, (am)n= amn ➢ laws of logarithms: logA + logB = logAB, logAn = nlogA, logA – logB = logABocommon logarithms (base 10), natural logarithms (base e). ➢ Application to problems involving exponential growth and decay. ➢ Linear equations and straight line graphs: ➢ linear equations of the form y= mx+ c ➢ straight-line graph (coordinates on a pair of labelled Cartesian axes, positive or negative gradient, intercept, plot of a straight line) ➢ pair of simultaneous linear equations in two unknowns. ➢ Factorisation and quadratics:	The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students	➢ Mistakes often made due to not applying GCSE maths skills correctly. ➢ Concept of logarithms is often difficult to understand and apply ➢ There is a wide breadth of knowledge from many different engineering disciplines making deep understanding difficult to acquire as time is stretched over	Careers ➢ Production engineer ➢ Automotive engineer ➢ Maintenance engineer ➢ Design engineer ➢ Structural engineer ➢ Aerospace engineer ➢ Crash test investigator Future learning ➢ Mechanical engineering ➢ Transport engineering ➢ Robotics and mechatronics ➢ Production engineering ➢ Electrical engineering.

	➢ multiply expressions in brackets by a number, symbol or by another expression in a bracket ➢ extraction of a common factor ax+ ay, a(x + 2) + b(x +2) ➢ grouping ax– ay+ bx– by ➢ quadratic expressions a2 + 2ab + b2oroots of an equation, including quadratic equations with real roots by factorisation, and by the use of formula. A2 Trigonometric methods ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ submerged surfaces in fluid systems: ➢ hydrostatic pressure and hydrostatic thrust on an immersed plane surface F= ρgAx ➢ centre of pressure of a rectangular retaining surface with one edge in the free surface of a liquid ➢ immersed bodies: ➢ Archimedes' principle ➢ determination of density using floatation methods ➢ relative density ➢ fluid flow in a gradually tapering pipe: ➢ flow rate (volumetric and mass) ➢ flow velocities (input and output) ➢ input and output pipe diameters ➢ incompressible fluid flow (continuity of volumetric flowA1v1 = A2v2and mass flow ρA1v1= ρA2v2) ➢ Circular measure: ➢ Radian	will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-	the breadth of materials. ➢ Electrical and electronic concepts can be difficult to visualise and understand.	➢ Design engineering

	➢ conversion of degree measure to radian measure and vice versa ➢ angular rotations (multiple number (n) of radians) ➢ problems involving areas and angles measured in radians ➢ length of arc of a circle s= rθ ➢ area of a sector A= 12r2θ ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems, involving: ➢ Non-concurrent coplanar forces: ➢ representation of forces using space and free body diagrams ➢ moments ➢ resolution of forces in perpendicular directions Fx= Fcosθ, Fy= Fsinθ ➢ vector addition of forces – resultant, equilibrant and line of action ➢ conditions for static equilibrium ΣFx = 0, ΣFy= 0, ΣM = 0 ➢ Simply supported beams: ➢ concentrated loads ➢ uniformly distributed loads (UDL). ➢ Reactions: ➢ support reactions ➢ pin reaction forces ➢ roller reaction forces.B2 Loaded components ➢ Recall, perform procedures, demonstrate an understanding of and analyse information and systems involving: ➢ direct stress and strain: direct stress σ= FA, direct strain ε= LLΔ	answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical principles to solve engineering problems. The final assessment will be via one paper of 80 marks lasting two hours that will be set and marked by Pearson. Students will be assessed through a number of short- and long-answer problem-solving questions. Students will need to explore and relate to the engineering contexts and data presented. Assessment will focus on students' ability to solve problems that require individual and combined application of mathematical techniques, and electrical, electronic and mechanical		

	➢ shear stress and strain: shear stress τ = FA, shear strainγ = ab ➢ tensile and shear strength ➢ elastic constants: Young's Modulus (modulus of elasticity) E= σε; Modulus of rigidity G= τγ	principles to solve engineering problems.		
Autumn 1	**Unit 2** Delivery of manufacturing or service engineering processes for engineered products or engineering services. Selecting, setting up and using engineering equipment to manufacture engineered products Selecting, setting up and using engineering equipment to deliver engineering services A team is defined as containing three or more individual members who have a shared common objective to complete. ➢ Strengths and limitations of team members – perceived competencies and constructive peer feedback. ➢ Allocation of responsibilities – roles, activities. ➢ Timescales – planning the activities. ➢ Objectives – team targets. Risk assessment in an engineering workshop and for specific engineering processes, following guidance from the HSE (or other relevant international equivalents), including: ➢ identification of hazards	Plan and complete practical engineering processes as a leader and as a member of a team. The evidence will include records of team meetings (minutes), activity logs, a risk assessment, set-up planning notes, quality control charts/annotated drawings, modified production plans, annotated photographs of the processes and observation records/witness statements		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning ➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering

