

# Metallurgy Courses by TCR Arabia

## Mechanical Metallurgy Laboratory – Level II Training (1/5)

This course covers the following topics:

### **Part III Applications to materials testing**

- Tensile test
- Hardness test
- Bend test
- Engineering Measurements
- Brittle fracture and impact testing
- Fatigue of materials
- Creep and stress rupture

This course aims to provide practical skills on mechanical testing of metals including hardness, tensile, torsion, creep, impact, bending and fatigue testing. Students are required to extract and interpret sensible information from mechanical test data as well as to give explanation on relationships between metallurgy of the metals and their mechanical properties.

### **Upon completing this course the students will have a good understanding on the subject area including:**

- Students will understand the principles and the use of engineering measurements by employing different measuring tools and methods in order to suit the desired applications.

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## Mechanical Metallurgy Laboratory – Level I Training (2/5)

- To understand the meaning of the measured values in engineering applications.
- Students will understand the principles of hardness testing, i.e., Rockwell, Brinell and Vickers hardness tests.
- Students are able to explain variations in hardness properties of selected materials such as aluminum, steel, brass and welded metals and can explain factors that might affect their hardness properties.
- Students can select appropriate macro-micro hardness testing techniques for suitable materials-property analysis.
- Students are able to analyze the obtained hardness values in relevant to the nature of each material to be measured and use this information as a tool for selecting suitable materials for engineering applications.
- Students will understand the principle of a uniaxial tensile testing and gain their practices on operating the tensile testing machine to achieve the required tensile properties.
- Students should be able to explain the causes of creep in metals, creep deformation and be able to indicate factors influencing creep behavior in metals.
- Students can analyze the obtained creep data and use it for the selection of appropriate engineering materials to prevent creep failures.

## Metallurgy Courses by TCR Arabia

### Mechanical Metallurgy Laboratory – Level I Training (3/5)

- Students are able to explain load-extension and stress-strain relationships and represent them in graphical forms.
- To evaluate the values of ultimate tensile strength, yield strength, % elongation, fracture strain and Young's Modulus of the selected metals when subjected to uniaxial tensile loading.
- Students can explain deformation and fracture characteristics of different materials such as aluminium, steels or brass when subjected to uniaxial tensile loading.
- Students will to study and understand the principle of impact testing using metals which are susceptible to brittle fracture such as mild steels.
- Types of fracture in metals are investigated using the fracture energy absorption criterion.
- Students can explain the meaning and use of Ductile-to-Brittle-Transition-Temperature Curve (DBTT) and explain the relationship between the absorbed energy of the specimen and its fracture surfaces. Identify the transition temperature of the tested materials.
- Students are capable of interpreting the obtained experimental data for the selection of engineering materials.
- Students will study the principles of bend testing, practice their testing skills and interpreting the experimental results of the provided materials when failed under three-point bending.

## Metallurgy Courses by TCR Arabia

### Mechanical Metallurgy Laboratory – Level I Training (4/5)

- Investigate responses of metals when subjected to bending
- Determine parameters such as bend strength, yield strength in bending and elastic modulus.
- Students can interpret the obtained test data and select appropriate engineering materials for their intended uses in order to prevent creep failures.
- Students will understand the principles of torsion testing, practice their testing skills and interpreting the experimental results of the provided materials when failed under torsion.
- To determine the maximum shearing stress, shear stress at proportional limit, shear modulus or modulus of rigidity and relationships between torque and degree of rotation of the tested materials.
- Students are able to differentiate the ability of materials such as cast iron and brass to withstand torque prior to torsion failure. Analysis and interpretation of the test parameters obtained should be carried out in relation to the failure nature of each material.
- Students are capable of selecting materials for engineering applications associated with torsion.
- Students will study the principal of creep testing and practice the testing procedure.



## Metallurgy Courses by TCR Arabia

### Mechanical Metallurgy Laboratory – Level I Training (5/5)

The duration of this course is 10 days and it is conducted by a Senior Metallurgist. Students will be given a course completion certificate at the end of this course.

All courses, unless specified in advanced with the client, will be conducted at the training facility located at: **TCR Arabia Limited | Gas Gardens, King Abdulaziz Seaport, Dammam, Saudi Arabia**