# Mechanical Testing Techniques
## 1 Day Course

### Key Learning Objectives:
- Understand the meaning of terms such as strength, ductility, hardness and toughness
- Appreciate why compromise between high values of strength and toughness is necessary
- Understand the metal structural differences that give rise to continuous and discontinuous yielding
- Be familiar with parameters such as Young’s modulus (E), yield strength, 0.2 and 1.0% proof strength, UTS, ductility measures, engineering stress-strain, true stress-strain and work hardening index ‘n’
- Distinguish between ductile, brittle and intergranular failures
- Be able to interpret the test metrics displayed on mill certificates and specifications

### Who Should Attend:
This course suits managers and technicians responsible for the QA testing of metals & metal products. It is also relevant to designers, specifiers, sales people & buyers.

The course gives a grounding in the range of mechanical properties and associated metrics measured for metals together with detailed descriptions of the test methods and equipment used.

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### Section 1: Tensile Tests
- Tensile tests: parameters, sample preparation and types
- Gripping methods: screw, wedge, hydraulic and pneumatic
- Contact and non contact extensimeters
- Definitions for yield, 0.2 % and 1.0% proof strength, ductility measures and difference between engineering and true stress-strain
- Typical measurements for the 5 types of stainless steel

### Section 2: Ductile, Brittle and Intergranular Failure
- Deformation of ductile metals
- Brittle (or cleavage) fracture
- Ductile-brittle transition
- Crack propagation and crack arresting mechanisms
- Intergranular fracture
- Relevance of failure mechanism to stainless steel types and applications

### Section 3: Hardness Tests
- Macro Hardness tests: Brinell, Vickers, Rockwell; indenters and test conditions
- Relationship between hardness and grain size
- Microhardness tests: Vickers and Knoop
- Hardness conversion
- Typical values for 5 types of stainless steel
Section 4: Charpy Impact Tests

- Toughness: a definition
- Charpy and IZOD test procedures
- Sample types: full and sub-sized samples
- Test results: ductile-brittle transition temperature
- Role of microstructure; Differences in toughness of the 5 types of stainless steel

Charpy Impact Test Machines

Section 5: Fatigue and Creep Tests

- Fatigue in metals
- Fatigue testing: axial loading and rotating bend test machines
- Fatigue testing: stress-life (S-N), strain-life (\(\varepsilon\)-N) and fatigue crack growth rate (\(\frac{da}{dn}\)-\(\Delta K\)) approaches
- Stages of creep
- Creep mechanisms
- Creep and stress rupture testing
- Typical values for the 5 types of stainless steel

Servo Hydraulic Fatigue Testing Frame

Section 6: Comparison of Stainless Steel Properties with other Engineering Metals

- Mechanical and physical properties of stainless steel and,
- Aluminium alloys
- Titanium alloys
- Nickel alloys
- Copper and its alloys

Stress Strain Plot for Stainless Steel

Types of Other Metal Systems
Mechanical Testing Techniques - Booking Form

Please reserve the following places on the Mechanical Testing Techniques course:
BSSA Member (£190 + VAT) / Non-Member (£250 + VAT) (delete as appropriate)

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VAT (20%)
Grand Total

Please enter your details below:
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N.B. All invoices and event information will be emailed to this address

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  ☐ Mastercard ☐ Visa ☐ Maestro ☐ Other

Card No: ______________________
Security No: (last three digits on rear of card) __________
Valid From: _______ To: _______ Issue No: __________

NB: We require the cardholder’s registered address if different from the details given above:
Name on card ………………………………….. Signed ……………………… Date ……………………

Please complete the form and return to Association Administrator:
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