Foundation Year - Skills Assessment for Engineering - White headers are NC

		Duration	Focus	Investigate: Understanding, contexts, users and purpose, research and analysis	Application of knowledge and skills	Design: Generating, developing, modelling and communicating ideas	Application of knowledge and skills	Make: Planning and sequencing, modelling, protoyping	Application of knowledge and skills	Evaluate: Own ideas and products, other products, prolific designers	Application of knowledge and skills	Technical Knowledge: Understanding of machines, processes, tools and techniques, Development of materials, component and process knowledge	Application of knowledge and skills	Communication: Recording, presenting and sharing ideas through 2D and 3D media	Application of knowledge and skills	Mathematical Thinking & Scientific Links: Maths and Science in learning related to real world design and make situations	Application of knowledge and skills	Career Development: How these projects and skills will help in the real world
Systems	Autumn	14 weeks based on 2 lessons wk/	Programmable Control 1- Life on Mars - Satellite Applications Catapult Link & DSE EEP	Interpret the design scenario, re using a block based program to navigate through a lunar landscape. Consider a range of input sensors and output actuators to power the robot.	4	Create a range of solutions for programming a simple automonous robot. Communicate these in a series of VEX VR animation and screenshots.	4	Create a plan for a series of control programs to use with VEX IQ robots to navigate a course using sensors and coding. Use the Genie microcontroller virtual set up as well as VEX VR to make programs. (link Y10 CW R048)	4	Answer a series of questions and prompts demonstrating why each iteration of the robot program showed progression and solved the control task. Evaluation of ideas shows a range of influencing factors were considered.	4	understanding operating systems for VEX and circuit wizard microcontrollers. Knowledge of input sensors and output actuators. Knowledge of coding protocols using flowchart based software.	4	Team presentation demonstrating PVES as to why the selected protocols were used. Screenshots of programming as well as live footage of each team performing their task.(possibly link to national comp)	4	Interpret the scenario - apply it to an interplanetary mission to navigate part of a journey autonomously (eg. lunar, martian, driverless vehicles). Propose and iterate sequences of commands to successfully solve a course requiring input and output devices. Reflect on progress, and make further suggestions, contributing to the development of coding and component deployment in real world situations.	4	This project develops skills for careers in robotics, automation, and aerospace engineering. Learners design and program autonomous robotic systems using VEX VR and Genie microcontrollers, applying real-world coding principles linked to Satellite Applications Catapult and DSE EEP. The work mirrors industry challenges in space exploration, driverless vehicles, and automated control systems, supporting progression into roles such as robotics engineer, systems programmer, or mechatronics technician.
	Spring 1 DSAK link	10 weeks based on 2 lesson per week	Sustainability - Solar motor drive system Energy Systems Catapult - Schneider Electric EEP	Analysis and experimentation of renewable energy - solar. Investiagte 6R's	4	Generate a range of ideas in a variety of media and protoype various designs to demonstrate evidence of iterative design for circuit. Use of CAD to design and develop circuit for solar system.	3	Use of CAD to test circuit. Manufacture of solar circuit.	4	Analysis and evaluation of existing solutions. Analysis, testing and evaluation of circuits and systems. Evaluation of circuit from testing. Testing of distance travelled by solar car.	3	circuit components, use of CAD CAM, developed understanding of sustainability - 6R's. Use of advanced machines and techniques circuit manufacture.	4	Create a portfolio of evidence showing project development. Present this to a small group as part of the evaluation and reflection.	4	Planning and orgainsing of manufacture. Understanding of components. Understanding of gear systems and wheel sizes. Understanding or aerodynamics and sustainability including renewable energy systems.	4	This project develops skills for careers in renewable energy, electrical engineering, and sustainable design. Learners design, test, and evaluate solar-powered circuits and drive systems, applying CAD and CAM to prototype renewable solutions inspired by Energy Systems Catapult and Schneider Electric. The project supports progression into roles such as renewable energy engineer, electrical technician, sustainability consultant, or product designer, focusing on innovation and environmental responsibility in modern engineering.
