



# METALLURGY FOR NON-METALLURGISTS

The Metallurgy for Non-Metallurgists programme is designed for anyone who needs to know more about metals and processes used in their company.

It is part of a suite of programmes within the Metals Industry Skills Strategy, that have been developed by the metals industry and Metskill, to meet employer needs.

The programme can be adapted to specifically meet individual company needs.

# METALLURGY FOR NON-METALLURGISTS

## BUSINESS BENEFITS

The Metallurgy for Non-Metallurgists programme will enable participants to:

- communicate more effectively with technical colleagues
- be better informed and more efficient when dealing with customer enquiries
- avoid mistakes caused by lack of understanding
- understand the production, processing and testing of relevant metals and alloys
- appreciate the properties and applications of relevant industrial alloys

### Core Knowledge Components

<b>Introduction to microstructure</b> <ul style="list-style-type: none"> <li>• Solification</li> <li>• Grain structures</li> <li>• Crystal structures</li> <li>• Effect of alloying elements</li> <li>• Allotropy</li> </ul>	<b>Metal Properties</b> <ul style="list-style-type: none"> <li>• Strength</li> <li>• Ductility</li> <li>• Toughness</li> <li>• Hardness</li> <li>• Stiffness</li> <li>• Creep</li> <li>• Fatigues</li> <li>• Corrosion and oxidation</li> </ul>	<b>Mechanical Testing</b> <ul style="list-style-type: none"> <li>• Importance of testing</li> <li>• Impact testing</li> <li>• Hardness testing <small>Rockwell, Brinell and Vickers test</small></li> <li>• Tensile testing</li> <li>• Sheet metal formability</li> <li>• Sampling</li> </ul>
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### Extended Knowledge Modules

<b>Metal Processing</b> <ul style="list-style-type: none"> <li>• Extraction and refining</li> <li>• Casting</li> <li>• Rolling</li> <li>• Forging</li> <li>• Extrusion</li> <li>• Drawing</li> </ul>	<b>Hot and Cold Working</b> <ul style="list-style-type: none"> <li>• Casting defects</li> <li>• Reason for working</li> <li>• Effect or cold work on properties</li> <li>• Microstructure of worked products</li> <li>• Application to forging</li> <li>• Application to deep drawing and stretch forming</li> </ul>	<b>Heat Treatment</b> <ul style="list-style-type: none"> <li>• Microstructural changed</li> <li>• Effect of cooling rate</li> <li>• Reasons for heat treatment</li> <li>• Tempering and ageing</li> <li>• Surface hardening</li> <li>• Hot isostatic pressing</li> <li>• The effect of welding</li> </ul>	<b>Industrial Alloys</b> <p>A selection from:</p> <ul style="list-style-type: none"> <li>• Classification of alloys</li> <li>• Carbon steels</li> <li>• Alloys steels</li> <li>• Nickel alloys and superalloy</li> <li>• Titanium alloys</li> <li>• Copper alloys</li> <li>• Zinc alloys</li> </ul>	<b>Steelmaking and casting</b> <ul style="list-style-type: none"> <li>• Ore preparation</li> <li>• Making iron</li> <li>• BOS steelmaking</li> <li>• Secondary steelmaking</li> <li>• Steel integrity</li> <li>• Casting</li> </ul>
<b>Freezing and filling</b> <ul style="list-style-type: none"> <li>• Defects in casting</li> <li>• Impurities in metals</li> <li>• Removing gases</li> <li>• Running systems</li> <li>• Feeding systems</li> <li>• Cracking problems</li> </ul>	<b>NDT techniques</b> <ul style="list-style-type: none"> <li>• Internal examination                             <ul style="list-style-type: none"> <li>• Radiography</li> <li>• Ultrasonic inspection</li> </ul> </li> <li>• Surface examination                             <ul style="list-style-type: none"> <li>• Dye penetration testing</li> <li>• Magnetic particle inspection</li> <li>• Eddy current methods</li> </ul> </li> <li>• Visual inspection</li> </ul>	<b>Corrosion principles</b> <ul style="list-style-type: none"> <li>• Corrosion</li> <li>• Formation of corrosion cells</li> <li>• Factors affecting the rate of corrosion</li> <li>• Passivity</li> <li>• Effect of PH</li> <li>• Galvanic corrosion</li> <li>• Hydrogen induced cracking</li> </ul>	<b>Protective coatings</b> <ul style="list-style-type: none"> <li>• Methods of avoiding corrosion</li> <li>• Metallic coatings                             <ul style="list-style-type: none"> <li>• Deposition methods</li> <li>• Electroplating</li> <li>• Galvanising</li> <li>• Other metallic coatings</li> </ul> </li> <li>• Organic coatings</li> </ul>	<b>Markets and Applications</b> <ul style="list-style-type: none"> <li>• Output</li> <li>• Products</li> <li>• Applications</li> <li>• Trade (export &amp; import)</li> </ul>

## PROGRAMME CONTENT

Courses commence with delivery of core knowledge components and progress onto a series of extended knowledge modules (listed left). However, bespoke in-company courses can be customised by selecting specific modules or by combining relevant content from appropriate modules.

Specialist advice is available to select and combine course content to meet your needs.

## PROGRAMME DELIVERY

Courses take the form of participative workshops, led by an expert metallurgist with extensive metals industry experience.

The content, length and structure of the course will vary according to individual company needs. However, a typical course lasts two days. A folder of course materials is supplied.

Open courses may be available.

### Key

Core Knowledge Options
Open Course Extended Knowledge Options
Extended Knowledge Options

### For more details contact

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