-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **0064051** **-Session-1986-87**

-Superclass- **RC**

-Title- **MATERIALS: STRUCTURES AND PROPERTIES (X $^1/_2$)**

-DESCRIPTION-

Type and Purpose

A general module ($^1/_2$) which enables the student to develop his/her understanding of materials and their properties. There would be advantages in, studying this module in parallel with e.g. 04063 Materials: Mechanical Testing ($^1/_2$) and 04064 Inspection: Non-Destructive Testing Skills ($^1/_2$).

Preferred Entry Level

04050 Introduction to Materials ($^1/_2$).

Learning Outcomes

The student should:

1. relate relevant physical and chemical principles to the structure and properties of materials;
2. know how the characteristics and properties of ingots, mouldings and castings are linked to cooling and freezing phenomena;
3. for selected processes, investigate how materials are formed and the effects of the processes on the material properties;
4. comply with regulations and procedures and use safe working practices specified for equipment and work areas.

Content/ Context

Corresponding to the Learning Outcomes:

1. appreciation of: chemical bonding; crystalline and amorphous structures; allotropy; crystal growth. Cooling curves; formation of alloys; simple phase diagrams (eutectic and solid solution).

Polymerisation; heat transfer segregation; re-crystallisation; deformation of crystals; types of fracture. Typical structures and related properties.

2. ingot production.

   Effects of moulding processes used in the manufacture of metal, plastics, powder and composite components on the properties of the finished product; structure/property dependence.

3. investigation of selected material forming processes; their industrial applications; relationship between material properties, design and manufacturing processes.

4. safety regulations, procedures and working practices for laboratories and work areas.

Suggested Learning and Teaching Approaches

It is strongly recommended that the content should be integrated with practical exercises, demonstrations and case studies.

The approach should be student centred and include group discussions, contacts with industry and presentation of oral and written reports. Examples of practical work:

1. cast paraffin wax in glass mould and observe solidification; section and examine after solidification;

2. cast a low melting point metal under controlled conditions and examine the grain structure;

3. investigate the lead-tin alloy system - its application and use;

4. investigate plastic deformation using coloured plasticine blanks;

5. produce, examine and test cast and formed components.

Assessment Procedures

All learning outcomes must be validly assessed.

The student must be informed of the tasks which contribute to summative assessment. Any unsatisfactory aspects of performance should, if possible, be discussed with the student as and when they arise.

Acceptable performance in the module will be satisfactory achievement of the performance criteria specified for each learning outcome.

The following abbreviations are used below:

LO Learning Outcome IA Instrument of Assessment PC Performance Criteria

LO1 IA Short answer questions (written or oral).

PC The student satisfactorily describes the relationship between the structure and properties of materials in terms of their physical and chemical make up.

LO2 IA Short answer questions (written or oral).

PC The student satisfactorily explains how phenomena of solidification affect the characteristics and properties of materials.

LO3 IA Case study report and observation checklist.

PC For a specified artefact, the student:

(a) selects at least two manufacturing processes and makes reasonable predictions of their effects on material properties;

(b) outlines appropriate investigational procedures;

(c) carries out a simple test(s) correctly;

(d) presents valid conclusions.

LO4 IA Observation checklist (in which the following elements must be included).

PC The student consistently:

(a) wears all necessary safety clothing and equipment;

(b) behaves in a manner appropriate to the working environment;

(c) uses tools and equipment safely.