	Summer 1	12 weeks 2 hours per week	Low voltage lighting - final assessed project Northern Powergrid Link	Analyse a range of series and parallel circuits - intent to identify a suitable design for a low cost USB lamp - add in continuity tester	4	Using CAD to draw a circuit, and create a range of layouts. Use this to make a personal PCB layout, amending a template. Use CAD software to model and generate sequence evidence of the circuit and PCB.	4	Create a working CAD circuit. Create a working USB LED SUTC light.	4	Follow a test plan and carry out some electrical and non-electrical testing	4	Electronic principles, units, CAD, virtual and real life test equipment. Soldering equipment.	4	Create a portfolio of evidence showing project development. Present this to a small group as part of the evaluation and reflection.	4	Use of Ohm's Law to demonstrate current, resistance and voltage both virtually and with real components	4	This project develops practical and analytical skills for careers in electrical engineering, electronics, and energy systems. Learners design and test low-voltage USB lighting circuits, using CAD and PCB design tools alongside real-world testing linked to Northern Powergrid. The project builds understanding of Ohm's Law, circuit design, and sustainable energy use, supporting progression into roles such as electrical engineer, electronics technician, energy systems apprentice, or product designer.
		Average			4		4		4		4		4		4		4	
Design	Autumn	15 weeks	Locker Tags: Introduction to CAD/CAM, (2D Design and Laser cutting). Casting metals and CNC milling. Solidworks - skills builder intervention classes introduced	Research/investigate the problem and user needs. Use of 2D Design. introduce ACCESS FM (R038 link) introduction to linear, iterative and user centred design.	3	Research/investigate the problem and user needs - analyse a design brief. Construct a specification for the locker tag. Learn and use creative techniques to generate original sketch ideas. Introduction to solidworks (skills builder and isolated from project)	4	Use CAD/CAM to draw and laser cut 3-part tag mould. Workshop safety induction and introduction to hand fabrication skills. Pewter cast tag then fettle using hand tools. Use design to send to CNC mill	4	Sketch ideas evaluated against constructed specification. Seek 3rd party feedback. Compare 2D Design against hand drawn and Solidworks. Evaluate making skills and practical outcome.	3	Learn about material properties comparing pewter against aluminium for casting. Learning about CAD/CAM, CNC and casting processes.	3	Communication of ideas as 2D and 3D rendered sketches and CAD drawn solution. Communication through final outcome.	4	Drawing to scale . (CAD mould drawing).	4	This project introduces key skills for careers in product design, manufacturing, and mechanical engineering. Learners use 2D Design, SolidWorks, laser cutting, casting, and CNC milling to develop and produce a functional locker tag, applying user-centred and iterative design principles. These experiences reflect modern industry practices used in digital manufacturing and prototyping, supporting progression into roles such as CAD designer, product engineer, CNC technician, or industrial designer.
	Spring	11 weeks	Designers and the design process - Origami animal light	Using secondary research. Investigating famous designers. Researching to inform design ideas, (moodboards). Researching existing solutions using Product Analysis, (ACCESSFM).	4	Introduction to iterative design. Sketching designs in 2D and 3D. Prototyping - card modelling and virtual modelling, (SolidWorks)	4	Hand fabrication with focus on measuring and marking out to construct 2 piece sheet metal light.	4	Evaluation of hand skills competency, (students to complete skills audit). Evaluation of practical outcome.	4	Understanding of how to measure and mark accurately.Increased understanding and competency with SolidWorks virtual modelling software.	4	Communication through 3D practical outcome, (sheet metal origami animal). And through 2D/3D sketching and card/virtual modelling.	4	Measuring and marking out for making. Drawing to scale, (for prototype modelling). Use of symmetry in prototype construction.	4	This project builds creative and technical skills for careers in product design, industrial design, and engineering. Learners explore famous designers, research methods, and iterative design, using SolidWorks, card modelling, and metal fabrication to create a functional prototype. The project reflects real-world design processes used in lighting, consumer product, and furniture industries, supporting progression into roles such as product designer, design engineer, or model maker.
