Component 1 — Assignment

This comparison table shows those topic areas within materials and manufacturing study and/or activities most likely to be observed within the Assignment. These tables must be read in conjunction with the published versions of the respective Course Assessment Specifications (CAS) for National 5 and Higher Design and Manufacture.

	National 5		Higher		Cuts across N5/Higher		Not applicable in this component at this level

Materials and manufacturing topic areas (from CAS)

National 5			Higher		
Planning for manufacture Application of planning techniques as required by the response to a brief		Preparing materials, planning for practical tasks, assembly, selecting appropriate tooling and finishes, reading of working drawings and diagrams, including an appreciation of orthographic projection.	**Planning for manufacture**	**Production and planning systems**	One-off, batch, mass, line, flow. Gantt charts, flow charts, project planning, JIT, jigs, patterns, standard components, CAD/CAM, CNC machining (automation) and rapid prototyping.
Tools, materials and processes The use of appropriate tools, materials and processes , as required, in the manufacturing of a prototype as required	**Knowledge and understanding of common tools and equipment**	A range of common and acceptable hand tools for: Measuring, marking, cutting, shaping and forming of materials A range of common and acceptable tools or equipment for: holding, clamping and restraining materials	**Materials and processes**	**Plastics(including composites)**	Polythene (high and low density), polyvinyl chloride, polystyrene, nylon, cellulose acetate, acrylic, polypropylene, ABS, epoxy resin, melamine formaldehyde, urea formaldehyde, polyester resin, glass-reinforced plastic, carbon-fibre plastics, elastomers including, where appropriate, labelling and symbols.

		A range of common and acceptable machine tools for: Sanding, shaping, drilling or other similar activities		**Metals**	Mild steel, carbon steel, stainless steel, high-speed steel, cast iron, brass, bronze, aluminium and aluminium alloys, copper, tin, lead, zinc.
				Woods	Beech, oak, ash, mahogany, teak, walnut, balsa, Scots pine, red cedar, Parana pine, spruce.
				Timber derivatives	Manufactured boards- fibreboards, plywood, block-board, chip-board, hard-board, and veneer.
	Fixing and joining techniques	A range of standard and recognised jointing/joining techniques for woods, metals and plastics including thermal joining and adhesive bonding			
	Metalworking and associated processes	Cutting, shearing, notching, parallel and step turning, taper turning, drilling, knurling, annealing, hardening, tempering, filing, folding, bending, fitting and fixing, and in industry — casting, die-casting.		**Metal processes**	Cutting, turning, milling, die-casting, sand casting, lost wax casting, pressing, stamping, punching, extrusion, spot welding, arc welding, adhesive bonding, riveting , fitted joints, bolts, screws, piercing and blanking, drop forging, finishing.

	Woodworking and associated processes	Cutting, sizing, drilling, shaping, turning.		**Wood processes**	Cutting, drilling, turning, routering, laminating, spindle moulding, adhesive bonding, knock-down fittings, finishing.
	Plastic work	Cutting, drilling, filing, forming, bending and twisting, moulding and, in industry, vacuum forming, injection moulding, and rotational moulding.		**Plastic processes**	Cutting, injection-moulding, extrusion, rotational moulding, vacuum-forming, blow-moulding, laminating, joining, compression moulding, calendering, casting, bending, fabrication, coating, forming, adhesive bonding, finishing.
				Identification of commercial processes	Form, material, split lines, injection points, ejector points, shrinkage, draft angle, intricate form, clean and precise, flash, thinning of sheet material, shear marks, cross-section over length, surface finish (texture/detail).
	Surface finishing	Sanding/abrading, polishing, varnishing, oiling, staining, waxing, painting/lacquering, dip coating.			

The properties of common materials In supporting design proposals, in response to a brief, and selecting appropriate materials for a prototype	Softwoods, hardwoods, manufactured boards, ferrous and non-ferrous metals, thermoplastics and thermosetting plastics.		**Properties of materials**	Justification of the selection of materials based upon their properties in the design, manufacturing and use of products.
Health and safety Adherence to safe working practice when undertaking design and manufacturing tasks	Safe working practices and systems applicable to manufacturing activities, workshops or environments.			
		Society, environment and the world of work	**The impact of design and manufacturing technologies on society and the environment and the world of work**	Energy efficiency, sustainability, pollution, materials innovation, design for recyclability, design for re-use.