	➢ assessing risk by determining how hazards can cause injury ➢ choosing and using appropriate control measures and precautions to reduce risk ➢ recording all findings – standard HSE (five steps) pro forma ➢ reviewing the risk assessment after new equipment/work activities have been undertaken, at regular intervals. ➢ C4 Preparation activities for batch manufacture or batch service delivery ➢ A batch is defined as a quantity of three or more of a product or service delivered together. ➢ Understanding the requirements of production plans, specifications, engineering drawings and other technical documentation			
Autumn 1	**Unit 3** Dependent upon the group and individual students results from the external assessment in Y12 Further study will be individually targeted, selected from the following: Design triggers The triggers that stimulate engineering design activity, including: market pull/technology, profitability, innovation,	8 Hours written External Assessment	➢ 2D CAD Skills from KS3 & 4	

	market research, product/process performance issues, sustainability (carbon footprint) Design challenges Commercial-, regulatory or public policy-based trends that challenge current technology or design, including: reduction of energy wasted, energy wasted during operation, physical dimensions, energy, product life cycle costs ➢ Equipment level and system level constraints and opportunities Factors that place limitations and offer opportunities at equipment level on the design of engineering products, including: ➢ reasons for selecting different solutions for equipment interfaces Material Properties, modes of failure, protection and lubrication of engineering materials and components that impact upon their selection when designing an engineering product, including: ➢ mechanical properties, physical, thermal, electrical and magnetic properties Mechanical power transmission Characteristics of an engineering system that makes use of forces and movement that impacts on mechanical power transmission component selection when designing an engineering product, including: linkages,	When dates are announced there will be an intensive preparation f the examination. This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. The supervised assessment period is eight hours once the assessment has started the learner must complete within five days. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal.		

	mechanical motion, power sources, control of power transmission ➢ Manufacturing processes Characteristics and effects of manufacturing processes that impact on the selection of engineering materials and components when designing an engineering product, including: ➢ processes for metals, polymers, ceramics (additive, casting, forming) ➢ processes for composites) ➢ scales of manufacture (one-off, small batch, large batch, mass, continuous Interpreting a brief into operational requirements and analysing existing products Design for a customer Meeting customer needs during engineering design activity, including: ➢ types of customer ➢ product and service requirements ➢ product design specification ➢ commercial protection B2 ➢ Regulatory constraints and opportunities Regulatory factors that place limitations and opportunities on the design of engineering products, including: ➢ legislation, standards, codes of practice environmental constraints health and safety	8 Hours written External Assessment When dates are announced there will be an intensive preparation f the examination. This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. The supervised assessment period is eight hours once the assessment has started the learner must complete within five days. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal.		

	➢ Market analysis Engineering goals in terms of marketing when designing an engineering product, including: unique selling point (USP) benefits of the design obsolescence ➢ Performance analysis ➢ Engineering goals in terms of performance when designing an engineering product, including ➢ product form, functionality, technical considerations, choice of materials and components, environmental sustainability (impact, carbon footprint), processes for manufacturing/assembly, manufacturing requirements, quality indicators, environmental sustainability (impact, carbon footprint), design for manufacture Design proposals Initial and developed propositions to improve an engineering product, including: ➢ technical design criteria, idea generation, developed design idea, use of information sources. Communicating designs Communication of an initial and a developed proposition to improve an engineering product, including:	8 Hours written External Assessment When dates are announced there will be an intensive preparation f the examination. This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. The supervised assessment period is eight hours once the assessment has started the learner must complete within five days. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal. 8 Hours written External Assessment When dates are announced there will be an intensive preparation f the examination.		