	Summer	10 weeks	Robot vacuum cleaner - (R039 walk through for pre-assessment)	Familiarstaion with R039 structure and expectations. Analysis of design briefs and specifications.	4	Recapping oblique and Isometric sketching and rendering techniques. Discussion on idea selection and development "do's and don'ts" Introduction to 3rd Angle Orthographic Projection and engineering drawings	4	Virtual modelling only. Advanced learning with SolidWorks software.	2	Evaluation of work for each Task against mock marking criteria, (based around OCR guidelines).	4	Introduction to Scales of Production and Mass production manufacturing techniques.	4	Communication of design process leading to final outcome. Communicated through an e-portfolio.	4	Drawing to scale . (Engineering drawings). Using a Ranking matrix.	4	This project develops design and technical communication skills relevant to product design, robotics, and manufacturing engineering. Learners apply SolidWorks virtual modelling, engineering drawing, and design evaluation techniques to create and analyse autonomous product concepts. The project mirrors professional design and development processes used in consumer technology and robotics industries, supporting progression into roles such as design engineer, CAD technician, or product development engineer.
		Average			4		4		3		4		4		4		4	
Manufacture	Autumn 1		Hand Fabrication - Royal Navy - Firmac - schneider	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties. Drawing conventions, line types link to R039 BS8888, holes, countersinks etc	3	Risk assessments of hand fabrication tools and techniques. Communication of production plan. Clear link to Big Picture and where used in industry.	1	Manufacture of the PFCU bracket using hand fabrication techniques - focus on measuring and marking. Manufacture of the hanging basket bracket using the forge. Use of hacksaw, files (cross and draw filing), radius gauge, pillar drill, box pan folder.	5	Evaluation of product against technical drawing. Evaluation of skills development. Constant use of QC	4	Understanding of forging - crystaline structure of metals, heat treatments and material properties. Measuring and marking - accuracy, metal types. Use of technology and machines.	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs.	4	Learners apply industry practices in technical drawing, fabrication, material selection, and quality control, mirroring roles in the Royal Navy, Firmac, and Schneider. The experience supports progression into roles such as fabricator, mechanical engineer, CAD technician, or engineering apprentice.
	Autumn 2		Turing project - Plaxtons	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties. Investiagtion of machines applications and kinematics of centre lathe	4	Risk assessments of turning. Communication of production plan. Clear link to Big Picture and where used in industry.	1	Manufacture of component using centre lathe techniques; Facing off, parallel turning, boring, counter boring, turning between centres, automatic thread cutting, tapping, chamfering.	5	Evaluation of product against technical drawing. Evaluation of skills development. Constant use of QC. Application of tolerance +/- 0.3mm	4	Use of centre lathe, tooling and techniques. understanding of speeds and feed rates for materials. Use of co-ordiantes	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs. Spindle speeds and feeds calculations - use of gears, ratios and co-ordiantes	4	This project develops core skills for precision engineering and manufacturing careers. Learners use centre lathe techniques, apply tolerances, and understand machine kinematics, reflecting industry practice at Plaxtons. It supports progression into roles such as CNC machinist, mechanical engineer, toolmaker, or maintenance technician, where accuracy, planning, and material knowledge are essential.
	Autumn 2		Hand Fabrication, Forging and MIG welding - Age UK	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties.	3	Risk assessments of welding and hand fabrication tools and techniques. Communication of production plan. Clear link to Big Picture and where used in industry.	2	Manufacture of the hanging basket bracket using the forge. Use of hacksaw, files (cross and draw filing), radius gauge, pillar drill, box pan folder. Production of welded joints including; lap, butt, T fillet and vertical. Extension activity using developed techniques to product log artifact.	5	Evaluation of product against technical drawing. Evaluation of skills development. Constant use of QC	4	Understanding of forging - crystaline structure of metals, heat treatments and material properties. Measuring and marking - accuracy, metal types. Use of technology and machines.	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs.	4	This project develops essential skills for careers in fabrication, welding, and metalworking. Learners apply technical drawing interpretation, forging, and MIG welding techniques to create real products, reflecting practices used in engineering and maintenance industries. It supports progression into roles such as fabricator-welder, maintenance engineer, blacksmith, or metalwork technician, where precision, safety, and material knowledge are vital.
