

## **2 4 2 Graphical Communication**

## **2 4 3 Computer-generated graphics**

## **2 4 4 Modelling and prototyping**

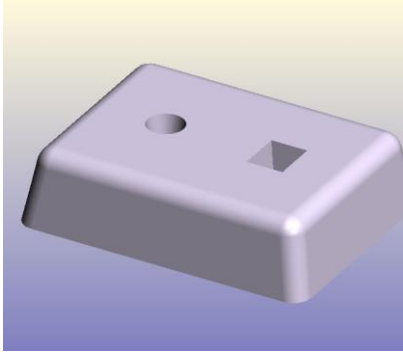
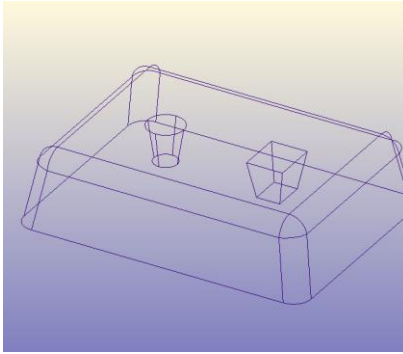
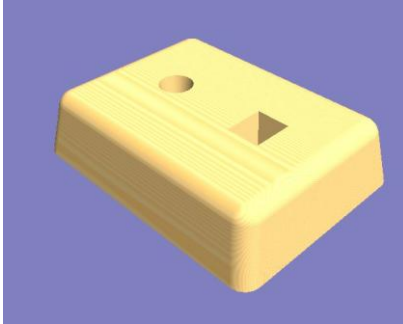
## **2 4 6 Industrial and commercial processes**

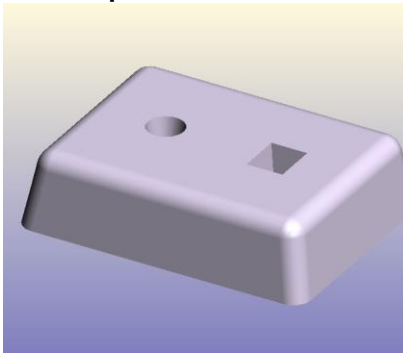
### **Preparation**

- Read pages 49 – 56; 58 - 60

### **Resources**

- Worksheet (printer friendly version below)
- A3 ink jet paper
- CNC Mill
- Card printer
- Plotter cutter
- Bland Graphical Communication book 1 and 2
- Collins CDT: Design and Communication
- Desk tidy prototype
- Workshop access
- Modelling materials

	<b>Project procedure</b>	<b>Text book</b>	<b>Resources</b>
1	<p>Decide on a design for a single component, solid product of your choice.</p> <ul style="list-style-type: none"> <li>- flat base, sloping sides, rounded edges, suitable for machining on a CNC mill</li> <li>- ensure machining feasibility</li> </ul> <p>The product is to be packaged                      The product will be vacuum formed at a later date</p>	55 - 56	<ul style="list-style-type: none"> <li>• Design example  </li> <li>• Wire frame  </li> <li>• Solid model example  </li> </ul>
	The product is to be packaged	58 - 59	

<p>Sketch model the product</p> <ul style="list-style-type: none"> <li>- use appropriate modelling materials</li> <li>- include the items to be stored in the recesses when modelling</li> </ul>	<p>54</p>	<p><a href="http://www.technologystudent.com/rddes1/model1.html">http://www.technologystudent.com/rddes1/model1.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/model2.html">http://www.technologystudent.com/rddes1/model2.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/model3.html">http://www.technologystudent.com/rddes1/model3.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/model4.html">http://www.technologystudent.com/rddes1/model4.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/model5.html">http://www.technologystudent.com/rddes1/model5.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/modmat1.html">http://www.technologystudent.com/rddes1/modmat1.html</a></p> <p><a href="http://www.technologystudent.com/rddes1/modemat2.html">http://www.technologystudent.com/rddes1/modemat2.html</a></p>
<p>Draw the product using a CAD package, eg ProDESKTOP</p>		<ul style="list-style-type: none"> <li>• Design example</li> </ul> 
<p>Export the geometry in a suitable machining format</p>	<p>55</p>	<ul style="list-style-type: none"> <li>• Stereolithography (4 pages in all, follow the links) <a href="http://www.technologystudent.com/cam/prn3d1.htm">http://www.technologystudent.com/cam/prn3d1.htm</a></li> <li>• More rapid prototyping examples <a href="http://www.designandtech.com/RP/index.html">http://www.designandtech.com/RP/index.html</a></li> <li>• Motorola video on YouTube <a href="http://www.youtube.com/watch?v=s3gHHeD6cv8">http://www.youtube.com/watch?v=s3gHHeD6cv8</a></li> <li>• Motorola video <a href="http://www.motorola.com/testseries/stereolithography1.html">http://www.motorola.com/testseries/stereolithography1.html</a></li> </ul>

