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|------------------------|---|
| Unit Title: | Materials and material application |
| OCR unit number | 10 |
| Level: | 2 |
| Credit value: | 7 |
| Guided learning hours: | 50 |
| Unit reference number | M/503/5863 |

Unit purpose and aim

This unit will develop learners' knowledge of materials and their suitability for given applications. Learners will experiment with a range of materials to identify their key characteristics.

Learners will identify suitable materials for different design applications.

| Learning Outcomes | Assessment Criteria | Teaching Content |
|---|--|---|
| <p>The Learner will:</p> <p>1 Know properties of materials</p> | <p>The Learner can:</p> <p>1.1 Describe the mechanical properties of materials:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • thermosetting plastics • Thermoplastic <p>1.2 Describe the electromagnetic properties of materials:</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • thermosetting plastics • thermoplastics <p>1.3 Describe the resistance properties of materials</p> <ul style="list-style-type: none"> • ferrous • non-ferrous • thermosetting plastics • thermoplastics | <p>Mechanical properties of materials:</p> <ul style="list-style-type: none"> ○ tensile strength ○ hardness ○ toughness ○ brittleness ○ malleability ○ ductility ○ elasticity <p>Electromagnetic properties of materials:</p> <ul style="list-style-type: none"> ○ conductivity ○ magnetism <p>Properties of materials in relation to their resistance against:</p> <ul style="list-style-type: none"> ○ corrosion ○ solvents ○ wear ○ environment |

| Learning Outcomes | Assessment Criteria | Teaching Content |
|--|--|---|
| 2 Know the standard supply form of materials | 2.1 Describe the form and supply for materials | <ul style="list-style-type: none"> • Through the study of products learners will identify the form and supply of materials: <ul style="list-style-type: none"> ○ bar stock ○ sheet materials ○ pipe/tube ○ wire ○ rolled steel sections ○ castings ○ forgings ○ mouldings ○ extrusions |
| 3 Be able to select materials for a product | 3.1 Select a suitable material for a specific product 3.2 Justify the materials selection through testing | <ul style="list-style-type: none"> • Through the study of products develop learners' knowledge of the properties of material selection. Explain reasons for material usage • Material testing: Demonstration of material testing techniques to establish: <ul style="list-style-type: none"> ○ hardness ○ impact ○ tensile ○ toughness ○ brittleness ○ malleability ○ ductility ○ elasticity |

Assessment

This unit is centre assessed and externally verified. In order to achieve the unit you must produce a portfolio of evidence which, on request, will need to be made available to the OCR external verifier. Portfolios of work must be produced independently and centres must confirm to OCR that the evidence is authentic.

Evidence requirements

For a given product or client brief, learners will:

- select suitable material(s) for product manufacture based upon their knowledge of material properties.
- undertake material testing to establish the suitability of the selected material for the application.
- consider the supply form of materials when selecting the material for the product. .

Learners will:

- present photographic evidence of the tests they have undertaken, supported with evaluative comments about the results.
- use this information to confirm their selection of a specific material.

Guidance on assessment and evidence requirements

Learners should be given the opportunity to experiment with a range of materials. It is not necessary for learners to undertake detailed, engineering material tests.

This unit enables learners to practically experiment with materials to gain real 'hands-on' experience of how the materials react under different conditions. Where possible the testing and practical application should be embedded into a design challenge with the aim that learners are testing materials for selection as final production materials. Alternatively, learners can be given a scenario. Delivery of this unit can be supported by material data sheets or information taken from material data websites. It is also advisable that learners spend time looking at existing products and the selection and identification of materials within these.

It is recommended that all learning outcomes for this unit are taught holistically.

National Occupational Standards (NOS) mapping/signposting

NOS can be viewed on the relevant Sector Skills Council's website or the Occupational standards directory at www.ukstandards.co.uk.

| Occupational standards | Unit number | Title |
|---|--------------|---|
| Engineering Technical Support Suite 2 2007 | TS2-02 | Using and Interpreting Engineering Data and Documentation |
| Mechanical Manufacturing Engineering Suite 2 2008 | O45NMM E2-02 | Using and Interpreting Engineering Data and Documentation |
| Mechanical Manufacturing Engineering Suite 2 2008 | O45NETS 3-02 | Using and Interpreting Engineering Data and Documentation |

Functional skills signposting

This section indicates where learners may have an opportunity to develop their functional skills.

| Functional Skills Standards | | | | | |
|-----------------------------|---|--------------|--|--|---|
| English | | Mathematics | | ICT | |
| Speaking and Listening | ✓ | Representing | | Use ICT systems | |
| Reading | ✓ | Analysing | | Find and select information | |
| Writing | ✓ | Interpreting | | Develop, present and communicate information | ✓ |

Resources

Equipment

For effective delivery of this unit centres should have access to the following resources and equipment.

- Computer system with Internet access, word processing, spread sheet, business presentation and photo manipulation software.
- Photography equipment for recording evidence.
- Document scanner.
- Model making equipment – sander, hot wire cutter, plastic sheet line bender, band saw, pillar drill. Hand tools – files, craft knives, sand paper, hand saw, hand drill, clay sculpting equipment, hot glue gun.

- Optional equipment – Milling machines, lathes, routers, vacuum forming machines, rapid prototyping equipment.
- Materials – a range of materials for analysis. E.g. Metals – steel, aluminium, copper, brass. Plastics – Acrylic, PVC, Nylon, ABS, polycarbonate. Woods – MDF, Pine, Oak.
- A range of testing equipment – e.g. impact, tensile, conductivity

Additional information

For further information regarding administration for this qualification, please refer to the OCR document '*Admin Guide: Vocational Qualifications*' (A850) on the OCR website www.ocr.org.uk .