	Spring 1 / 2		Turning / hand fabrication -advanced project like solder pen or engineers square	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties. Investiagtion of machines applications and kinematics of centre lathe or hand tools	4	Risk assessments of hand fabrication tools and techniques / machines. Communication of production plan. Clear link to Big Picture and where used in industry.	1	Manufacture of solder pen or square using centre lathe techniques; Facing off, parallel turning, boring, counter boring, turning between centres, automatic thread cutting, tapping, chamfering.	5	Evaluation of product against technical drawing. Evaluation of skills development. Constant use of QC. Application of tolerance +/- 0.3mm	4	Use of centre lathe / hand fabriocation tools, tooling and techniques. understanding of speeds and feed rates for materials. Use of co-ordiantes	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs. Spindle speeds and feeds calculations - use of gears, ratios and co-ordiantes	4	This advanced project builds precision skills for engineering, toolmaking, and manufacturing careers. Learners apply lathe and hand fabrication techniques, work to tight tolerances, and interpret technical drawings to produce high-quality components. These skills align with roles such as CNC machinist, precision engineer, toolmaker, or mechanical engineering apprentice, where accuracy, problem-solving, and process planning are essential.
	Spring 1 / 2		Milling introduction	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties. Investiagtion of machines applications and kinematics of milling machine.	4	Risk assessments of milling tools and techniques. Communication of production plan. Clear link to Big Picture and where used in industry.	1	Manufacture of products using manual milling techniques; Face cutting, slot cutting, boring, counter boring, tapping, chamfering.	5	Evaluation of welds. Application of understanding of cold lap, undercuts and poor welds.	4	Use of MIG/MAG welding using mild steel. Development of understanding for permanent fixing of metals.	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs. Thickness and power calculations for welders - heat transfer.	4	This project develops core skills for precision machining and manufacturing careers. Learners apply manual milling and MIG welding techniques, interpret technical drawings, and understand machine kinematics and material behaviour. These skills prepare students for roles such as CNC machinist, milling technician, mechanical engineer, or fabrication apprentice, where precision, planning, and process control are vital.
	Summer		Milling or CNC - IGUS UK & Unison pipe bender Final assessment / baseline for KS4	Investigating 2D and 3D technical drawings. Analysis of technical drawings. Investigate material types and properties. Investiagtion of machines applications and kinematics of milling machine. Application of levers to bend pipes - link to industry.	4	Risk assessments of milling tools and techniques. Communication of production plan. Clear link to Big Picture and where used in industry.	1	Manufacture of pipe bender using manual milling techniques; Face cutting, slot cutting, boring, counter boring, tapping, chamfering.	5	Evaluation of product against technical drawing. Evaluation of skills development. Constant use of QC. Application of tolerance +/- 0.3mm	4	Use of vertical milling machines, tooling and techniques. understanding of speeds and feed rates for materials. Application of co-ordiantes	5	Communication through risk assessments, production plan, evaluation and past paper questions.	3	Planning and organising of manufacture. Understanding of material types, categories, properties and uses (Periodic table). Quality control and visualisation of designs. Spindle speeds and feeds calculations - use of gears, ratios and co-ordiantes	4	This project builds advanced skills for careers in CNC machining, manufacturing, and mechanical engineering. Learners apply manual and CNC milling techniques, understand machine kinematics, and use precision measurement and tolerances to produce industry-standard components. These experiences reflect real processes used at IGUS UK and Unison, supporting progression into roles such as CNC programmer, manufacturing engineer, mechanical technician, or production .
		Average			4		1		5		4		5		3		4