	Machine the product Post processing finishing		•
	Use a photo editing package, eg Fireworks to design your art work and export as a .jpg file	53	
	Design a net to package the product above - read and comply with all the points of detail in the text book	58 – 59 52	<ul style="list-style-type: none"> <li>• Commercial D&amp;T programme Package Designer</li> <li>• Commercial D&amp;T programme Packaging Industry</li> </ul>
	Draw the net using a 2D Design programme, eg 2D Design Tools Load the A3 registration marks Apply the art work		
	Print the art work on the A3 printer using the registration marks		
	Cut the net on the plotter cutter		
	Assemble the package with the 3D product inside		

<p>Draw the made product in</p> <ul style="list-style-type: none"><li>• Isometric</li><li>• 2 point perspective</li><li>• Planometric (axonometric)</li><li>• 3<sup>rd</sup> angle orthographic drawing</li></ul>	<p>50 - 52</p>	<p><b>Bland 1</b></p> <ul style="list-style-type: none"><li>• p 60 Isometric</li><li>• p 86 3<sup>rd</sup> angle Orthographic</li></ul> <p><b>Bland 2</b></p> <ul style="list-style-type: none"><li>• p 13 2 point Perspective</li><li>• p 24 Planometric</li></ul> <ul style="list-style-type: none"><li>• Also Collins <b>CDT:Design and Communication</b></li></ul>
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### **Wider study in addition to the project resources**

- Table 2 12 Pictorial and working drawing methods
- Table 2 13 3D modelling techniques
- Table 2 15 Stages in the commercial production of packaging nets
- Drawing techniques <http://www.technologystudent.com/designpro/drawdex.htm>  
<http://www.designandtech.com/graphics>
- Model examples <http://www.technologystudent.com/prddes1/sample1.html>  
<http://www.technologystudent.com/prddes1/modcard1.html>  
<http://www.technologystudent.com/prddes1/archi1.html>  
<http://www.technologystudent.com/prddes1/compmd1.html>  
<http://www.technologystudent.com/prddes1/cmp1.html>

### **Assignment**

- Student project

### **Homework**

- As above

### **Revision questions**

- 1 Discuss the exploration/communication of ideas through block modelling:
- 2 Discuss CAD modelling for a virtual architectural interior
- 3 Discuss the advantages and disadvantages of the following modelling materials
  - Styrofoam
  - PVD sheets and rods
  - Balsa
  - 700g card
- 4 "Explain why CAD is a key part of the industrial design process"

## **Specification and Learning Objectives**

### **2 4 2 Graphical Communication**

Application, demonstration and advantages/disadvantages of the following graphical-drawing techniques:

- pictorial drawing methods for representing 3D forms
  - isometric
  - 2-point perspective
  - planometric (axonometric)
- working drawings for communicating 2D technical information
  - 3rd angle orthographic projection to BSI standards
  - nets
- translation from working drawings to pictorial drawings and vice versa
- translation from pictorial drawings to nets and vice versa.

### **2 4 3 Computer-generated graphics**

The application, advantages/disadvantages of computer generated graphics in the design and production of graphic products:

- use of desktop publishing (DTP) to create and modify designs and layouts for printed materials
- process of 2D image creation and manipulation.

### **2 4 4 Modelling and prototyping**

Processes, application and advantages/disadvantages of the following 2D/3D models and prototype to aid the development of

- graphic products:
- block modelling
- rapid prototyping using CAD/CAM
- computer modelling for creating photo realistic images and
- 'virtual' products using wire frame, surface modelling and solid modelling.

### **2 4 6 Industrial and commercial processes**

Production and advantages/disadvantages of the following processes for creating structural packaging nets for containing,

- protecting, dispensing and advertising products:
- designing and creating nets using hand-drawn and CAD
- methods
- commercial automated production of packaging nets using diecutting,
- folding, scoring and spot gluing.

