## Year 7

## Engineering - Designing (Sketching, Drawing & Modelling)

- **Sketching & Graphic Techniques:** 2D sketching, 3D sketching, elevations, mark making, line weight/pressure, rendering, shading (light, depth, texture), and annotations.
- **Technical & Pictorial Projection:** Oblique projection, isometric projection, one-point perspective, two-point perspective, horizon line, vanishing point, construction lines, projection lines, and exploded views.
- **Prototyping & Physical Modelling:** 3D nets (faces, dimensions, tabs), scale models, physical prototypes, ergonomic data, anthropometrics, and ergonomes.

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## Engineering - Mechanical Systems & Movement

- **Forms of Motion:** Linear (straight line), rotary (circular), reciprocating (back-and-forth in a straight line), and oscillating (back-and-forth in an arc).
- **Levers & Linkages:** Fulcrum (pivot), effort, load, mechanical advantage, Class 1 levers, Class 2 levers, Class 3 levers, parallel motion linkage, reverse motion linkage, bell crank, crank and slider, and lazy tongs.
- **Cams & Followers:** Rotary cams (eccentric, snail, pear, heart-shaped / constant velocity), followers (flat, knife-edged, roller), and cam phases (rise, dwell, fall).
- **Drive Systems & Gearing:** Gear trains, spur gears, drive gear, driven gear, idler gear, compound gears, bevel gears, velocity ratio (gearing up vs. gearing down), pulleys and belts, chain and sprocket, transmission, friction, lubrication, and bearings.

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## Food and nutrition - Nutrition & Health

- **Nutritional Science & Energy:** Macronutrients (carbohydrates, fats, proteins), micronutrients (vitamins, minerals), dietary fibre / NSP (non-starch polysaccharides), kilocalories (kcal), metabolic rate, and energy forms (mechanical, chemical, heat, electrical).
- **Dietary Needs & Food Provenance:** Eatwell Guide, food miles, carbon footprint, provenance, organic farming, sustainability, 6 Rs (Refuse, Rethink, Reduce, Recycle, Reuse, Repair), MAP (Modified Atmosphere Packaging), anaerobic digesters, and ethical/religious diets (vegan, vegetarian, Halal, Kosher).
- **Health & Food Safety:** Allergens vs. intolerances (anaphylaxis, lactose, gluten), diabetes, obesity, intrinsic vs. extrinsic sugars, gustatory perception (sweet, sour, salty, bitter, umami), biological/chemical/physical hazards, food poisoning pathogens, and pasteurisation.

### Practical Skills & Food Preparation Techniques

- Bridge Grip
- Claw Grip
- Rubbing In
- Cutting In
- Enrobing
- Dicing & Batons
- Grating & Quartering

### Kitchen Hygiene, Safety & Organisation

- Cross-Contamination
- Hygiene
- Hazard
- Risk
- Control Measure
- Mise en Place
- Colour-Coded Chopping Boards

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## Textiles - Functionality & Aesthetics

- **Design Principles & Form:** Form, function, aesthetics, "form follows function", fit for purpose, anthropomorphic design, harmony, balance, and asymmetrical balance.
- **Natural Structures & Mathematics:** Biomimicry, organic architecture, Fibonacci sequence (spiral geometry), geometric forms vs. organic forms, tessellation, triangulation, and camouflage.
- **Sustainability & Life Cycle:** Linear economy (extract-make-dispose) vs. circular economy (zero-waste cycle), life cycle, and circular design.

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## Year 8

## Engineering - 3D Printing & Prototyping

- **Core Technical Vocabulary:** Additive manufacturing, iterative designing, CAD (Computer-Aided Design), deposition, STL file, slicing software, tolerances, thermoplastic, extruder, prototyping, extrusion, G-code, post-processing, PLA (Polylactic Acid), and ABS (Acrylonitrile Butadiene Styrene).
- **Manufacturing Processes & Hardware:** FDM (Fused Deposition Modelling) / FFF (Fused Filament Fabrication), SLA (Stereolithography using UV light curing photopolymer resin), SLS (Selective Laser Sintering of powdered nylon/metal), build plate/bed, and CNC (Computer Numerical Control).