Component 2 — question paper

The purpose of the question paper is to assess the learner's ability to retain and integrate knowledge and understanding from across the Course.
The question paper Component of Course Assessment will require learners to draw upon and apply knowledge and understanding of a sample from the topic areas listed below.

	National 5		Higher		Cuts across N5/Higher		Not applicable in this component at this level

Design topic areas		National 5	Higher
Members of a design team		Designers, market researchers, accountants, engineers, manufacturers, marketing teams, ergonomists, consumers, retailers, economists.	Designers, market researchers, accountants, engineers, manufacturers, lawyers, materials technologists, production specialists, marketing teams, ergonomists, consumers, retailers economists, sub-contractor. Relationships between team members and types of teams.
Design process **The uses and/or roles (or function) of key elements within the processes of designing.**	**Identification of a problem**	Situation analysis, needs and wants, and product evaluation.	
	Brief	Statement of problem, target market, design brief analysis.	Purpose, statement of problem, target market. Open brief, closed brief. Design brief analysis.
	Research	Such as use of search engines, measuring and recording, asking questions, surveys, using data.	Sources of recorded and non-recorded information, methods of gathering information. Analysis, application and presentation of researched material
	Specification	Generation of a specification.	Types and purpose of specifications: brief, product design specification, performance specification, marketing specification and technical specification. Application of researched material to produce a product design specification.

	Idea generation	Morphological analysis, thought showers, technology transfer, analogy, and lateral thinking. Application of idea generation techniques. Mood and lifestyle boards.	
	Development and refinement of ideas	Synthesis of ideas. Justification and recording of decisions taken. Presentation techniques. Modelling techniques.	
	Evaluation	Surveys, user trials, comparisons with specifications and standards, the concept of function and fitness for purpose.	Surveys, questionnaires, user trips/trials, observation, testing, test rigs, comparison to other products, and comparison to specification. Application of evaluation techniques, presentation of results.
Design factors The role of key design factors as they influence design and manufacturing decisions and activities	**Function**	Primary and secondary functions, fitness for purpose.	Primary and secondary functions, fitness for purpose, safety in use.
	Performance	Ease of maintenance, strength and durability, ease of use, material selection, construction, size.	Design for re-use, for recycling, planned obsolescence, value for money, ease of maintenance, environmental aspects.
	Market	Consumer demands, social expectations, niche marketing, branding, introduction of new products, product life cycle, needs, wants, technology push, market pull.	
	Aesthetics	Shape, proportion, size, colour, contrast, harmony, texture, materials, fashion.	Factors influencing aesthetics (line, shape, form, colour, proportion, contrast, pattern, texture, harmony, balance), influences of fashion, market trends, style
	Ergonomics	Establishing critical sizes, basic understanding of how humans interact with products, anthropometrics.	Anthropometrics, psychology, physiology.

Communication techniques and modelling The purpose and role of communication as an integral part of designing	**Graphic techniques**	Working drawings, annotated sketches and drawings, perspective sketches, illustration and presentation techniques, scale and proportion, simple orthographic drawings.	The role of graphic techniques in communicating design ideas.
	Range of modelling techniques and materials	The role of simple modelling as it supports designing — scale models, mock-ups, fully crafted prototypes, computer generated models. Use of appropriate modelling materials such as paper, card, corrugated card, MDF, wire, pipe cleaners, foam, clay, modelling compound, balsa wood, expanded foam, sheet plastic, construction kits, smart materials.	The role of modelling as it supports designing.
The impact of design technologies on the society and the environment		Rise of consumerism, affordable and accessible products, and potential impact of design and manufacturing decisions on society and the environment.	Energy efficiency, sustainability, pollution, materials innovation, design for recyclability, design for re-use, employment patterns, consumer choices and new or different skills required.

