## Processes & Manufacture

**Product Manufacture**
- How materials are cut, shaped & formed
- Difference between quality control & quality assurance
- Produce detailed working schedules to include:
  - Flow charts
  - Production plans
- Identify Critical points QA &
- Be able to evaluate quality of products to devise suitable modi-

**Industrial & Commercial Practice: Methods of Production**
- Scale of Production
  - One-off
  - Batch
  - Mass
  - Continuous
  - J.I.T (just in time)
- CAD/CAM
  - Hand tools
  - Machine tools

**Manufacturing Systems**
- Understand commercial manufacturing is a system or group of sub-systems requiring:
  - Special buildings or work places
  - Organisation of people
  - Organisation of tools & equipment
  - Risk assessment & compliance with health & safety
  - Organisation of materials
  - Information systems to help people communicate with
  - Changing shape & form to increase their usefulness
  - Using tools & equipment to transform materials into
  - Design & production of products in a systematic way
  - Quality assurance procedures & quality checks to be made
  - Ways of safely taking care of the unwanted
  - Efficient working methods
  - Outputs of manufacture: disposing & recycling
  - Ways of looking after the environment
- Use of ICT (Information & Communication Technology)
  - Understand how ICT facilitates manufacturing functions:
    - JIT
    - Video conferencing
    - Software sharing
    - Stock control
    - Data transfer
    - Remote manufacturing
    - Understanding the application of CNC (Computer Numeric Con-
    - Understand how CAD (Computer Aided-Manufacture) is used in
    - Understand how CAD/CAM allows for higher levels of accuracy.
- Manipulating & combining materials
  - How materials can be combined & processed to be more useful
  - How properties can be utilised in industrial contexts
  - How a range of materials can are prepared for manufac-
  - Finishes: aesthetic & functional
  - Pre-manufactured components & their uses
- New materials
  - Knowledge & understanding of new & smart materials:
    - Precious Metal Clays (PMC) used in jewellery manu-
    - Corn starch polymers used in packaging
    - Thermochromic pigments used in thermal warming
    - Shape memory alloys
    - Quantum Tunnelling Composite (QTC) used to incor-
  - Have an awareness of the importance of the develop-
  - Outputs of manufacture: disposing & recycling
  - Ways of looking after the environment

## Materials & Components

### Plastic

<table>
<thead>
<tr>
<th>Thermoplastics</th>
<th>Thermosetting plastics</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIPS</td>
<td>GRP</td>
</tr>
<tr>
<td>Expanded poly sty-</td>
<td>Epoxy Resin</td>
</tr>
<tr>
<td>acry-</td>
<td></td>
</tr>
<tr>
<td>Acetate</td>
<td>UF</td>
</tr>
<tr>
<td>HDPE</td>
<td>MF</td>
</tr>
<tr>
<td>PVC</td>
<td></td>
</tr>
</tbody>
</table>

### Properties & Characteristics

| Difference between thermoplastic & thermo-
| Sourcing                     |
| Conversion to a workable material |
| Properties                   |
| Rigidity, reduce weight, insulation |

### Forming

<table>
<thead>
<tr>
<th>Vacuum forming</th>
<th>Injection moulding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blow moulding</td>
<td>Line bending</td>
</tr>
<tr>
<td>Compression moulding</td>
<td>extrusion</td>
</tr>
</tbody>
</table>

### Stock forms

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pow-</td>
<td>granules</td>
</tr>
<tr>
<td>foam</td>
<td></td>
</tr>
</tbody>
</table>
### Design & Market Influences

**Evolution of Product Design**
- Development of ideas, materials & manufacturing processes
- Social changes
- Political changes
- Design movements
  - Art deco
  - Bauhaus
  - De Stijl
  - Arts & Crafts movement
  - Design movements
  - Continuous improvements
  - Technological push

**Design Influences**
- Design movements
- Design influences
- Manufacturing Industries (C.I.)

**Design in Practice; Product Development**
- Design Brief
- Specification
- Respond to research
- Inclusive design
- Accuracy in function
- Dimensions & tolerances
- ICT software
- Cad Modelling
- Copyright
- Patents
- Registered designs
- Designing starting points:
  - Natural form, pattern & structure
  - Geometry & maths
- Detailed product analysis
  - Cultural & religious influences

**Packaging**
- Materials
- Processes
- Environmental concerns
- Sustainability
- Functions of packaging:
  - Protect
  - Inform
  - Contain
  - Transport
  - Preserve
  - Display (promote)
- Product Labelling:
  - Hazards
  - Storage & handling
  - Maintenance
  - Disposal

**Product Marketing**
- Branding
- Advertising
  - Leaflets
  - Flyers
  - Point of sale displays
  - Packaging
  - Digital media

### Design in the Human Context

**Human Factors**
- Understand the wide range of human factors which can influence design, to produce inclusive products
- Access
  - Cultural anthropometrics
  - 5th—95th percentile
  - Influence of colour
- Social, economic & ethnic groups
  - Disabled
  - Religious groups
  - Manufacturing systems
    - Working triangles (kitchen)
    - Production lines
    - Assembly lines
- Safety
  - Safety with regard to themselves, manufacturer & user
  - Moral & Legal responsibility
  - Hazardous
  - Safety testing
  - Risk assessment

**Quality**
- Suitable quality for the user
  - Subjective criteria
  - Resource availability
  - Social factors
  - Cost
  - Commercial methods used to improve quality assurance
    - Quality circles
    - Team working
    - BS EN ISO 9000
    - Identify critical quality control points during development to improve products

**Packaging**
- Knowledge & understanding of factors relating to recycling/reusing materials or products:
  - Material identification
  - Material separation
  - Collection
  - Processing
  - Energy costs
  - Subsequent usage
  - Wastage

- Knowledge & understanding of governing environmentally friendly products, ‘Green Designs’ & identify them

**Ethical, Environmental & Sustainability Issues**
- Consider ethical, environmental & sustainability issues relating to:
  - Fair trade
  - Product miles
  - Carbon footprint
  - Product disposal
- Re-use
  - Re-cycle
- Repair
  - Reduce
- Rethink
  - Refuse

- Knowledge & understanding of consumer groups & pressure groups and the way products are evaluated
- Which? Reports
- Standards & Agencies, implications of standards in designing
  - ISO
  - BSI
- Product legislation