Module 3 - PAPERS AND BOARDS

3.1 Design contexts

3.1.1 When designing or modifying a product, students should be able to apply their knowledge and understanding of papers and boards, components and manufacturing processes.

3.2 The sources, origins, physical and working properties of papers and boards and their social and ecological footprint

*To apply knowledge and understanding of the advantages, disadvantages and applications of the following materials, in order to be able to discriminate between them and select appropriately.*

3.2.1 Paper: a) copier paper (in topic 1) b) cartridge paper (in topic 1) c) tracing paper (in topic 1) d) bonded e) heat transfer printing paper (sublimation printing).

3.2.2 Board: a) folding boxboard (in topic 1) b) corrugated board (in topic 1) c) solid white board (in topic 1) d) foil-lined board.

3.2.3 Packaging laminate (including Tetra Pak™): a) paperboard b) polyethylene c) aluminium foil.

3.2.4 Sources and origins – where paper and boards are resourced/manufactured and their geographical origin: a) China, USA, Japan – pulp, paper and cardboard b) Eastern Asia – rice paper.

3.2.5 The physical characteristics of each type of paper and board: a) density b) transparency c) texture.

3.2.6 Working properties – the way in which each material behaves or responds to external sources: a) flexibility (in topic 1) b) printability (in topic 1) c) biodegradability (in topic 1) d) weight e) surface finish f) printability g) absorbency.

3.2.7 Social footprint: a) trend forecasting b) impact of material production on communities and wildlife c) impact of logging and material production on communities and wildlife d) recycling/disposal – ethical responsibility e) reduction of packaging materials – reduction in litter/waste/energy use f brand identity – consumerism, changing the packaging of products over time.

3.2.8 Ecological footprint: a) sustainability b) harvesting and erosion of the landscape c) processing d) transportation e) wastage f) pollution.

3.3 The way in which the selection of papers and boards is influenced

*The influence of the following factors when selecting materials for a specific application.*

3.3.1 Aesthetic factors: a) form b) colour c) texture d) surface graphics (across all areas).

3.3.2 Environmental factors: a) sustainability b) pollution c) genetic engineering.

3.3.3 Availability factors: a) use of stock materials b) use of specialist materials.

3.3.4 Cost factors: a) quality of material b) decorative techniques c) manufacturing processes necessary d) commodity price e) cost of recycling in comparison to cost of production from raw materials.

3.3.5 Social factors: a) use for different social groups b) trends/fashion c) popularity.

3.3.6 Cultural and ethical factors: a) avoiding offence b) suitability for intended market c) use of colour and language d) the consumer society e) the effects of mass production f) built-in product obsolescence.

3.4 The impact of forces and stresses on papers and boards and how they can be reinforced and stiffened

*An awareness of the influence of forces and stresses that act on materials and the methods that can be employed to resist them.*

3.4.1 Forces and stresses: a) bending b) torsion c) shear d) compression.

3.4.2 Reinforcement/stiffening techniques: a) laminating b) encapsulation c) corrugation d) additions of layers and ribs e) sandwich construction f) packaging laminates.

3.5 Stock forms, types and sizes in order to calculate and determine the quantity of papers and boards required

*To apply knowledge and understanding of the advantages, disadvantages and applications of the following forms/sizes of materials, in order to be able to discriminate between them and select appropriately.*

3.5.1 Stock forms/types: a) weights b) bond c) laminates.

3.5.2 Sizes: a) common A sizes b) foolscap c) B series d) letter e) envelope f) area g) diameter.

3.6 Alternative processes that can be used to manufacture paper and board products to different scales of production

*Application, advantages and disadvantages, of the following processes, scales of production and techniques when manufacturing products, in order to be able to discriminate between them and select appropriately for use.*

3.6.1 Processes: a) printing b) cutting c) intermediate modelling of paper and card prototypes d) frame modelling e) test modelling.

3.6.2 Scales of production: a) one off b) batch c) mass production d continuous.

3.6.3 Techniques for quantity production: a) marking-out methods (use of reference points, lines and surfaces) b) jigs for folding c) fixtures d) templates e) patterns f) stencils g) photocopying h) computer-aided manufacturing (CAM) i) quality control j) working within tolerance k) efficient cutting to minimise waste.

3.7 Specialist techniques, tools, equipment and processes that can be used to shape, fabricate, construct and assemble a high-quality paper and board prototype

*Application, advantages and disadvantages, of the following specialist techniques when manufacturing products, in order to be able to discriminate between them and select appropriately for use.*

3.7.1 Tools and equipment: a) hand tools b) machinery c) digital design and manufacture.

3.7.2 Shaping: a) cutting b) folding c) notching d) modelling e) manipulation.

3.7.3 Fabricating/assembling/constructing: a) strengthening b) addition of dissimilar materials – windows, inserts, stickers, temporary components c) lamination d) use of split pins e) use of mapping pins f) stapling g) taping h) paper engineering i) use of adhesives j) lettering k) binding l) marking-out tools.

3.8 Appropriate surface treatments and finishes that can be applied to papers and boards for functional and aesthetic purposes

*Application, advantages and disadvantages of the following finishing techniques and methods of preservation, in order to be able to discriminate between them and select appropriately for use.*

3.8.1 Surface finishes and treatments: a) varnishing b) hot foil blocking c) edge staining d) embossing e) UV varnishes f) packaging laminates and films.