Materials and manufacturing topic areas (from CAS)

Learners should be able to demonstrate knowledge of materials and processes used in the commercial manufacture of products. They should be able to demonstrate knowledge of the characteristics of materials which make them suitable for producing particular products. They should be able to identify materials used in existing products and apply their knowledge of materials to the design of new products. It should be noted that learners may refer to materials outside of the list given providing the material has appropriate characteristics for the intended use.

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National 5			Higher		
Planning for manufacture Application of planning techniques as required by the response to a brief		Preparing materials, planning for practical tasks, assembly, selecting appropriate tooling and finishes, reading of working drawings and diagrams, including an appreciation of orthographic projection.	**Planning for manufacture**	**Production and planning systems**	One-off, batch, mass, line, flow. Gantt charts, flow charts, project planning, JIT, jigs, patterns, standard components, CAD/CAM, CNC machining (automation) and rapid prototyping.
Tools, materials and processes The use of appropriate tools, materials and processes , as required, in the manufacturing of a prototype as required	**Knowledge and understanding of common tools and equipment**	A range of common and acceptable hand tools for: Measuring, marking, cutting, shaping and forming of materials A range of common and acceptable tools or equipment for: holding, clamping and restraining materials	**Materials and processes**	**Plastics(including composites)**	Polythene (high and low density), polyvinyl chloride, polystyrene, nylon, cellulose acetate, acrylic, polypropylene, ABS, epoxy resin, melamine formaldehyde, urea formaldehyde, polyester resin, glass-reinforced plastic, carbon-fibre plastics, elastomers including, where appropriate, labelling and symbols.

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				Woods	Beech, oak, ash, mahogany, teak, walnut, balsa, Scots pine, red cedar, Parana pine, spruce.
				Timber derivatives	Manufactured boards- fibreboards, plywood, block-board, chip-board, hard-board, and veneer.
	Fixing and joining techniques	A range of standard and recognised jointing/joining techniques for woods, metals and plastics including thermal joining and adhesive bonding			
	Metalworking and associated processes	Cutting, shearing, notching, parallel and step turning, taper turning, drilling, knurling, annealing, hardening, tempering, filing, folding, bending, fitting and fixing, and in industry — casting, die-casting.		**Metal processes**	Cutting, turning, milling, die-casting, sand casting, lost wax casting, pressing, stamping, punching, extrusion, spot welding, arc welding, adhesive bonding, riveting , fitted joints, bolts, screws, piercing and blanking, drop forging, finishing.

	Woodworking and associated processes	Cutting, sizing, drilling, shaping, turning.		**Wood processes**	Cutting, drilling, turning, routering, laminating, spindle moulding, adhesive bonding, knock-down fittings, finishing.
	Plastic work	Cutting, drilling, filing, forming, bending and twisting, moulding and, in industry, vacuum forming, injection moulding, and rotational moulding.		**Plastic processes**	Cutting, injection-moulding, extrusion, rotational moulding, vacuum-forming, blow-moulding, laminating, joining, compression moulding, calendering, casting, bending, fabrication, coating, forming, adhesive bonding, finishing.
				Identification of commercial processes	Form, material, split lines, injection points, ejector points, shrinkage, draft angle, intricate form, clean and precise, flash, thinning of sheet material, shear marks, cross-section over length, surface finish (texture/detail).
	Surface finishing	Sanding/abrading, polishing, varnishing, oiling, staining, waxing, painting/lacquering, dip coating.			

The properties of common materials In supporting design proposals, in response to a brief, and selecting appropriate materials for a prototype	Softwoods, hardwoods, manufactured boards, ferrous and non-ferrous metals, thermoplastics and thermosetting plastics.		**Properties of materials**	Justification of the selection of materials based upon their properties in the design, manufacturing and use of products.
The impact of manufacturing technologies and activities on the world of work and society	Reduction in workforce, skilled workforce, cost of equipment, impact on environment (energy and pollution) and the measures that can be taken to support sustainability	**Society, environment and the world of work**	**The impact of design and manufacturing technologies on society and the environment and the world of work**	Energy efficiency, sustainability, pollution, materials innovation, design for recyclability, design for re-use.