## **Solutions to revision questions**

**Next page**

1 Discuss the exploration/communication of ideas through block modelling:

- These are made (used) to help determine shape (2D/3D), dimensions & surface finish
- They are accurate representations of the external appearance of the product
- They show external details (features) such as: screws, joints, surface texture and colour
- This type of model does not deal with internal detail (such as moving or working parts)

2 Discuss CAD modelling for a virtual architectural interior

- Useful tool for the visualisation of the design
- The building interior can be modelled on screen
- Internal/external layout can be shown on screen
- Different materials & colour schemes can be readily shown
- Different times of the day/year, weather & sun positions can be easily shown
- A wide variety of camera (viewing) angles can be explored
- The client can 'walk' round & through the building (virtually)
- Ready access to import data
- Time & cost savings to all involved
- Scale of modelling can be easily altered (time/cost/savings)
- Comment about animation is acceptable
- Advantages of CAD
- Designs can easily be modified on screen without the need for re-drawing
- Designs can be stored electronically and easily retrieved
- Design data can be directly outputted to printers of CAM equipment

3 Discuss the advantages and disadvantages of the following modelling materials

- Styrofoam
- PVD sheets and rods
- Balsa
- 700g card

Styrofoam

- Properties – lightweight, dry, powdery, rigid, easily shaped
- Joining difficulties – quickly absorbs flue, not dense enough to hold pins, delicate edges easily wear away

PVC sheets and rods

- Properties – Thermoforming, easily shaped by vacuum forming or strip bending, can be transparent, surface can be polished to high sheen, hard and rigid.
- Joining difficulties - special adhesive required, adhesive requires care against fumes, adhesive melts surface so cannot be cleaned off area surrounding a joint.

Balsa

- Properties - lightweight, rigid along the grain, adhesive
- requires care against fumes and is flammable, holes or pins near an edge will cause splits.

700g card

- Properties - colour available, flexible and can be folded, even strength throughout, can tear and become soft when wet.
  - Joining difficulties - large surface contact required by adhesive, strength is needed to hold curves and folds in position, special joints required with bulky lugs and flaps.
- 4 "Explain why CAD is a key part of the industrial design process"
- Enables fast turn-around of ideas
  - Designers can test and modify ideas in 2D before manufacture
  - Designers can simulate products on screen in 3D to produce virtual products
  - Virtual products can be evaluated before manufacture
  - Reduces the need for sampling products before manufacture
  - Saves resources, time and costs

Printer friendly worksheet

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**2 4 3 Computer-generated graphics**

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**2 4 6 Industrial and commercial processes**

**Resources** Refer to the on line project procedure and use the links therein

	<b>Student project procedure</b>	<b>Text book reference</b>
1	<ul style="list-style-type: none"> <li>• Decide on a design for a single component, solid product of your choice.                             <ul style="list-style-type: none"> <li>- flat base, sloping sides, rounded edges, suitable for machining on the mill</li> <li>- ensure machining feasibility</li> <li>- the product is to be packaged</li> <li>- the product will be vacuum formed at a later date</li> </ul> </li> </ul>	55 – 56
	<ul style="list-style-type: none"> <li>• The product is to be packaged</li> </ul>	58 – 59
	<ul style="list-style-type: none"> <li>• Sketch model the product                             <ul style="list-style-type: none"> <li>- use appropriate modelling materials</li> <li>- include the items to be stored in the recesses when modelling</li> </ul> </li> </ul>	54
	<ul style="list-style-type: none"> <li>• Draw the product using a CAD programme, eg Pro/DESKTOP</li> </ul>	
	<ul style="list-style-type: none"> <li>• Export the geometry formatted for machining</li> </ul>	55
	<ul style="list-style-type: none"> <li>• Machine the product</li> <li>• Post processing finishing</li> </ul>	
	<ul style="list-style-type: none"> <li>• Use a photo editing programme, eg Fireworks to design your art work and export as a .jpg file</li> </ul>	53
	<ul style="list-style-type: none"> <li>• Design a net to package the product above                             <ul style="list-style-type: none"> <li>- read and comply with all the points of detail in the text book</li> </ul> </li> </ul>	58 – 59 52
	<ul style="list-style-type: none"> <li>• Draw the net using a 2D design programme, eg 2D Design Tools</li> <li>• Load the A3 registration marks</li> <li>• Apply the art work</li> </ul>	
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	<ul style="list-style-type: none"> <li>• Assemble the package with the 3D product inside</li> </ul>	
	<ul style="list-style-type: none"> <li>• Draw the made product in                             <ul style="list-style-type: none"> <li>• Isometric</li> <li>• 2 point perspective</li> <li>• Planometric (axonometric)</li> <li>• 3<sup>rd</sup> angle orthographic drawing</li> <li>• Print the net</li> </ul> </li> </ul>	50 - 52