- **3D Design & Geometry Constraints:** Overhangs, support material, bridging, wall thickness, and draft angles.
- **Advanced Concepts:** Disruptive technology, generative design, and biomimicry.

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## Engineering - Forces & Stresses

- **Primary Stresses & Forces:** Tension (stretching), compression (squashing), bending, torsion (twisting), shear (perpendicular sliding forces), static loads, dynamic loads, and neutral axis.
- **Material Strengthening Techniques:** Reinforcement, stiffening, flexibility, lamination, folding, webbing, interfacing, and composite materials (FRP, GRP, Kevlar, reinforced concrete).
- **Structural Elements & Bridges:** Strut (compression member), tie (tension member), truss, triangulation, cantilever, arch, and suspension structures.
- **Testing & Mechanical Properties:** Yield strength, elasticity, ductility, brittleness, strength-to-weight ratio (bridge factor), destructive testing, and non-destructive testing (NDT).

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## Engineering - Programming Microcontrollers

- **Electronics & Circuit Basics:** Power supplies, polarity (anode, cathode), switches (SPST, Push-to-Make [PTM], Push-to-Break [PTB], latching, toggle, rocker), resistors (ohms Ω, 220Ω protective resistors, 10kΩ pull-up/pull-down resistors), Light Emitting Diodes (LEDs), potential difference, voltage, current, series circuits, and parallel circuits.
- **Systems Architecture:** Systems design (input, process/control, output), sub-systems, block diagrams, simulation mode, digital signals (logic level 0/1, high/low), and analogue signals.
- **Flowcharts & Programming Control:** Programmable Integrated Circuits (PICs / microcontrollers like GENIE), flowcharts (start/stop, decision blocks, output blocks), digital decision feedback loop, timing delays (Wait in seconds, Pause in milliseconds), open-loop vs. closed-loop systems, subroutines.
- **Displays & Audio Outputs:** Seven-segment displays (common anode vs. common cathode), Liquid Crystal Displays (LCDs), increment (+1), decrement (-1), random number generation, Piezo transducers, buzzers, speakers.

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## Food and nutrition -

- **Advanced Practical Skills & Culinary Processes**

  Mise en Place, Gluten Development, Kneading, Proving, Knock Back, Roux Sauce & Starch Thickening, Shortcrust Pastry & Shortening, Whisking Method, Fatless

Sponge, Enrobing, Time Planning & Contingencies, Organoleptic Qualities, Garnish & Accompaniments

- **Food Science & Physical / Chemical Properties**

  Gelatinisation, Dextrinisation, Yeast Fermentation, Coagulation, Foam Formation, Viscosity

- **Microbiology, Hygiene & Food Safety ("Invisible Killers")**

  Pathogens, Temperature Danger Zone (5°C – 63°C), High-Risk Foods, Cross-Contamination, Critical Control Prevention Methods, Bacterial Pathogens (Salmonella, Campylobacter, E. coli, Listeria, Bacillus Cereus, Staphylococcus Aureus, Clostridium Perfringens), Allergens & Anaphylaxis, Food Intolerance, Visible vs. Non-Visible Symptoms

- **Nutrition & Metabolism**

  Macronutrients & Micronutrients, Starchy / Complex Carbohydrates, Simple Carbohydrates, High Biological Value (HBV) Protein, Low Biological Value (LBV) Protein, Saturated & Unsaturated Fats, Dietary Fibre

- **Provenance, Ethics, Sustainability & Food Waste**

  Provenance, Seasonality, Food Miles, Carbon Footprint, The Waste Hierarchy (Reduce, Reuse, Recycle / Compost), Food Quality & Assurance Logos (Red Tractor,, Fairtrade, Marine Stewardship Council / MSC, RSPCA Assured), Food Redistribution & "Wonky Veg"

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## Textiles -

Dye resist
Batik
Shears
Quick unpick
Tjanting tool
Stitch
Natural
Synthetic
Cotton
Polyester
Repeat pattern
Applique
Sublimation printing
Seam allowance

Paper pattern
Bio-degrade
Sustainability