OCR Engineering Manufacturing

Manufacturing Processes

- Wasting
    - Sawing
    - Shearing
    - Drilling
    - Filing
    - Threading
    - Routing
    - Laser-cutting
    - Turning
    - milling
- Shaping
    - Sand casting
    - Die casting
    - Injection moulding
    - Powder metallurgy
- Forming
    - Forging
    - Press forming
    - Strip heating
    - Vacuum forming
    - moulding
- Additive process
    - 3D Printing (FDM)
- Joining
    - Brazing
    - MIG/MAG welding
    - Riveting
        - Hammer rivets
        - Pop rivets
    - Mechanical fastenings
        - Nuts & bolts
        - Self tapping screws
- Finishing
    - Painting
        - Brush
        - Spray
    - Powder coating

Engineering materials properties

- Strength
    - yield/ tensile
    - Compressive

- Elasticity
- Ductility
- Hardness
- Malleability
- Machinability
- Cost
    - Material
    - Manufacturing
- Sustainability

Types of Engineering Materials

- Metals
    - Ferrous
        - Cast iron
        - Low carbon steel
        - High carbon steel
        - Stainless steel
    - Non-ferrous
        - Aluminium alloys
        - Copper
        - Brass
        - Bronze
- Polymers
    - Thermoplastic
        - Acrylonitrile-Butadiene-Styrene (ABS)
        - High Impact Polystyrene (HIPS)
        - Polymethylmethacrylate (PMMA/ Acrylic)
        - Polycarbonate
        - Polylactic Acid (PLA)
    - Thermosetting Plastic
        - Urea formaldehyde
        - Melamine formaldehyde
        - Epoxy resin
        - Polyester resin
- Ceramics
    - Silicon carbide
    - Tungsten carbide
    - Silicate glass
- Composite Materials
    - Glass reinforced polymer (GRP/ fibreglass)
    - Carbon reinforced polymer (CRP)
- Smart Materials
    - Shape memory alloy
    - Thermochromatic pigment
    - Photochromic pigment
    - Quantum Tunnelling Composite (QTC)

Manufacturing Requirements

- Line types
    - Outlines
    - Hidden detail
    - Centre line
    - Projection
    - Dimension
    - Leader line
- Standard conventions for dimensions
    - Linear measurements
    - Radius
    - Diameter
    - Tolerances
    - Surface finish
- Abbreviations
    - Across flat
    - Centre line
    - Diameter
    - Drawing
    - Material
    - Square
- Representation of mechanical features
    - Threads
    - Holes
    - Chamfers
    - Countersink
    - Knurls
- Scales of manufacture
    - One-off
    - Batch
    - Mass
- Jigs
- Fixtures
- Templates
- Moulds
- Manual Control
- CAM processes
- Robotic control
- Quality control
- Quality Assurance
- Just in time manufacture (JIT)
- Materials Requirements Planning (MRP)
- Lean Manufacturing
- Environmental Material Impact