	➢ freehand sketching and diagrams, graphical techniques, written skills, documentation Iterative development process ➢ Using an iterative process to improve an engineering product, including: ➢ refining a task or process, cyclic process (logical non-linear approach, focus on product design specification/criteria) Statistical methods Statistical techniques as applied to engineering problems, including: ➢ statistical measurement, data handling Validating designs Rationalise choices made when generating a developed proposition to improve an engineering product, including:• objective referencing against product design specification/criteria, indirect benefits and opportunities, balancing benefits and opportunities with constraints, further modifications	This unit is assessed by a set task of 60 marks provided by Pearson and completed under supervised conditions. The supervised assessment period is eight hours once the assessment has started the learner must complete within five days. During the supervised assessment period, learners will complete a task that will require them to follow a standard development process of interpreting a brief, scoping initial design ideas, preparing a design proposal and evaluating their proposal.		

Autumn 1	**Unit 10** Develop two-dimensional detailed computer-aided drawings of an engineered product that can be used a part of other engineering processes 2D drawing commands Development of 2D engineering drawings Output of 2D drawings	Portfolio containing accurate models and drawings that meet an international standard of an assembled 3D product containing at least seven well orientated components and apply a material to all components.		Careers ➢ CAD Draftsperson ➢ Design engineer ➢ Structural engineer ➢ CAD/CAM operator Future learning ➢ Mechanical Engineering ➢ Transport Engineering ➢ Robotics and mechatronics ➢ Design engineer ➢
	Big Idea, Continued: Rationale: The UK has a world class presence in many engineering sectors, based upon an army of knowledgeable, innovative and hardworking engineers. The engineering sectors provide relatively stable and well-paid careers in a wide range of jobs. These units of study provide a broad basis of study designed to provide progression into higher education or employment.			
Autumn 2	**Unit 2** Delivery of manufacturing or service engineering processes For engineered products or engineering services. Selecting, setting up and using engineering equipment to manufacture engineered products Selecting, setting up and using engineering equipment to deliver engineering services	Plan and complete practical engineering processes as a leader and as a member of a team. The evidence will include records of team meetings (minutes), activity logs, a risk assessment, set-up planning notes, quality control charts/annotated drawings, modified production plans, annotated photographs of the processes and observation records/witness statements		Careers ➢ Mechanical technician ➢ Production engineer ➢ Manufacturing engineer ➢ Process engineer ➢ Quality Engineer Future learning

	A team is defined as containing three or more individual members who have a shared common objective to complete. ➢ Strengths and limitations of team members – perceived competencies and constructive peer feedback. ➢ Allocation of responsibilities – roles, activities. ➢ Timescales – planning the activities. ➢ Objectives – team targets. Risk assessment in an engineering workshop and for specific engineering processes, following guidance from the HSE (or other relevant international equivalents), including: ➢ identification of hazards ➢ assessing risk by determining how hazards can cause injury ➢ choosing and using appropriate control measures and precautions to reduce risk ➢ recording all findings – standard HSE (five steps) pro forma ➢ reviewing the risk assessment after new equipment/work activities have been undertaken, at regular intervals. ➢ C4 Preparation activities for batch manufacture or batch service delivery ➢ A batch is defined as a quantity of three or more of a product or service delivered together.			➢ Mechanical Engineering ➢ Production engineering ➢ CAD/CAM engineering ➢ Design engineering

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	Big Idea, Continued:			

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	➢ choosing and using appropriate control measures and precautions to reduce risk ➢ recording all findings – standard HSE (five steps) pro forma ➢ reviewing the risk assessment after new equipment/work activities have been undertaken, at regular intervals. ➢ C4 Preparation activities for batch manufacture or batch service delivery ➢ A batch is defined as a quantity of three or more of a product or service delivered together. ➢ Understanding the requirements of production plans, specifications, engineering drawings and other technical documentation			
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	➢ Objectives – team targets. Risk assessment in an engineering workshop and for specific engineering processes, following guidance from the HSE (or other relevant international equivalents), including: ➢ identification of hazards ➢ assessing risk by determining how hazards can cause injury ➢ choosing and using appropriate control measures and precautions to reduce risk ➢ recording all findings – standard HSE (five steps) pro forma ➢ reviewing the risk assessment after new equipment/work activities have been undertaken, at regular intervals. ➢ C4 Preparation activities for batch manufacture or batch service delivery ➢ A batch is defined as a quantity of three or more of a product or service delivered together. ➢ Understanding the requirements of production plans, specifications, engineering drawings and other technical documentation			