# COURSE PLAN

## FIRST: BASIC INFORMATION

| | |
|---|---|
| **College** | |
| College | : Faculty of Karak – AL-Balqa Applied University |
| Department | : Mechanical Engineering |
| **Course** | |
| Course Title | : Introduction to Metallic Materials |
| Course Code | : 020209132 |
| Credit Hours | : 2 (2 Theoretical, 0 Practical) |
| Prerequisite | : 020209131 |
| **Instructor** | |
| Name | : Dr. Jamil Haddad |
| Office No. | : |
| Tel (Ext) | : |
| E-mail | : drjamil@bau.edu.jo |
| Office Hours | : |

Class Times

| The building | today | Start time | End time | Hall number |
|---|---|---|---|---|
| | | | | |

**Text Book**

1) Materials for Engineers and Technicians By William Bolton, R.A. Higgins / 7th Edition

2) Materials Science and Engineering /An Introduction By William D. Callister, Jr. G. Rethwisch / EIGHTHE DITION

**References**

1. Engineering materials technology(William Bolton)
2. Engineering materials: Properties and applications of metals and alloys(C.P. Sharma)

## SECOND: PROFESSIONAL INFORMATION

**COURSE DESCRIPTION**

This course covers engineering metals, reasons for its selection and ferrous metals, Non-ferrous metal, non-metallic materials and its properties, metal structure and binary in materials, crystal structure of materials, general properties of metallic materials, materials testing, heat treatment of carbon steel, forming operation of metals, phase equilibrium diagram.

**COURSE OBJECTIVES**

The objectives of this course are to enable the student to do the following :

- Explain ferrous metal and its classification, explain non-ferrous metals,
- Ability to define materials testing and explain types of heat treatment with explaining phase equilibrium diagram
- Explain the forming of metals, techniques of metals and two types of casting
- Define and understand types of hot and cold working processing

## COURSE LEARNING OUTCOMES

On successful completion of this course, students are expected to be able to:

CLO1. Explain the requirements and structure of engineering materials, ferrous metal and its classification, explain non-ferrous metals
CLO2. Define materials testing including of tensile test, hardness test, impact test and fatigue test, etc.
CLO3. Explain types of heat treatment and its effectiveness on materials
CLO4. Explain Phase equilibrium diagram and draw it on alloys
CLO5. Explain the forming of metals, the forming techniques of metals
CLO6. Define casting and the two types of casting
CLO7. Define hot working and understand types of hot working
CLO8. Define cold working and list the cold working processing

## COURSE SYLLABUS

| Week | Unit | Content | Related L.O. and reference (Chapter ) | Proposed assignments |
|---|---|---|---|---|
| 1 | Engineering materials | • Introduction<br>• The requirements of materials<br>• Structure of materials | CLO1 | Text Book1 |
| 2 | Types of Metal Alloys | • Ferrous metal and its classification | CLO1 | Text Book 2 |
| 3 | Types of Metal Alloys | • Non-ferrous metals | CLO1 | |
| 4 | Materials testing | • The tensile test<br>• Hardness test<br>• Impact tests | CLO2 | Text Book1 |
| 5 | Materials testing | • Creep<br>• Fatigue test<br>• Other mechanical tests<br>• Factor of safety | CLO2 | |
| 6 | Thermal processing of metals | • Heat treatment and its effects | CLO3 | Text Book 2 |
| 7 | Phase equilibrium Diagram | • The phase equilibrium diagram (eutectic, soluble and combination types) | CLO4 | |
| 8 | **Midterm Exam** | | | |
| 9 | Forming | • Forming operations | CLO5 | Text Book 2 |
| 10 | Casting | • Ingot casting<br>• Sand casting<br>• Die casting<br>• Centrifugal casting<br>• Investment casting | CLO6 | Text Book1 |

| Week | Unit | Content | Related L.O. and reference (Chapter ) | Proposed assignments |
|---|---|---|---|---|
| 11 | Casting | • Full-mould process<br>• Semi solid metal processing<br>• The choice of casting process | CLO6 | |
| 12 | Hot working | • Definition, method and working process<br>• Forging | CLO7 | Text Book1 |
| 13 | Hot working | • Hot-rolling<br>• Extrusion | CLO7 | |
| 14 | Cold working | • Cold-rolling<br>• Drawing<br>• Cold pressing and deep drawing | CLO8 | |
| 15 | Cold working | • Spinning<br>• Stretch-forming<br>• Coining and embossing<br>• Impact extrusion | CLO8 | |
| 16 | **Final Exam** | | | |

## COURSE LEARNING RESOURCES

The effectiveness of teaching in this course depends on making students familiar with metals, reasons for its selection and ferrous metals, Non-ferrous metal, non-metallic materials and its properties, metal structure and binary in materials, crystal structure of materials, general properties of metallic materials, materials Testing, heat treatment of carbon steel, forming operation of metals, phase equilibrium diagram**.**

**Teaching methods:**

- Problem-solving skills: through application of these principles to basic engineering problems.
- Online research skills on topics related to course objectives and recent developments in the field of mechanical engineering (welding and plumbing).
- Learning skills and adaptability: Developed by transferring students and reconfiguring work teams to enable them to adapt to other individuals from time to time.

## ONLINE RESOURCES

1) Library Genesis (libgen.rs)

## ASSESSMANT TOOLS

| Assessment Tools | % |
|---|---|
| Projects and Quizzes | 20% |
| MID Exam | 30% |
| Final Exam | 50% |
| Total Marks | 100% |

## THIRD: COURSE RULES

## ATTENDANCE RULES

Attendance and participation are extremely important, and the usual University rules will apply. Attendance will be recorded for each class. Absence of 10% will result in a first written warning. Absence of 15% of the course will result in a second warning. Absence of 20% or more will result in forfeiting the course and the student will not be permitted to attend the final examination. Should a student encounter any special circumstances (i.e. medical or personal), he/she is encouraged to discuss this with the instructor and written proof will be required to delete any absences from his/her attendance records.

## GRADING SYSTEM

**Example:**

| Average | Maximum | Minimum |
|---|---|---|
| Excellent | 100% | 90% |
| Very Good | 89% | 80% |
| Good | 79% | 70% |
| Satisfactory | 69% | 60% |
| Weak | 59% | 50% |
| Failed | 49% | 35% |

## REMARKS

{The instructor can add any comments and directives such as the attendance policy and topics related to ethics}

## COURSE COORDINATOR

| | |
|---|---|
| **Course Coordinator** | **Department Head:** |
| **Signature:** | **Signature:** |
| **Date:** | **Date:** |