

Semester:	4				
Course Code:	CE2180				
Course Name:	Materials Science II				
Credit Value:	3 (Notional hours: 150)				
Pre-requisites:	CE1110				
Core/Optional	Core				
Hourly Breakdown	Lecture hrs.	Tutorial hrs.	Practical class hrs.	Assignment hrs	Independent Learning & Assessment hrs
	33	4	10	6	97

Course Aim: To introduce various methods for controlling the properties of different materials, identifying and preventing corrosion and selecting the best material in mechanical design.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- **describe** binary alloy systems, equilibrium microstructure and elementary deformation theory
- **apply** solidification theories in order to design castings of metals.
- **explain** Fe-C phase diagram, mechanisms of plastic deformation, slip systems and strengthening mechanisms to control microstructure of materials and heat treatment methods
- **identify** different types of corrosion processes and oxidation, protection against corrosion, wear and erosion
- **select** the most appropriate and suitable materials for different components based on material properties

Course Content:

- **Important binary alloy systems:** Prediction of equilibrium microstructure of different binary alloys using phase diagram
- **Elementary deformation theory:** Plastic deformation of materials, slip systems in crystalline solids
- **Casting and solidification of metals**
- **Physical metallurgy of steels and cast iron:** Fe-C diagram, TTT and CCT diagrams, Microstructural development during transformations from the liquid and solid states and during crystallization from solution; Microstructural control in materials processing via phase transformations,
- **Strengthening methods:** Heat treatment of steels, Case hardening of steels
- **Corrosion and corrosion prevention:** Surface properties of materials - degradation, oxidation, corrosion, friction and wear; use of corrosion charts and introduction to surface engineering
- **Materials selection:** Use of Materials Selection charts and performance indices in selecting materials in design

Teaching /Learning Methods:

Lectures, Laboratory classes, Group studies, presentations					
Assessment Strategy: Assignments/quizzes, Laboratory performance/ reports, Group study/presentation/short report , Mid semester examination, End semester examination					
Continuous Assessment 50%		Final Assessment 50%			
Details: Quizzes/ assignments 10% , Practicals ...10...% Mid Semester Examination- 25..% Other % (specify) Group study 5 %		Theor y (%) 50%	Practical (%)		Other (%) (specify) Group study
Recommended Reading: <ul style="list-style-type: none"> ➤ Ashby, M. F., Jones, D. R. H., (1996). “Engineering Materials 1: An introduction to the Properties and Applications”, 2nd Edition, Butterworth – Heinemann ➤ Ashby, M. F., Jones, D. R. H., (1998). “Engineering Materials 2: An introduction to Microstructures, Processing and Design”, 2nd Edition, Butterworth – Heinemann. ➤ Ashby, M. F., (2005). “Materials Selection in Mechanical Design”, 3rd Edition, Butterworth – Heinemann. ➤ Askeland, D. R., Fulay, P. P., Wright, W. J., (2010). “The Science and Engineering of Materials”, 6th Edition, Cengage Learning 					